

A
EC
C
D
E
F
G
H
I
J
K
L
M
N
O
P

SECTION EC

ENGINE CONTROL SYSTEM

CONTENTS

<p style="text-align: center;">VQ40DE</p> <p>BASIC INSPECTION14</p> <p>DIAGNOSIS AND REPAIR WORKFLOW14</p> <p style="padding-left: 20px;">Trouble Diagnosis Introduction 14</p> <p>INSPECTION AND ADJUSTMENT20</p> <p style="padding-left: 20px;">Basic Inspection20</p> <p style="padding-left: 20px;">Idle Speed and Ignition Timing Check24</p> <p style="padding-left: 20px;">Procedure After Replacing ECM24</p> <p style="padding-left: 20px;">VIN Registration25</p> <p style="padding-left: 20px;">Accelerator Pedal Released Position Learning25</p> <p style="padding-left: 20px;">Throttle Valve Closed Position Learning25</p> <p style="padding-left: 20px;">Idle Air Volume Learning25</p> <p>HOW TO SET SRT CODE28</p> <p style="padding-left: 20px;">Description28</p> <p style="padding-left: 20px;">SRT Set Driving Pattern29</p> <p style="padding-left: 20px;">Work Procedure31</p> <p>HOW TO ERASE PERMANENT DTC34</p> <p style="padding-left: 20px;">Description34</p> <p style="padding-left: 20px;">Work Procedure (Group A)35</p> <p style="padding-left: 20px;">Work Procedure (Group B)37</p> <p>SYSTEM DESCRIPTION40</p> <p>ENGINE CONTROL SYSTEM40</p> <p style="padding-left: 20px;">System Diagram40</p> <p style="padding-left: 20px;">Engine Control Component Parts Location41</p> <p>MULTIPOINT FUEL INJECTION SYSTEM48</p> <p style="padding-left: 20px;">System Description48</p> <p>ELECTRIC IGNITION SYSTEM51</p> <p style="padding-left: 20px;">System Description51</p> <p>AIR CONDITIONING CUT CONTROL52</p> <p style="padding-left: 20px;">Input/Output Signal Chart52</p> <p style="padding-left: 20px;">System Description52</p>	<p>AUTOMATIC SPEED CONTROL DEVICE (ASCD)53</p> <p style="padding-left: 20px;">System Description53</p> <p style="padding-left: 20px;">Component Description54</p> <p>CAN COMMUNICATION55</p> <p style="padding-left: 20px;">System Description55</p> <p>COOLING FAN CONTROL56</p> <p style="padding-left: 20px;">Description56</p> <p>EVAPORATIVE EMISSION SYSTEM57</p> <p style="padding-left: 20px;">Description57</p> <p>INTAKE VALVE TIMING CONTROL60</p> <p style="padding-left: 20px;">Description60</p> <p>FUEL FILLER CAP WARNING SYSTEM61</p> <p style="padding-left: 20px;">System Diagram61</p> <p style="padding-left: 20px;">System Description61</p> <p>VARIABLE INDUCTION AIR SYSTEM63</p> <p style="padding-left: 20px;">Description63</p> <p style="padding-left: 20px;">Vacuum Hose Drawing65</p> <p>ON BOARD DIAGNOSTIC (OBD) SYSTEM66</p> <p style="padding-left: 20px;">Diagnosis Description66</p> <p style="padding-left: 20px;">GST (Generic Scan Tool)66</p> <p>DIAGNOSIS SYSTEM (ECM)67</p> <p>DIAGNOSIS DESCRIPTION67</p> <p style="padding-left: 20px;">DIAGNOSIS DESCRIPTION : 1st Trip Detection Logic and Two Trip Detection Logic67</p> <p style="padding-left: 20px;">DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data67</p> <p style="padding-left: 20px;">DIAGNOSIS DESCRIPTION : Counter System68</p> <p style="padding-left: 20px;">DIAGNOSIS DESCRIPTION : Driving Pattern71</p> <p style="padding-left: 20px;">DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code72</p> <p style="padding-left: 20px;">DIAGNOSIS DESCRIPTION : Permanent Diagnostic Trouble Code (Permanent DTC)73</p>
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DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)	74	Component Description	113
On Board Diagnosis Function	74	On Board Diagnosis Logic	113
CONSULT Function	77	DTC Confirmation Procedure	113
		Diagnosis Procedure	114
		Component Inspection	116
DTC/CIRCUIT DIAGNOSIS	86		
TROUBLE DIAGNOSIS - SPECIFICATION VALUE	86	P0102, P0103 MAF SENSOR	118
Description	86	Component Description	118
Testing Condition	86	On Board Diagnosis Logic	118
Inspection Procedure	86	DTC Confirmation Procedure	118
Diagnosis Procedure	86	Diagnosis Procedure	119
		Component Inspection	120
POWER SUPPLY AND GROUND CIRCUIT	94	P0111 IAT SENSOR	123
Diagnosis Procedure	94	Component Description	123
Ground Inspection	97	On Board Diagnosis Logic	123
		DTC Confirmation Procedure	123
U0101 CAN COMM CIRCUIT	98	Component Function Check	124
Description	98	Diagnosis Procedure	124
On Board Diagnosis Logic	98	Component Inspection	125
DTC Confirmation Procedure	98		
Diagnosis Procedure	98	P0112, P0113 IAT SENSOR	126
		Component Description	126
U1001 CAN COMM CIRCUIT	99	On Board Diagnosis Logic	126
Description	99	DTC Confirmation Procedure	126
On Board Diagnosis Logic	99	Diagnosis Procedure	126
DTC Confirmation Procedure	99	Component Inspection	128
Diagnosis Procedure	99		
		P0116 ECT SENSOR	129
P0011, P0021 IVT CONTROL	100	Component Description	129
On Board Diagnosis Logic	100	On Board Diagnosis Logic	129
DTC Confirmation Procedure	100	DTC Confirmation Procedure	129
Diagnosis Procedure	101	Component Function Check	130
Component Inspection	102	Diagnosis Procedure	131
		Component Inspection	131
P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER	103	P0117, P0118 ECT SENSOR	132
Description	103	Component Description	132
On Board Diagnosis Logic	103	On Board Diagnosis Logic	132
DTC Confirmation Procedure	103	DTC Confirmation Procedure	133
Diagnosis Procedure	103	Diagnosis Procedure	133
Component Inspection	105	Component Inspection	134
P0037, P0038, P0057, P0058 HO2S2 HEATER	106	P0122, P0123 TP SENSOR	136
Description	106	Component Description	136
On Board Diagnosis Logic	106	On Board Diagnosis Logic	136
DTC Confirmation Procedure	106	DTC Confirmation Procedure	136
Diagnosis Procedure	107	Diagnosis Procedure	136
Component Inspection	108	Component Inspection	138
P0075, P0081 IVT CONTROL SOLENOID VALVE	110	P0125 ECT SENSOR	140
Component Description	110	Component Description	140
On Board Diagnosis Logic	110	On Board Diagnosis Logic	140
DTC Confirmation Procedure	110	DTC Confirmation Procedure	140
Diagnosis Procedure	110	Diagnosis Procedure	141
Component Inspection	111	Component Inspection	141
P0101 MAF SENSOR	113	P0127 IAT SENSOR	143
		Component Description	143
		On Board Diagnosis Logic	143
		DTC Confirmation Procedure	143

Diagnosis Procedure	144	DTC Confirmation Procedure	185
Component Inspection	144	Diagnosis Procedure	186
P0128 THERMOSTAT FUNCTION	146	P0172, P0175 FUEL INJECTION SYSTEM	
On Board Diagnosis Logic	146	FUNCTION	191
DTC Confirmation Procedure	146	On Board Diagnosis Logic	191
Diagnosis Procedure	146	DTC Confirmation Procedure	191
Component Inspection	147	Diagnosis Procedure	192
P0130, P0150 A/F SENSOR 1	148	P0181 FTT SENSOR	197
Component Description	148	Component Description	197
On Board Diagnosis Logic	148	On Board Diagnosis Logic	197
DTC Confirmation Procedure	148	DTC Confirmation Procedure	197
Overall Function Check	149	Component Function Check	199
Diagnosis Procedure	149	Diagnosis Procedure	199
P0131, P0151 A/F SENSOR 1	152	Component Inspection	201
Component Description	152	P0182, P0183 FTT SENSOR	202
On Board Diagnosis Logic	152	Component Description	202
DTC Confirmation Procedure	152	On Board Diagnosis Logic	202
Diagnosis Procedure	153	DTC Confirmation Procedure	202
P0132, P0152 A/F SENSOR 1	156	Diagnosis Procedure	202
Component Description	156	Component Inspection	204
On Board Diagnosis Logic	156	P0222, P0223 TP SENSOR	205
DTC Confirmation Procedure	156	Component Description	205
Diagnosis Procedure	157	On Board Diagnosis Logic	205
P0133, P0153 A/F SENSOR 1	160	DTC Confirmation Procedure	205
Component Description	160	Diagnosis Procedure	205
On Board Diagnosis Logic	160	Component Inspection	207
DTC Confirmation Procedure	160	P0300, P0301, P0302, P0303, P0304, P0305,	
Diagnosis Procedure	161	P0306 MISFIRE	209
P0137, P0157 HO2S2	165	On Board Diagnosis Logic	209
Component Description	165	DTC Confirmation Procedure	209
On Board Diagnosis Logic	165	Diagnosis Procedure	210
DTC Confirmation Procedure	165	P0327, P0328, P0332, P0333 KS	216
Overall Function Check	166	Component Description	216
Diagnosis Procedure	166	On Board Diagnosis Logic	216
Component Inspection	169	DTC Confirmation Procedure	216
P0138, P0158 HO2S2	171	Diagnosis Procedure	216
Component Description	171	Component Inspection	218
On Board Diagnosis Logic	171	P0335 CKP SENSOR (POS)	219
DTC Confirmation Procedure	172	Component Description	219
Overall Function Check	172	On Board Diagnosis Logic	219
Diagnosis Procedure	173	DTC Confirmation Procedure	219
Component Inspection	177	Diagnosis Procedure	219
P0139, P0159 HO2S2	179	Component Inspection	221
Component Description	179	P0340, P0345 CMP SENSOR (PHASE)	223
On Board Diagnosis Logic	179	Component Description	223
DTC Confirmation Procedure	179	On Board Diagnosis Logic	223
Overall Function Check	181	DTC Confirmation Procedure	223
Diagnosis Procedure	181	Diagnosis Procedure	224
Component Inspection	183	Component Inspection	226
P0171, P0174 FUEL INJECTION SYSTEM		P0420, P0430 THREE WAY CATALYST	
FUNCTION	185	FUNCTION	227
On Board Diagnosis Logic	185	On Board Diagnosis Logic	

A
EC
C
D
E
F
G
H
I
J
K
L
M
N
O
P

DTC Confirmation Procedure	227	Component Description	266
Overall Function Check	228	On Board Diagnosis Logic	266
Diagnosis Procedure	228	DTC Confirmation Procedure	266
P0441 EVAP CONTROL SYSTEM	232	Diagnosis Procedure	267
System Description	232	Component Inspection	269
On Board Diagnosis Logic	232	P0453 EVAP CONTROL SYSTEM PRES-	SURE SENSOR
DTC Confirmation Procedure	232	Component Description	270
Overall Function Check	233	On Board Diagnosis Logic	270
Diagnosis Procedure	233	DTC Confirmation Procedure	270
Component Inspection	236	Diagnosis Procedure	271
P0442 EVAP CONTROL SYSTEM	237	Component Inspection	274
On Board Diagnosis Logic	237	P0455 EVAP CONTROL SYSTEM	275
DTC Confirmation Procedure	238	On Board Diagnosis Logic	275
Diagnosis Procedure	238	DTC Confirmation Procedure	275
Component Inspection	243	Diagnosis Procedure	276
P0443 EVAP CANISTER PURGE VOLUME		Component Inspection	280
CONTROL SOLENOID VALVE	244	P0456 EVAP CONTROL SYSTEM	282
Description	244	On Board Diagnosis Logic	282
On Board Diagnosis Logic	244	DTC Confirmation Procedure	283
DTC Confirmation Procedure	245	Overall Function Check	283
Diagnosis Procedure	246	Diagnosis Procedure	284
Component Inspection	248	Component Inspection	289
P0444, P0445 EVAP CANISTER PURGE		P0460 FUEL LEVEL SENSOR	290
VOLUME CONTROL SOLENOID VALVE	250	Component Description	290
Description	250	On Board Diagnosis Logic	290
On Board Diagnosis Logic	250	DTC Confirmation Procedure	290
DTC Confirmation Procedure	251	Diagnosis Procedure	290
Diagnosis Procedure	251	P0461 FUEL LEVEL SENSOR	292
Component Inspection	252	Component Description	292
P0447 EVAP CANISTER VENT CONTROL		On Board Diagnosis Logic	292
VALVE	253	Overall Function Check	292
Component Description	253	Diagnosis Procedure	293
On Board Diagnosis Logic	253	P0462, P0463 FUEL LEVEL SENSOR	294
DTC Confirmation Procedure	253	Component Description	294
Diagnosis Procedure	253	On Board Diagnosis Logic	294
Component Inspection	255	DTC Confirmation Procedure	294
P0448 EVAP CANISTER VENT CONTROL		Diagnosis Procedure	294
VALVE	257	P0500 VSS	296
Component Description	257	Description	296
On Board Diagnosis Logic	257	On Board Diagnosis Logic	296
DTC Confirmation Procedure	257	DTC Confirmation Procedure	296
Diagnosis Procedure	258	Overall Function Check	297
Component Inspection	259	Diagnosis Procedure	297
P0451 EVAP CONTROL SYSTEM PRES-		P0506 ISC SYSTEM	298
SURE SENSOR	262	Description	298
Component Description	262	On Board Diagnosis Logic	298
On Board Diagnosis Logic	262	DTC Confirmation Procedure	298
DTC Confirmation Procedure	262	Diagnosis Procedure	298
Diagnosis Procedure	263	P0507 ISC SYSTEM	300
Component Inspection	264	Description	300
P0452 EVAP CONTROL SYSTEM PRES-		On Board Diagnosis Logic	300
SURE SENSOR	266		

DTC Confirmation Procedure	300	P1217 ENGINE OVER TEMPERATURE	320	
Diagnosis Procedure	300	On Board Diagnosis Logic	320	A
P050A, P050E COLD START CONTROL	302	Overall Function Check	320	
Description	302	Diagnosis Procedure	321	
On Board Diagnosis Logic	302	Main 12 Causes of Overheating	322	EC
DTC Confirmation Procedure	302	P1225 TP SENSOR	324	
Diagnosis Procedure	303	Component Description	324	C
P0550 PSP SENSOR	304	On Board Diagnosis Logic	324	
Component Description	304	DTC Confirmation Procedure	324	
On Board Diagnosis Logic	304	Diagnosis Procedure	324	D
DTC Confirmation Procedure	304	P1226 TP SENSOR	326	
Diagnosis Procedure	304	Component Description	326	E
Component Inspection	306	On Board Diagnosis Logic	326	
P0603 ECM POWER SUPPLY	307	DTC Confirmation Procedure	326	
Component Description	307	Diagnosis Procedure	326	F
On Board Diagnosis Logic	307	P1550 BATTERY CURRENT SENSOR	328	
DTC Confirmation Procedure	307	Component Description	328	
Diagnosis Procedure	307	On Board Diagnosis Logic	328	
P0605 ECM	309	DTC Confirmation Procedure	328	G
Component Description	309	Diagnosis Procedure	328	
On Board Diagnosis Logic	309	Component Inspection	330	
DTC Confirmation Procedure	309	P1551, P1552 BATTERY CURRENT SEN-		H
Diagnosis Procedure	310	SOR	332	
P0607 ECM	311	Component Description	332	I
Description	311	On Board Diagnosis Logic	332	
On Board Diagnosis Logic	311	DTC Confirmation Procedure	332	
DTC Confirmation Procedure	311	Diagnosis Procedure	332	J
Diagnosis Procedure	311	Component Inspection	334	
P0643 SENSOR POWER SUPPLY	312	P1553 BATTERY CURRENT SENSOR	336	
On Board Diagnosis Logic	312	Component Description	336	K
DTC Confirmation Procedure	312	On Board Diagnosis Logic	336	
Diagnosis Procedure	312	DTC Confirmation Procedure	336	
P0850 PNP SWITCH	315	Diagnosis Procedure	336	
Component Description	315	Component Inspection	338	L
On Board Diagnosis Logic	315	P1554 BATTERY CURRENT SENSOR	340	
DTC Confirmation Procedure	315	Component Description	340	M
Overall Function Check	315	On Board Diagnosis Logic	340	
Diagnosis Procedure	316	Overall Function Check	340	
P1148, P1168 CLOSED LOOP CONTROL	317	Diagnosis Procedure	341	
On Board Diagnosis Logic	317	Component Inspection	342	N
P1211 TCS CONTROL UNIT	318	P1564 ASCD STEERING SWITCH	344	
Description	318	Component Description	344	O
On Board Diagnosis Logic	318	On Board Diagnosis Logic	344	
DTC Confirmation Procedure	318	DTC Confirmation Procedure	344	
Diagnosis Procedure	318	Diagnosis Procedure	344	
P1212 TCS COMMUNICATION LINE	319	Component Inspection	346	P
Description	319	P1572 ASCD BRAKE SWITCH	348	
On Board Diagnosis Logic	319	Component Description	348	
DTC Confirmation Procedure	319	On Board Diagnosis Logic	348	
Diagnosis Procedure	319	DTC Confirmation Procedure	348	
		Diagnosis Procedure	349	
		Component Inspection	352	

P1574 ASCD VEHICLE SPEED SENSOR	353	P2127, P2128 APP SENSOR	376
Component Description	353	Component Description	376
On Board Diagnosis Logic	353	On Board Diagnosis Logic	376
DTC Confirmation Procedure	353	DTC Confirmation Procedure	376
Diagnosis Procedure	353	Diagnosis Procedure	376
Component Inspection	353	Component Inspection	378
P1715 INPUT SPEED SENSOR	355	P2135 TP SENSOR	380
Description	355	Component Description	380
On Board Diagnosis Logic	355	On Board Diagnosis Logic	380
Diagnosis Procedure	355	DTC Confirmation Procedure	380
P1800 VIAS CONTROL SOLENOID VALVE 1	356	Diagnosis Procedure	380
Component Description	356	Component Inspection	383
On Board Diagnosis Logic	356	P2138 APP SENSOR	384
DTC Confirmation Procedure	356	Component Description	384
Diagnosis Procedure	356	On Board Diagnosis Logic	384
Component Inspection	357	DTC Confirmation Procedure	384
P1805 BRAKE SWITCH	359	Diagnosis Procedure	385
Description	359	Component Inspection	387
On Board Diagnosis Logic	359	P2A00, P2A03 A/F SENSOR 1	388
DTC Confirmation Procedure	359	Component Description	388
Diagnosis Procedure	359	On Board Diagnosis Logic	388
Component Inspection	361	DTC Confirmation Procedure	388
P2100, P2103 THROTTLE CONTROL MO-		Diagnosis Procedure	389
TOR RELAY	362	ASCD BRAKE SWITCH	393
Component Description	362	Component Description	393
On Board Diagnosis Logic	362	Diagnosis Procedure	393
DTC Confirmation Procedure	362	Component Inspection	396
Diagnosis Procedure	362	ASCD INDICATOR	397
P2101 ELECTRIC THROTTLE CONTROL		Component Description	397
FUNCTION	365	Diagnosis Procedure	397
Description	365	COOLING FAN	398
On Board Diagnosis Logic	365	Description	398
DTC Confirmation Procedure	365	Diagnosis Procedure	398
Diagnosis Procedure	365	Component Inspection	399
Component Inspection	368	ELECTRICAL LOAD SIGNAL	400
P2118 THROTTLE CONTROL MOTOR	369	Description	400
Component Description	369	Diagnosis Procedure	400
On Board Diagnosis Logic	369	FUEL INJECTOR	402
DTC Confirmation Procedure	369	Component Description	402
Diagnosis Procedure	369	Diagnosis Procedure	402
Component Inspection	370	Component Inspection	405
P2119 ELECTRIC THROTTLE CONTROL		FUEL PUMP	406
ACTUATOR	371	Description	406
Component Description	371	Diagnosis Procedure	406
On Board Diagnosis Logic	371	Component Inspection	409
DTC Confirmation Procedure	371	IGNITION SIGNAL	410
Diagnosis Procedure	372	Component Description	410
P2122, P2123 APP SENSOR	373	Diagnosis Procedure	410
Component Description	373	Component Inspection	413
On Board Diagnosis Logic	373		
DTC Confirmation Procedure	373		
Diagnosis Procedure	374		
Component Inspection	375		

AUTOMATIC SPEED CONTROL DEVICE	
(ASCD)	512
System Description	512
Component Description	513
CAN COMMUNICATION	514
System Description	514
COOLING FAN CONTROL	515
Description	515
EVAPORATIVE EMISSION SYSTEM	516
Description	516
INTAKE VALVE TIMING CONTROL	519
Description	519
FUEL FILLER CAP WARNING SYSTEM	520
System Diagram	520
System Description	520
ON BOARD DIAGNOSTIC (OBD) SYSTEM ..	522
Diagnosis Description	522
GST (Generic Scan Tool)	522
DIAGNOSIS SYSTEM (ECM)	523
DIAGNOSIS DESCRIPTION	523
DIAGNOSIS DESCRIPTION : 1st Trip Detection	
Logic and Two Trip Detection Logic	523
DIAGNOSIS DESCRIPTION : DTC and Freeze	
Frame Data	523
DIAGNOSIS DESCRIPTION : Counter System ...	524
DIAGNOSIS DESCRIPTION : Driving Pattern	527
DIAGNOSIS DESCRIPTION : System Readiness	
Test (SRT) Code	528
DIAGNOSIS DESCRIPTION : Permanent Diag-	
nostic Trouble Code (Permanent DTC)	529
DIAGNOSIS DESCRIPTION : Malfunction Indica-	
tor Lamp (MIL)	530
On Board Diagnosis Function	530
CONSULT Function	533
ECU DIAGNOSIS INFORMATION	542
ECM	542
CONSULT Reference Value in Data Monitor	
Mode	542
ECM Harness Connector Terminal Layout	545
ECM Terminal and Reference Value	545
Fail-Safe Chart	553
DTC Inspection Priority Chart	555
DTC Index	555
Test Value and Test Limit	559
WIRING DIAGRAM	567
ENGINE CONTROL SYSTEM	567
Wiring Diagram	567
BASIC INSPECTION	587
DIAGNOSIS AND REPAIR WORK FLOW	587
Trouble Diagnosis Introduction	587
INSPECTION AND ADJUSTMENT	592
Basic Inspection	592
Idle Speed and Ignition Timing Check	596
Procedure After Replacing ECM	596
VIN Registration	596
Accelerator Pedal Released Position Learning ...	597
Throttle Valve Closed Position Learning	597
Idle Air Volume Learning	597
Mixture Ratio Self-Learning Value Clear	599
HOW TO SET SRT CODE	600
Description	600
SRT Set Driving Pattern	601
Work Procedure	603
HOW TO ERASE PERMANENT DTC	606
Description	606
Work Procedure (Group A)	607
Work Procedure (Group B)	609
DTC/CIRCUIT DIAGNOSIS	612
TROUBLE DIAGNOSIS - SPECIFICATION	
VALUE	612
Description	612
Testing Condition	612
Inspection Procedure	612
Diagnosis Procedure	613
POWER SUPPLY AND GROUND CIRCUIT ...	620
Diagnosis Procedure	620
Ground Inspection	623
U0101 CAN COMM CIRCUIT	624
Description	624
On Board Diagnosis Logic	624
DTC Confirmation Procedure	624
Diagnosis Procedure	624
U1001 CAN COMM CIRCUIT	625
Description	625
On Board Diagnosis Logic	625
DTC Confirmation Procedure	625
Diagnosis Procedure	625
P0011, P0021 IVT CONTROL	626
On Board Diagnosis Logic	626
DTC Confirmation Procedure	626
Diagnosis Procedure	627
Component Inspection	631
P0031, P0032, P0051, P0052 A/F SENSOR 1	
HEATER	633
Description	633
On Board Diagnosis Logic	633
DTC Confirmation Procedure	633
Diagnosis Procedure	633
Component Inspection	635

P0037, P0038, P0057, P0058 HO2S2 HEAT-ER	636	Diagnosis Procedure	664	A
Description	636	Component Inspection	667	
On Board Diagnosis Logic	636	P0125 ECT SENSOR	668	EC
DTC Confirmation Procedure	636	Component Description	668	
Diagnosis Procedure	637	On Board Diagnosis Logic	668	
Component Inspection	638	DTC Confirmation Procedure	668	
P0075, P0081 IVT CONTROL SOLENOID VALVE	640	Diagnosis Procedure	669	C
Component Description	640	Component Inspection	669	
On Board Diagnosis Logic	640	P0127 IAT SENSOR	671	D
DTC Confirmation Procedure	640	Component Description	671	
Diagnosis Procedure	640	On Board Diagnosis Logic	671	
Component Inspection	641	DTC Confirmation Procedure	671	
P0101 MAF SENSOR	643	Diagnosis Procedure	672	E
Component Description	643	Component Inspection	672	
DTC Logic	643	P0128 THERMOSTAT FUNCTION	674	F
Diagnosis Procedure	644	On Board Diagnosis Logic	674	
Component Inspection	645	DTC Confirmation Procedure	674	
P0102, P0103 MAF SENSOR	647	Diagnosis Procedure	674	G
Component Description	647	Component Inspection	675	
On Board Diagnosis Logic	647	P0130, P0150 A/F SENSOR 1	676	H
DTC Confirmation Procedure	647	Component Description	676	
Diagnosis Procedure	648	On Board Diagnosis Logic	676	
Component Inspection	649	DTC Confirmation Procedure	676	
P0111 IAT SENSOR	652	Overall Function Check	677	I
DTC Logic	652	Diagnosis Procedure	677	
Component Function Check	653	P0131, P0151 A/F SENSOR 1	680	J
Diagnosis Procedure	653	Component Description	680	
Component Inspection	653	On Board Diagnosis Logic	680	
P0112, P0113 IAT SENSOR	654	DTC Confirmation Procedure	680	
Component Description	654	Diagnosis Procedure	681	K
On Board Diagnosis Logic	654	P0132, P0152 A/F SENSOR 1	684	L
DTC Confirmation Procedure	654	Component Description	684	
Diagnosis Procedure	654	On Board Diagnosis Logic	684	
Component Inspection	656	DTC Confirmation Procedure	684	
P0116 ECT SENSOR	657	Diagnosis Procedure	685	M
Component Description	657	P0133, P0153 A/F SENSOR 1	688	N
DTC Logic	657	Component Description	688	
Component Function Check	658	On Board Diagnosis Logic	688	
Diagnosis Procedure	659	DTC Confirmation Procedure	688	
Component Inspection	659	Diagnosis Procedure	689	
P0117, P0118 ECT SENSOR	660	P0137, P0157 HO2S2	694	O
Component Description	660	Component Description	694	
On Board Diagnosis Logic	660	On Board Diagnosis Logic	694	
DTC Confirmation Procedure	661	DTC Confirmation Procedure	694	
Diagnosis Procedure	661	Overall Function Check	695	P
Component Inspection	662	Diagnosis Procedure	695	
P0122, P0123 TP SENSOR	664	Component Inspection	697	
Component Description	664	P0138, P0158 HO2S2	699	
On Board Diagnosis Logic	664	Component Description	699	
DTC Confirmation Procedure	664	On Board Diagnosis Logic	699	
		DTC Confirmation Procedure	699	
		Overall Function Check	700	

Diagnosis Procedure	701	Diagnosis Procedure	745
Component Inspection	705	Component Inspection	747
P0139, P0159 HO2S2	707	P0340 CMP SENSOR (PHASE)	749
Component Description	707	Component Description	749
On Board Diagnosis Logic	707	On Board Diagnosis Logic	749
DTC Confirmation Procedure	707	DTC Confirmation Procedure	749
Overall Function Check	709	Diagnosis Procedure	750
Diagnosis Procedure	710	Component Inspection	751
Component Inspection	711		
P0171, P0174 FUEL INJECTION SYSTEM		P0420, P0430 THREE WAY CATALYST	
FUNCTION	714	FUNCTION	753
On Board Diagnosis Logic	714	On Board Diagnosis Logic	753
DTC Confirmation Procedure	714	DTC Confirmation Procedure	753
Diagnosis Procedure	716	Overall Function Check	754
		Diagnosis Procedure	754
P0172, P0175 FUEL INJECTION SYSTEM		P0441 EVAP CONTROL SYSTEM	757
FUNCTION	719	System Description	757
On Board Diagnosis Logic	719	On Board Diagnosis Logic	757
DTC Confirmation Procedure	719	DTC Confirmation Procedure	757
Diagnosis Procedure	720	Overall Function Check	758
		Diagnosis Procedure	758
P0181 FTT SENSOR	724	Component Inspection	761
Component Description	724	P0442 EVAP CONTROL SYSTEM	762
DTC Logic	724	On Board Diagnosis Logic	762
Component Function Check	725	DTC Confirmation Procedure	763
Diagnosis Procedure	726	Diagnosis Procedure	763
Component Inspection	727	Component Inspection	768
P0182, P0183 FTT SENSOR	728	P0443 EVAP CANISTER PURGE VOLUME	
Component Description	728	CONTROL SOLENOID VALVE	769
On Board Diagnosis Logic	728	Description	769
DTC Confirmation Procedure	728	On Board Diagnosis Logic	769
Diagnosis Procedure	728	DTC Confirmation Procedure	770
Component Inspection	730	Diagnosis Procedure	770
		Component Inspection	773
P0222, P0223 TP SENSOR	731	P0444, P0445 EVAP CANISTER PURGE	
Component Description	731	VOLUME CONTROL SOLENOID VALVE	774
On Board Diagnosis Logic	731	Description	774
DTC Confirmation Procedure	731	On Board Diagnosis Logic	774
Diagnosis Procedure	731	DTC Confirmation Procedure	775
Component Inspection	734	Diagnosis Procedure	775
		Component Inspection	776
P0300, P0301, P0302, P0303, P0304, P0305,		P0447 EVAP CANISTER VENT CONTROL	
P0306, P0307, P0308 MISFIRE	735	VALVE	777
On Board Diagnosis Logic	735	Component Description	777
DTC Confirmation Procedure	735	On Board Diagnosis Logic	777
Diagnosis Procedure	736	DTC Confirmation Procedure	777
		Diagnosis Procedure	777
P0327, P0328, P0332, P0333 KS	742	Component Inspection	779
Component Description	742	P0448 EVAP CANISTER VENT CONTROL	
On Board Diagnosis Logic	742	VALVE	781
DTC Confirmation Procedure	742	Component Description	781
Diagnosis Procedure	742	On Board Diagnosis Logic	781
Component Inspection	744	DTC Confirmation Procedure	781
P0335 CKP SENSOR (POS)	745		
Component Description	745		
On Board Diagnosis Logic	745		
DTC Confirmation Procedure	745		

Diagnosis Procedure	782	Diagnosis Procedure	820	A
Component Inspection	783			
P0451 EVAP CONTROL SYSTEM PRES- SURE SENSOR	786	P0506 ISC SYSTEM	822	EC
Component Description	786	Description	822	
On Board Diagnosis Logic	786	On Board Diagnosis Logic	822	
DTC Confirmation Procedure	786	DTC Confirmation Procedure	822	
Diagnosis Procedure	787	Diagnosis Procedure	822	
Component Inspection	788			
P0452 EVAP CONTROL SYSTEM PRES- SURE SENSOR	790	P0507 ISC SYSTEM	824	C
Component Description	790	Description	824	
On Board Diagnosis Logic	790	On Board Diagnosis Logic	824	
DTC Confirmation Procedure	790	DTC Confirmation Procedure	824	D
Diagnosis Procedure	791	Diagnosis Procedure	824	
Component Inspection	793			
P0453 EVAP CONTROL SYSTEM PRES- SURE SENSOR	794	P050E COLD START CONTROL	826	E
Component Description	794	Description	826	
On Board Diagnosis Logic	794	DTC Logic	826	
DTC Confirmation Procedure	794	Diagnosis Procedure	827	
Diagnosis Procedure	795			
Component Inspection	798	P0550 PSP SENSOR	828	F
P0455 EVAP CONTROL SYSTEM	799	Component Description	828	
On Board Diagnosis Logic	799	On Board Diagnosis Logic	828	G
DTC Confirmation Procedure	799	DTC Confirmation Procedure	828	
Diagnosis Procedure	800	Diagnosis Procedure	828	
Component Inspection	805	Component Inspection	830	
P0456 EVAP CONTROL SYSTEM	806	P0603 ECM POWER SUPPLY	831	H
On Board Diagnosis Logic	806	Component Description	831	
DTC Confirmation Procedure	807	On Board Diagnosis Logic	831	I
Overall Function Check	807	DTC Confirmation Procedure	831	
Diagnosis Procedure	808	Diagnosis Procedure	831	
Component Inspection	813			
P0460 FUEL LEVEL SENSOR	814	P0605 ECM	833	J
Component Description	814	Component Description	833	
On Board Diagnosis Logic	814	On Board Diagnosis Logic	833	
DTC Confirmation Procedure	814	DTC Confirmation Procedure	833	K
Diagnosis Procedure	814	Diagnosis Procedure	834	
P0461 FUEL LEVEL SENSOR	816	P0607 ECM	835	L
Component Description	816	Description	835	
On Board Diagnosis Logic	816	On Board Diagnosis Logic	835	
Overall Function Check	816	DTC Confirmation Procedure	835	M
Diagnosis Procedure	817	Diagnosis Procedure	835	
P0462, P0463 FUEL LEVEL SENSOR	818	P0643 SENSOR POWER SUPPLY	836	N
Component Description	818	On Board Diagnosis Logic	836	
On Board Diagnosis Logic	818	DTC Confirmation Procedure	836	
DTC Confirmation Procedure	818	Diagnosis Procedure	836	
Diagnosis Procedure	818			
P0500 VSS	820	P0850 PNP SWITCH	839	O
Description	820	Component Description	839	
DTC Logic	820	On Board Diagnosis Logic	839	
		DTC Confirmation Procedure	839	P
		Overall Function Check	839	
		Diagnosis Procedure	840	
		P1140, P1145 IVT CONTROL POSITION SENSOR	842	
		Component Description	842	
		On Board Diagnosis Logic	842	
		DTC Confirmation Procedure	842	

Diagnosis Procedure	842	Overall Function Check	869
Component Inspection	845	Diagnosis Procedure	870
P1148, P1168 CLOSED LOOP CONTROL	846	Component Inspection	871
On Board Diagnosis Logic	846	P1564 ASCD STEERING SWITCH	873
P1211 TCS CONTROL UNIT	847	Component Description	873
Description	847	On Board Diagnosis Logic	873
On Board Diagnosis Logic	847	DTC Confirmation Procedure	873
DTC Confirmation Procedure	847	Diagnosis Procedure	873
Diagnosis Procedure	847	Component Inspection	875
P1212 TCS COMMUNICATION LINE	848	P1572 ASCD BRAKE SWITCH	877
Description	848	Component Description	877
On Board Diagnosis Logic	848	On Board Diagnosis Logic	877
DTC Confirmation Procedure	848	DTC Confirmation Procedure	877
Diagnosis Procedure	848	Diagnosis Procedure	878
P1217 ENGINE OVER TEMPERATURE	849	Component Inspection	881
On Board Diagnosis Logic	849	P1805 BRAKE SWITCH	882
Overall Function Check	849	Description	882
Diagnosis Procedure	850	On Board Diagnosis Logic	882
Main 12 Causes of Overheating	851	DTC Confirmation Procedure	882
P1225 TP SENSOR	853	Diagnosis Procedure	882
Component Description	853	Component Inspection	884
On Board Diagnosis Logic	853	P2100, P2103 THROTTLE CONTROL MO-	
DTC Confirmation Procedure	853	TOR RELAY	885
Diagnosis Procedure	853	Component Description	885
P1226 TP SENSOR	855	On Board Diagnosis Logic	885
Component Description	855	DTC Confirmation Procedure	885
On Board Diagnosis Logic	855	Diagnosis Procedure	885
DTC Confirmation Procedure	855	P2101 ELECTRIC THROTTLE CONTROL	
Diagnosis Procedure	855	FUNCTION	888
P1550 BATTERY CURRENT SENSOR	857	Description	888
Component Description	857	On Board Diagnosis Logic	888
On Board Diagnosis Logic	857	DTC Confirmation Procedure	888
DTC Confirmation Procedure	857	Diagnosis Procedure	888
Diagnosis Procedure	857	Component Inspection	891
Component Inspection	859	P2118 THROTTLE CONTROL MOTOR	892
P1551, P1552 BATTERY CURRENT SEN-		Component Description	892
SOR	861	On Board Diagnosis Logic	892
Component Description	861	DTC Confirmation Procedure	892
On Board Diagnosis Logic	861	Diagnosis Procedure	892
DTC Confirmation Procedure	861	Component Inspection	893
Diagnosis Procedure	861	P2119 ELECTRIC THROTTLE CONTROL	
Component Inspection	863	ACTUATOR	894
P1553 BATTERY CURRENT SENSOR	865	Component Description	894
Component Description	865	On Board Diagnosis Logic	894
On Board Diagnosis Logic	865	DTC Confirmation Procedure	894
DTC Confirmation Procedure	865	Diagnosis Procedure	895
Diagnosis Procedure	865	P2122, P2123 APP SENSOR	896
Component Inspection	867	Component Description	896
P1554 BATTERY CURRENT SENSOR	869	On Board Diagnosis Logic	896
Component Description	869	DTC Confirmation Procedure	896
On Board Diagnosis Logic	869	Diagnosis Procedure	896
		Component Inspection	898

P2127, P2128 APP SENSOR	899	Diagnosis Procedure	931	
Component Description	899	Component Inspection	934	A
On Board Diagnosis Logic	899			
DTC Confirmation Procedure	899	MALFUNCTION INDICATOR LAMP	936	
Diagnosis Procedure	899	Component Function Check	936	EC
Component Inspection	902	Diagnosis Procedure	936	
P2135 TP SENSOR	903	ON BOARD REFUELING VAPOR RECOV-		
Component Description	903	ERY (ORVR)	937	C
On Board Diagnosis Logic	903	System Description	937	
DTC Confirmation Procedure	903	Diagnosis Procedure	937	
Diagnosis Procedure	903	Component Inspection	940	D
Component Inspection	906	POSITIVE CRANKCASE VENTILATION	942	
P2138 APP SENSOR	907	Description	942	
Component Description	907	Component Inspection	942	E
On Board Diagnosis Logic	907	REFRIGERANT PRESSURE SENSOR	944	
DTC Confirmation Procedure	907	Component Description	944	F
Diagnosis Procedure	907	Diagnosis Procedure	944	
Component Inspection	910	SYMPTOM DIAGNOSIS	947	
P2A00, P2A03 A/F SENSOR 1	911	ENGINE CONTROL SYSTEM SYMPTOMS ...	947	G
Component Description	911	Symptom Matrix Chart	947	
On Board Diagnosis Logic	911	NORMAL OPERATING CONDITION	951	H
DTC Confirmation Procedure	911	Fuel Cut Control (at No Load and High Engine		
Diagnosis Procedure	912	Speed)	951	I
ASCD BRAKE SWITCH	917	PERIODIC MAINTENANCE	952	
Component Description	917	FUEL PRESSURE	952	J
Diagnosis Procedure	917	Fuel Pressure Check	952	
Component Inspection	918	EVAP LEAK CHECK	954	K
ASCD INDICATOR	920	How to Detect EVAP Leakage	954	
Component Description	920	SERVICE DATA AND SPECIFICATIONS		
Diagnosis Procedure	920	(SDS)	956	L
COOLING FAN	921	SERVICE DATA AND SPECIFICATIONS		
Description	921	(SDS)	956	M
Diagnosis Procedure	921	Fuel Pressure	956	
Component Inspection	922	Idle Speed and Ignition Timing	956	
ELECTRICAL LOAD SIGNAL	923	Calculated Load Value	956	
Description	923	Mass Air Flow Sensor	956	N
Diagnosis Procedure	923	Intake Air Temperature Sensor	956	
FUEL INJECTOR	925	Engine Coolant Temperature Sensor	956	
Component Description	925	A/F Sensor 1 Heater	956	O
Diagnosis Procedure	925	Heated Oxygen sensor 2 Heater	957	
Component Inspection	926	Crankshaft Position Sensor (POS)	957	
FUEL PUMP	928	Camshaft Position Sensor (PHASE)	957	P
Description	928	Throttle Control Motor	957	
Diagnosis Procedure	928	Fuel Injector	957	
Component Inspection	930	Fuel Pump	957	
IGNITION SIGNAL	931			
Component Description	931			

BASIC INSPECTION

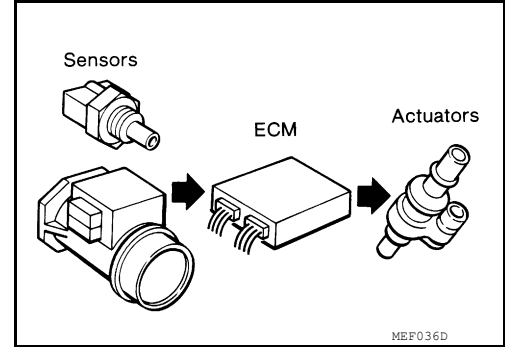
DIAGNOSIS AND REPAIR WORKFLOW

Trouble Diagnosis Introduction

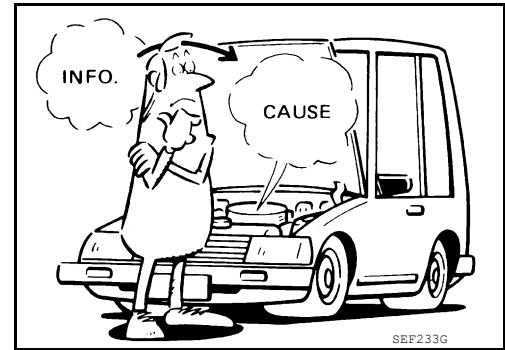
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INTRODUCTION

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no malfunctions such as vacuum leaks, fouled spark plugs, or other malfunctions with the engine.



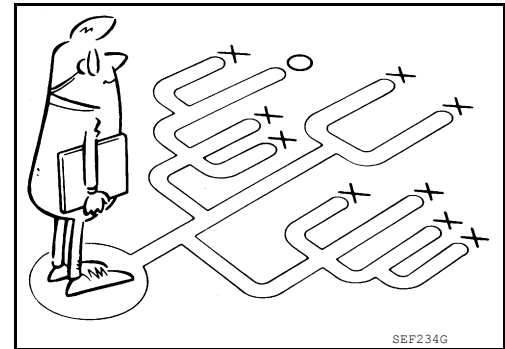
It is much more difficult to diagnose an incident that occurs intermittently rather than continuously. Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.



A visual check only may not find the cause of the incidents. A road test with CONSULT (or GST) or a circuit tester connected should be performed. Follow the Work Flow on "Work Flow".

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such incidents, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A Diagnostic Worksheet like the example on "Worksheet Sample" should be used.

Start your diagnosis by looking for conventional malfunctions first. This will help troubleshoot driveability malfunctions on an electronically controlled engine vehicle.



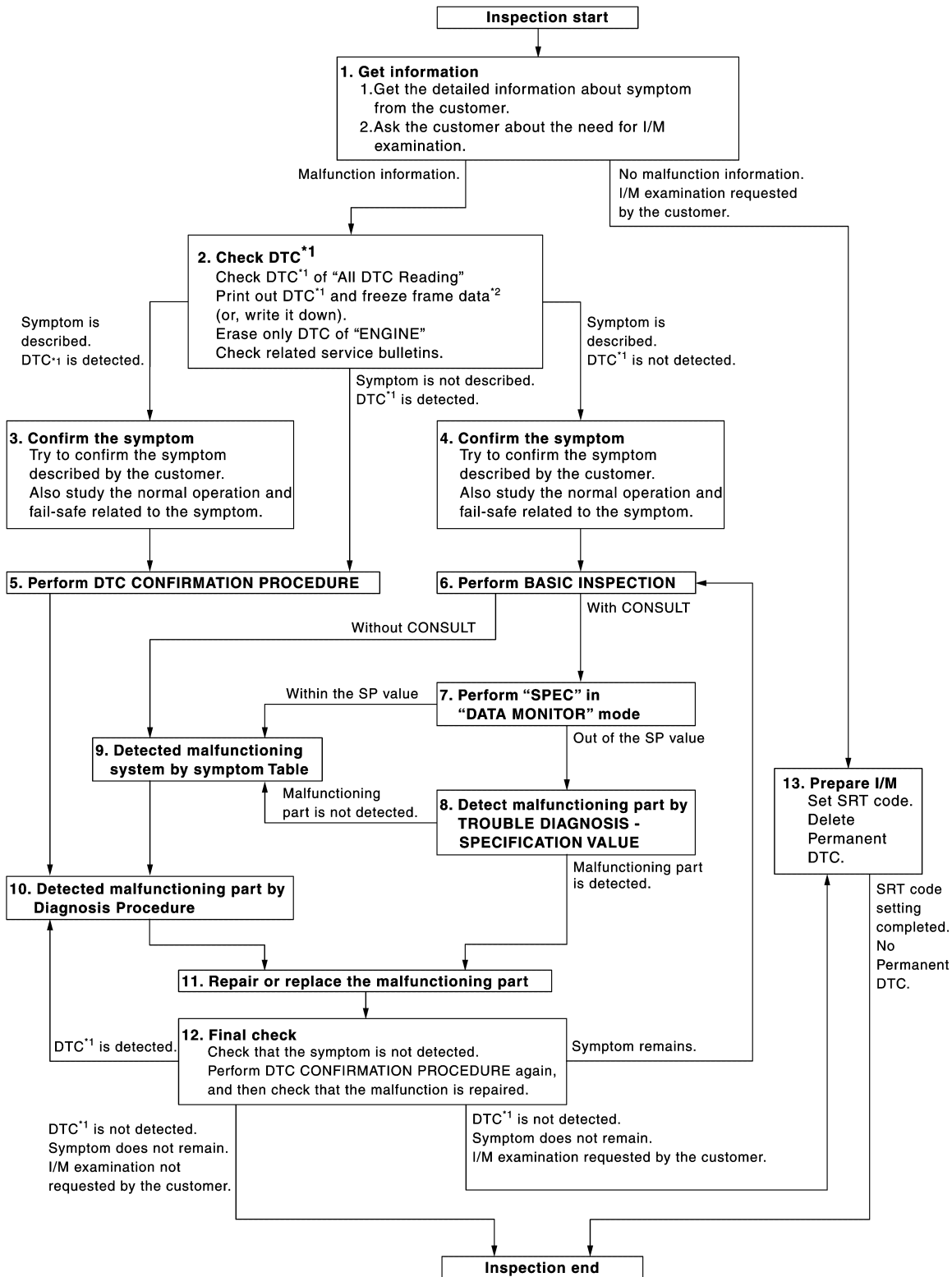
WORK FLOW

Overall Sequence

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

[VQ40DE]



*1: Include 1st trip DTC.

*2: Include 1st trip freeze frame data.

Detailed Flow

1. GET INFORMATION FOR SYMPTOM

DIAGNOSIS AND REPAIR WORKFLOW

[VQ40DE]

< BASIC INSPECTION >

1. Get the detailed information from the customer about the symptom (the condition and the environment when the incident/malfunction occurred) using the "Diagnostic Work Sheet".
2. Ask if the customer requests I/M examination.

Malfunction information, obtained>>GO TO 2.

No malfunction information, but a request for I/M examination>>GO TO 13.

2.CHECK DTC

1. Check DTC.
2. Perform the following procedure if DTC is displayed.
 - Record DTC and freeze frame data. (Print them out with CONSULT or GST.)
 - Erase DTC. Refer to [EC-74. "On Board Diagnosis Function"](#) (Without CONSULT) or [EC-77. "CONSULT Function"](#) (With CONSULT).
 - Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to [EC-475. "Symptom Matrix Chart"](#).)
3. Check related service bulletins for information.

Are any symptoms described and any DTCs detected?

Symptom is described, DTC is detected>>GO TO 3.

Symptom is described, DTC is not detected>>GO TO 4.

Symptom is not described, DTC is detected>>GO TO 5.

3.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer (except MIL ON).

Also study the normal operation and fail-safe related to the symptom.

Diagnosis Work Sheet is useful to verify the incident.

Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

4.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.

Also study the normal operation and fail-safe related to the symptom.

Diagnosis Work Sheet is useful to verify the incident.

Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 6.

5.PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE for the displayed DTC, and then make sure that DTC is detected again.

If two or more DTCs are detected, refer to [EC-443. "DTC Inspection Priority Chart"](#) and determine trouble diagnosis order.

NOTE:

- Freeze frame data is useful if the DTC is not detected.
- Perform Component Function Check if DTC CONFIRMATION PROCEDURE is not included on Service Manual. This simplified check procedure is an effective alternative though DTC cannot be detected during this check.
If the result of Component Function Check is NG, it is the same as the detection of DTC by DTC CONFIRMATION PROCEDURE.

Is DTC detected?

YES >> GO TO 10.

NO >> Check according to [GI-33. "Work Flow"](#).

6.PERFORM BASIC INSPECTION

Perform [EC-20. "Basic Inspection"](#).

Do you have CONSULT?

YES >> GO TO 7.

NO >> GO TO 9.

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

[VQ40DE]

7. PERFORM SPEC IN DATA MONITOR MODE

With CONSULT

Make sure that "MAS A/F SE-B1", "MAS A/F SE-B2", "B/FUEL SCHDL", "A/F ALPHA-B1", and "A/F ALPHA-B2" are within the SP value using CONSULT "SPEC" in "DATA MONITOR" mode. Refer to [EC-86, "Inspection Procedure"](#).

Is the measurement value within the SP value?

YES >> GO TO 9.

NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Detect malfunctioning part according to [EC-86, "Diagnosis Procedure"](#).

Is a malfunctioning part detected?

YES >> GO TO 11.

NO >> GO TO 9.

9. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE

Detect malfunctioning system according to [EC-475, "Symptom Matrix Chart"](#) based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptoms.

>> GO TO 10.

10. DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE

Inspect according to Diagnosis Procedure of the system.

NOTE:

The Diagnosis Procedure in EC section described based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnosis Procedure. For details, refer to [GI-33, "Work Flow"](#).

Is a malfunctioning part detected?

YES >> GO TO 11.

NO >> Monitor input data from related sensors or check voltage of related ECM terminals using CONSULT. Refer to [EC-433, "ECM Terminal and Reference Value"](#), [EC-430, "CONSULT Reference Value in Data Monitor Mode"](#).

11. REPAIR OR REPLACE THE MALFUNCTIONING PART

1. Repair or replace the malfunctioning part.
2. Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replacement.
3. Check DTC. If DTC is displayed, erase it. Refer to [EC-74, "On Board Diagnosis Function"](#) (Without CONSULT) or [EC-77, "CONSULT Function"](#) (With CONSULT).

>> GO TO 12.

12. FINAL CHECK

When DTC was detected in step 2, perform DTC CONFIRMATION PROCEDURE or Component Function Check again, and then make sure that the malfunction have been completely repaired.

When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and make sure that the symptom is not detected.

Is DTC detected and does symptom remain?

YES-1 >> DTC is detected: GO TO 10.

YES-2 >> Symptom remains: GO TO 6.

NO-1 >> No request for I/M examination from the customer: Before returning the vehicle to the customer, always erase unnecessary DTC in ECM and TCM (Transmission Control Module). Refer to [EC-74, "On Board Diagnosis Function"](#) (Without CONSULT) or [EC-77, "CONSULT Function"](#) and [TM-37, "CONSULT Function \(TRANSMISSION\)"](#) (With CONSULT).

NO-2 >> I/M examination, requested from the customer: GO TO 13.

13. PREPARE FOR I/M EXAMINATION

1. Set SRT codes. Refer to [EC-28, "Description"](#).

DIAGNOSIS AND REPAIR WORKFLOW

[VQ40DE]

< BASIC INSPECTION >

2. Erase permanent DTCs. Refer to [EC-34. "Description"](#).

>> INSPECTION END

DIAGNOSTIC WORKSHEET

Description

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.

In general, each customer feels differently about symptoms. It is important to fully understand the symptoms or conditions for a customer complaint.

Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.

Some conditions may cause the MIL to illuminate or blink and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.

KEY POINTS

WHAT Vehicle & engine model
WHEN Date, Frequencies
WHERE..... Road conditions
HOW Operating conditions,
Weather conditions,
Symptoms

SEP907L

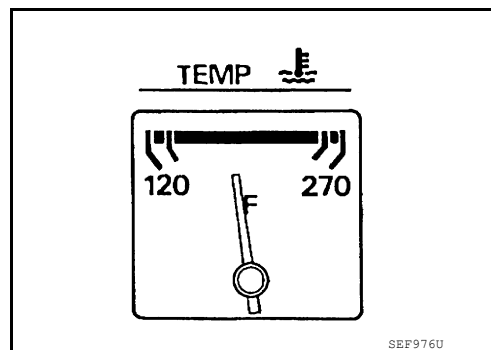
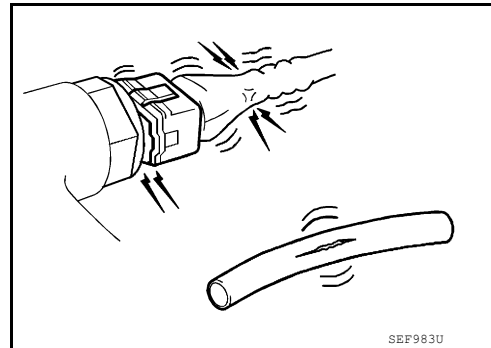
INSPECTION AND ADJUSTMENT

Basic Inspection

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1. INSPECTION START

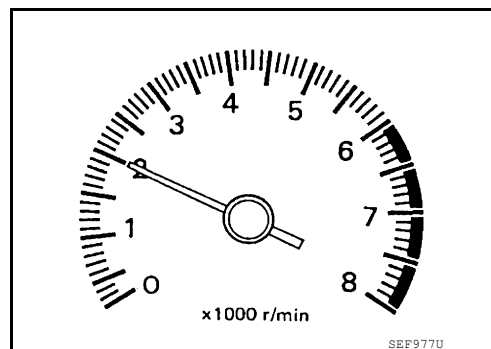
1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
 - Harness connectors for improper connections
 - Wiring harness for improper connections, pinches and cut
 - Vacuum hoses for splits, kinks and improper connections
 - Hoses and ducts for leakage
 - Air cleaner clogging
 - Gasket
3. Check that electrical or mechanical loads are not applied.
 - Headlamp switch is OFF.
 - Air conditioner switch is OFF.
 - Rear window defogger switch is OFF.
 - Steering wheel is in the straight-ahead position, etc.
4. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge. Ensure engine stays below 1,000 rpm.



5. Run engine at about 2,000 rpm for about 2 minutes under no load.
6. Make sure that no DTC is displayed with CONSULT or GST.

OK or NG

- OK >> GO TO 3.
 NG >> GO TO 2.



2. REPAIR OR REPLACE

Repair or replace components as necessary according to corresponding Diagnostic Procedure.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

Ⓟ With CONSULT

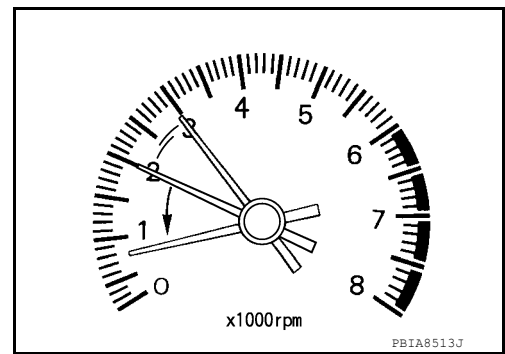
1. Run engine at about 2,000 rpm for about 2 minutes under no load.

INSPECTION AND ADJUSTMENT

[VQ40DE]

< BASIC INSPECTION >

- Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.



- Read idle speed in "DATA MONITOR" mode with CONSULT. Refer to [EC-24. "Idle Speed and Ignition Timing Check"](#).

625 ± 50 rpm (in P or N position)

⊗ Without CONSULT

- Run engine at about 2,000 rpm for about 2 minutes under no load.
- Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.
- Check idle speed. Refer to [EC-24. "Idle Speed and Ignition Timing Check"](#).

625 ± 50 rpm (in P or N position)

OK or NG

- OK >> GO TO 10.
- NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- Stop engine.
- Perform [EC-25. "Accelerator Pedal Released Position Learning"](#).

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform [EC-25. "Throttle Valve Closed Position Learning"](#).

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to [EC-25. "Idle Air Volume Learning"](#).

Is Idle Air Volume Learning carried out successfully?

Yes or No

- Yes >> GO TO 7.
- No >> 1. Follow the instruction of Idle Air Volume Learning.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

Ⓜ With CONSULT

- Start engine and warm it up to normal operating temperature.
- Read idle speed in "DATA MONITOR" mode with CONSULT. Refer to [EC-24. "Idle Speed and Ignition Timing Check"](#).

625 ± 50 rpm (in P or N position)

⊗ Without CONSULT

- Start engine and warm it up to normal operating temperature.

< BASIC INSPECTION >

2. Check idle speed.
Refer to [EC-24, "Idle Speed and Ignition Timing Check"](#).

625 ± 50 rpm (in P or N position)

OK or NG

- OK >> GO TO 10.
- NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to [EC-224, "Diagnosis Procedure"](#).
- Check crankshaft position sensor (POS) and circuit. Refer to [EC-219, "Diagnosis Procedure"](#).

OK or NG

- OK >> GO TO 9.
- NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to [SEC-10, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (with Intelligent Key system) or [SEC-120, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (without Intelligent Key system).

>> GO TO 4.

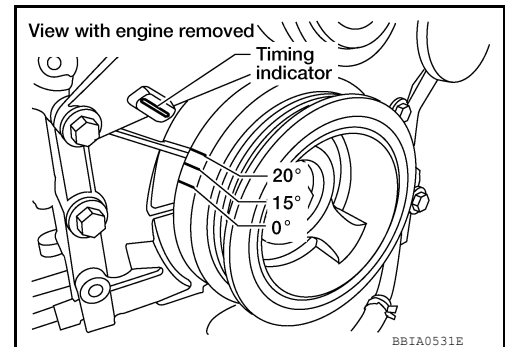
10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.
Refer to [EC-24, "Idle Speed and Ignition Timing Check"](#).

15 ± 5° BTDC (in P or N position)

OK or NG

- OK >> GO TO 19.
- NG >> GO TO 11.



11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform [EC-25, "Accelerator Pedal Released Position Learning"](#).

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform [EC-25, "Throttle Valve Closed Position Learning"](#).

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to [EC-25, "Idle Air Volume Learning"](#).

Is Idle Air Volume Learning carried out successfully?

Yes or No

INSPECTION AND ADJUSTMENT

[VQ40DE]

< BASIC INSPECTION >

- Yes >> GO TO 14.
No >> 1. Follow the instruction of Idle Air Volume Learning.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in "DATA MONITOR" mode with CONSULT.
Refer to [EC-24, "Idle Speed and Ignition Timing Check"](#).

625 ± 50 rpm (in P or N position)

Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed. Refer to [EC-24, "Idle Speed and Ignition Timing Check"](#).

625± 50 rpm (in P or N position)

OK or NG

- OK >> GO TO 15.
NG >> GO TO 17.

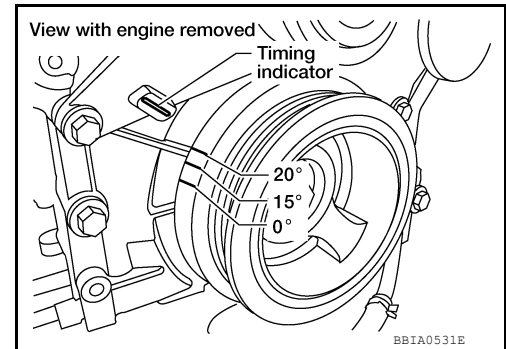
15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.
Refer to [EC-24, "Idle Speed and Ignition Timing Check"](#).

15 ± 5° BTDC (in P or N position)

OK or NG

- OK >> GO TO 19.
NG >> GO TO 16.



16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to [EM-61, "Removal and Installation"](#).

OK or NG

- OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to [EC-224, "Diagnosis Procedure"](#).
- Check crankshaft position sensor (POS) and circuit. Refer to [EC-219, "Diagnosis Procedure"](#).

OK or NG

- OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to [SEC-10, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (with Intelligent Key system) or [SEC-120, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (without Intelligent Key system).

>> GO TO 4.

19. INSPECTION END

Did you replace the ECM, referring this Basic Inspection Procedure?

Yes or No

Yes >> 1. Perform [EC-25, "VIN Registration"](#).


2. **INSPECTION END**

No >> **INSPECTION END**

Idle Speed and Ignition Timing Check

INFOID:000000007357944

IDLE SPEED

 With CONSULT

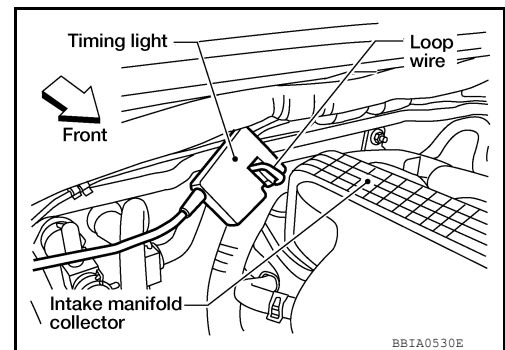
Check idle speed in "DATA MONITOR" mode with CONSULT.

 With GST

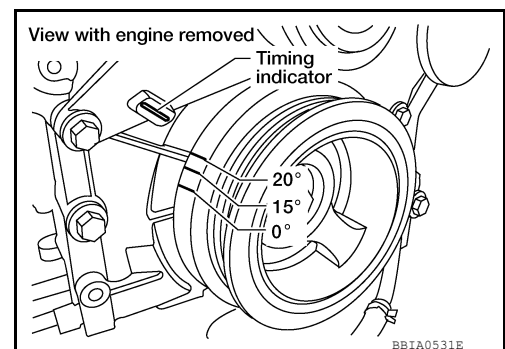
Check idle speed with GST.

IGNITION TIMING

1. Attach timing light to loop wire as shown.



2. Check ignition timing.



Procedure After Replacing ECM

INFOID:000000007357945

When replacing ECM, the following procedure must be performed.

1. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to [SEC-10, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (with Intelligent Key system) or [SEC-120, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (without Intelligent Key system).
2. Perform [EC-25, "VIN Registration"](#).
3. Perform [EC-25, "Accelerator Pedal Released Position Learning"](#).
4. Perform [EC-25, "Throttle Valve Closed Position Learning"](#).
5. Perform [EC-25, "Idle Air Volume Learning"](#).

VIN Registration

INFOID:000000007357946

A

DESCRIPTION

VIN Registration is an operation to register VIN in ECM. It must be performed each time ECM is replaced.

NOTE:

Accurate VIN which is registered in ECM may be required for Inspection & Maintenance (I/M).

EC

OPERATION PROCEDURE

④ With CONSULT

1. Check the VIN of the vehicle and note it. Refer to [GI-21, "Identification Number"](#).
2. Turn ignition switch ON with engine stopped.
3. Select "VIN REGISTRATION" in "WORK SUPPORT" mode.
4. Follow the instruction on the CONSULT display.

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Accelerator Pedal Released Position Learning

INFOID:000000007357947

DESCRIPTION

Accelerator Pedal Released Position Learning is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time the harness connector of the accelerator pedal position sensor or ECM is disconnected.

F

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OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch ON and wait at least 2 seconds.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON and wait at least 2 seconds.
5. Turn ignition switch OFF and wait at least 10 seconds.

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Throttle Valve Closed Position Learning

INFOID:000000007357948

DESCRIPTION

Throttle Valve Closed Position Learning is a function of ECM to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time the harness connector of the electric throttle control actuator or ECM is disconnected or electric throttle control actuator inside is cleaned.

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OPERATION PROCEDURE

④ With CONSULT

1. Turn ignition switch ON.
2. Select "CLSD THL POS LEARN" in "WORK SUPPORT" mode of "ENGINE" using CONSULT.
3. Follow the instructions on the CONSULT display.
4. Turn ignition switch OFF and wait at least 10 seconds.
Check that throttle valve moves during the above 10 seconds by confirming the operating sound.

L

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⊗ Without CONSULT

1. Start the engine.
NOTE:
Engine coolant temperature is 25°C (77°F) or less before engine starts.
2. Warm up the engine.
NOTE:
Raise engine coolant temperature until it reaches 65°C (149°F) or more.
3. Turn ignition switch OFF and wait at least 10 seconds.
Check that throttle valve moves during the above 10 seconds by confirming the operating sound.

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Idle Air Volume Learning

INFOID:000000007357949

DESCRIPTION

Idle Air Volume Learning is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under the following conditions:

INSPECTION AND ADJUSTMENT

[VQ40DE]

< BASIC INSPECTION >

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PREPARATION

Before performing Idle Air Volume Learning, make sure that all of the following conditions are satisfied. Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9 V (At idle)
- Engine coolant temperature: 70 - 100°C (158 - 212°F)
- Selector lever: P or N
- Electric load switch: OFF
(Air conditioner, headlamp, rear window defogger)
On vehicles equipped with daytime light systems, if the parking brake is applied before the engine is started the headlamp will not illuminate.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
- With CONSULT: Drive vehicle until "ATF TEMP SE" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9 V.
- Without CONSULT: Drive vehicle for 10 minutes.

OPERATION PROCEDURE

Ⓟ With CONSULT

1. Perform [EC-25, "Accelerator Pedal Released Position Learning"](#).
2. Perform [EC-25, "Throttle Valve Closed Position Learning"](#).
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic PREPARATION (previously mentioned) are in good order.
5. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
6. Touch "START" and wait 20 seconds.
7. Check that "CMPLT" is displayed on CONSULT screen. If "CMPLT" is not displayed, Idle Air Volume Learning will not be carried out successfully. In this case, find the cause of the incident by referring to the Diagnostic Procedure below.
8. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	625 ± 50 rpm (in P or N position)
Ignition timing	15 ± 5° BTDC (in P or N position)

ⓧ Without CONSULT

NOTE:

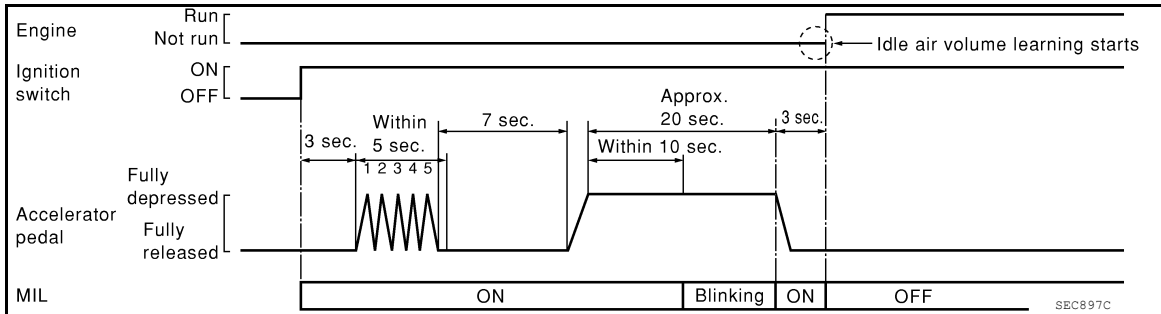
- **It is better to count the time accurately with a clock.**
 - **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
1. Perform [EC-25, "Accelerator Pedal Released Position Learning"](#).
 2. Perform [EC-25, "Throttle Valve Closed Position Learning"](#).
 3. Start engine and warm it up to normal operating temperature.
 4. Check that all items listed under the topic PREPARATION (previously mentioned) are in good order.
 5. Turn ignition switch OFF and wait at least 10 seconds.
 6. Confirm that accelerator pedal is fully released, then turn ignition switch ON and wait 3 seconds.
 7. Repeat the following procedure quickly five times within 5 seconds.
 - a. Fully depress the accelerator pedal.
 - b. Fully release the accelerator pedal.

INSPECTION AND ADJUSTMENT

[VQ40DE]

< BASIC INSPECTION >

8. Wait 7 seconds, fully depress the accelerator pedal it for approx. 20 seconds until the MIL stops blinking and turns ON.
9. Fully release the accelerator pedal within 3 seconds after the MIL turns ON.
10. Start engine and let it idle.
11. Wait 20 seconds.



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	625 ± 50 rpm (in P or N position)
Ignition timing	15 ± 5° BTDC (in P or N position)

13. If idle speed and ignition timing are not within the specification, Idle Air Volume Learning will not be carried out successfully. In this case, find the cause of the incident by referring to the DIAGNOSTIC PROCEDURE below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as follows:

1. Check that throttle valve is fully closed.
2. Check PCV valve operation.
3. Check that downstream of throttle valve is free from air leakage.
4. When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident. It is useful to perform "TROUBLE DIAGNOSIS - SPECIFICATION VALUE". Refer to [EC-86](#).
5. If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning again:
 - Engine stalls.
 - Incorrect idle.

HOW TO SET SRT CODE

< BASIC INSPECTION >

[VQ40DE]

HOW TO SET SRT CODE

Description

INFOID:000000007357950

OUTLINE

In order to set all SRTs, the self-diagnoses as in the "SRT ITEM" table must have been performed at least once. Each diagnosis may require actual driving for a long period of time under various conditions.

SRT ITEM

The table below shows required self-diagnostic items to set the SRT to "CMPLT".

SRT item* ¹ (CONSULT indication)	Performance Priority* ²	Required self-diagnostic items to set the SRT to "CMPLT"	Corresponding DTC No.
CATALYST	2	Three way catalyst function	P0420, P0430
EVAP SYSTEM	2	EVAP control system purge flow monitoring	P0441
	1	EVAP control system	P0442
	2	EVAP control system	P0456
HO2S	1	Air fuel ratio (A/F) sensor 1	P0133, P0153
		Heated oxygen sensor 2	P0137, P0157
		Heated oxygen sensor 2	P0138, P0158
		Heated oxygen sensor 2	P0139, P0159
EGR/VVT SYSTEM	3	Intake valve timing control function	P0011, P0021

- *1: Though displayed on the CONSULT screen, "HO2S HTR" is not SRT item.
- *2: If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT.

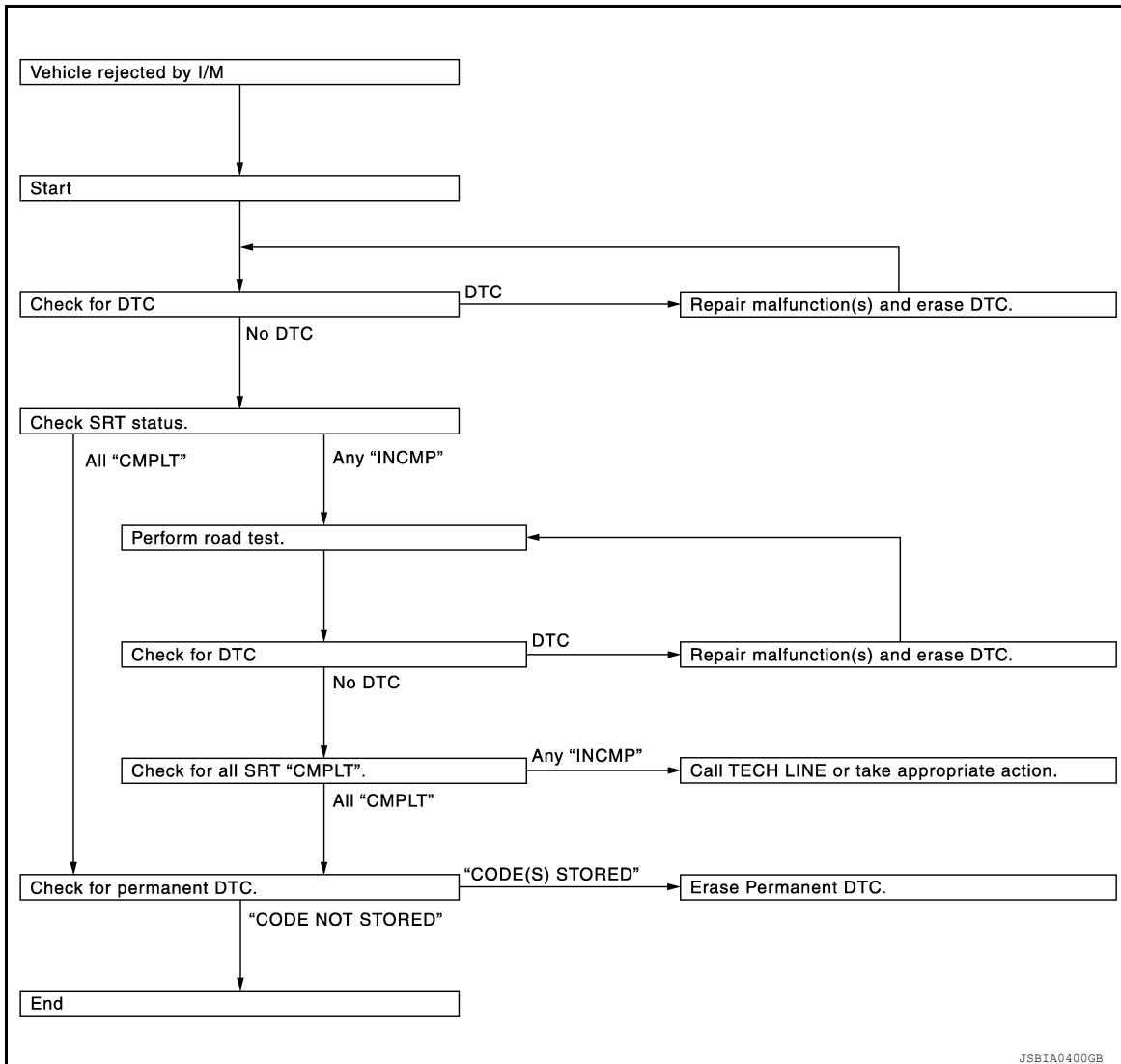
SRT SERVICE PROCEDURE

If a vehicle has failed the state emissions inspection due to one or more SRT items indicating "INCMP", review the flowchart diagnostic sequence, referring to the following flowchart.

HOW TO SET SRT CODE

< BASIC INSPECTION >

[VQ40DE]



SRT Set Driving Pattern

INFOID:000000007357951

CAUTION:

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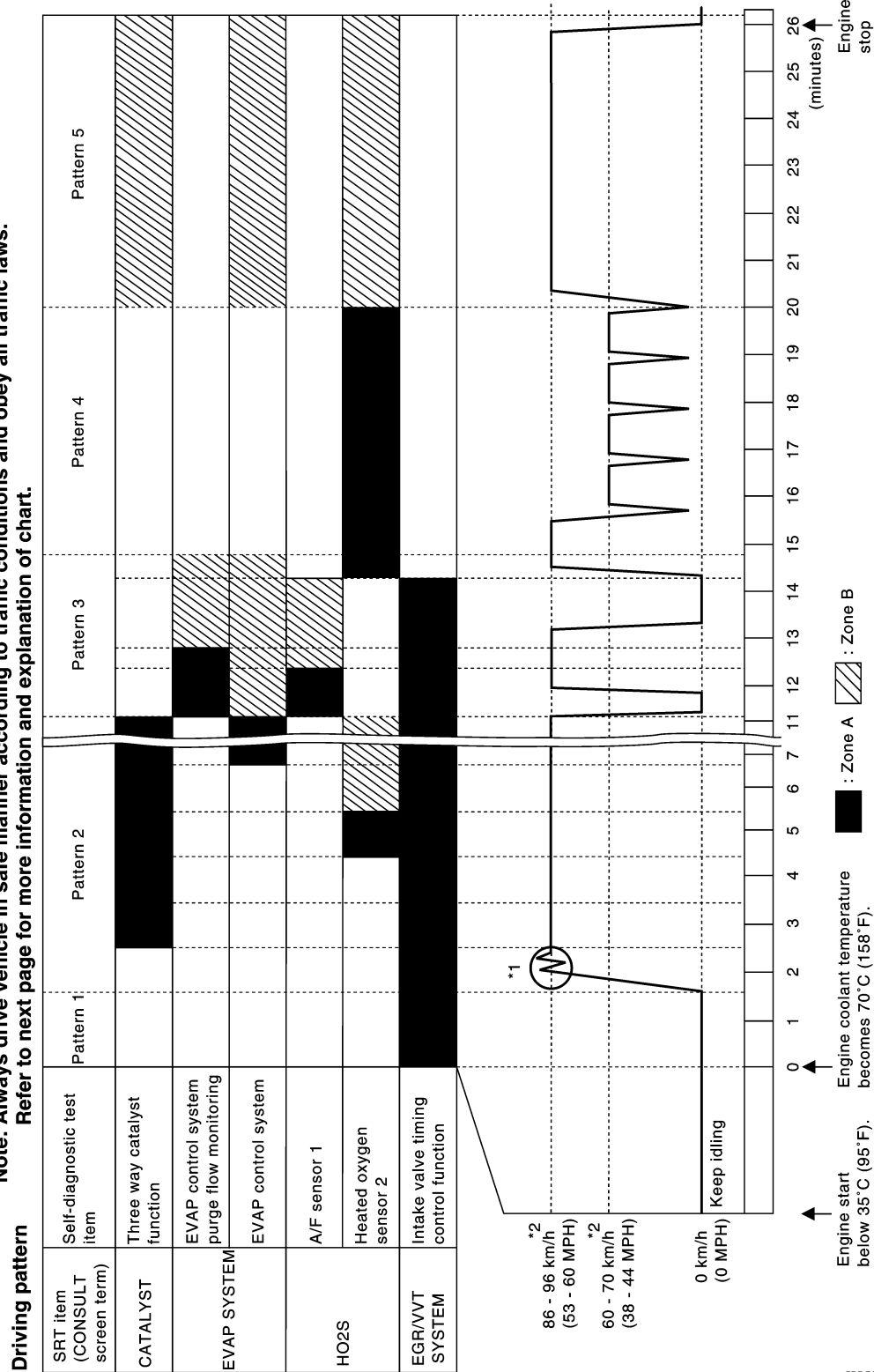
HOW TO SET SRT CODE

< BASIC INSPECTION >

[VQ40DE]

Always drive the vehicle in safe manner according to traffic conditions and obey all traffic laws.

Note: Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws. Refer to next page for more information and explanation of chart.



*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.

*2: Checking the vehicle speed with GST is advised.

- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
- "Zone A" is the fastest time where required for the diagnosis under normal conditions*. If the diagnosis is not completed within "Zone A", the diagnosis can still be performed within "Zone B".

HOW TO SET SRT CODE

[VQ40DE]

< BASIC INSPECTION >

*: Normal conditions

- Sea level
- Flat road
- Ambient air temperature: 20 – 30°C (68 – 86°F)

NOTE:

Diagnosis is performed as quickly as possible under normal conditions. However, under other conditions, diagnosis may also be performed. [For example: ambient air temperature other than 20 – 30°C (68 – 86°F)]

Work Procedure

INFOID:000000007357952

1. CHECK DTC

Check DTC.

Is any DTC detected?

- YES >> Repair malfunction(s) and erase DTC. Refer to [EC-444, "DTC Index"](#).
- NO >> GO TO 2.

2. CHECK SRT STATUS

With CONSULT

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.

Without CONSULT

Perform "SRT status" mode with [EC-74, "On Board Diagnosis Function"](#).

With GST

Select Service \$01 with GST.

Is SRT code(s) set?

- YES >> GO TO 11.
- NO-1 >> With CONSULT: GO TO 3.
- NO-2 >> Without CONSULT: GO TO 4.

3. DTC CONFIRMATION PROCEDURE

1. Select "SRT WORK SUPPORT" in "DTC & SRT CONFIRMATION" mode with CONSULT.
2. For SRT(s) that is not set, perform the corresponding "DTC CONFIRMATION PROCEDURE" according to the "Performance Priority" in the "SRT ITEM" table. Refer to [EC-28, "Description"](#).
3. Check DTC.

Is any DTC detected?

- YES >> Repair malfunction(s) and erase DTC. Refer to [EC-444, "DTC Index"](#).
- NO >> GO TO 10.

4. PERFORM ROAD TEST

- Check the "Performance Priority" in the "SRT ITEM" table. Refer to [EC-28, "Description"](#).
- Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to [EC-29, "SRT Set Driving Pattern"](#).

In order to set all SRTs, the SRT set driving pattern must be performed at least once.

>> GO TO 5.

5. PATTERN 1

1. Check the vehicle condition;
 - Engine coolant temperature is –10 to 35°C (14 to 95°F).
 - Fuel tank temperature is more than 0°C (32°F).
2. Start the engine.
3. Keep engine idling until the engine coolant temperature is greater than 70°C (158°F)

NOTE:

ECM terminal voltage is follows;

- Engine coolant temperature
 - –10 to 35°C (14 to 95°F): 3.0 – 4.3 V
 - 70°(158°F): Less than 4.1 V
- Fuel tank temperature: Less than 1.4 V

Refer to [EC-430, "CONSULT Reference Value in Data Monitor Mode"](#).

>> GO TO 6.

6. PATTERN 2

1. Drive the vehicle. And depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds.
2. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again

NOTE:

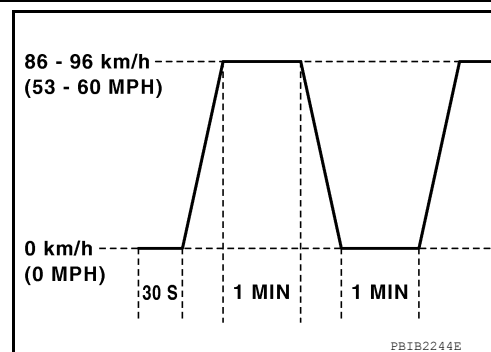
- Checking the vehicle speed with GST is advised.
- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

>> GO TO 7.

7. PATTERN 3

- Operate vehicle following the driving pattern shown in the figure.
- Release the accelerator pedal during deceleration of vehicle speed from 90 km/h (56 MPH) to 0 km/h (0 MPH).

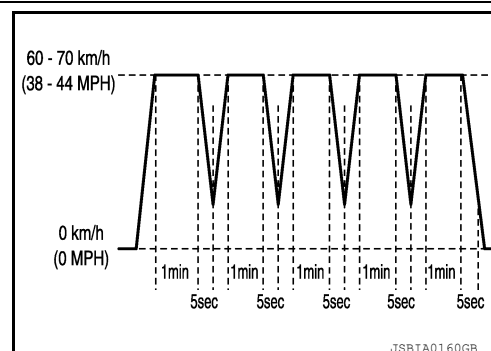
>> GO TO 8.



8. PATTERN 4

- Operate vehicle, following the driving pattern shown in the figure.
- Drive the vehicle in a proper gear at 60 km/h (38 MPH) and maintain the speed.
- Release the accelerator pedal fully at least 5 seconds.
- Repeat the above two steps at least 5 times.

>> GO TO 9.



9. PATTERN 5

- The accelerator pedal must be held very steady during steady-state driving.
- If the accelerator pedal is moved, the test must be conducted again.

>> GO TO 10.

10. CHECK SRT STATUS

Ⓟ With CONSULT

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.

ⓧ Without CONSULT

Perform "SRT status" mode with [EC-74. "On Board Diagnosis Function"](#).

Ⓢ With GST

Select Service \$01 with GST.

Is SRT(s) set?

YES >> GO TO 11.

NO >> Call TECH LINE or take appropriate action.

11. CHECK PERMANENT DTC

HOW TO SET SRT CODE

[VQ40DE]

< BASIC INSPECTION >

NOTE:

Permanent DTC cannot be checked with a tool other than CONSULT or GST.

☐ With CONSULT

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.

Ⓜ With GST

Select Service \$0A with GST.

Is permanent DTC(s) detected?

YES >> Go to [EC-34. "Description"](#).

NO >> END

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HOW TO ERASE PERMANENT DTC

[VQ40DE]

< BASIC INSPECTION >

HOW TO ERASE PERMANENT DTC

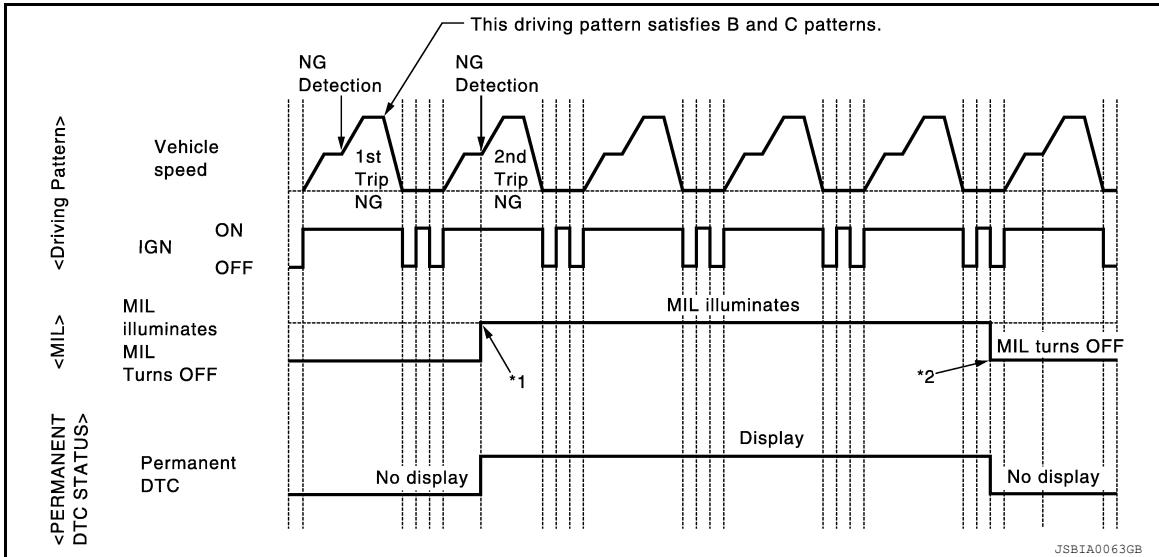
Description

INFOID:000000007357953

OUTLINE

When a DTC is stored in ECM

When a DTC is stored in ECM and MIL is ON, a permanent DTC is erased with MIL shutoff if the same malfunction is not detected after performing the driving pattern for MIL shutoff three times in a row.



*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.

*2: MIL will turn off after vehicle is driven 3 times (driving pattern B) without any malfunctions.

When a DTC is not stored in ECM

The erasing method depends on a permanent DTC stored in ECM. Refer to the following table.

NOTE:

If the applicable permanent DTC includes multiple groups, perform the procedure of Group B first. If the permanent DTC is not erased, perform the procedure of Group A.

×: Applicable —: Not applicable

Group *	Perform "DTC CONFIRMATION PROCEDURE" for applicable DTCs.	Driving pattern		Reference
		B	D	
A	×	—	—	EC-35
B	—	×	×	EC-37

*: For group, refer to [EC-444, "DTC Index"](#).

PERMANENT DTC ITEM

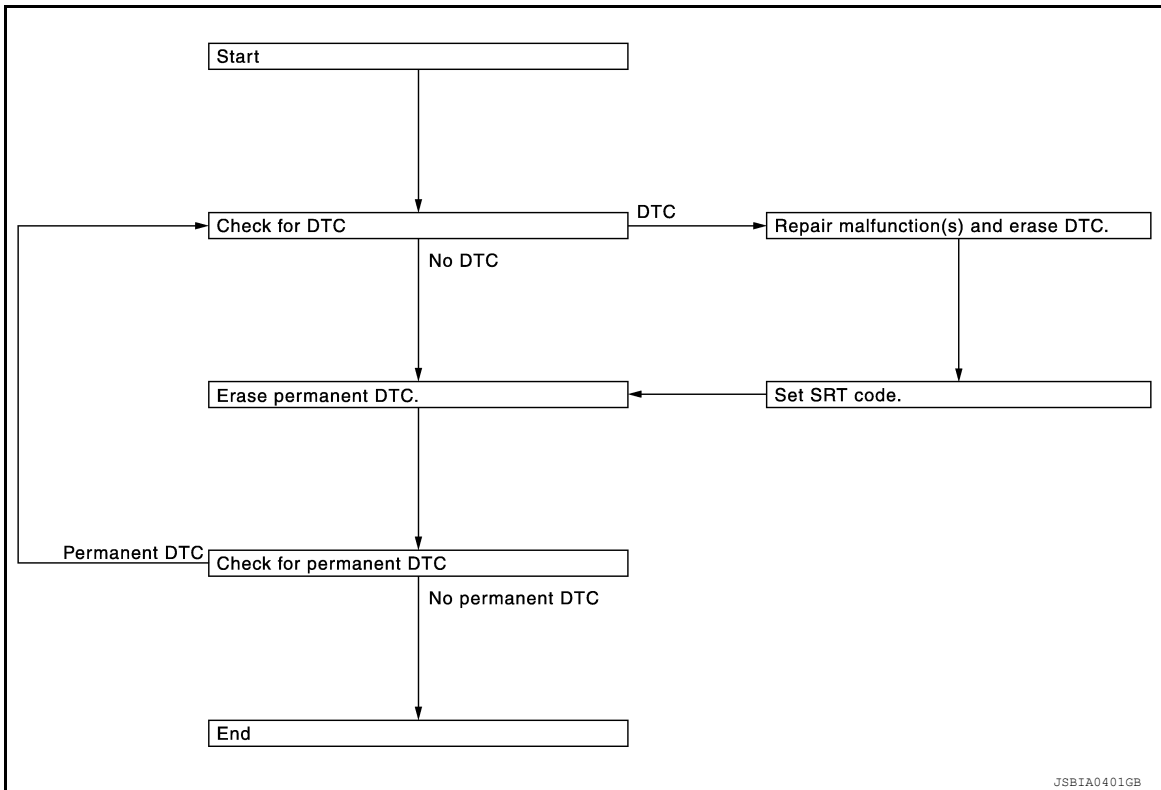
For permanent DTC items, MIL turns ON. Refer to [EC-444, "DTC Index"](#).

HOW TO ERASE PERMANENT DTC

< BASIC INSPECTION >

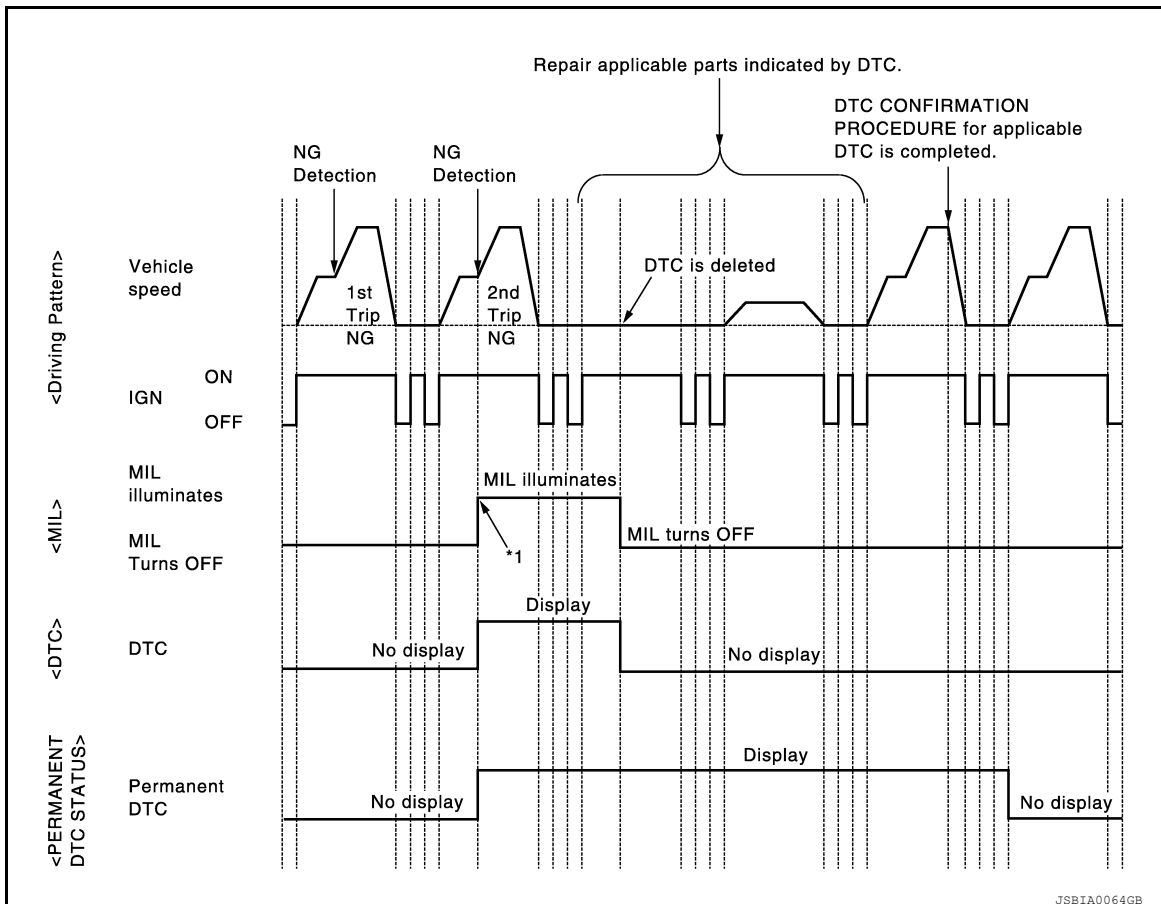
[VQ40DE]

PERMANENT DTC SERVICE PROCEDURE



Work Procedure (Group A)

INFOID:000000007357954



HOW TO ERASE PERMANENT DTC

[VQ40DE]

< BASIC INSPECTION >

*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.

1. CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to [EC-74, "On Board Diagnosis Function"](#).
NO >> GO TO 2.

2. CHECK PERMANENT DTC

 With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.

 With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?


YES >> GO TO 3.
NO >> END

3. PERFORM DTC CONFIRMATION PROCEDURE

Perform "DTC CONFIRMATION PROCEDURE" for DTCs which are the same as permanent DTCs stored in ECM. Refer to [EC-444, "DTC Index"](#).

>> GO TO 4.

4. CHECK PERMANENT DTC

 With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.

 With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

YES >> GO TO 1.
NO >> END

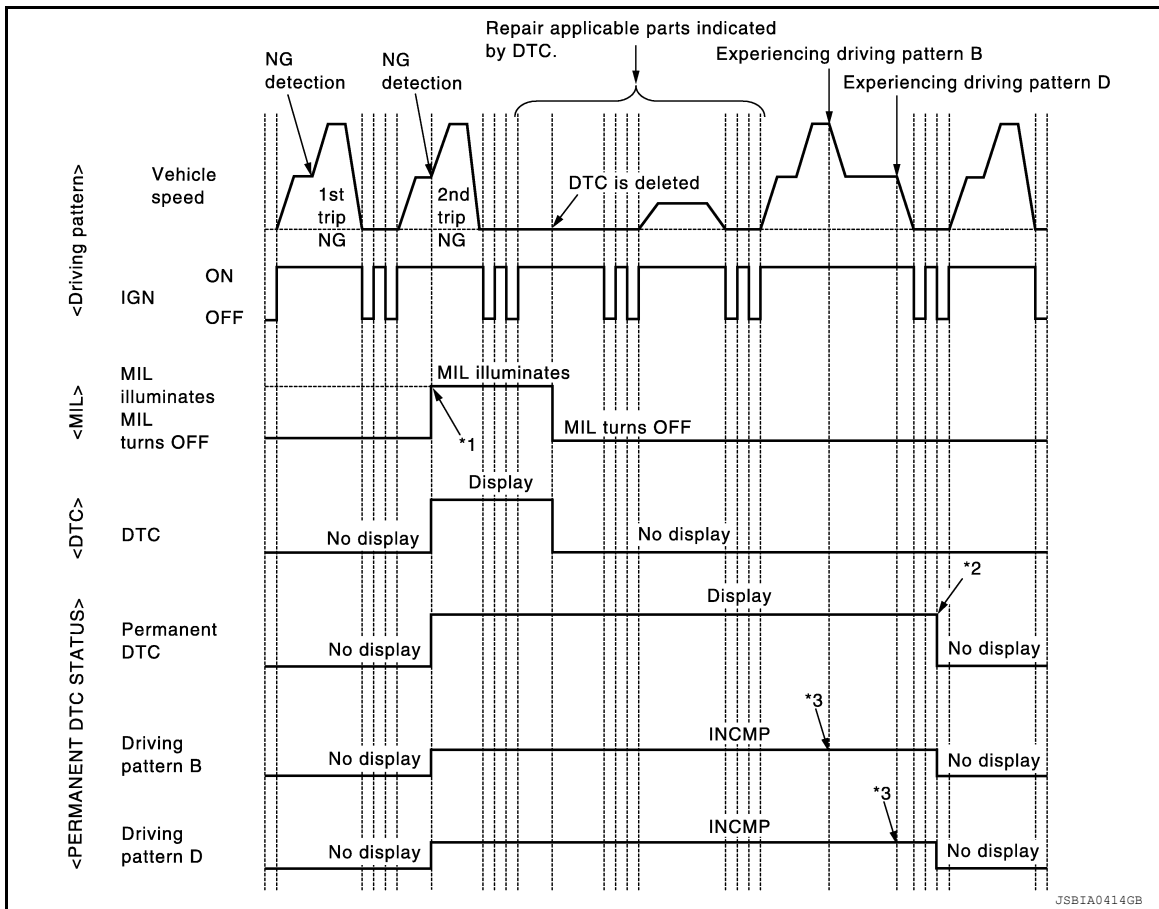
HOW TO ERASE PERMANENT DTC

< BASIC INSPECTION >

[VQ40DE]

Work Procedure (Group B)

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*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.

*2: After experiencing driving pattern B and D, permanent DTC is erased.

*3: Indication does not change unless the ignition switch is turned from ON to OFF twice even after experiencing driving pattern B or D.

NOTE:

Drive the vehicle according to only driving patterns indicating "INCMP" in driving patterns B and D on the "PERMANENT DTC STATUS" screen.

1. CHECK DTC

Check DTC.

Is any DTC detected?

- YES >> Repair malfunction(s) and erase DTC. Refer to [EC-74. "On Board Diagnosis Function"](#).
- NO >> GO TO 2.

2. CHECK PERMANENT DTC

Ⓜ With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.

Ⓜ With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.

HOW TO ERASE PERMANENT DTC

[VQ40DE]

< BASIC INSPECTION >

5. Select Service \$0A with GST.

Is any permanent DTC detected?

YES >> GO TO 3.

NO >> END

3.DRIVE DRIVING PATTERN B

CAUTION:

- Always drive at a safe speed.
- Never erase self-diagnosis results.
- If self-diagnosis results are erased during the trip of driving pattern B or D, the counter of driving pattern B and D is reset.

Ⓟ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Use "PERMANENT DTC WORK SUPPORT" mode with CONSULT to drive the vehicle according to driving pattern B. Refer to [EC-77. "CONSULT Function"](#), [EC-71. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

Ⓢ With GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle according to driving pattern B. Refer to [EC-71. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

>> GO TO 4.

4.CHECK PERMANENT DTC

Ⓟ With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.

Ⓢ With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

YES >> GO TO 5.

NO >> END

5.DRIVE DRIVING PATTERN D

CAUTION:

- Always drive at a safe speed.
- Never erase self-diagnosis results.
- If self-diagnosis results are erased during the trip of driving pattern B or D, the counter of driving pattern B and D is reset.

1. Drive the vehicle according to driving pattern D. Refer to [EC-71. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

>> GO TO 6.

6.CHECK PERMANENT DTC

Ⓟ With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.

HOW TO ERASE PERMANENT DTC

[VQ40DE]

< BASIC INSPECTION >

 With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

- YES >> GO TO 1.
NO >> END

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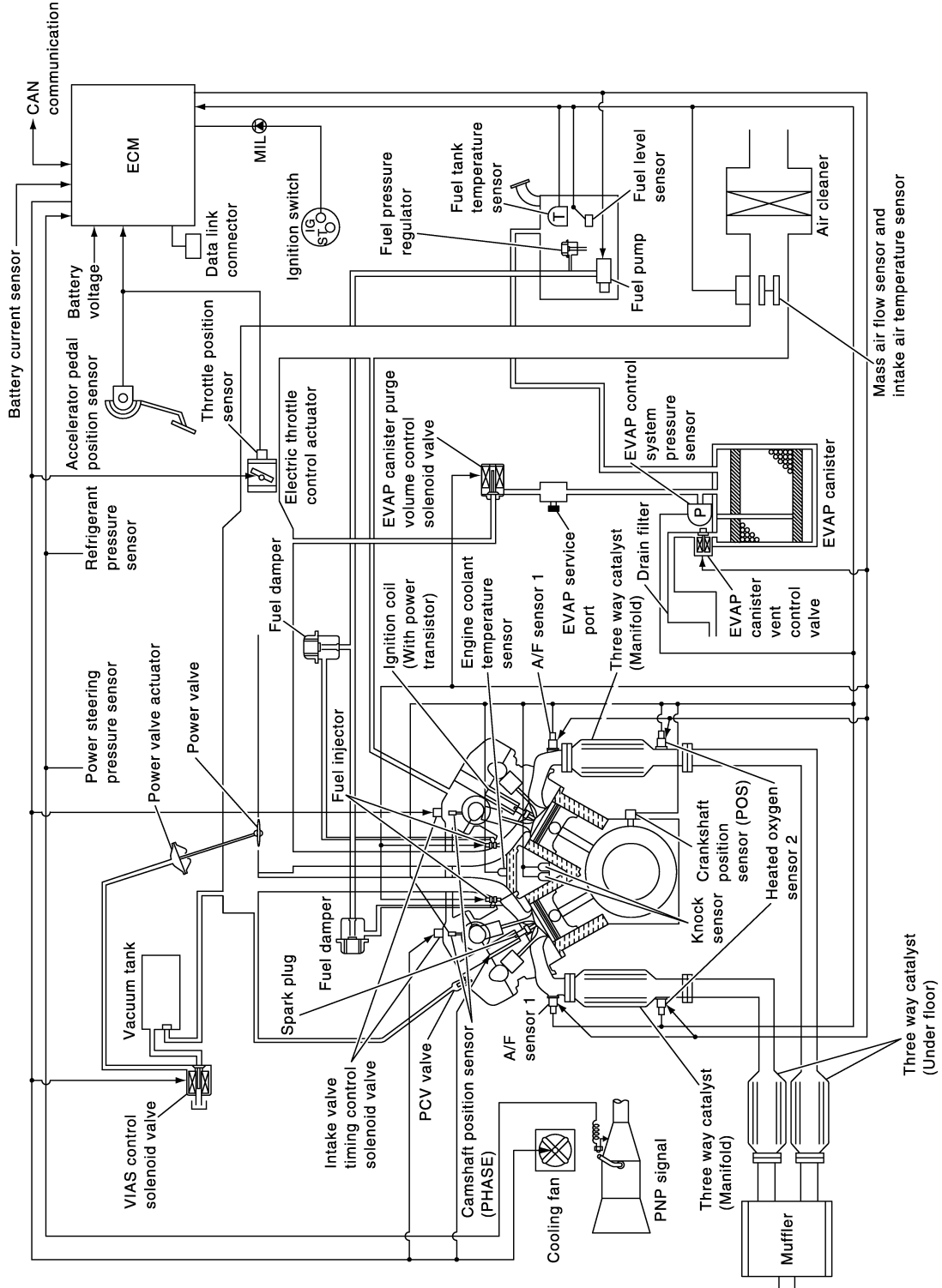
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SYSTEM DESCRIPTION

ENGINE CONTROL SYSTEM

System Diagram

INFOID:000000007357956



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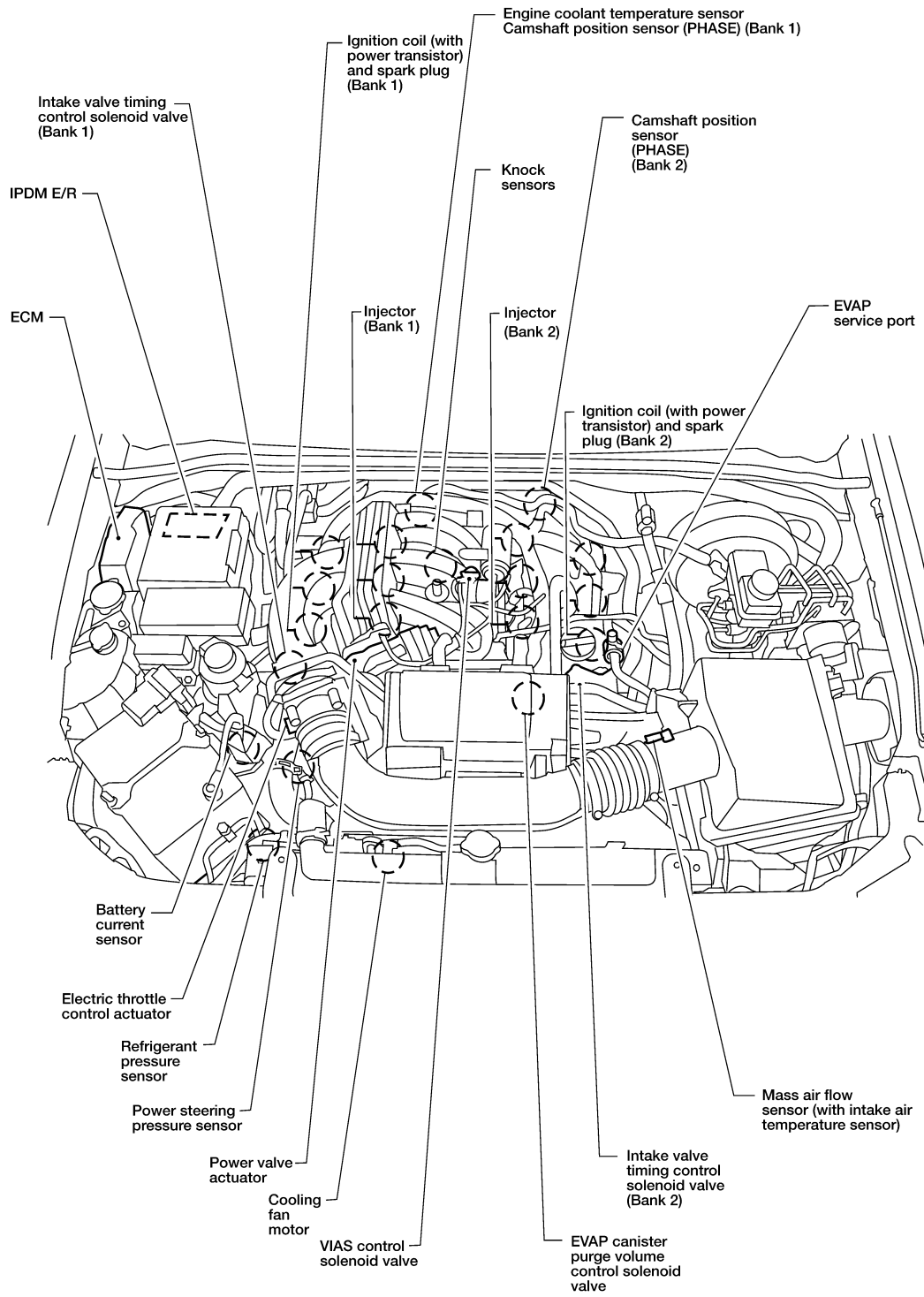
ENGINE CONTROL SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

Engine Control Component Parts Location

INFOID:000000007357957



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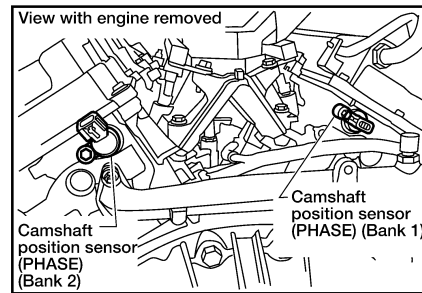
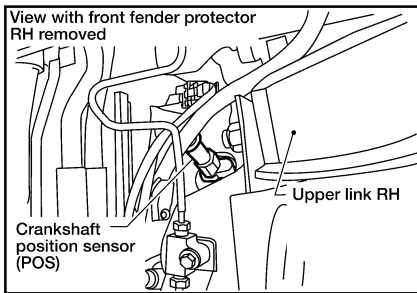
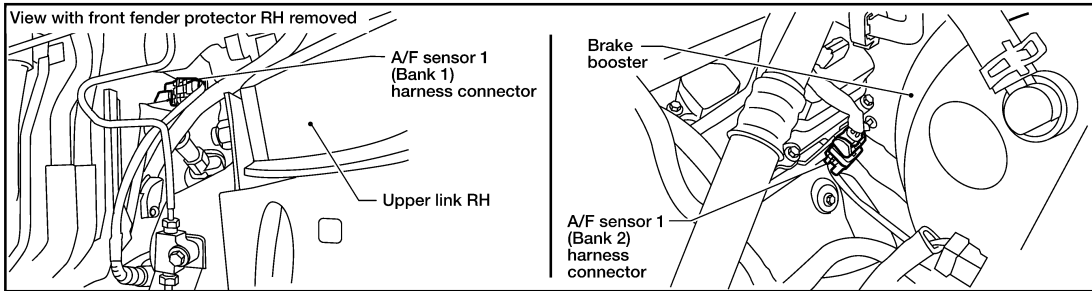
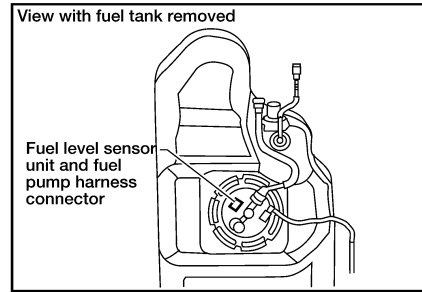
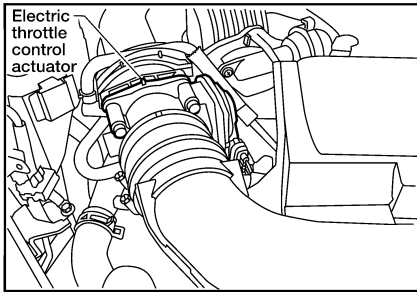
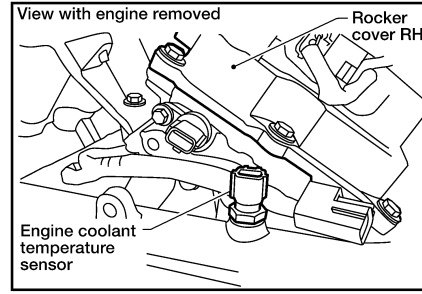
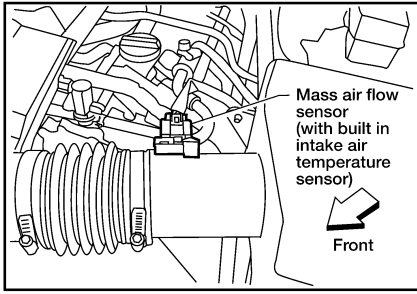
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BBIA0536E

ENGINE CONTROL SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

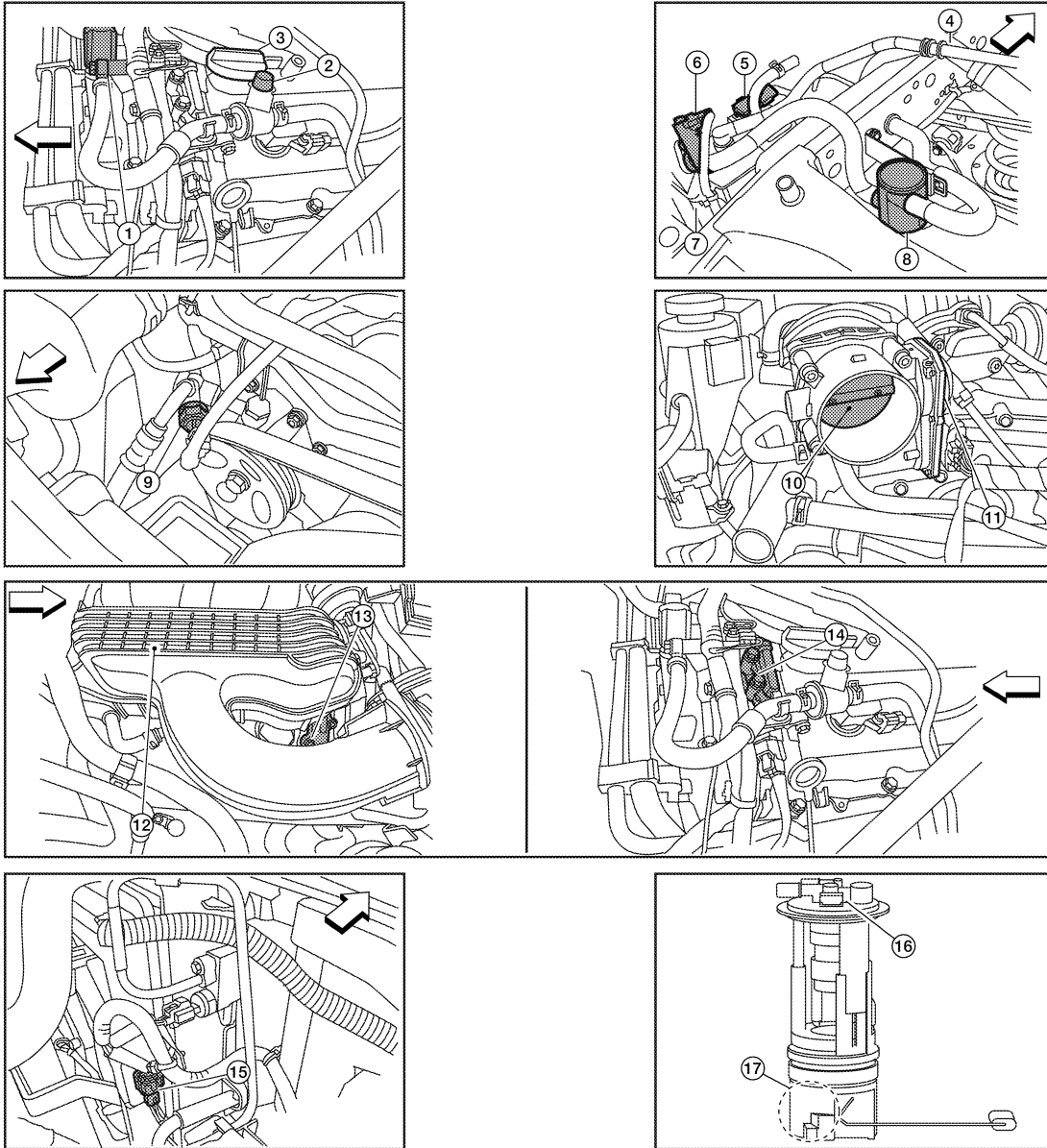


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ENGINE CONTROL SYSTEM

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[VQ40DE]



AWBIA01352Z

- | | | |
|---|--|---|
| 1. EVAP canister purge volume control solenoid valve (view with engine cover removed) | 2. EVAP service port | 3. Oil filler cap |
| 4. Fuel filler pipe (top of frame view) | 5. EVAP control system pressure sensor | 6. EVAP canister vent control valve |
| 7. EVAP canister | 8. Drain filter | 9. Power steering pressure sensor |
| 10. Throttle valve (view with intake air duct removed) | 11. Electric throttle control actuator | 12. Intake manifold collector |
| 13. Intake valve timing control solenoid valve (bank 1) | 14. Intake valve timing control solenoid valve (bank 2) (view with engine cover and intake air duct removed) | 15. Cooling fan motor harness connector (view with battery removed) |
| 16. Fuel pump, fuel level sensor unit and fuel filter | 17. Fuel pressure regulator | |

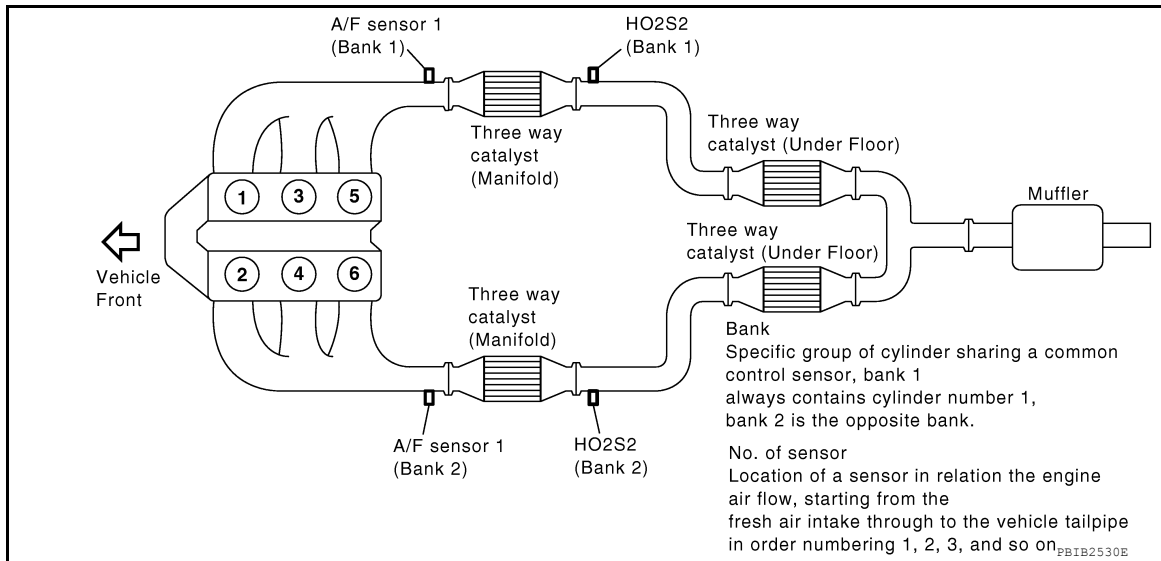
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ENGINE CONTROL SYSTEM

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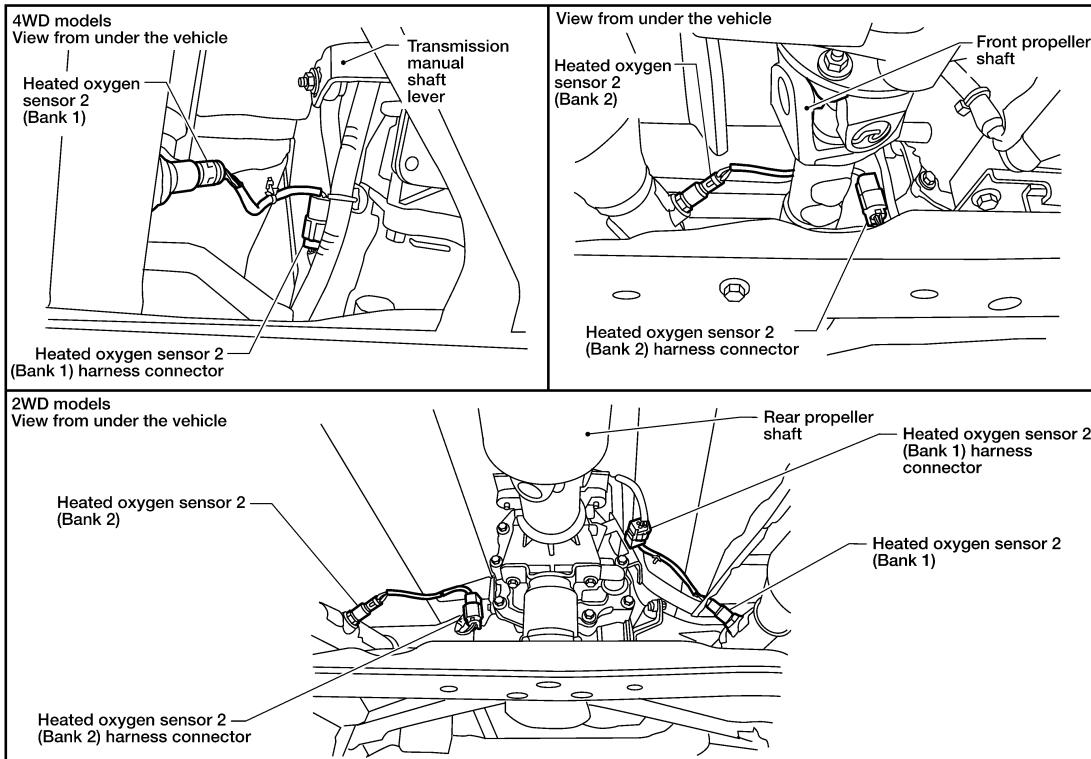
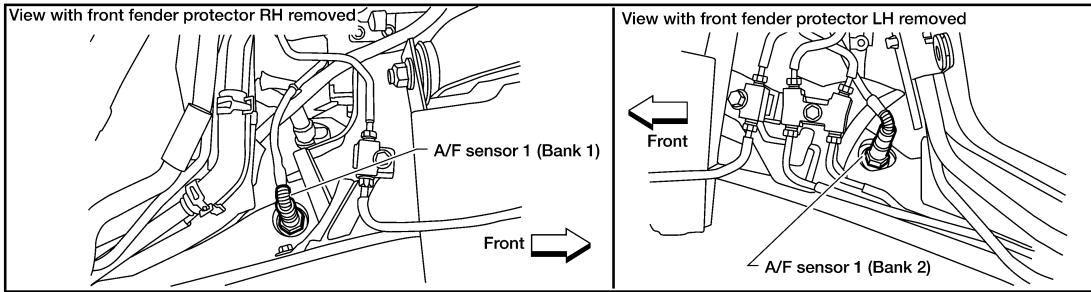
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[VQ40DE]



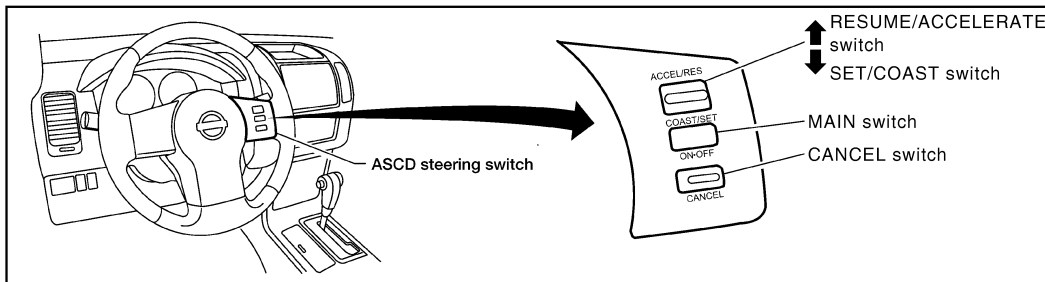
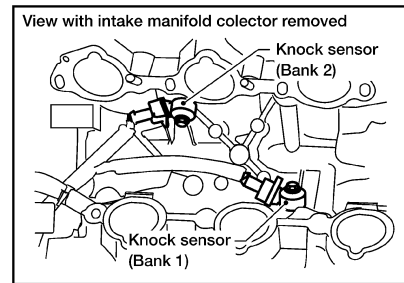
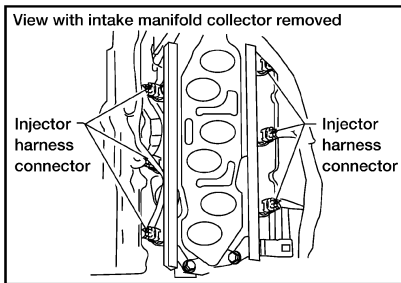
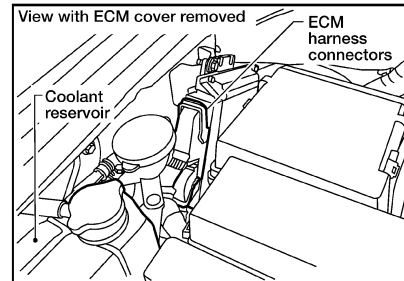
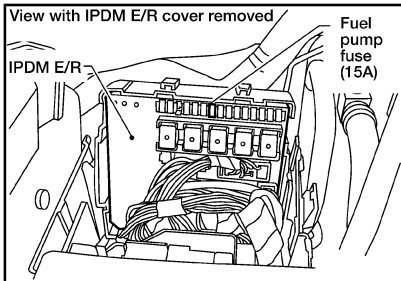
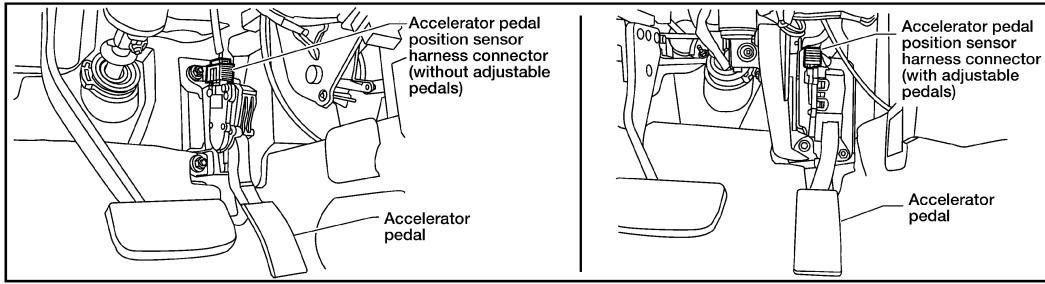
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ENGINE CONTROL SYSTEM

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[VQ40DE]

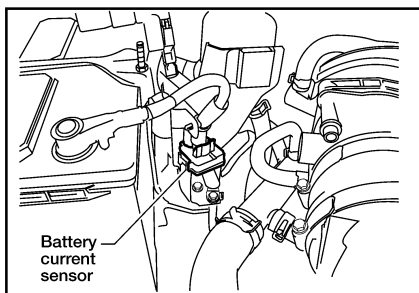
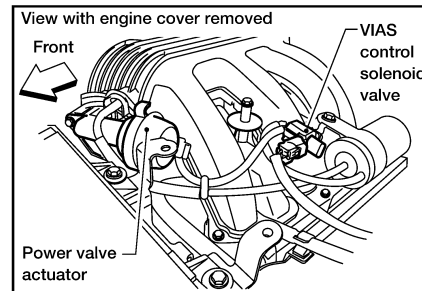
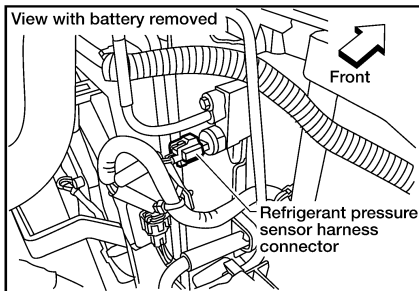
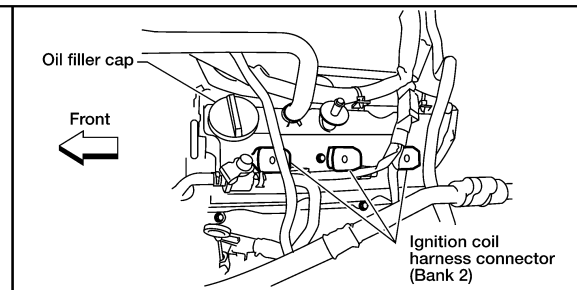
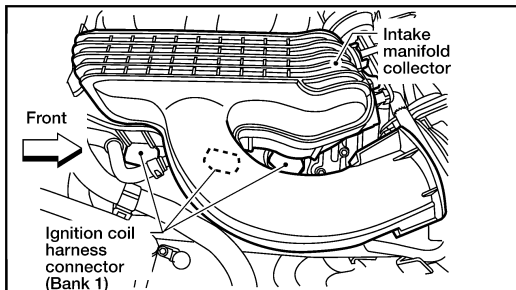
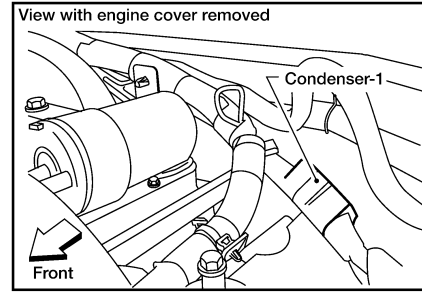
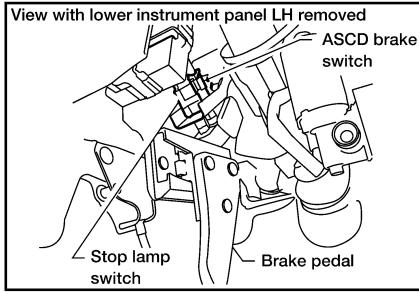


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ENGINE CONTROL SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]



BBIA0581E

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MULTIPOINT FUEL INJECTION SYSTEM

[VQ40DE]

< SYSTEM DESCRIPTION >

MULTIPOINT FUEL INJECTION SYSTEM

System Description

INFOID:000000007357958

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*3	Fuel injection & mixture ratio control	Fuel injector
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
TCM	Gear position		
Knock sensor	Engine knocking condition		
Battery	Battery voltage*3		
Power steering pressure sensor	Power steering operation		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		
Air conditioner switch	Air conditioner operation*2		
Wheel sensor	Vehicle speed*2		

*1: This sensor is not used to control the engine system under normal conditions.

*2: This signal is sent to the ECM via the CAN communication line.

*3: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from both the crankshaft position sensor and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from N to D
- High-load, high-speed operation

<Fuel decrease>

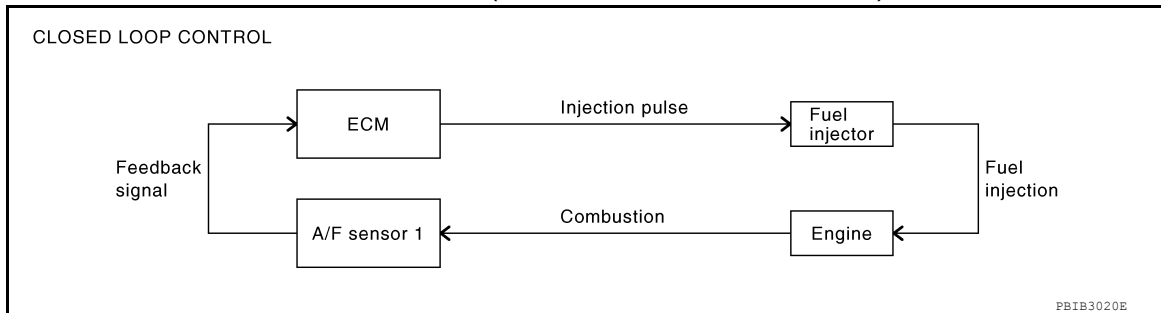
- During deceleration
- During high engine speed operation

MULTIPOINT FUEL INJECTION SYSTEM

[VQ40DE]

< SYSTEM DESCRIPTION >

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can better reduce CO, HC and NOx emissions. This system uses air fuel ratio (A/F) sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about air fuel ratio (A/F) sensor 1, refer to [EC-148](#). This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

This stage is referred to as the closed loop control condition.

Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of air fuel ratio (A/F) sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

Open Loop Control

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of air fuel ratio (A/F) sensor 1 or its circuit
- Insufficient activation of air fuel ratio (A/F) sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from N to D
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from air fuel ratio (A/F) sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., fuel injector clogging) directly affect mixture ratio.

Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.

"Fuel trim" refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short-term fuel trim and long-term fuel trim.

"Short-term fuel trim" is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from air fuel ratio (A/F) sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.

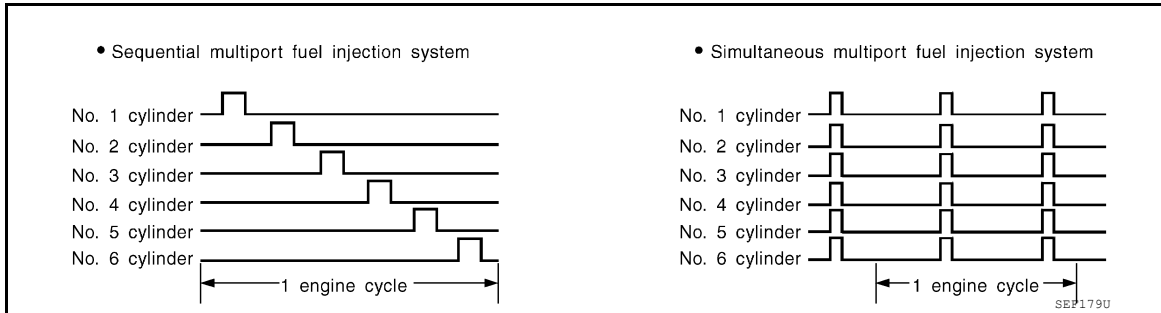
"Long-term fuel trim" is overall fuel compensation carried out overtime to compensate for continual deviation of the short-term fuel trim from the central value. Continual deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

MULTIPOINT FUEL INJECTION SYSTEM

[VQ40DE]

< SYSTEM DESCRIPTION >

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.

The six fuel injectors will then receive the signals two times for each engine cycle.

This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration, operation of the engine at excessively high speeds or operation of the vehicle at excessively high speeds.

ELECTRIC IGNITION SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

ELECTRIC IGNITION SYSTEM

System Description

INFOID:000000007357959

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*2	Ignition timing control	Power transistor
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Knock sensor	Engine knocking		
TCM	Gear position		
Battery	Battery voltage*2		
Wheel sensor	Vehicle speed*1		

*1: This signal is sent to the ECM via the CAN communication line.

*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

Firing order: 1-2-3-4-5-6

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM.

The ECM receives information such as the injection pulse width and camshaft position sensor (PHASE) signal. Computing this information, ignition signals are transmitted to the power transistor.

During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

AIR CONDITIONING CUT CONTROL

< SYSTEM DESCRIPTION >

[VQ40DE]

AIR CONDITIONING CUT CONTROL

Input/Output Signal Chart

INFOID:000000007357960

Sensor	Input Signal to ECM	ECM function	Actuator
Air conditioner switch	Air conditioner ON signal* ¹	Air conditioner cut control	Air conditioner relay
Accelerator pedal position sensor	Accelerator pedal position		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed* ²		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage* ²		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering pressure sensor	Power steering operation		
Wheel sensor	Vehicle speed* ¹		

*1: This signal is sent to the ECM via the CAN communication line.

*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

System Description

INFOID:000000007357961

This system improves engine operation when the air conditioner is used. Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

< SYSTEM DESCRIPTION >

[VQ40DE]

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

System Description

INFOID:000000007357962

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
ASCD brake switch	Brake pedal operation	ASCD vehicle speed control	Electric throttle control actuator
Stop lamp switch	Brake pedal operation		
ASCD steering switch	ASCD steering switch operation		
TCM	Gear position		
Wheel sensor	Vehicle speed*		
TCM	Powertrain revolution*		

*: This signal is sent to the ECM via the CAN communication line.

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.

Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH).

ECM controls throttle angle of electric throttle control actuator to regulate engine speed.

Operation status of ASCD is indicated by CRUISE indicator and SET indicator in combination meter. If any malfunction occurs in the ASCD system, it automatically deactivates control.

NOTE:

Always drive vehicle in a safe manner according to traffic conditions and obey all traffic laws.

SET OPERATION

Press MAIN switch. (The CRUISE indicator in combination meter illuminates.)

When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH), press SET/COAST switch. (Then SET indicator in combination meter illuminates.)

ACCELERATE OPERATION

If the RESUME/ACCELERATE switch is pressed during cruise control driving, increase the vehicle speed until the switch is released or vehicle speed reaches maximum speed controlled by the system.

And then ASCD will maintain the new set speed.

CANCEL OPERATION

When any of following conditions exist, cruise operation will be canceled.

- CANCEL switch is pressed
- More than 2 switches on ASCD steering switch are pressed at the same time (Set speed will be cleared)
- Brake pedal is depressed
- Selector lever position is changed to N, P or R
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed
- VDC system is operated

When the ECM detects any of the following conditions, the ECM will cancel the cruise operation and inform the driver by blinking indicator lamp.

- Engine coolant temperature is slightly higher than the normal operating temperature, CRUISE lamp may blink slowly.

When the engine coolant temperature decreases to the normal operating temperature, CRUISE lamp will stop blinking and the cruise operation will be able to work by depressing SET/COAST switch or RESUME/ACCELERATE switch.

- Malfunction for some self-diagnoses regarding ASCD control: SET lamp will blink quickly.

If MAIN switch is turned to OFF while ASCD is activated, all of ASCD operations will be canceled and vehicle speed memory will be erased.

COAST OPERATION

When the SET/COAST switch is pressed during cruise control driving, decrease vehicle set speed until the switch is released. And then ASCD will maintain the new set speed.

RESUME OPERATION

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

[VQ40DE]

< SYSTEM DESCRIPTION >

When the RESUME/ACCELERATE switch is pressed after canceling operation other than depressing the MAIN switch, vehicle speed will return to last set speed. To resume vehicle set speed, vehicle condition must meet following conditions.

- Brake pedal is released
- Selector lever position is in other than P and N
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 144 km/h (89 MPH)

Component Description

INFOID:000000007357963

ASCD STEERING SWITCH

Refer to [EC-344](#).

ASCD BRAKE SWITCH

Refer to [EC-348](#) and [EC-393](#).

STOP LAMP SWITCH

Refer to [EC-348](#), [EC-359](#) and [EC-393](#).

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to [EC-362](#), [EC-365](#), [EC-369](#) and [EC-371](#).

ASCD INDICATOR

Refer to [EC-397](#).

CAN COMMUNICATION

System Description

INFOID:000000007357964

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

Refer to [LAN-52. "CAN System Specification Chart"](#), about CAN communication for detail.

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COOLING FAN CONTROL

[VQ40DE]

< SYSTEM DESCRIPTION >

COOLING FAN CONTROL

Description

INFOID:000000007357965

SYSTEM DESCRIPTION

Cooling Fan Control

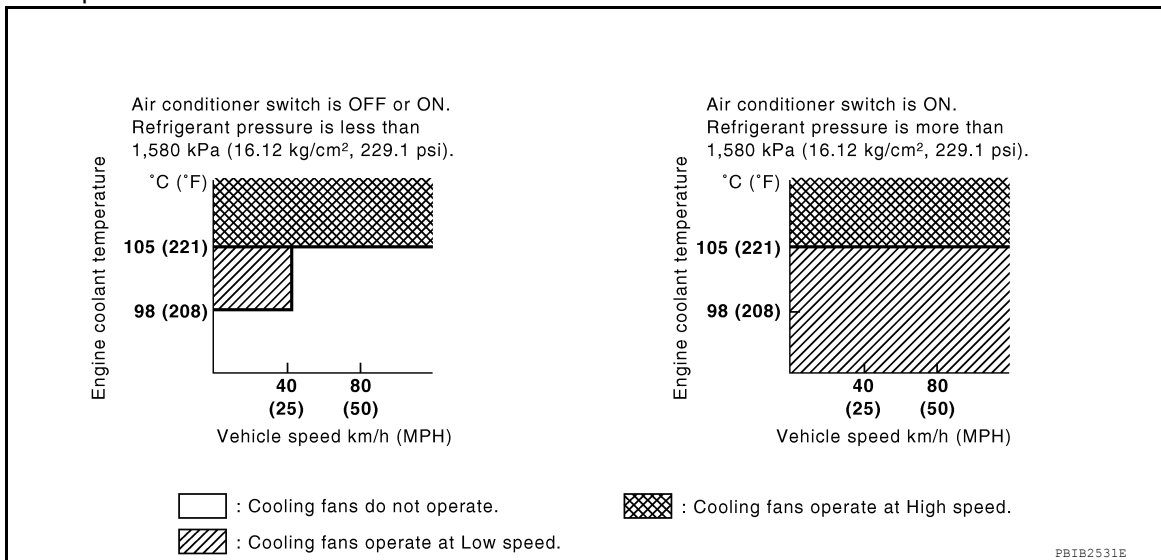
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	Cooling fan control	IPDM E/R (Cooling fan relays)
Battery	Battery voltage*1		
Wheel sensor	Vehicle speed*2		
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner ON signal*2		
Refrigerant pressure sensor	Refrigerant pressure		

*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to ECM via the CAN communication line.

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

Cooling Fan Operation



Cooling Fan Relay Operation

The ECM controls cooling fan relays in the IPDM E/R via the CAN communication line.

Cooling fan speed	Cooling fan relay	
	LO	HI
Stop (OFF)	OFF	OFF
Low (LOW)	ON	OFF
High (HI)	ON	ON

EVAPORATIVE EMISSION SYSTEM

< SYSTEM DESCRIPTION >

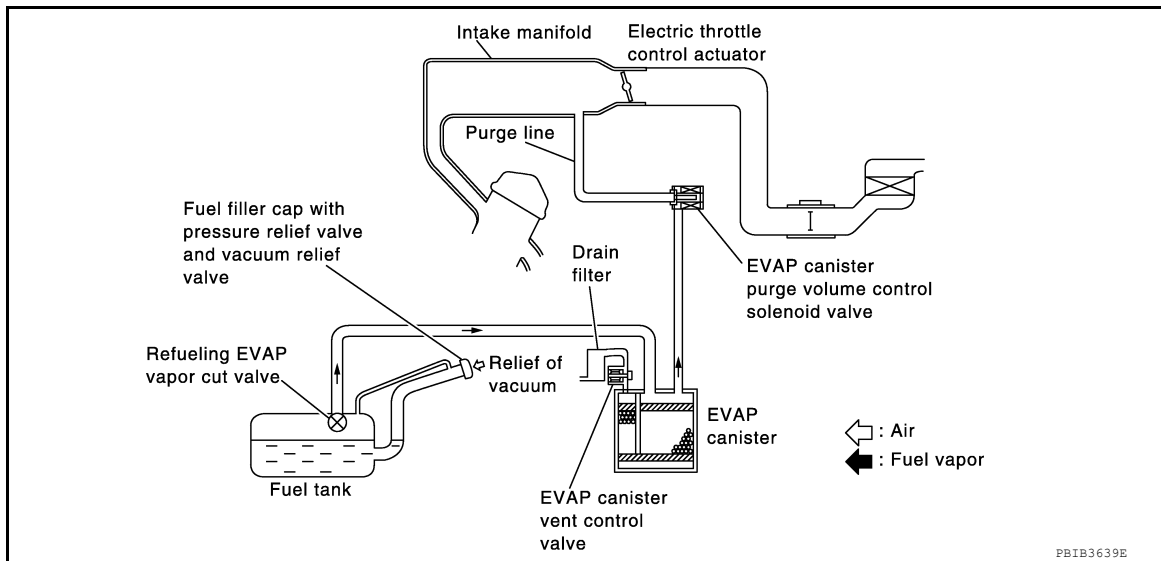
[VQ40DE]

EVAPORATIVE EMISSION SYSTEM

Description

INFOID:000000007357966

SYSTEM DESCRIPTION



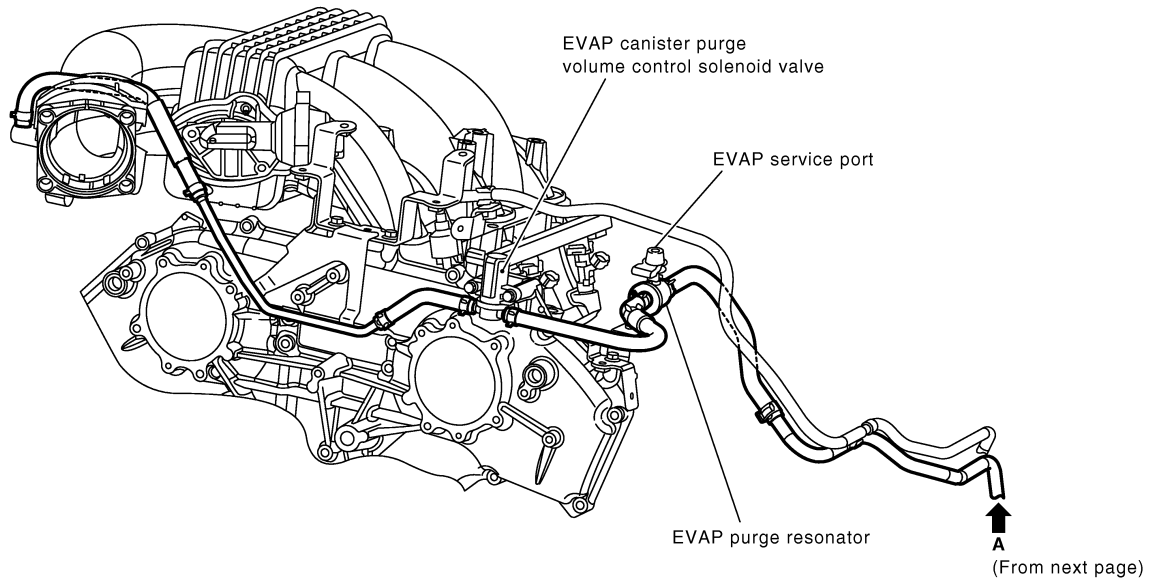
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister. The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank. The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases. EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating.

EVAPORATIVE EMISSION SYSTEM

[VQ40DE]

< SYSTEM DESCRIPTION >

EVAPORATIVE EMISSION LINE DRAWING



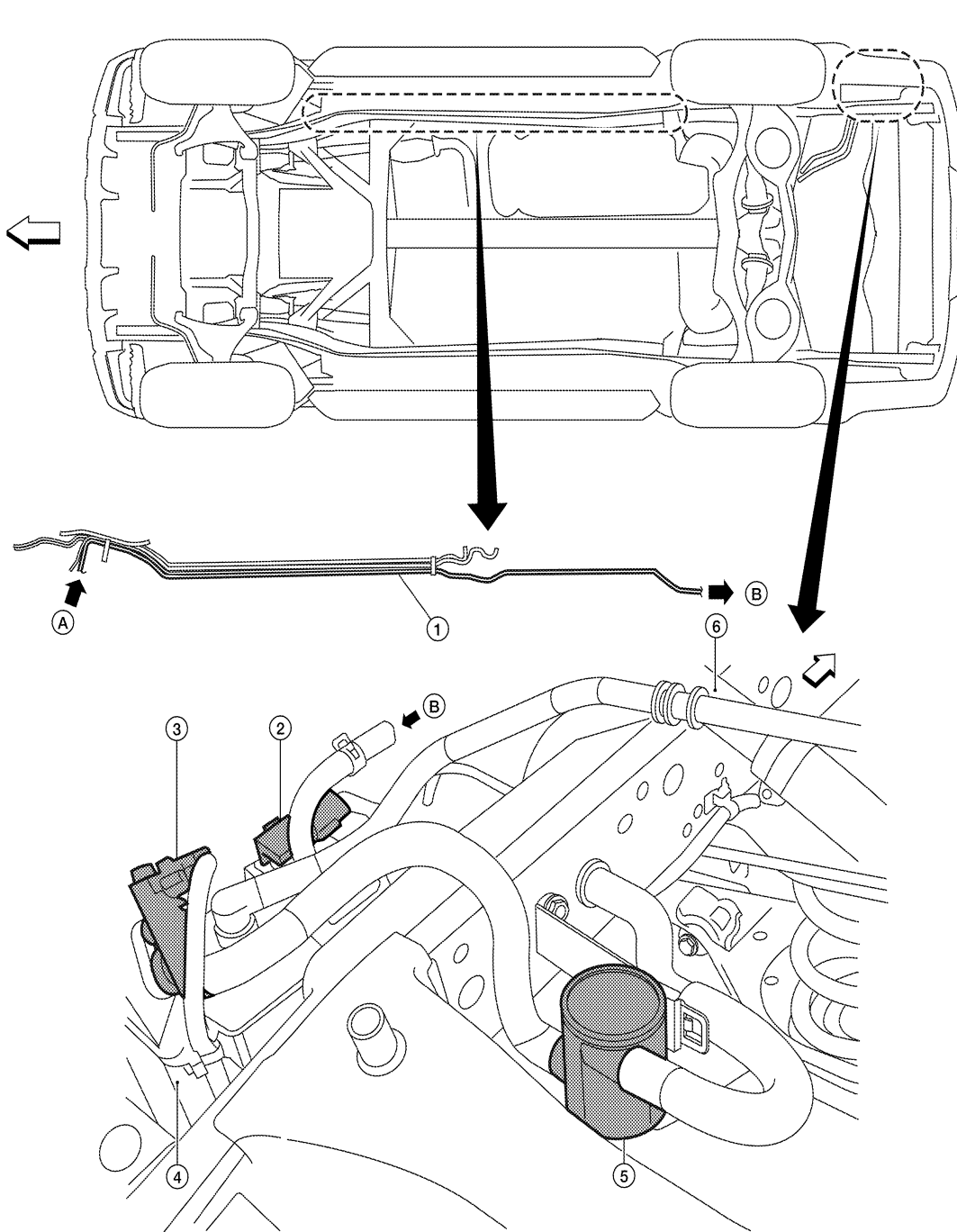
NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

PBIB2528E

EVAPORATIVE EMISSION SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]



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- 1. EVAP vapor purge line
- 2. EVAP control system pressure sensor
- 3. EVAP canister vent control valve
- 4. EVAP canister
- 5. Drain filter
- 6. Fuel filler pipe

⇐ :Vehicle front

← :Previous page

ALBIA0366ZZ

INTAKE VALVE TIMING CONTROL

[VQ40DE]

< SYSTEM DESCRIPTION >

INTAKE VALVE TIMING CONTROL

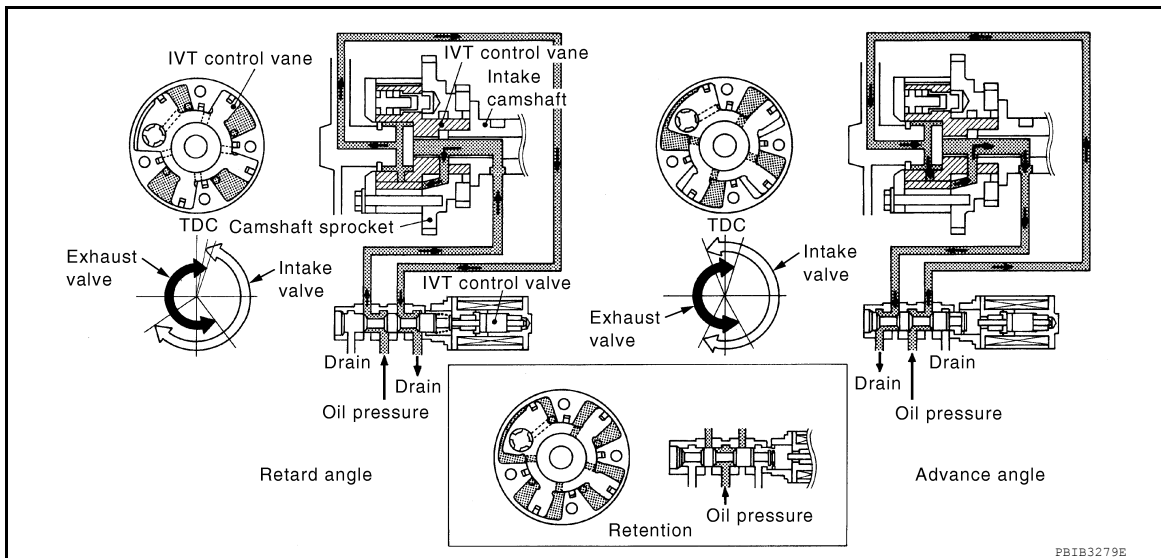
Description

INFOID:000000007357967

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed and piston position	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Wheel sensor	Vehicle speed*		

*: This signal is sent to the ECM via the CAN communication line



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

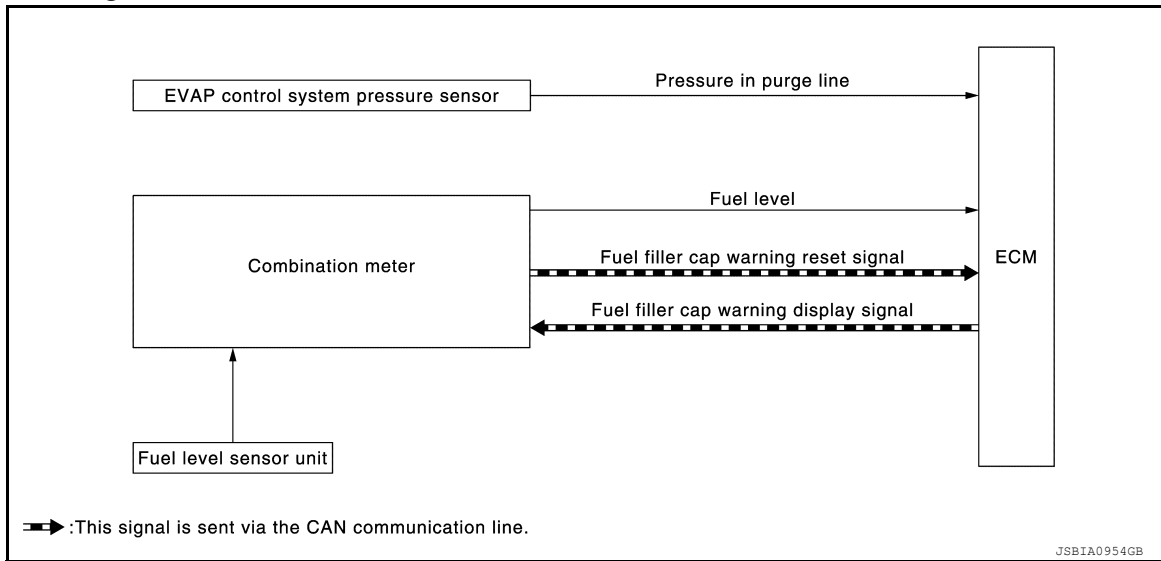
FUEL FILLER CAP WARNING SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

FUEL FILLER CAP WARNING SYSTEM

System Diagram



System Description

INFOID:000000007357969

INPUT/OUTPUT SIGNAL CHART

Input

Unit/Sensor	Input signal to ECM	ECM function
EVAP control system pressure sensor	Pressure in purge line	Fuel filler cap warning control
Combination meter	Fuel level	
	Fuel filler cap warning reset signal*	

*: This signal is sent to the ECM via the CAN communication line.

Output

Unit	Output signal	Actuator
ECM	Fuel filler cap warning display signal*	Combination meter

*: This signal is sent to the combination meter via the CAN communication line.

SYSTEM DESCRIPTION

The fuel filler cap warning system alerts the driver to the prevention of the fuel filler being left uncapped and malfunction occurrences after refueling, by turning ON the fuel filler cap warning display on the combination meter.

ECM judges a refueled state, based on a fuel level signal transmitted from the combination meter.

When a very small leak is detected through the EVAP leak diagnosis performed after judging the refueled state, ECM transmits a fuel filler cap warning display signal (request for display ON) to the combination meter via CAN communication.

When receiving the signal, the combination meter turns ON the fuel filler cap warning display.

CAUTION:

Check fuel filler cap installation condition when the fuel filler cap warning display turns ON.

Reset Operation

The fuel filler cap warning lamp turns OFF, according to any condition listed below:

- Reset operation is performed by operating the meter control switch on the combination meter.
- When the reset operation is performed, the combination meter transmits a fuel filler cap warning reset signal to ECM via CAN communication. ECM transmits a fuel filler cap warning display signal (request for display OFF) to the combination meter via CAN communication. When receiving the signal, the combination meter turns OFF the fuel filler cap warning display.
- EVAP leak diagnosis result is normal.
- Fuel refilled.

FUEL FILLER CAP WARNING SYSTEM

[VQ40DE]

< SYSTEM DESCRIPTION >

- DTC erased by using CONSULT.

NOTE:

MIL turns ON if a malfunction is detected in leak diagnosis results again at the trip after the fuel filler cap warning display turns ON/OFF.

VARIABLE INDUCTION AIR SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

VARIABLE INDUCTION AIR SYSTEM

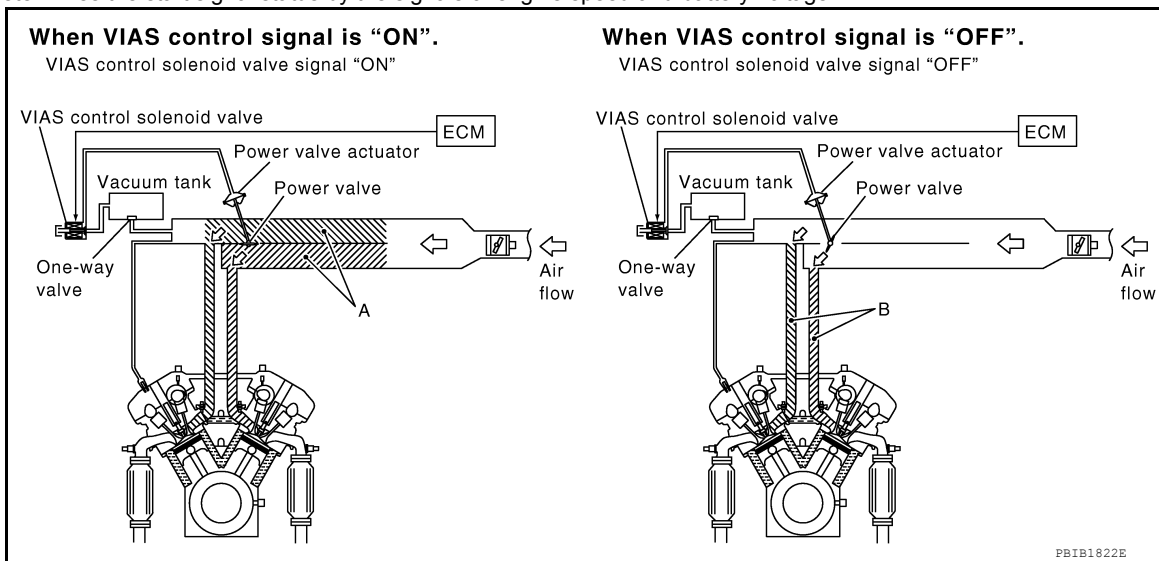
Description

INFOID:000000007357970

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	VIAS control	VIAS control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Battery	Battery voltage*		

*: ECM determines the start signal status by the signals of engine speed and battery voltage.



When the engine is running at medium speed, the ECM sends the ON signal to the VIAS control solenoid valve. This signal introduces the intake manifold vacuum into the power valve actuator and therefore closes the power valve.

Under this condition, the effective intake manifold length is equivalent to the total length of passage A and passage B. This long intake manifold provides increased amount of intake air, which results in improved suction efficiency and higher torque.

When engine is running at low or high speed, the ECM sends the OFF signal to the VIAS control solenoid valve and the power valve is opened.

Under this condition, the effective intake manifold length is equivalent to the length of passage B. This shortened intake manifold length results in enhanced engine output due to reduced suction resistance under high speeds.

COMPONENT DESCRIPTION

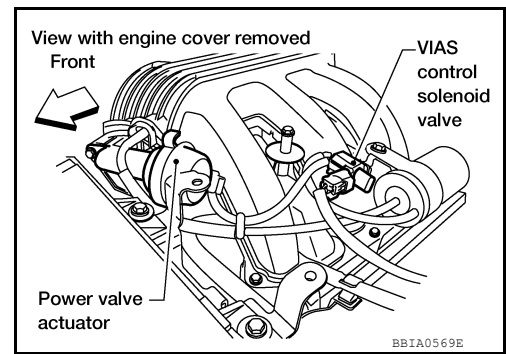
Power Valve

VARIABLE INDUCTION AIR SYSTEM

[VQ40DE]

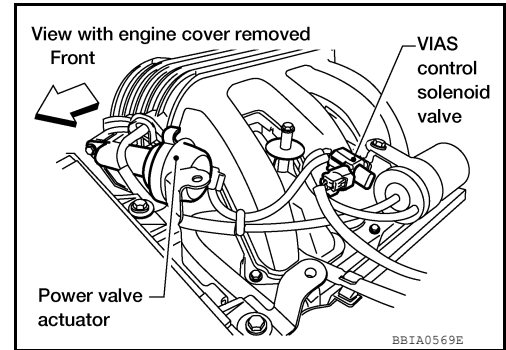
< SYSTEM DESCRIPTION >

The power valve is installed in intake manifold collector and used to control the suction passage of the variable induction air control system. It is set in the fully closed or fully opened position by the power valve actuator operated by the vacuum stored in the surge tank. The vacuum in the surge tank is controlled by the VIAS control solenoid valve.



VIAS Control Solenoid Valve

The VIAS control solenoid valve cuts the intake manifold vacuum signal for power valve control. It responds to ON/OFF signals from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal the coil pulls the plunger downward and feeds the vacuum signal to the power valve actuator.



VARIABLE INDUCTION AIR SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

Vacuum Hose Drawing

INFOID:000000007357971

A

EC

C

D

E

F

G

H

I

J

K

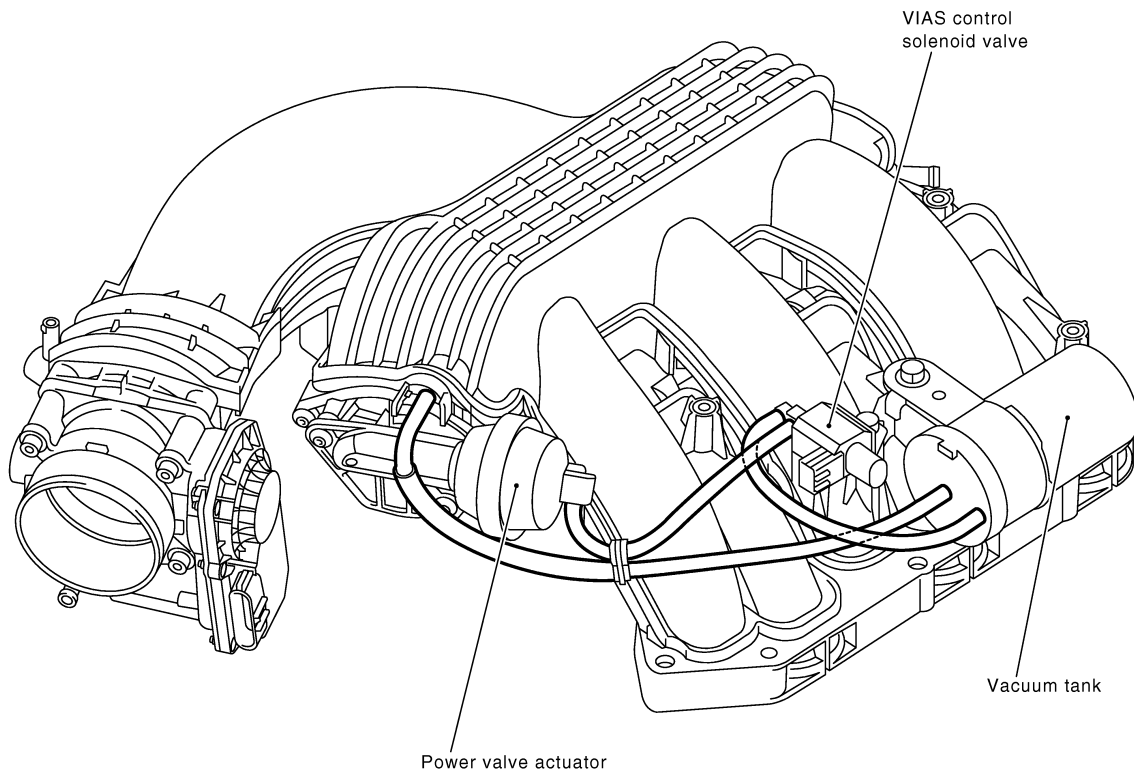
L

M

N

O

P



NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

Refer to [EC-40, "System Diagram"](#) for Vacuum Control System.

PBIB2529E

ON BOARD DIAGNOSTIC (OBD) SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:000000007357972

This system is an on board diagnostic system that records exhaust emission-related diagnostic information and detects a sensors/actuator-related malfunction. A malfunction is indicated by the malfunction indicator lamp (MIL) and stored in control module memory as a DTC. The diagnostic information can be obtained with the diagnostic tool (GST: Generic Scan Tool).

GST (Generic Scan Tool)

INFOID:000000007357973

When GST is connected with a data link connector equipped on the vehicle side, it will communicate with the control module equipped in the vehicle and then enable various kinds of diagnostic tests. Refer to [EC-66](#), "[Diagnosis Description](#)".

NOTE:

Service \$0A is not applied for regions where it is not mandated.

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

DIAGNOSIS SYSTEM (ECM)

DIAGNOSIS DESCRIPTION

DIAGNOSIS DESCRIPTION : 1st Trip Detection Logic and Two Trip Detection Logic

INFOID:000000007357974

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not illuminate at this stage. <1st trip>

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL illuminates. The MIL illuminates at the same time when the DTC is stored. <2nd trip> The "trip" in the "Two Trip Detection Logic" means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to illuminate or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

Items	MIL				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Illuminated	Blinking	Illuminated				
Misfire (Possible three way catalyst damage) — DTC: P0300 – P0306 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 – P0306 is being detected	—	—	×	—	—	×	—	—
One trip detection diagnoses (Refer to EC-444, "DTC Index" .)	—	×	—	—	×	—	—	—
Except above	—	—	—	×	—	×	×	—

DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data

INFOID:000000007357975

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not recur, the 1st trip DTC will not be displayed.

If a malfunction is detected during the 1st trip, the 1st trip DTC is saved in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are saved in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.

For malfunctions in which 1st trip DTCs are displayed, refer to [EC-444, "DTC Index"](#). These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT.

1st trip DTC is specified in Service \$07 of SAE J1979/ISO 15031-5. 1st trip DTC detection occurs without illuminating the MIL and therefore does not warn the driver of a malfunction.

When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in Work Flow procedure Step 2, refer to [EC-14, "Trouble Diagnosis Introduction"](#). Then perform DTC Confirmation Procedure or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, absolute throttle position, base fuel schedule and intake air temperature at the moment a malfunction is detected.

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT or GST. The 1st trip freeze frame data can only be displayed on the CONSULT screen.

DIAGNOSIS SYSTEM (ECM)

[VQ40DE]

< SYSTEM DESCRIPTION >

Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 – P0306 Fuel Injection System Function — DTC: P0171, P0172, P0174, P0175
2		Except the above items
3	1st trip freeze frame data	

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was saved in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased.

DIAGNOSIS DESCRIPTION : Counter System

INFOID:000000007357976

RELATIONSHIP BETWEEN MIL, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on.
- The MIL will turn OFF after the vehicle is driven 3 times (driving pattern B) with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The “TIME” in “SELF-DIAGNOSTIC RESULTS” mode of CONSULT will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in OK for the 2nd trip.

COUNTER SYSTEM CHART

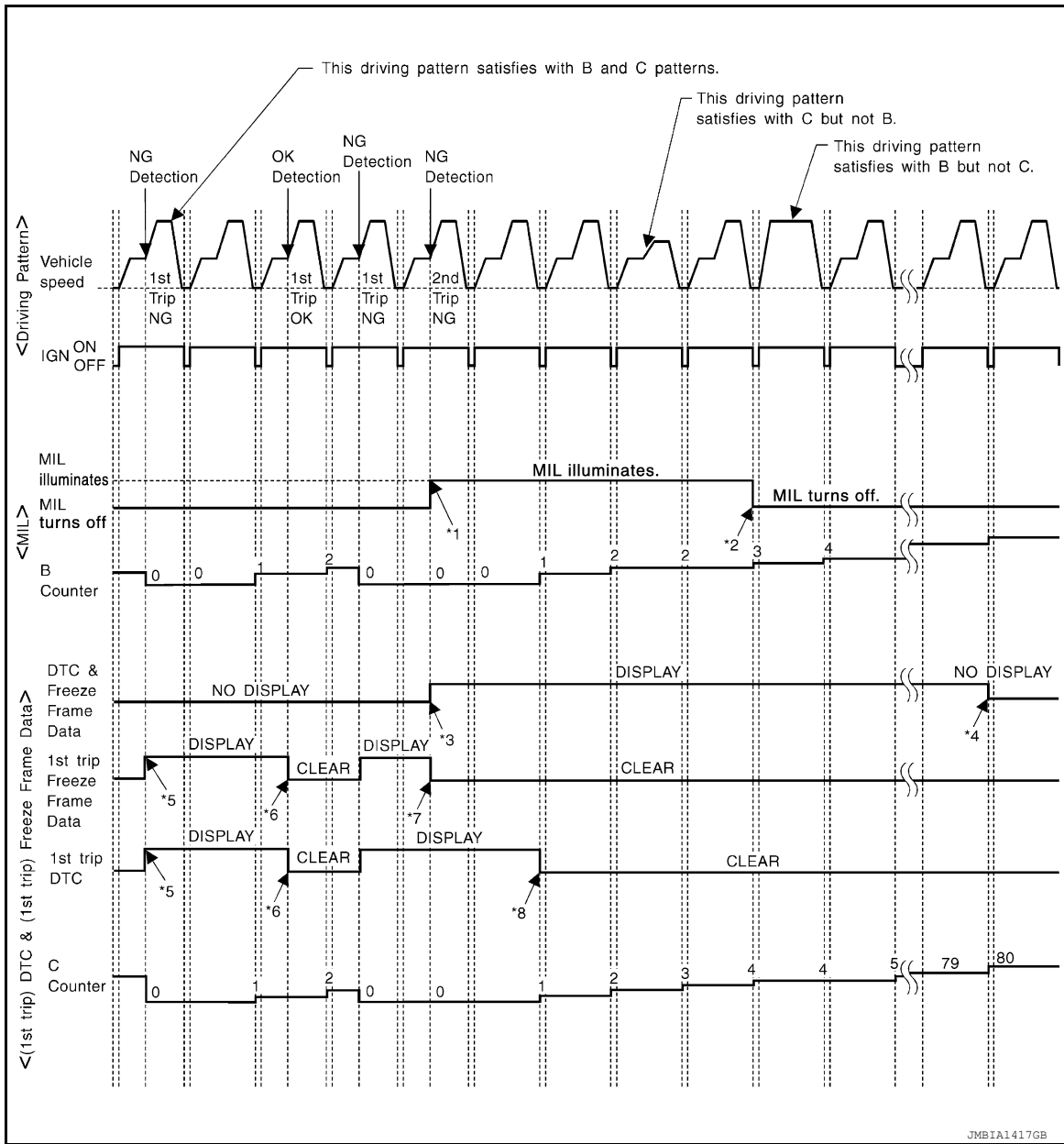
Items	Fuel Injection System	Misfire	Other
MIL (turns OFF)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2	1 (pattern B)

For details about patterns B and C under “Fuel Injection System” and “Misfire”, see “EXPLANATION FOR DRIVING PATTERNS FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”.

For details about patterns A and B under Other, see “EXPLANATION FOR DRIVING PATTERNS FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”.

- *1: Clear timing is at the moment OK is detected.
- *2: Clear timing is when the same malfunction is detected in the 2nd trip.

Relationship Between MIL, DTC, 1st Trip DTC and Driving Patterns for “Misfire <Exhaust Quality Deterioration>”, “Fuel Injection System”



*1: When the same malfunction is detected in two consecutive trips, MIL will light up.

*2: MIL will turn OFF after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

Explanation for Driving Patterns for "Misfire <Exhaust Quality Deterioration>", "Fuel Injection System"

Driving Pattern B

Refer to [EC-71, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

DIAGNOSIS SYSTEM (ECM)

[VQ40DE]

< SYSTEM DESCRIPTION >

Driving Pattern C

Refer to [EC-71. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

Example:

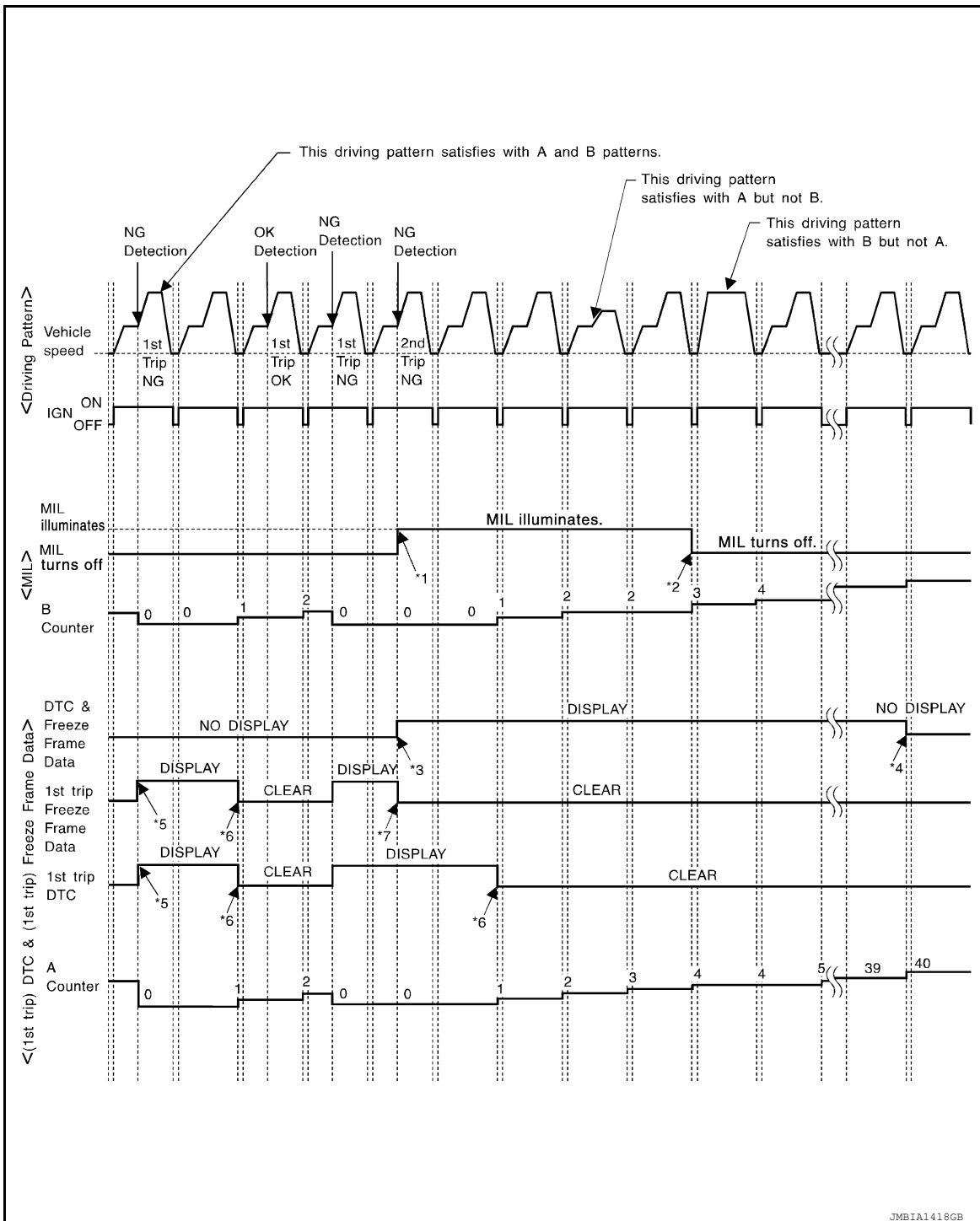
If the stored freeze frame data is as per the following:

Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)

To be satisfied with driving pattern C, the vehicle should run under the following conditions:

Engine speed: 475 – 1,225 rpm, Calculated load value: 27 – 33%, Engine coolant temperature: more than 70°C (158°F)

Relationship Between MIL, DTC, 1st Trip DTC and Driving Patterns Except For "Misfire <Exhaust Quality Deterioration>", "Fuel Injection System"



- | | | | |
|---|--|---|----|
| <p>*1: When the same malfunction is detected in two consecutive trips, MIL will light up.</p> | <p>*2: MIL will turn OFF after vehicle is driven 3 times (pattern B) without any malfunctions.</p> | <p>*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.</p> | A |
| <p>*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)</p> | <p>*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.</p> | <p>*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.</p> | EC |
| <p>*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.</p> | | | C |

Explanation for Driving Patterns Except for “Misfire <Exhaust Quality Deterioration>”, “Fuel Injection System”

Driving Pattern A

Refer to [EC-71, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

Driving Pattern B

Refer to [EC-71, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

DIAGNOSIS DESCRIPTION : Driving Pattern

INFOID:000000007357977

CAUTION:

Always drive at a safe speed.

DRIVING PATTERN A

Driving pattern A means a trip satisfying the following conditions.

- Engine speed reaches 400 rpm or more.
- Engine coolant temperature rises by 20°C (36°F) or more after starting the engine.
- Engine coolant temperature reaches 70°C (158°F) or more.
- The ignition switch is turned from ON to OFF.

NOTE:

- When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern A.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern A.

DRIVING PATTERN B

Driving pattern B means a trip satisfying the following conditions.

- Engine speed reaches 400 rpm or more.
- Engine coolant temperature reaches 70°C (158°F) or more.
- Vehicle speed of 70 – 120 km/h (44 – 75 MPH) is maintained for 60 seconds or more under the control of closed loop.
- Vehicle speed of 30 – 60 km/h (19 – 37 MPH) is maintained for 10 seconds or more under the control of closed loop.
- Under the closed loop control condition, the following state reaches 12 seconds or more in total: Vehicle speed of 4 km/h (2 MPH) or less with idling condition.
- The state of driving at 10 km/h (7 MPH) or more reaches 10 minutes or more in total.
- A lapse of 22 minutes or more after engine start.

NOTE:

- Drive the vehicle at a constant velocity.
- When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern B.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern B.

DRIVING PATTERN C

Driving pattern C means operating vehicle as per the following:
 The following conditions should be satisfied at the same time:
 Engine speed: (Engine speed in the freeze frame data) ±375 rpm

< SYSTEM DESCRIPTION >

Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]

Engine coolant temperature condition:

- When the freeze frame data shows lower than 70°C (158°F), engine coolant temperature should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), engine coolant temperature should be higher than or equal to 70°C (158°F).

NOTE:

- When the same malfunction is detected regardless of the above vehicle conditions, reset the counter of driving pattern C.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern C.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

DRIVING PATTERN D

Driving pattern D means a trip satisfying the following conditions.

- The state of driving at 40 km/h (25 MPH) reaches 300 seconds or more in total.
- Idle speed lasts 30 seconds or more.
- A lapse of 600 seconds or more after engine start.

NOTE:

- When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern D.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern D.

DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code

INFOID:000000007357978

System Readiness Test (SRT) code is specified in Service \$01 of SAE J1979/ISO 15031-5.

As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.

If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating "INCMP", use the information in this Service Manual to set the SRT to "CMPLT".

In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate "CMPLT" for each application system. Once set as "CMPLT", the SRT status remains "CMPLT" until the self-diagnosis memory is erased.

Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate "INCMP" for these items.

NOTE:

The SRT will also indicate "INCMP" if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.

If, during the state emissions inspection, the SRT indicates "CMPLT" for all test items, the inspector will continue with the emissions test. However, if the SRT indicates "INCMP" for one or more of the SRT items the vehicle is returned to the customer untested.

NOTE:

If MIL is ON during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates "CMPLT" for all test items. Therefore, it is important to check SRT ("CMPLT") and DTC (No DTCs) before the inspection.

SRT SET TIMING

SRT is set as "CMPLT" after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

Self-diagnosis result		Example						
		Diagnosis	Ignition cycle					
			← ON →	OFF	← ON →	OFF	← ON →	OFF
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)		
		P0402	OK (1)	— (1)	— (1)	OK (2)		
		P1402	OK (1)	OK (2)	— (2)	— (2)		
		SRT of EGR	“CMPLT”	“CMPLT”	“CMPLT”	“CMPLT”		
	Case 2	P0400	OK (1)	— (1)	— (1)	— (1)		
		P0402	— (0)	— (0)	OK (1)	— (1)		
		P1402	OK (1)	OK (2)	— (2)	— (2)		
		SRT of EGR	“INCMP”	“INCMP”	“CMPLT”	“CMPLT”		
NG exists	Case 3	P0400	OK	OK	—	—		
		P0402	—	—	—	—		
		P1402	NG	—	NG	NG (Consecutive NG)		
		(1st trip) DTC	1st trip DTC	—	1st trip DTC	DTC (= MIL ON)		
		SRT of EGR	“INCMP”	“INCMP”	“INCMP”	“CMPLT”		

OK: Self-diagnosis is carried out and the result is OK.

NG: Self-diagnosis is carried out and the result is NG.

—: Self-diagnosis is not carried out.

When all SRT related self-diagnoses show OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate “CMPLT”. → Case 1 above

When all SRT related self-diagnoses show OK results through several different cycles, the SRT will indicate “CMPLT” at the time the respective self-diagnoses have at least one OK result. → Case 2 above

If one or more SRT related self-diagnoses show NG results in 2 consecutive cycles, the SRT will also indicate “CMPLT”. → Case 3 above

The table above shows that the minimum number of cycles for setting SRT as “INCMP” is the number one (1) for each self-diagnosis (Case 1 & 2) or the number two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate “CMPLT” at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires “CMPLT” of the SRT only with OK self-diagnosis results.
- During SRT driving pattern, the 1st trip DTC (NG) is detected prior to “CMPLT” of SRT and the self-diagnosis memory must be erased from the ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate “INCMP”.

NOTE:

SRT can be set as “CMPLT” together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates “CMPLT”.

DIAGNOSIS DESCRIPTION : Permanent Diagnostic Trouble Code (Permanent DTC)

INFOID:000000007800634

Permanent DTC is defined in SAE J1979/ISO 15031-5 Service \$0A.

ECM stores a DTC issuing a command of turning on MIL as a permanent DTC and keeps storing the DTC as a permanent DTC until ECM judges that there is no presence of malfunction.

Permanent DTCs cannot be erased by using the erase function of CONSULT or Generic Scan Tool (GST) and by disconnecting the battery to shut off power to ECM. This prevents a vehicle from passing the in-use inspection without repairing a malfunctioning part.

When not passing the in-use inspection due to more than one permanent DTC, permanent DTCs should be erased, referring to this manual.

NOTE:

- The important items in in-use inspection are that MIL is not ON, SRT test items are set, and permanent DTCs are not included.
- Permanent DTCs do not apply for regions that permanent DTCs are not regulated by law.

< SYSTEM DESCRIPTION >

PERMANENT DTC SET TIMING

The setting timing of permanent DTC is stored in ECM with the lighting of MIL when a DTC is confirmed.

DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)

INFOID:000000007357979

When emission-related ECU detects a malfunction in the emission control systems components and/or the powertrain control components (which affect vehicle emissions), it turns on/blinks MIL to inform the driver that a malfunction has been detected.

1. The MIL illuminates when ignition switch is turned ON (engine is not running).

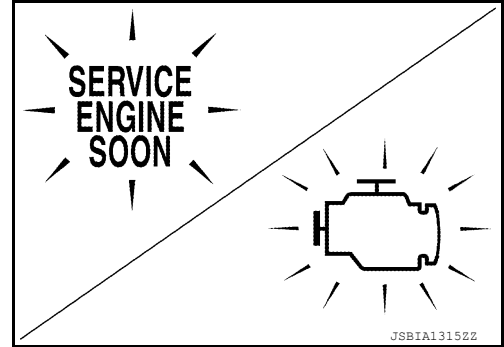
NOTE:

Check the MIL circuit if MIL does not illuminate. Refer to [GI-33, "Work Flow"](#).

2. When the engine is started, the MIL should go off.

NOTE:

If MIL continues to illuminate/blink, perform self-diagnoses and inspect/repair accordingly because an emission-related ECU has detected a malfunction in the emission control systems components and/or the powertrain control components (which affect vehicle emissions).



On Board Diagnosis Function

INFOID:000000007357980

ON BOARD DIAGNOSIS ITEM

The on board diagnostic system has the following functions.

Diagnostic test mode	Function
Bulb check	MIL can be checked.
SRT status	ECM can read if SRT codes are set.
Malfunction warning	If ECM detects a malfunction, it illuminates or blinks MIL to inform the driver that a malfunction has been detected.
Self-diagnostic results	DTCs or 1st trip DTCs stored in ECM can be read.
Accelerator pedal released position learning	ECM can learn the accelerator pedal released position. Refer to EC-25, "Accelerator Pedal Released Position Learning" .
Throttle valve closed position learning	ECM can learn the throttle valve closed position. Refer to EC-25, "Throttle Valve Closed Position Learning" .
Idle air volume learning	ECM can learn the idle air volume. Refer to EC-25, "Idle Air Volume Learning" .

BULB CHECK MODE

Description

This function allows damage inspection in the MIL bulb (blown, open circuit, etc.).

Operation Procedure

1. Turn ignition switch ON.
2. The MIL on the instrument panel should stay ON.
If it remains OFF, check MIL circuit. Refer to [GI-33, "Work Flow"](#).

SRT STATUS MODE

Description

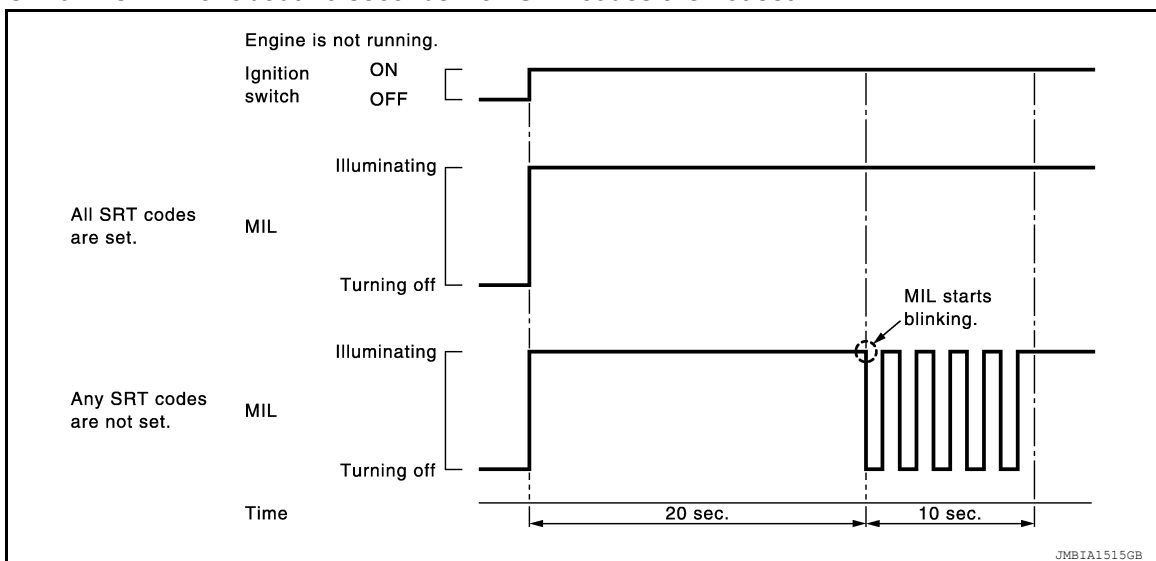
This function allows to read if ECM has completed the self-diagnoses of major emission control systems and components. For SRT, refer to [EC-72, "DIAGNOSIS DESCRIPTION : System Readiness Test \(SRT\) Code"](#).

Operation Procedure

1. Turn ignition switch ON and wait 20 seconds.
2. SRT status is indicated as shown blow.
 - ECM continues to illuminate MIL if all SRT codes are set.

< SYSTEM DESCRIPTION >

- ECM blinks MIL for about 10 seconds if all SRT codes are not set.



MALFUNCTION WARNING MODE

Description

In this function ECM turns on or blinks MIL when it detects a malfunction in the emission control system components and/or the powertrain control components (which affect vehicle emissions) to inform the driver that a malfunction has been detected.

Operation Procedure

1. Turn ignition switch ON.
2. Check that MIL illuminates.
If it remains OFF, check MIL circuit. Refer to [GI-33, "Work Flow"](#).
3. Start engine and let it idle.
 - For two trip detection logic diagnoses, ECM turns on MIL when it detects the same malfunction twice in the two consecutive driving cycles.
 - For 1st trip detection logic diagnoses, ECM turns on MIL when it detects a malfunction in one driving cycle.
 - ECM blinks MIL when it detects a malfunction that may damage the three way catalyst (misfire).

SELF-DIAGNOSTIC RESULTS MODE

Description

This function allows to indicate DTCs or 1st trip DTCs stored in ECM according to the number of times MIL is blinking.

How to Set Self-diagnostic Results Mode

NOTE:

- It is better to count the time accurately with a clock.
 - It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
 - After ignition switch is turned off, ECM is always released from the "self-diagnostic results" mode.
1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
 2. Repeat the following procedure quickly five times within 5 seconds.
 - Fully depress the accelerator pedal.
 - Fully release the accelerator pedal.
 3. Wait 7 seconds, fully depress the accelerator pedal and keep it depressed for approx. 10 seconds until the MIL starts blinking.

NOTE:

Do not release the accelerator pedal for 10 seconds if MIL starts blinking during this period. This blinking is displaying SRT status and is continued for another 10 seconds.

4. Fully release the accelerator pedal.
ECM has entered to "Self-diagnostic results" mode.

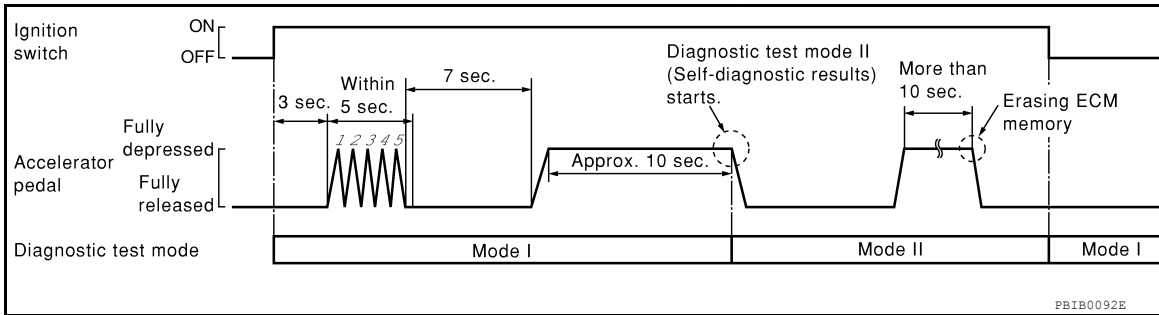
DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

NOTE:

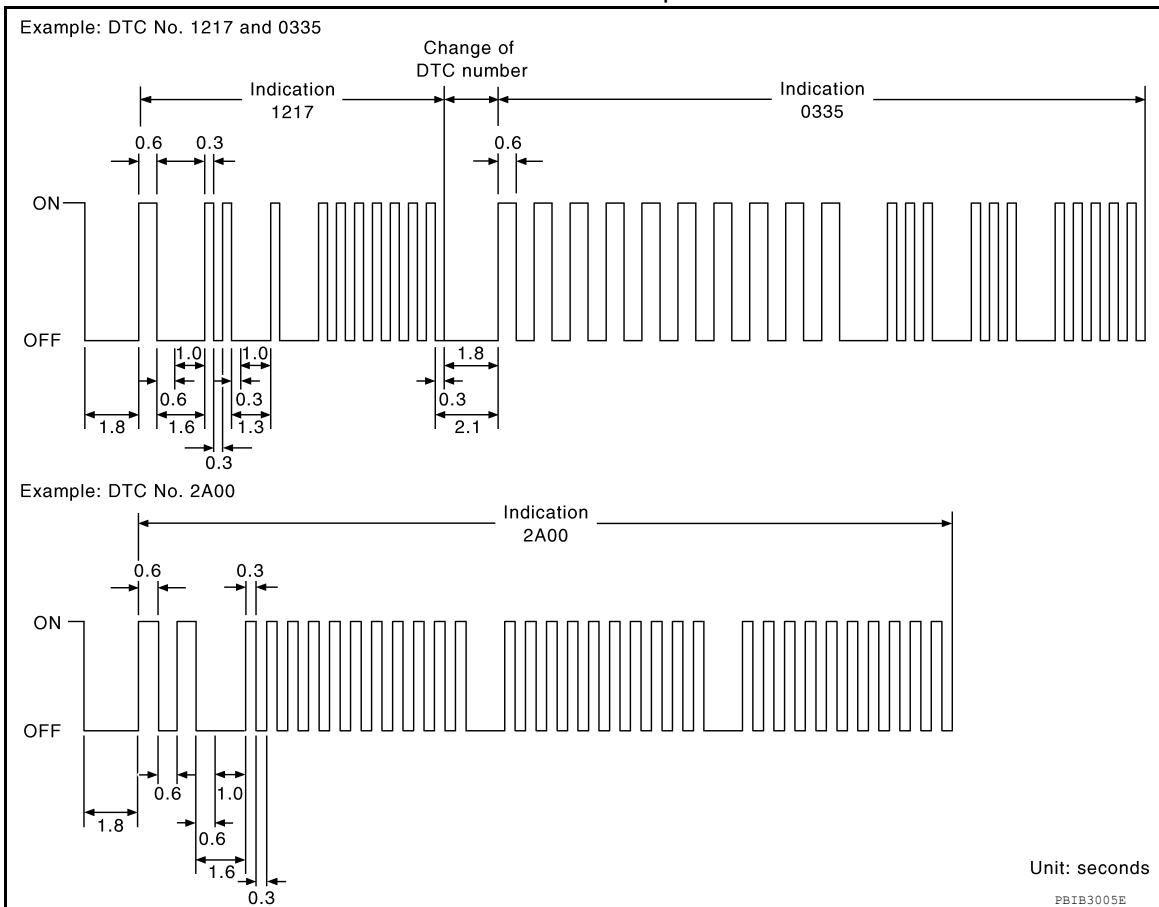
Wait until the same DTC (or 1st trip DTC) appears to completely confirm all DTCs.



How to Read Self-diagnostic Results

The DTC and 1st trip DTC are indicated by the number of blinks of the MIL as shown below.

The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MIL illuminates in "malfunction warning" mode, it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes per the following.

Number	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Flashes	10	1	2	3	4	5	6	7	8	9	11	12	13	14	15	16

The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-seconds) - OFF (0.6-seconds) cycle.

The 100th-digit numeral and lower digit numerals consist of a 0.3-seconds ON and 0.3-seconds OFF cycle.

A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.

A change from one trouble code to another occurs at an interval of 1.8-seconds OFF.

DIAGNOSIS SYSTEM (ECM)

[VQ40DE]

< SYSTEM DESCRIPTION >

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. Refer to [EC-444, "DTC Index"](#).

How to Erase Self-diagnostic Results

By performing this procedure, ECM memory is erased and the following diagnostic information is erased as well.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

NOTE:

Also, if a battery terminal is disconnected, ECM memory is erased and the diagnostic information as listed above is erased. (The amount of time required for erasing may vary from a few seconds to several hours.)

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Set ECM in "self-diagnostic results" mode.
6. The diagnostic information has been erased from the backup memory in the ECM. Fully depress the accelerator pedal and keep it depressed for more than 10 seconds.
7. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

CONSULT Function

INFOID:000000007357981

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*
Data monitor	Input/Output data in the ECM can be read.
Active test	Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
Function test	This mode is used to inform customers when the vehicle requires periodic maintenance.
DTC & SRT confirmation	The status of system monitoring tests and the self-diagnosis status/results can be confirmed.
ECU identification	ECM part number can be read.

*: The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	• Fuel pump will stop by touching "START" during idling. Crank a few times after engine stalls.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	• The idle air volume that keeps the engine within the specified range is memorized in ECM.	When learning the idle air volume

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

WORK ITEM	CONDITION	USAGE
SELF-LEARNING CONT	<ul style="list-style-type: none"> The coefficient of self-learning control mixture ratio returns to the original coefficient. 	When clearing the coefficient of self-learning control value
EVAP SYSTEM CLOSE	Close the EVAP canister vent control valve in order to make EVAP system close under the following conditions. <ul style="list-style-type: none"> IGN SW ON Engine not running Ambient temperature is above 0°C (32°F). No vacuum and no high pressure in EVAP system Fuel tank temp is more than 0°C (32°F). Within 10 minutes after starting "EVAP SYSTEM CLOSE" When trying to execute "EVAP SYSTEM CLOSE" under the condition except above, CONSULT will discontinue it and display appropriate instruction. NOTE: When starting engine, CONSULT may display "BATTERY VOLTAGE IS LOW. CHARGE BATTERY", even when using a charged battery.	When detecting EVAP vapor leak in the EVAP system
VIN REGISTRATION	<ul style="list-style-type: none"> In the mode, VIN is registered in ECM. 	When registering VIN in ECM
TARGET IDLE RPM ADJ*	<ul style="list-style-type: none"> Idle condition 	When setting target idle speed
TARGET IGN TIM ADJ*	<ul style="list-style-type: none"> Idle condition 	When adjusting target ignition timing
CLSD THL POS LEARN	<ul style="list-style-type: none"> Ignition on and engine stopped. 	When learning the throttle valve closed position

*: This function is not necessary in the usual service procedure.

SELF-DIAGNOSTIC RESULT MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to [EC-444, "DTC Index".](#))

How to Read DTC and 1st Trip DTC

DTCs and 1st trip DTCs related to the malfunction are displayed in "self-diag results".

- When ECM detects a 1st trip DTC, 1t is displayed for "TIME".
- When ECM has detected a current DTC, "0" is displayed for "TIME".
- If "TIME" is neither "0" nor "1t", the DTC occurred in the past and ECM shows the number of times the vehicle has been driven since the last detection of the DTC.

How to Erase DTC and 1st Trip DTC

NOTE:

- If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.
- If the DTC is not for A/T related items (see [EC-444, "DTC Index"](#)), skip step 1.

1. Erase DTC in TCM. Refer to [EC-444, "DTC Index"](#).

2. Select "ENGINE" with CONSULT.

3. Select "SELF-DIAG RESULTS".

4. Touch "ERASE". (DTC in ECM will be erased.)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	<ul style="list-style-type: none"> The engine control component part/control system has a trouble code, that is displayed as PXXXX. (Refer to EC-444, "DTC Index".)
FUEL SYS-B1	<ul style="list-style-type: none"> "Fuel injection system status" at the moment a malfunction is detected is displayed. One of in the following mode is displayed.
FUEL SYS-B2	Mode2: Open loop due to detected system malfunction Mode3: Open loop due to driving conditions (power enrichment, deceleration enrichment) Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control Mode5: Open loop - has not yet satisfied condition to go to closed loop

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

Freeze frame data item*	Description
CAL/LD VALUE [%]	<ul style="list-style-type: none"> The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	<ul style="list-style-type: none"> The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRM-B1 [%]	<ul style="list-style-type: none"> “Long-term fuel trim” at the moment a malfunction is detected is displayed. The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
L-FUEL TRM-B2 [%]	
S-FUEL TRM-B1 [%]	<ul style="list-style-type: none"> “Short-term fuel trim” at the moment a malfunction is detected is displayed. The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
S-FUEL TRM-B2 [%]	
ENGINE SPEED [rpm]	<ul style="list-style-type: none"> The engine speed at the moment a malfunction is detected is displayed.
VEHICL SPEED [km/h] or [mph]	<ul style="list-style-type: none"> The vehicle speed at the moment a malfunction is detected is displayed.
ABSOL TH-P/S [%]	<ul style="list-style-type: none"> The throttle valve opening angle at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	<ul style="list-style-type: none"> The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	<ul style="list-style-type: none"> The intake air temperature at the moment a malfunction is detected is displayed.
INT MANI PRES [kPa]	<ul style="list-style-type: none"> Always a certain value is displayed. These items are displayed but are not applicable to this model.
COMBUST CONDI-TION	

*: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE

Monitored Item

Monitored item	Unit	Description	Remarks
ENG SPEED	rpm	<ul style="list-style-type: none"> Indicates the engine speed computed from the signal of the crankshaft position sensor (POS) and camshaft position sensor (PHASE). 	<ul style="list-style-type: none"> Accuracy becomes poor if engine speed drops below the idle rpm. If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1	V	<ul style="list-style-type: none"> The signal voltage of the mass air flow sensor is displayed. 	<ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. When engine is running specification range is indicated in “SPEC”.
B/FUEL SCHDL	ms	<ul style="list-style-type: none"> “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction. 	<ul style="list-style-type: none"> When engine is running specification range is indicated in “SPEC”.
A/F ALPHA-B1	%	<ul style="list-style-type: none"> The mean value of the air-fuel ratio feedback correction factor per cycle is indicated. 	<ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. When engine is running specification range is indicated in “SPEC”. This data also includes the data for the air-fuel ratio learning control.
A/F ALPHA-B2	%		
COOLAN TEMP/S	°C or °F	<ul style="list-style-type: none"> The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed. 	<ul style="list-style-type: none"> When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
A/F SEN1 (B1)	V	<ul style="list-style-type: none"> The A/F signal computed from the input signal of the Air fuel ratio (A/F) sensor 1 is displayed. 	
A/F SEN1 (B2)	V		
HO2S2 (B1)	V	<ul style="list-style-type: none"> The signal voltage of the heated oxygen sensor 2 is displayed. 	
HO2S2 (B2)	V		

DIAGNOSIS SYSTEM (ECM)

[VQ40DE]

< SYSTEM DESCRIPTION >

Monitored item	Unit	Description	Remarks
HO2S2 MNTR(B1)	RICH/ LEAN	<ul style="list-style-type: none"> Display of heated oxygen sensor 2 signal: RICH: Means the amount of oxygen after three way catalyst is relatively small. LEAN: Means the amount of oxygen after three way catalyst is relatively large. 	<ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated.
HO2S2 MNTR(B2)	RICH/ LEAN		
VHCL SPEED SE	km/h or mph	<ul style="list-style-type: none"> The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed. 	
BATTERY VOLT	V	<ul style="list-style-type: none"> The power supply voltage of ECM is displayed. 	
ACCEL SEN 1	V	<ul style="list-style-type: none"> The accelerator pedal position sensor signal voltage is displayed. 	<ul style="list-style-type: none"> ACCEL SEN 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.
ACCEL SEN 2	V		
TP SEN 1-B1	V	<ul style="list-style-type: none"> The throttle position sensor signal voltage is displayed. 	<ul style="list-style-type: none"> THRTL SEN 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.
TP SEN 2-B1	V		
FUEL T/TMP SE	°C or °F	<ul style="list-style-type: none"> The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed. 	
INT/A TEMP SE	°C or °F	<ul style="list-style-type: none"> The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated. 	
EVAP SYS PRES	V		
FUEL LEVEL SE	V		
START SIGNAL	ON/OFF	<ul style="list-style-type: none"> Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage. 	<ul style="list-style-type: none"> After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS	ON/OFF	<ul style="list-style-type: none"> Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal. 	
AIR COND SIG	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal. 	
P/N POSI SW	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from the park/neutral position (PNP) signal. 	
PW/ST SIGNAL	ON/OFF	<ul style="list-style-type: none"> [ON/OFF] condition of the power steering system (determined by the signal voltage of the power steering pressure sensor signal) is indicated. 	
LOAD SIGNAL	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from the electrical load signal. ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF: Both rear window defogger switch and lighting switch are OFF. 	
IGNITION SW	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from ignition switch signal. 	
HEATER FAN SW	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from the heater fan switch signal. 	
BRAKE SW	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from the stop lamp switch signal. 	
INJ PULSE-B1	msec	<ul style="list-style-type: none"> Indicates the actual fuel injection pulse width compensated by ECM according to the input signals. 	<ul style="list-style-type: none"> When the engine is stopped, a certain computed value is indicated.
INJ PULSE-B2	msec		
IGN TIMING	BTDC	<ul style="list-style-type: none"> Indicates the ignition timing computed by ECM according to the input signals. 	<ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated.
CAL/LD VALUE	%	<ul style="list-style-type: none"> Calculated load value indicates the value of the current air flow divided by peak air flow. 	

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

Monitored item	Unit	Description	Remarks
MASS AIRFLOW	g/s	<ul style="list-style-type: none"> Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor. 	A
PURG VOL C/V	%	<ul style="list-style-type: none"> Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. The opening becomes larger as the value increases. 	EC
INT/V TIM(B1)	°CA	<ul style="list-style-type: none"> Indicates [°CA] of intake camshaft advanced angle. 	C
INT/V TIM(B2)	°CA		D
INT/V SOL(B1)	%	<ul style="list-style-type: none"> The control condition of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. The advance angle becomes larger as the value increases. 	E
INT/V SOL(B2)	%		F
VIAS S/V-1	ON/OFF	<ul style="list-style-type: none"> The control condition of the VIAS control solenoid valve (determined by ECM according to the input signals) is indicated. ON: VIAS control solenoid valve is operating. OFF: VIAS control solenoid valve is not operating. 	G
AIR COND RLY	ON/OFF	<ul style="list-style-type: none"> The air conditioner relay control condition (determined by ECM according to the input signals) is indicated. 	H
FUEL PUMP RLY	ON/OFF	<ul style="list-style-type: none"> Indicates the fuel pump relay control condition determined by ECM according to the input signals. 	I
VENT CONT/V	ON/OFF	<ul style="list-style-type: none"> The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated. ON: Closed OFF: Open 	J
THRTL RELAY	ON/OFF	<ul style="list-style-type: none"> Indicates the throttle control motor relay control condition determined by the ECM according to the input signals. 	K
COOLING FAN	HI/LOW/OFF	<ul style="list-style-type: none"> The control condition of the cooling fan (determined by ECM according to the input signals) is indicated. HI: High speed operation LOW: Low speed operation OFF: Stop 	L
HO2S2 HTR (B1)	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals. 	M
HO2S2 HTR (B2)	ON/OFF		N
I/P PULLY SPD	rpm	<ul style="list-style-type: none"> Indicates the engine speed computed from their input speed sensor signal. 	O
VEHICLE SPEED	km/h or mph	<ul style="list-style-type: none"> Indicates the vehicle speed computed from the output speed sensor signal. 	P
IDL A/V LEARN	YET/CMPLT	<ul style="list-style-type: none"> Displays the condition of idle air volume learning YET: Idle air volume learning has not been performed yet. CMPLT: Idle air volume learning has already been performed successfully. 	
TRVL AFTER MIL	km or mile	<ul style="list-style-type: none"> Distance traveled while MIL is activated. 	
A/F S1 HTR(B1)	%	<ul style="list-style-type: none"> Air fuel ratio (A/F) sensor 1 heater control value computed by ECM according to the input signals. The current flow to the heater becomes larger as the value increases. 	
A/F S1 HTR(B2)	%		

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

Monitored item	Unit	Description	Remarks
AC PRESS SEN	V	<ul style="list-style-type: none"> The signal voltage from the refrigerant pressure sensor is displayed. 	
VHCL SPEED SE	km/h or mph	<ul style="list-style-type: none"> The vehicle speed computed from the vehicle speed signal sent from TCM is displayed. 	
SET VHCL SPD	km/h or mph	<ul style="list-style-type: none"> The preset vehicle speed is displayed. 	
MAIN SW	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from MAIN switch signal. 	
CANCEL SW	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from CANCEL switch signal. 	
RESUME/ACC SW	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from RESUME/ACCELERATE switch signal. 	
SET SW	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from SET/COAST switch signal. 	
BRAKE SW1	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from ASCD brake switch signal. 	
BRAKE SW2	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of stop lamp switch signal. 	
VHCL SPD CUT	NON/CUT	<ul style="list-style-type: none"> Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed increased to excessively high compared with the ASCD set speed, and ASCD operation is cut off. 	
LO SPEED CUT	NON/CUT	<ul style="list-style-type: none"> Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low compared with the ASCD set speed, and ASCD operation is cut off. 	
AT OD MONITOR	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of A/T O/D according to the input signal from the TCM. 	
AT OD CANCEL	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of A/T O/D cancel signal sent from the TCM. 	
CRUISE LAMP	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals. 	
SET LAMP	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of SET lamp determined by the ECM according to the input signals. 	
ALT DUTY	%	<ul style="list-style-type: none"> Indicates the duty ratio of the power generation command value. The ratio is calculated by ECM based on the battery current sensor signal. 	
BAT CUR SEN	mV	<ul style="list-style-type: none"> The signal voltage of battery current sensor is displayed. 	
ALT DUTY SIG	ON/OFF	<ul style="list-style-type: none"> The control condition of the power generation voltage variable control (determined by ECM according to the input signals) is indicated. ON: Power generation voltage variable control is active OFF: Power generation voltage variable control is inactive. 	
A/F ADJ-B1	—	<ul style="list-style-type: none"> Indicates the correction factor saved in ECM. The factor is calculated from the difference between the target air-fuel ratio saved in ECM and the air-fuel ratio calculated from A/F sensor 1 signal. 	
A/F ADJ-B2	—		

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

Monitored item	Unit	Description	Remarks
EVAP LEAK DIAG	YET/ CMPLT	<ul style="list-style-type: none"> Indicates the condition of EVAP leak diagnosis. YET: EVAP leak diagnosis has not been performed yet. CMPLT: EVAP leak diagnosis has been performed successfully. 	
EVAP DIAG READY	ON/OFF	<ul style="list-style-type: none"> Indicates the ready condition of EVAP leak diagnosis. ON: Diagnosis has been ready condition. OFF: Diagnosis has not been ready condition. 	
HO2 S2 DIAG1(B1)	INCMP/ CMPLT	<ul style="list-style-type: none"> Indicates DTC P0139 self-diagnosis (delayed response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. 	
HO2 S2 DIAG1(B2)	INCMP/ CMPLT	<ul style="list-style-type: none"> Indicates DTC P0159 self-diagnosis (delayed response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. 	
HO2 S2 DIAG2(B1)	INCMP/ CMPLT	<ul style="list-style-type: none"> Indicates DTC P0139 self-diagnosis (slow response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. 	
HO2 S2 DIAG2(B2)	INCMP/ CMPLT	<ul style="list-style-type: none"> Indicates DTC P0159 self-diagnosis (slow response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. 	
THRTL STK CNT B1*	—	—	

*: The item is indicated, but not used.

NOTE:

Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	<ul style="list-style-type: none"> Engine: Return to the original non-standard condition Change the amount of fuel injection using CONSULT. 	If malfunctioning symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Harness and connectors Fuel injector Air fuel ratio (A/F) sensor 1
IGNITION TIMING	<ul style="list-style-type: none"> Engine: Return to the original non-standard condition Timing light: Set Retard the ignition timing using CONSULT. 	If malfunctioning symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Perform Idle Air Volume Learning.
POWER BALANCE	<ul style="list-style-type: none"> Engine: After warming up, idle the engine. A/C switch: OFF Shift lever: P or N Cut off each fuel injector signal one at a time using CONSULT. 	Engine runs rough or stops.	<ul style="list-style-type: none"> Harness and connectors Compression Fuel injector Power transistor Spark plug Ignition coil
COOLING FAN*	<ul style="list-style-type: none"> Ignition switch: ON Turn the cooling fan HI, LOW and OFF using CONSULT. 	Cooling fan moves and stops.	<ul style="list-style-type: none"> Harness and connectors Cooling fan motor IPDM E/R
ENG COOLANT TEMP	<ul style="list-style-type: none"> Engine: Return to the original non-standard condition Change the engine coolant temperature using CONSULT. 	If malfunctioning symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Harness and connectors Engine coolant temperature sensor Fuel injector

DIAGNOSIS SYSTEM (ECM)

[VQ40DE]

< SYSTEM DESCRIPTION >

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL PUMP RE-LAY	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Turn the fuel pump relay ON and OFF using CONSULT and listen to operating sound. 	Fuel pump relay makes the operating sound.	<ul style="list-style-type: none"> Harness and connectors Fuel pump relay
VIAS S/V-1	<ul style="list-style-type: none"> Ignition switch: ON Turn solenoid valve ON and OFF with CONSULT and listen for operating sound. 	Solenoid valve makes an operating sound.	<ul style="list-style-type: none"> Harness and connectors Solenoid valve
PURG VOL CONT/V	<ul style="list-style-type: none"> Engine: After warming up, run engine at 1,500 rpm. Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT. 	Engine speed changes according to the opening percent.	<ul style="list-style-type: none"> Harness and connectors Solenoid valve
FUEL/T TEMP SEN	<ul style="list-style-type: none"> Change the fuel tank temperature using CONSULT. 		
VENT CONTROL/V	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Turn solenoid valve ON and OFF with the CONSULT and listen to operating sound. 	Solenoid valve makes an operating sound.	<ul style="list-style-type: none"> Harness and connectors Solenoid valve
V/T ASSIGN ANGLE	<ul style="list-style-type: none"> Engine: Return to the original non-standard condition Change intake valve timing using CONSULT. 	If malfunctioning symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Harness and connectors Intake valve timing control solenoid valve
ALTERNATOR DUTY	<ul style="list-style-type: none"> Engine: Idle Change duty ratio using CONSULT. 	Battery voltage changes.	<ul style="list-style-type: none"> Harness and connectors IPDM E/R Alternator

*: Leaving cooling fan OFF with CONSULT while engine is running may cause the engine to overheat.

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

- For items whose SRT codes are set, "CMPLT" is displayed on the CONSULT screen; for items whose SRT codes are not set, "INCMP" is displayed.
- "SRT STATUS" provides the presence or absence of permanent DTCs stored in ECM memory.

PERMANENT DTC STATUS Mode

How to display permanent DTC status

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Select "PERMANENT DTC STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.

NOTE:

Permanent DTCs stored in ECM memory are displayed on the CONSULT screen to show if a driving pattern required for erasing permanent DTCs is complete (CMPLT) or incomplete (INCMP).

CAUTION:

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

Since the “PERMANENT DTC STATUS” screen displays the previous trip information, repeat the following twice to update the information: “Ignition switch OFF”, “Wait for more than 10 seconds” and “Ignition switch ON”.

PERMANENT DTC & SRT CONFIRMATION : PERMANENT DTC STATUS		
<p>CAUTION: Turn ignition switch from ON to OFF twice to update the information on the status screen.</p>		
PERMANENT DTC	DRIVING PATTERN B	DRIVING PATTERN D
XXXX	INCOMP	INCOMP
XXXX	CMPLT	INCOMP
XXXX	INCOMP	CMPLT
XXXX	CMPLT	INCOMP
XXXX	INCOMP	INCOMP
XXXX	INCOMP	INCOMP
<p>The previous trip information is displayed. →</p>		

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NOTE:

This mode is not used in regions that permanent DTCs are not regulated by law.

SRT WORK SUPPORT Mode

This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

PERMANENT DTC WORK SUPPORT Mode

This mode enables a technician to drive a vehicle to complete the driving pattern that is required for erasing permanent DTC.

NOTE:

This mode is not used in regions that permanent DTCs are not regulated by law.

DTC WORK SUPPORT Mode

Test mode	Test item	Corresponding DTC No.	Reference page
EVAPORATIVE SYSTEM	EVP V/S LEAK P0456/P1456*	P0442	EC-237
		P0455	EC-275
		P0456	EC-282
	PURG VOL CN/V P1444	P0443	EC-244
	PURG FLOW P0441	P0441	EC-232
A/F SEN1	A/F SEN1(B1) P1278/P1279	P0133	EC-160
	A/F SEN1(B1) P1276	P0130	EC-148
	A/F SEN1(B2) P1288/P1289	P0153	EC-160
	A/F SEN1(B2) P1286	P0150	EC-148
HO2S2	HO2S2 (B1) P1146	P0138	EC-171
	HO2S2(B1) P1147	P0137	EC-165
	HO2S2(B1) P0139	P0139	EC-179
	HO2S2(B2) P1166	P0158	EC-171
	HO2S2(B2) P1167	P0157	EC-165
	HO2S2(B2) P0159	P0159	EC-179

*: DTC P1456 does not apply to R51 models but appears in DTC Work Support Mode screens.

DTC/CIRCUIT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

INFOID:000000007357982

The specification (SP) value indicates the tolerance of the value that is displayed in "SPEC" of "DATA MONITOR" mode of CONSULT during normal operation of the Engine Control System. When the value in "SPEC" of "DATA MONITOR" mode is within the SP value, the Engine Control System is confirmed OK. When the value "SPEC" of "DATA MONITOR" mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.

The SP value is used to detect malfunctions that may affect the Engine Control System, but will not illuminate the MIL.

The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1/B2 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Testing Condition

INFOID:000000007357983

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 - 104.3 kPa (1.003 - 1.064 kg/cm², 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up*¹
- Electrical load: Not applied*²
- Engine speed: Idle

*1: After the engine is warmed up to normal operating temperature, drive vehicle until "FLUID TEMP SE" (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).

*2: Rear window defogger switch, air conditioner switch lighting switch are OFF. Steering wheel is straight ahead.

Inspection Procedure

INFOID:000000007357984

NOTE:

Perform "SPEC" of "DATA MONITOR" mode in maximum scale display.

1. Perform [EC-20, "Basic Inspection"](#).
2. Confirm that the testing conditions indicated above are met.
3. Select "B/FUEL SCHDL", "A/F ALPHA-B1", "A/F ALPHA-B2" and "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode with CONSULT.
4. Make sure that monitor items are within the SP value.
5. If NG, go to [EC-86, "Diagnosis Procedure"](#).

Diagnosis Procedure

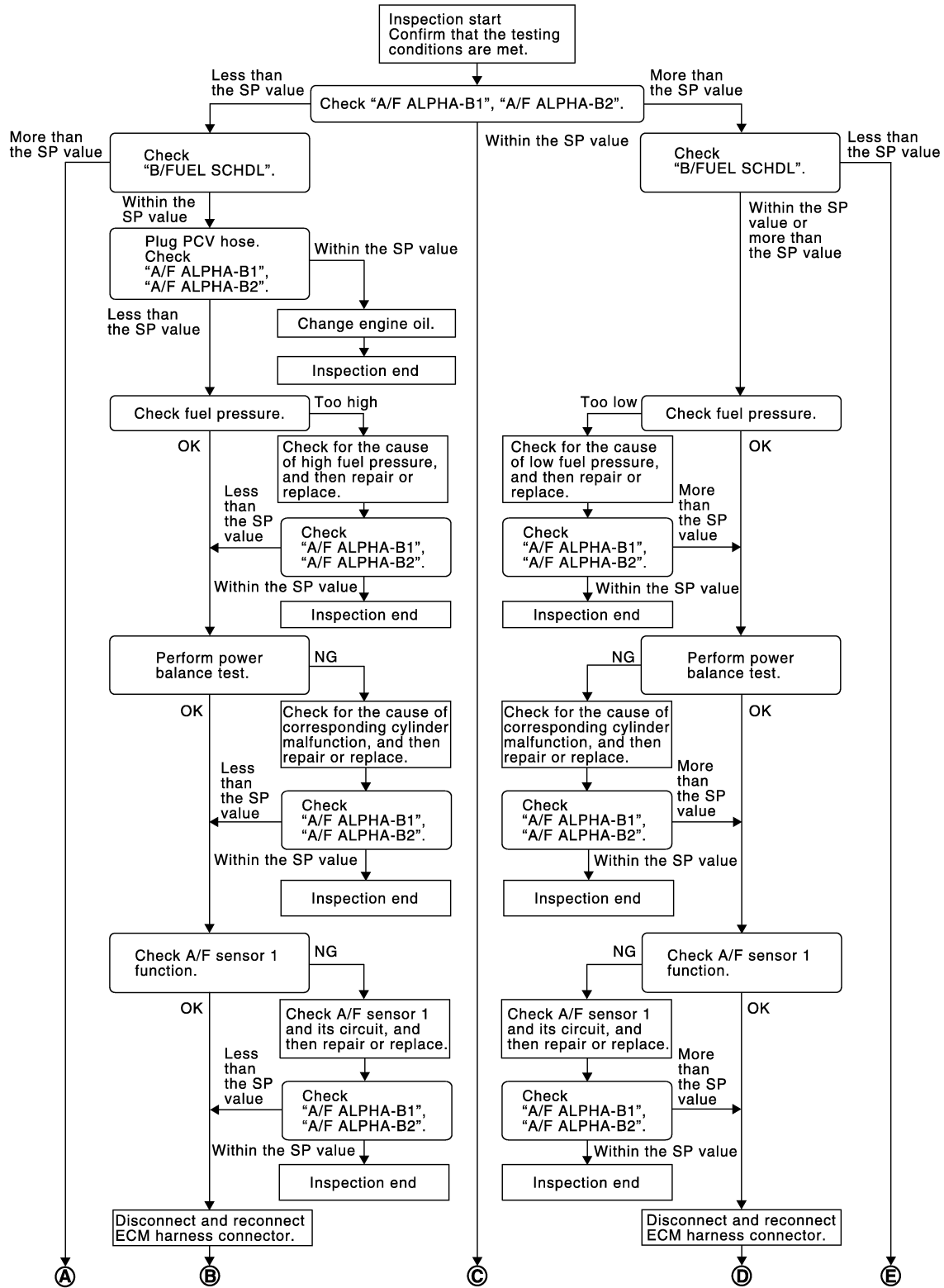
INFOID:000000007357985

OVERALL SEQUENCE

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]



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TROUBLE DIAGNOSIS - SPECIFICATION VALUE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Check "A/F ALPHA-B1", "A/F ALPHA-B2" for approximately 1 minute because they may fluctuate. It is NG if the indication is out of the SP value even a little.

OK or NG

OK >> GO TO 17.

NG (Less than the SP value)>>GO TO 2.

NG (More than the SP value)>>GO TO 3.

2.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

OK or NG

OK >> GO TO 4.

NG (More than the SP value)>>GO TO 19.

3.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

OK or NG

OK >> GO TO 6.

NG (More than the SP value)>>GO TO 6.

NG (Less than the SP value)>>GO TO 25.

4.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Stop the engine.

2. Disconnect PCV hose, and then plug it.

3. Start engine.

4. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

OK or NG

OK >> GO TO 5.

NG >> GO TO 6.

5.CHANGE ENGINE OIL

1. Stop the engine.

2. Change engine oil.

NOTE:

This symptom may occur when a large amount of gasoline is mixed with engine oil because of driving conditions (such as when engine oil temperature does not rise enough since a journey distance is too short during winter). The symptom will not be detected after changing engine oil or changing driving conditions.

>> INSPECTION END

6.CHECK FUEL PRESSURE

Check fuel pressure. (Refer to [EC-487, "Fuel Pressure Check"](#).)

OK or NG

OK >> GO TO 9.

NG (Fuel pressure is too high)>>Replace fuel pressure regulator, refer to [EC-481, "Precaution"](#) and [FL-11, "Removal and Installation"](#). GO TO 8.

NG (Fuel pressure is too low)>>GO TO 7.

7.DETECT MALFUNCTIONING PART

1. Check the following.

- Clogged and bent fuel hose and fuel tube

- Clogged fuel filter

- Fuel pump and its circuit (Refer to [EC-406, "Description"](#).)

2. If NG, repair or replace the malfunctioning part. (Refer to [EC-86, "Diagnosis Procedure"](#).)

If OK, replace fuel pressure regulator.

>> GO TO 8.

8. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

OK or NG

- OK >> **INSPECTION END**
NG >> GO TO 9.

9. PERFORM POWER BALANCE TEST

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Make sure that the each cylinder produces a momentary engine speed drop.

OK or NG

- OK >> GO TO 12.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

1. Check the following below
 - Ignition coil and its circuit (Refer to [EC-410, "Component Description"](#).)
 - Fuel injector and its circuit (Refer to [EC-402, "Component Description"](#).)
 - Intake air leakage
 - Low compression pressure (Refer to [EM-23, "Compression Pressure"](#).)
2. If NG, repair or replace the malfunctioning part.
If OK, replace fuel injector. (It may be caused by leakage from fuel injector or clogging.)

>> GO TO 11.

11. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

OK or NG

- OK >> **INSPECTION END**
NG >> GO TO 12.

12. CHECK A/F SENSOR 1 FUNCTION

Perform all DTC Confirmation Procedure related with A/F sensor 1.

- For DTC P0130, P0150, refer to [EC-148, "DTC Confirmation Procedure"](#).
- For DTC P0131, P0151, refer to [EC-152, "DTC Confirmation Procedure"](#).
- For DTC P0132, P0152, refer to [EC-156, "DTC Confirmation Procedure"](#).
- For DTC P0133, P0153, refer to [EC-160, "DTC Confirmation Procedure"](#).
- For DTC P2A00, P2A03, refer to [EC-388, "DTC Confirmation Procedure"](#).

OK or NG

- OK >> GO TO 15.
NG >> GO TO 13.

13. CHECK A/F SENSOR 1 CIRCUIT

Perform Diagnostic Procedure according to corresponding DTC.

>> GO TO 14.

14. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

OK or NG

- OK >> **INSPECTION END**
NG >> GO TO 15.

15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR

1. Stop the engine.
2. Disconnect ECM harness connector. Check pin terminal and connector for damage, and then reconnect it.

>> GO TO 16.

16. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

OK or NG

- OK >> **INSPECTION END**
NG >> Detect malfunctioning part according to [EC-475. "Symptom Matrix Chart"](#).

17. CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

OK or NG

- OK >> **INSPECTION END**
NG (More than the SP value) >> GO TO 18.
NG (Less than the SP value) >> GO TO 25.

18. DETECT MALFUNCTIONING PART

1. Check for the cause of large engine friction. Refer to the following.
 - Engine oil level is too high
 - Engine oil viscosity
 - Belt tension of power steering, alternator, A/C compressor, etc. is excessive
 - Noise from engine
 - Noise from transmission, etc.
2. Check for the cause of insufficient combustion. Refer to the following.
 - Valve clearance malfunction
 - Intake valve timing control function malfunction
 - Camshaft sprocket installation malfunction, etc.

>> Repair or replace malfunctioning part, and then GO TO 30.

19. CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of intake air system

OK or NG

- OK >> GO TO 21.
NG >> Repair or replace malfunctioning part, and then GO TO 20.

20. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2", AND "B/FUEL SCHDL"

Select "A/F ALPHA-B1", "A/F ALPHA-B2", and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

OK or NG

- OK >> **INSPECTION END**
NG ("B/FUEL SCHDL" is more, "A/F ALPHA-B1", "A/F ALPHA-B2" are less than the SP value) >> GO TO 21.

21. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Stop the engine.
2. Disconnect mass air flow sensor harness connector. Check pin terminal and connector for damage and then reconnect it again.

>> GO TO 22.

22.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

OK or NG

- OK >> 1. Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to [EC-114, "Diagnosis Procedure"](#).
2. GO TO 29.

NG >> GO TO 23.

23.CHECK "MAS A/F SE-B1"

Select "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

OK or NG

OK >> GO TO 24.

NG (More than the SP value)>>Replace mass air flow sensor, and then GO TO 29.

24.REPLACE ECM

1. Replace ECM.
2. Perform initialization of NVIS(NATS) system and registration of all NVIS(NATS) ignition key IDs. Refer to [SEC-10, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (with Intelligent Key system) or [SEC-120, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (without Intelligent Key system).
3. Perform [EC-25, "VIN Registration"](#).
4. Perform [EC-25, "Accelerator Pedal Released Position Learning"](#).
5. Perform [EC-25, "Throttle Valve Closed Position Learning"](#).
6. Perform [EC-25, "Idle Air Volume Learning"](#).

>> GO TO 29.

25.CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

- Crushed air ducts
- Malfunctioning seal in air cleaner element
- Uneven dirt in air cleaner element
- Improper specification in intake air system

OK or NG

OK >> GO TO 27.

NG >> Repair or replace malfunctioning part, and then GO TO 26.

26.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

OK or NG

OK >> **INSPECTION END**

NG (Less than the SP value)>>GO TO 27.

27.CHECK "MAS A/F SE-B1"

Select "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

OK or NG

OK >> GO TO 28.

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NG (Less than the SP value)>>Replace mass air flow sensor, and then GO TO 30.

28.CHECK INTAKE SYSTEM

Check for the cause of air leak after the mass air flow sensor. Refer to the following.

- Disconnection, looseness, and cracks in air duct
- Looseness of oil filler cap
- Disconnection of oil level gauge
- Open stuck, breakage, hose disconnection, or cracks of PCV valve
- Disconnection or cracks in EVAP purge hose, stuck open of EVAP canister purge volume control solenoid valve
- Malfunctioning seal in rocker cover gasket
- Disconnection, looseness, or cracks in hoses, such as a vacuum hose, connecting to intake air system parts
- Malfunctioning seal in intake air system, etc.

>> GO TO 30.

29.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2", AND "B/FUEL SCHDL"

Select "A/F ALPHA-B1", "A/F ALPHA-B2", and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

OK or NG

OK >> **INSPECTION END**

NG >> Detect malfunctioning part according to [EC-475. "Symptom Matrix Chart"](#).

30.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and then make sure that the indication is within the SP value.

OK or NG

OK >> **INSPECTION END**

NG >> Detect malfunctioning part according to [EC-475. "Symptom Matrix Chart"](#).

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

INFOID:000000007357986

1. INSPECTION START

Start engine.

Is engine running?

Yes or No

Yes >> GO TO 8.

No >> GO TO 2.

2. CHECK ECM POWER SUPPLY CIRCUIT-I

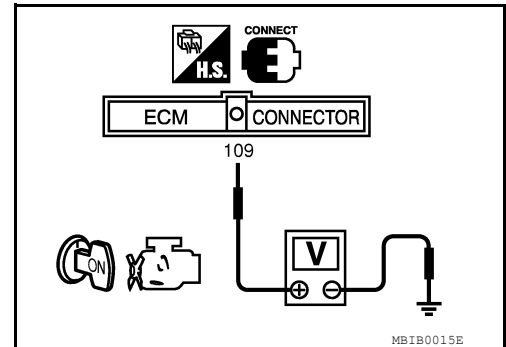
1. Turn ignition switch OFF and then ON.
2. Check voltage between ECM terminal 109 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

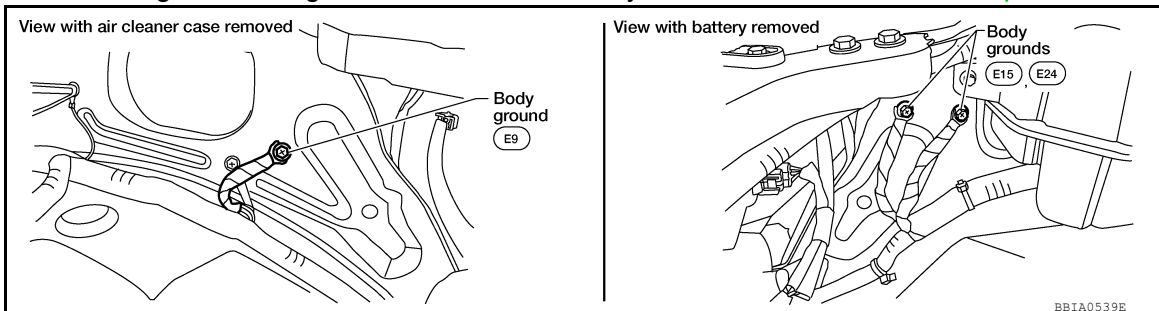
Check the following.

- Harness connectors M31, E152
- Fuse block (J/B) connector M4
- 10 A fuse (No.1)
- Harness for open or short between ECM and fuse

>> Repair harness or connectors.

4. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).



OK or NG

OK >> GO TO 5.

NG >> Repair or replace ground connections.

5. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 1, 115, 116 and ground. Refer to Wiring Diagram.

Continuity should exist.

POWER SUPPLY AND GROUND CIRCUIT

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Also check harness for short to power.

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F32, E2
- Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

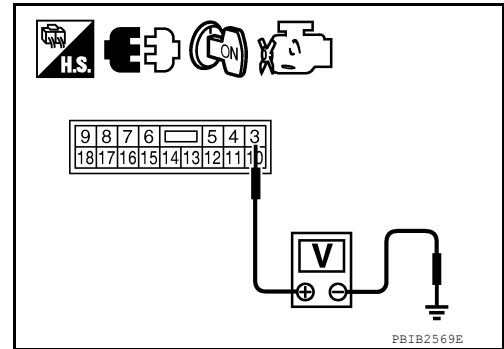
7. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Reconnect ECM harness connector.
2. Turn ignition switch ON.
3. Check voltage between IPDM E/R connector E119 terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> Go to [EC-410. "Diagnosis Procedure"](#).
- NG >> GO TO 8.



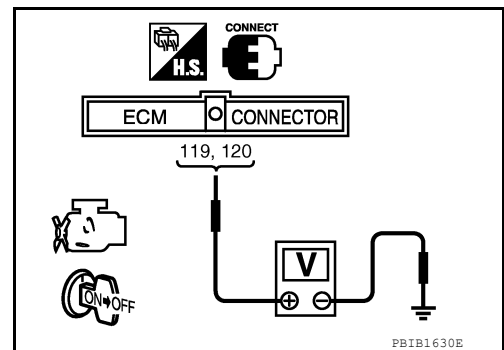
8. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON and then OFF.
3. Check voltage between ECM terminals 119, 120 and ground with CONSULT or tester.

Voltage: After turning ignition switch OFF, battery voltage will exist for a few seconds, then to drop approximately 0V.

OK or NG

- OK >> GO TO 13.
- NG (Battery voltage does not exist.) >> GO TO 9.
- NG (Battery voltage exists for more than a few seconds.) >> GO TO 11.



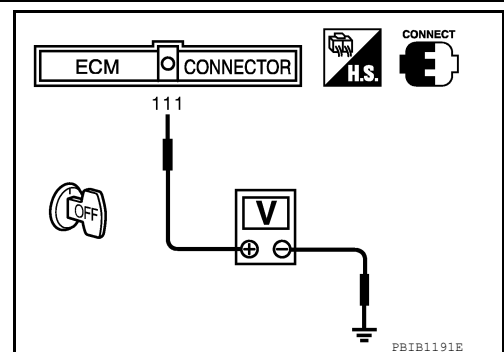
9. CHECK ECM POWER SUPPLY CIRCUIT-IV

Check voltage between ECM terminal 111 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 10.
- NG >> GO TO 11.



10. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E119.

POWER SUPPLY AND GROUND CIRCUIT

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Check harness continuity between ECM terminals 119, 120 and IPDM E/R terminal 4.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 16.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK ECM POWER SUPPLY CIRCUIT-VI

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E119.
3. Check harness continuity between ECM terminal 111 and IPDM E/R terminal 7.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK 20A FUSE

1. Disconnect 20 A fuse (No.53) from IPDM E/R. For the fuse arrangement, refer to [PG-75, "IPDM E/R Terminal Arrangement"](#).
2. Check 20 A fuse.

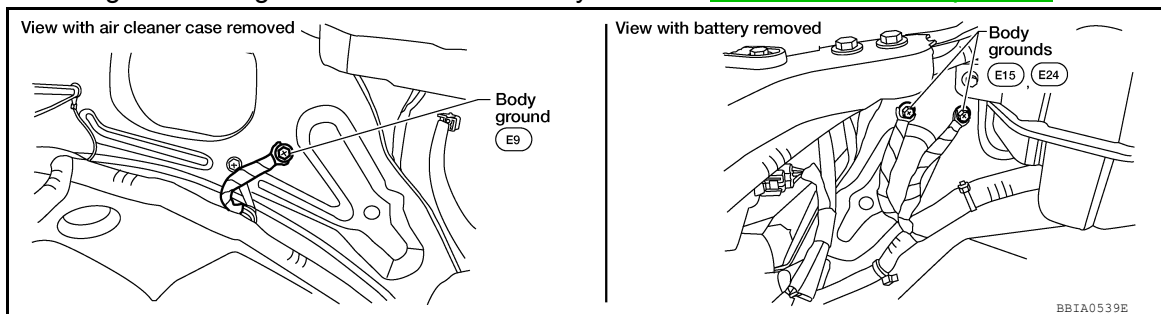
OK or NG

OK >> GO TO 16.

NG >> Replace 20A fuse.

13. CHECK GROUND CONNECTIONS

Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).



OK or NG

OK >> GO TO 14.

NG >> Repair or replace ground connections.

14. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Check harness continuity between ECM terminals 1, 115, 116 and ground.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to power.

OK or NG

OK >> GO TO 16.

NG >> GO TO 15.

15. DETECT MALFUNCTIONING PART

Check the following.

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

- Harness connectors F32, E2
- Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

16.CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

OK or NG

- OK >> Replace IPDM E/R. Refer to [PCS-29, "Removal and Installation of IPDM E/R"](#).
- NG >> Repair open circuit or short to power in harness or connectors.

Ground Inspection

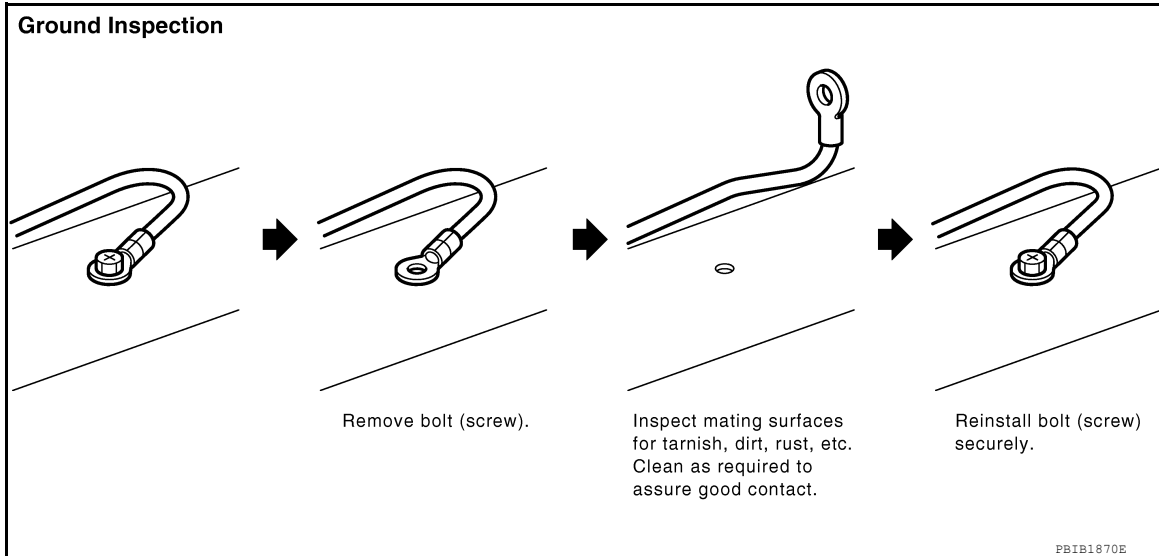
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Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This unwanted resistance can change the way a circuit works. Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can easily affect the circuit. Even when the ground connection looks clean, there can be a thin film of rust on the surface.

When inspecting a ground connection follow these rules:

- Remove the ground bolt or screw.
- Inspect all mating surfaces for tarnish, dirt, rust, etc.
- Clean as required to assure good contact.
- Reinstall bolt or screw securely.
- Inspect for "add-on" accessories which may be interfering with the ground circuit.
- If several wires are crimped into one ground eyelet terminal, check for proper crimps. Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are cased in one eyelet make sure no ground wires have excess wire insulation.

For detailed ground distribution information, refer to [GI-33, "Work Flow"](#).



U0101 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

U0101 CAN COMM CIRCUIT

Description

INFOID:000000007357988

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

INFOID:000000007357989

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U0101 0101	Lost communication with TCM	<ul style="list-style-type: none">When ECM is not transmitting or receiving CAN communication signal of OBD (emission-related diagnosis) with TCM for 2 seconds or more.	<ul style="list-style-type: none">CAN communication line between TCM and ECMCAN communication line is open or shorted

DTC Confirmation Procedure

INFOID:000000007357990

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-98. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007357991

Go to [LAN-52. "CAN System Specification Chart"](#).

U1001 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

U1001 CAN COMM CIRCUIT

Description

INFOID:000000007357992

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

INFOID:000000007357993

The MIL will not illuminate for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1001 1001	CAN communication line	<ul style="list-style-type: none">When ECM is not transmitting or receiving CAN communication signal other than OBD (emission-related diagnosis) for 2 seconds or more.	<ul style="list-style-type: none">Harness or connectors (CAN communication line is open or shorted)

DTC Confirmation Procedure

INFOID:000000007357994

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-99. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007357995

Go to [LAN-52. "CAN System Specification Chart"](#).

P0011, P0021 IVT CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0011, P0021 IVT CONTROL

On Board Diagnosis Logic

INFOID:000000007357996

DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
P0011 0011 (Bank 1)	Intake valve timing control performance	There is a gap between angle of target and phase-control angle degree.	<ul style="list-style-type: none"> • Crankshaft position sensor (POS) • Camshaft position sensor (PHASE) • Intake valve timing control solenoid valve • Accumulation of debris to the signal pick-up portion of the camshaft • Timing chain installation • Foreign matter caught in the oil groove for intake valve timing control
P0021 0021 (Bank 2)			

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode.

Detected items	Engine operating condition in fail-safe mode
Intake valve timing control	The signal is not energized to the solenoid valve and the valve control does not function.

DTC Confirmation Procedure

INFOID:000000007357997

CAUTION:

Always drive at a safe speed.

NOTE:

- If DTC P0011 or P0021 is displayed with DTC P0075 or P0081, first perform trouble diagnosis for DTC P0075 or P0081. Refer to [EC-110](#).
 - If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next step.
1. Turn ignition switch OFF and wait at least 10 seconds.
 2. Turn ignition switch ON.
 3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10V and 16V at idle.

WITH CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Maintain the following conditions for at least 6 consecutive seconds. Hold the accelerator pedal as steady as possible.

ENG SPEED	1,200 - 2,000 rpm
COOLAN TEMP/S	More than 60°C (140°F)
B/FUEL SCHDL	More than 3.5 msec
Selector lever	P or N position

4. Stop vehicle with engine running and let engine idle for 10 seconds.
5. Check 1st trip DTC.
6. If the 1st trip DTC is detected, go to [EC-101, "Diagnosis Procedure"](#).
If the 1st trip DTC is not detected, go to next step.
7. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	1,700 - 3,175 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 70°C (158°F)

< DTC/CIRCUIT DIAGNOSIS >

Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

8. Check 1st trip DTC.
9. If the 1st trip DTC is detected, go to [EC-101. "Diagnosis Procedure"](#).

 WITH GST

Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

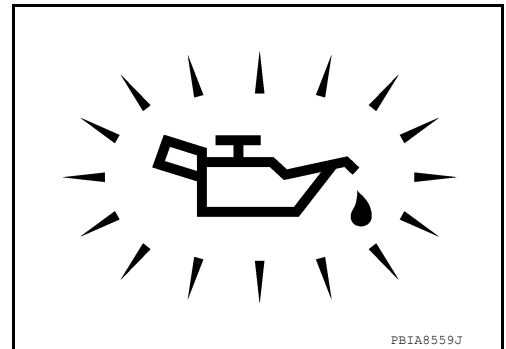
INFOID:000000007357998

1.CHECK OIL PRESSURE WARNING LAMP

1. Start engine.
2. Check oil pressure warning lamp and confirm it is not illuminated.

OK or NG

- OK >> GO TO 2.
- KG >> Go to [LU-8. "Inspection"](#).



2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to [EC-102. "Component Inspection"](#).

OK or NG

- OK >> GO TO 3.
- NG >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-77. "Exploded View"](#).

3.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to [EC-221. "Component Inspection"](#).

OK or NG

- OK >> GO TO 4.
- NG >> Replace crankshaft position sensor (POS). Refer to [EM-72. "Exploded View"](#).

4.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to [EC-226. "Component Inspection"](#).

OK or NG

- OK >> GO TO 5.
- NG >> Replace malfunctioning camshaft position sensor (PHASE). Refer to [EM-77. "Exploded View"](#).

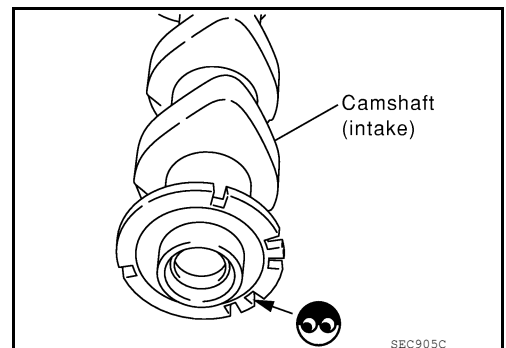
5.CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris on the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

- OK >> GO TO 6.
- NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft. Refer to [EM-78. "Removal and Installation"](#).



< DTC/CIRCUIT DIAGNOSIS >

6. CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misalignment.
Are there any service records that may cause timing chain misalignment?

Yes or No

- Yes >> Check timing chain installation. Refer to [EM-61, "Removal and Installation"](#).
- No >> GO TO 7.

7. CHECK LUBRICATION CIRCUIT

Refer to [EM-61, "Removal and Installation"](#).

OK or NG

- OK >> GO TO 8.
- NG >> Clean lubrication line.

8. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

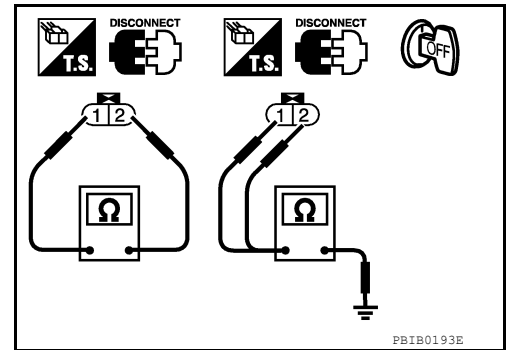
Component Inspection

INFOID:000000007357999

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.
2. Check resistance between intake valve timing control solenoid valve as follows.

Terminal	Resistance
1 and 2	7.0 - 7.7Ω at 20°C (68°F)
1 or 2 and ground	∞Ω (Continuity should not exist.)



If NG, replace intake valve timing control solenoid valve. Refer to [EM-77, "Exploded View"](#).

If OK, go to next step.

3. Remove intake valve timing control solenoid valve. Refer to [EM-77, "Exploded View"](#).

4. Provide 12V DC between intake valve timing control solenoid valve terminals and then interrupt it. Make sure that the plunger moves as shown in the figure.

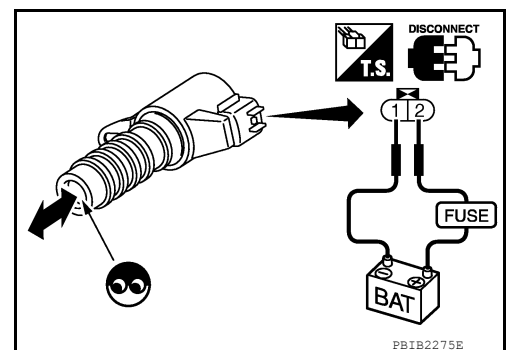
CAUTION:

Never apply 12V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

If NG, replace intake valve timing control solenoid valve. Refer to [EM-77, "Exploded View"](#).

NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.



P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

Description

INFOID:000000007358000

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Air fuel ratio (A/F) sensor 1 heater control	Air fuel ratio (A/F) sensor 1 heater
Mass air flow sensor	Amount of intake air		

The ECM performs ON/OFF duty control of the A/F sensor 1 heater corresponding to the engine operating condition to keep the temperature of A/F sensor 1 element within the specified range.

On Board Diagnosis Logic

INFOID:000000007358001

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031 0031 (Bank 1)	Air fuel ratio (A/F) sensor 1 heater control circuit low	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.)	<ul style="list-style-type: none"> • Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) • A/F sensor 1 heater
P0051 0051 (Bank 2)			
P0032 0032 (Bank 1)	Air fuel ratio (A/F) sensor 1 heater control circuit high	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.)	<ul style="list-style-type: none"> • Harness or connectors (The A/F sensor 1 heater circuit is shorted.) • A/F sensor 1 heater
P0052 0052 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358002

NOTE:

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-103, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358003

1. CHECK GROUND CONNECTIONS

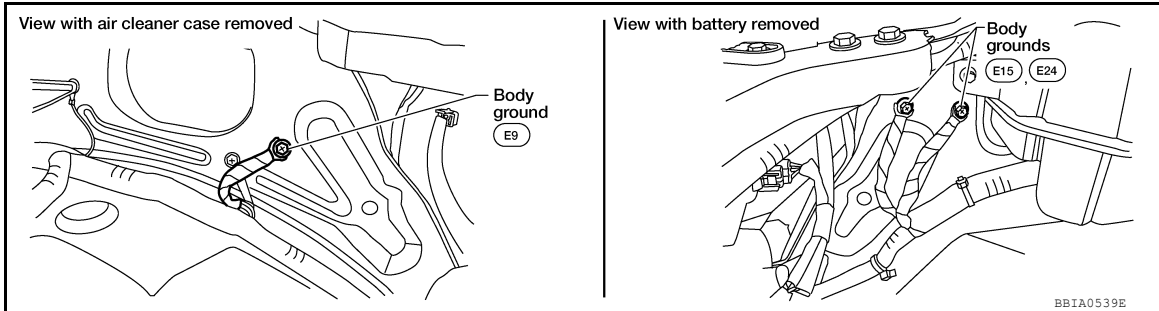
1. Turn ignition switch OFF.

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

- Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).

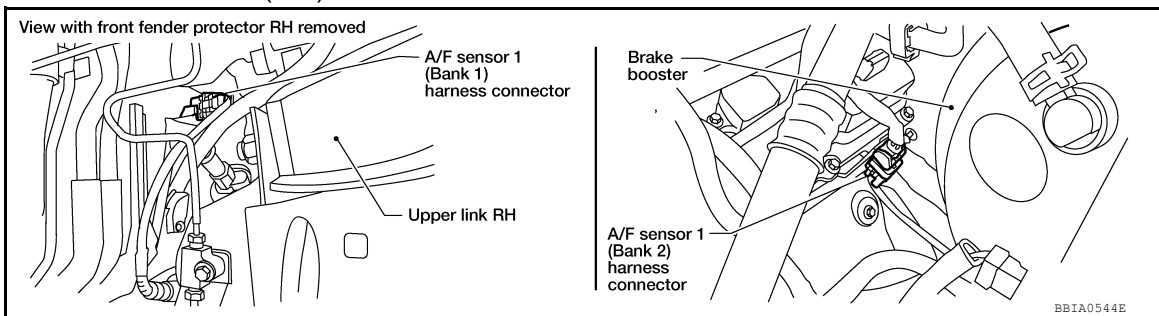


OK or NG

- OK >> GO TO 2.
- NG >> Repair or Replace ground connections.

2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect air fuel ratio (A/F) sensor 1 harness connector.

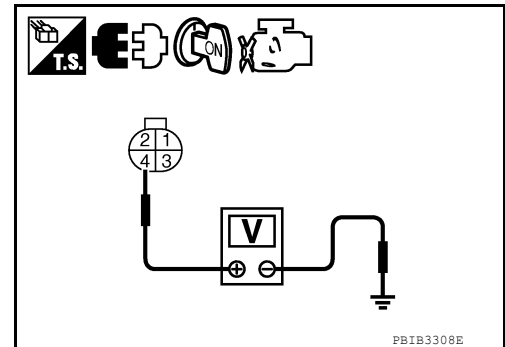


- Turn ignition switch ON.
- Check voltage between air fuel ratio sensor 1 terminal 4 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- 15 A fuse (No.54)
- Harness for open or short between air fuel ratio sensor 1 and fuse

>> Repair or replace harness or connectors.

4. CHECK AIR FUEL RATIO (A/F) SENSOR 1 HEATER OUTPUT SIGNAL CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 2 (bank 1) or 24, 43 (bank 2) and air fuel ratio (A/F) sensor 1 terminal 3. Refer to Wiring Diagram.

Continuity should exist.

- Also check harness for short to ground or short to power.

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> GO TO 5.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK AIR FUEL RATIO (A/F) SENSOR 1 HEATER

Refer to [EC-105, "Component Inspection"](#).

OK or NG

- OK >> GO TO 6.
- NG >> GO TO 7.

6. CHECK INTERMITTENT INCIDENT

Perform [GI-37, "Intermittent Incident"](#).

OK or NG

- OK >> GO TO 7.
- NG >> Repair or replace.

7. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to [EX-6, "Exploded View"](#).

CAUTION:

- Discard any air fuel ratio (A/F) sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new air fuel ratio (A/F) sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

>> INSPECTION END

Component Inspection

INFOID:000000007358004

AIR FUEL RATIO (A/F) SENSOR 1 HEATER

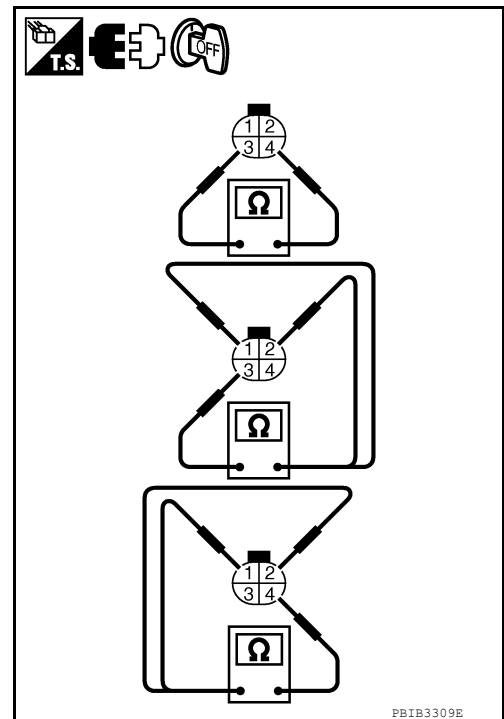
1. Check resistance between A/F sensor 1 terminals as follows.

Terminal No.	Resistance
3 and 4	1.98 - 2.66 Ω [at 25°C (77°F)]
3 and 1, 2	∞Ω (Continuity should not exist)
4 and 1, 2	

2. If NG, replace air fuel ratio (A/F) sensor 1. Refer to [EX-6, "Exploded View"](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.



P0037, P0038, P0057, P0058 HO2S2 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0037, P0038, P0057, P0058 HO2S2 HEATER

Description

INFOID:000000007358005

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Engine coolant temperature sensor	Engine coolant temperature		
Mass air flow sensor	Amount of intake air		

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,600	OFF
Below 3,600 rpm after the following conditions are met. <ul style="list-style-type: none">• Engine: After warming up• Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	ON

On Board Diagnosis Logic

INFOID:000000007358006

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037 0037 (Bank 1) P0057 0057 (Bank 2)	Heated oxygen sensor 2 heater control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	<ul style="list-style-type: none">• Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.)• Heater oxygen sensor 2 heater
P0038 0038 (Bank 1) P0058 0058 (Bank 2)	Heated oxygen sensor 2 heater control circuit high	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	<ul style="list-style-type: none">• Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.)• Heater oxygen sensor 2 heater

DTC Confirmation Procedure

INFOID:000000007358007

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

Ⓟ WITH CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.

P0037, P0038, P0057, P0058 HO2S2 HEATER

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start the engine and keep the engine speed between 3,500 rpm and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Check 1st trip DTC.
9. If 1st trip DTC is detected, go to [EC-107. "Diagnosis Procedure"](#).

Ⓢ WITH GST

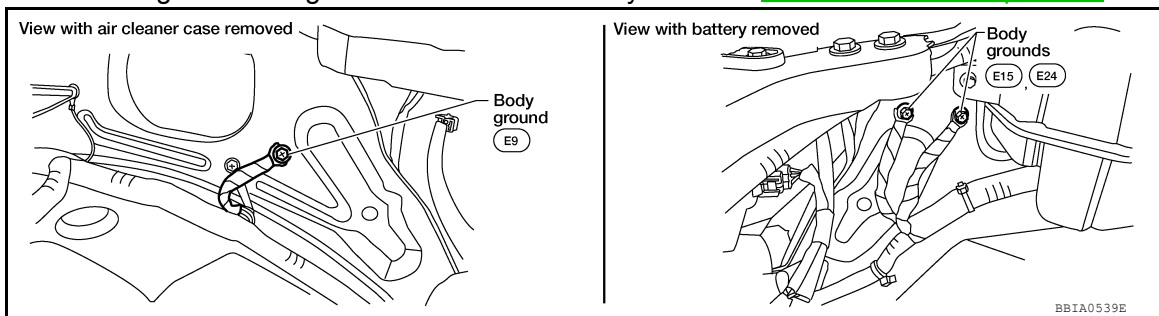
Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358008

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).



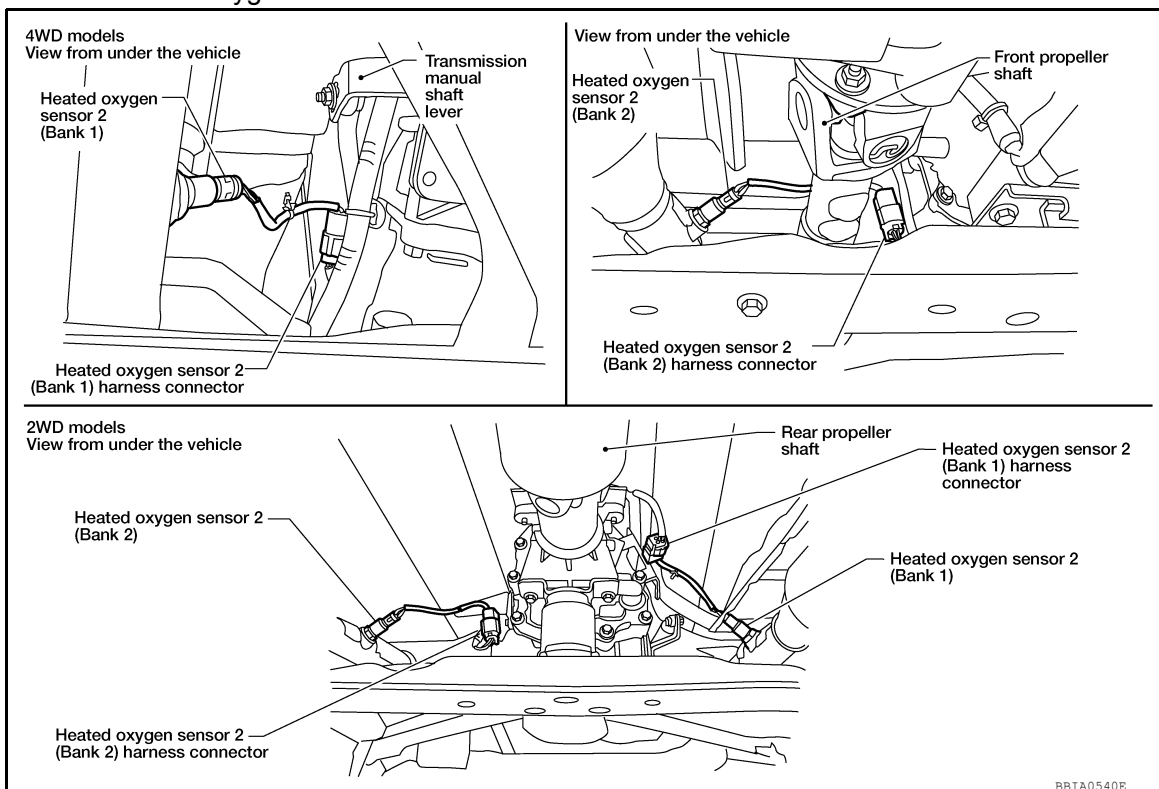
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Disconnect heated oxygen sensor 2 harness connector.



2. Turn ignition switch ON.

P0037, P0038, P0057, P0058 HO2S2 HEATER

[VQ40DE]

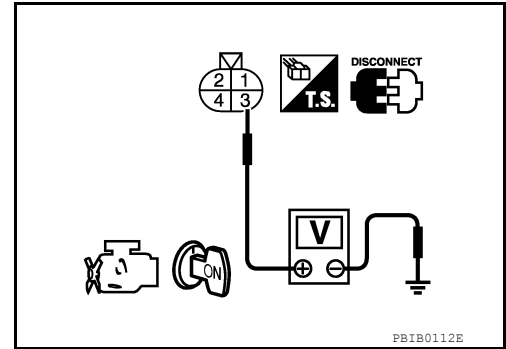
< DTC/CIRCUIT DIAGNOSIS >

3. Check voltage between HO2S2 terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- 15 A fuse (No.54)
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair harness or connectors.

4. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal and HO2S2 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0037, P0038	25	2	1
P0057, P0058	6	2	2

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to [EC-108. "Component Inspection"](#).

OK or NG

- OK >> GO TO 6.
- NG >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-6. "Exploded View"](#).

6. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358009

HEATED OXYGEN SENSOR 2 HEATER

P0037, P0038, P0057, P0058 HO2S2 HEATER

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

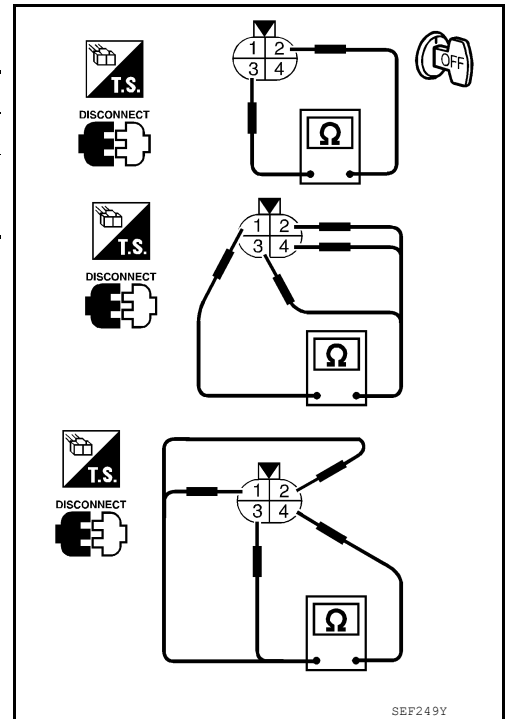
1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
2 and 3	9.9 - 13.3 Ω at 25°C (77°F)
1 and 2, 3, 4	$\infty \Omega$
4 and 1, 2, 3	(Continuity should not exist)

2. If NG, replace heated oxygen sensor 2. Refer to [EX-6](#).
["Exploded View"](#).

CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.



SEP249Y

A
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P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0075, P0081 IVT CONTROL SOLENOID VALVE

Component Description

INFOID:000000007358010

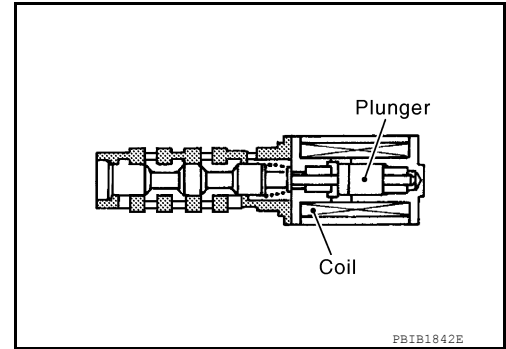
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



On Board Diagnosis Logic

INFOID:000000007358011

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0075 0075 (Bank 1)	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	<ul style="list-style-type: none"> • Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.) • Intake valve timing control solenoid valve
P0081 0081 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358012

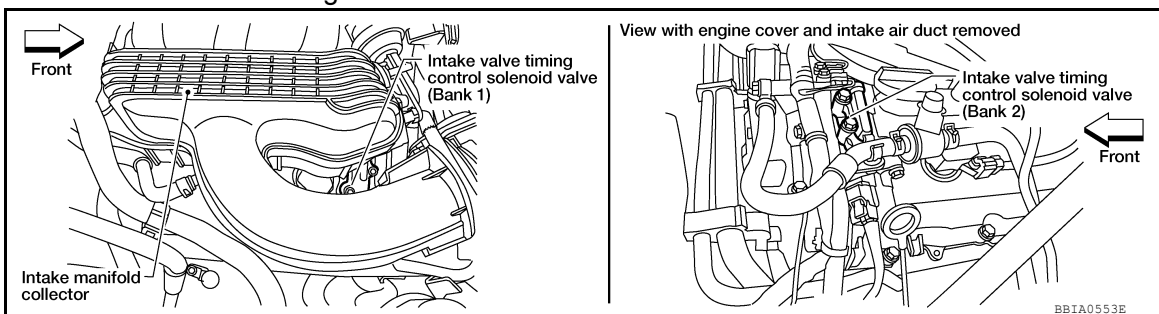
1. If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to [EC-110, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358013

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.



3. Turn ignition switch ON.

P0075, P0081 IVT CONTROL SOLENOID VALVE

[VQ40DE]

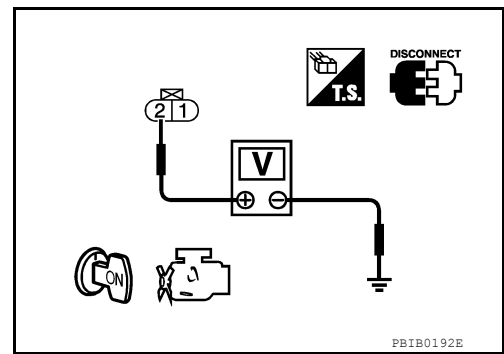
< DTC/CIRCUIT DIAGNOSIS >

4. Check voltage between intake valve timing control solenoid valve terminal 2 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 3.
- NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness connectors F26, F225 (bank 1)
- Harness for open or short between intake valve timing control solenoid valve and IPDM E/R
- Harness for open or short between intake valve timing control solenoid valve and ECM

>> Repair harness or connectors.

3. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 11 (bank 1) or 10 (bank 2) and intake valve timing control solenoid valve terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F26, F225 (bank 1)
- Harness for open and short between ECM and intake valve timing control solenoid valve

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to [EC-111, "Component Inspection"](#).

OK or NG

- OK >> GO TO 6.
- NG >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-77, "Exploded View"](#).

6. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358014

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.

P0075, P0081 IVT CONTROL SOLENOID VALVE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check resistance between intake valve timing control solenoid valve as follows.

Terminal	Resistance
1 and 2	7.0 - 7.7Ω at 20°C (68°F)
1 or 2 and ground	∞Ω (Continuity should not exist.)

If NG, replace intake valve timing control solenoid valve. Refer to [EM-77. "Exploded View"](#).
If OK, go to next step.

- Remove intake valve timing control solenoid valve. Refer to [EM-77. "Exploded View"](#).

- Provide 12V DC between intake valve timing control solenoid valve terminals and then interrupt it. Make sure that the plunger moves as shown in the figure.

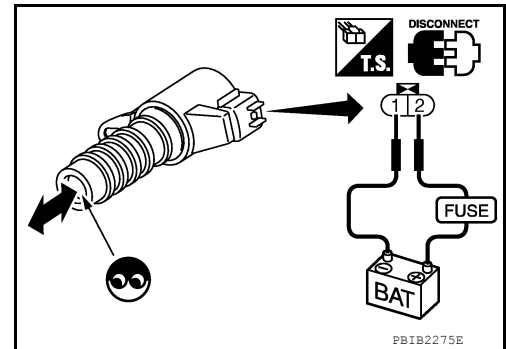
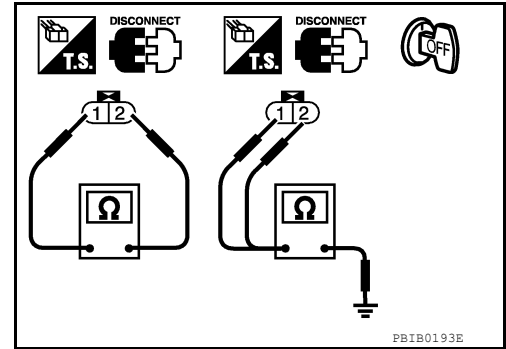
CAUTION:

Never apply 12V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

If NG, replace intake valve timing control solenoid valve. Refer to [EM-77. "Exploded View"](#).

NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.

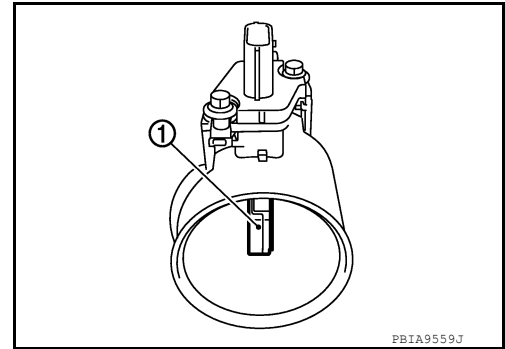


P0101 MAF SENSOR

Component Description

INFOID:000000007358015

The mass air flow sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The greater air flow, the greater the heat loss. Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



On Board Diagnosis Logic

INFOID:000000007358016

NOTE:

If DTC P0101 is displayed with other DTC, first perform the trouble diagnosis for other DTC.

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0101	MAF SEN/CIRCUIT-B1 [Mass air flow (MAF) sensor circuit range/performance]	<ul style="list-style-type: none"> A high voltage from the sensor is sent to ECM under light load driving condition. A low voltage from the sensor is sent to ECM under heavy load driving condition. 	<ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted.) Intake air leaks MAF sensor EVAP control system pressure sensor Intake air temperature sensor

DTC Confirmation Procedure

INFOID:000000007358017

1. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle for at least 5 seconds under the following conditions:

CAUTION:

Always drive vehicle at safe speed.

Selector lever	Suitable position
Vehicle speed	40 km/h (25 MPH) or more

NOTE:

- The gear must be fixed while driving the vehicle.
- Keep the accelerator pedal as steady as possible during cruising.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-114, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

P0101 MAF SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

INFOID:000000007358018

Diagnosis Procedure

1.INSPECTION START

Which malfunction (A or B) is duplicated?

A or B

A >> GO TO 3.

B >> GO TO 2.

2.CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct and intake manifold

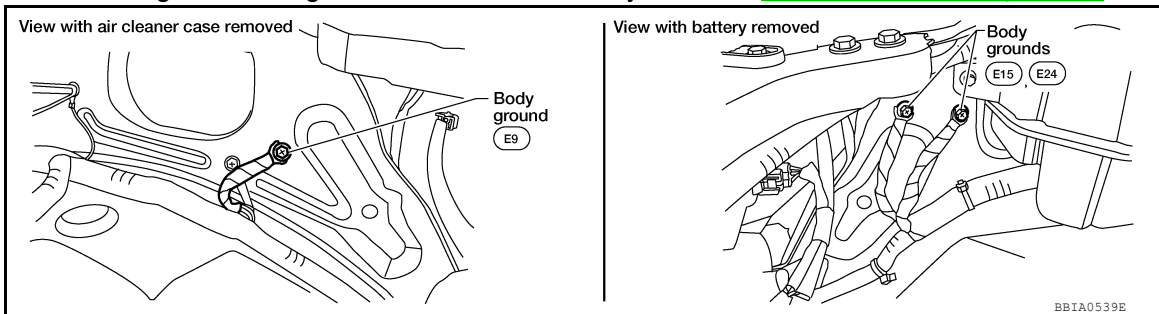
OK or NG

OK >> GO TO 3.

NG >> Reconnect the parts.

3.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).



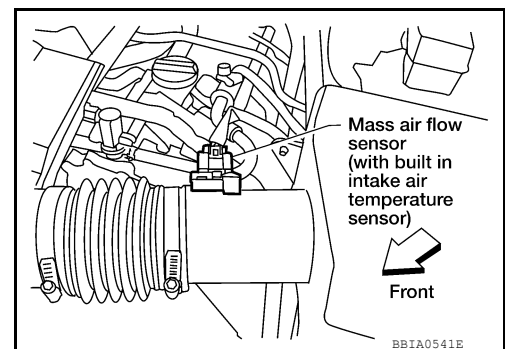
OK or NG

OK >> GO TO 4.

NG >> Repair or replace ground connections.

4.CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor harness connector.
2. Turn ignition switch ON.



P0101 MAF SENSOR

[VQ40DE]

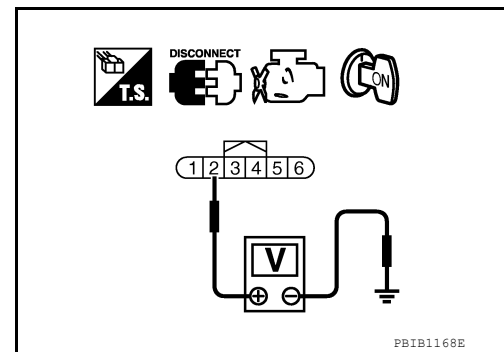
< DTC/CIRCUIT DIAGNOSIS >

3. Check voltage between MAF sensor terminal 2 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 6.
- NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between IPDM E/R and mass air flow sensor
- Harness for open or short between mass air flow sensor and ECM

>> Repair harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 67.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 4 and ECM terminal 51.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to [EC-128, "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace intake air temperature sensor. Refer to [EM-26, "Removal and Installation"](#).

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-264, "Component Inspection"](#).

OK or NG

- OK >> GO TO 10.
- NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

10. CHECK MASS AIR FLOW SENSOR

Refer to [EC-116, "Component Inspection"](#).

OK or NG

P0101 MAF SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK >> GO TO 11.

NG >> Replace mass air flow sensor. Refer to [EM-26, "Removal and Installation"](#).

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358019

MASS AIR FLOW SENSOR

Ⓟ With CONSULT

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Connect CONSULT and select "DATA MONITOR" mode.
4. Select "MAS A/F SE-B1" and check indication under the following conditions.

Condition	MAS A/F SE-B1 (V)
Ignition switch ON (Engine stopped.)	Approx. 0.4
Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.2
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 1.8
Idle to about 4,000 rpm	0.9 - 1.2 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

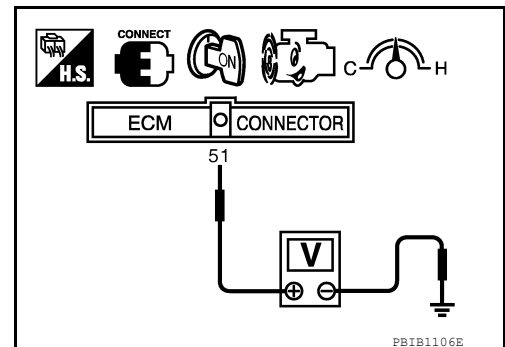
5. If the voltage is out of specification, proceed the following.
 - a. Check for the cause of uneven air flow through mass air flow sensor. Refer to following.
 - Crushed air ducts
 - Malfunctioning seal of air cleaner element
 - Uneven dirt of air cleaner element
 - Improper specification of intake air system parts
 - b. If NG, repair or replace malfunctioning part and perform step 2 to 4 again.
If OK, go to next step.
6. Turn ignition switch OFF.
7. Disconnect mass air flow sensor harness connector and reconnect it again.
8. Perform step 2 to 4 again.
9. If NG, clean or replace mass air flow sensor. Refer to [EM-26, "Removal and Installation"](#).

ⓧ Without CONSULT

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 51 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch ON (Engine stopped.)	Approx. 0.4
Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.2
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 1.8
Idle to about 4,000 rpm	0.9 - 1.2 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.



P0101 MAF SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

4. If the voltage is out of specification, proceed the following.
 - a. Check for the cause of uneven air flow through mass air flow sensor. Refer to following.
 - Crushed air ducts
 - Malfunctioning seal of air cleaner element
 - Uneven dirt of air cleaner element
 - Improper specification of intake air system parts
 - b. If NG, repair or replace malfunctioning part and perform step 2 to 3 again.
If OK, go to next step.
5. Turn ignition switch OFF.
6. Disconnect mass air flow sensor harness connector and reconnect it again.
7. Perform step 2 and 3 again.
8. If NG, clean or replace mass air flow sensor. Refer to [EM-26, "Removal and Installation"](#).

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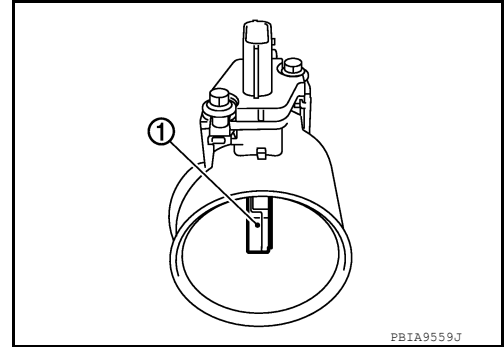
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P0102, P0103 MAF SENSOR

Component Description

INFOID:000000007358020

The mass air flow sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The greater air flow, the greater the heat loss. Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



On Board Diagnosis Logic

INFOID:000000007358021

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102 0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Intake air leaks • Mass air flow sensor
P0103 0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL illuminate.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

INFOID:000000007358022

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

PROCEDURE FOR DTC P0102

1. Start engine and wait at least 5 seconds.
2. Check DTC.
3. If DTC is detected, go to [EC-119, "Diagnosis Procedure"](#).

PROCEDURE FOR DTC P0103

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check DTC.
3. If DTC is detected, go to [EC-119, "Diagnosis Procedure"](#).
If DTC is not detected, go to next step.
4. Start engine and wait at least 5 seconds.
5. Check DTC.
6. If DTC is detected, go to [EC-119, "Diagnosis Procedure"](#).

P0102, P0103 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

INFOID:000000007358023

Diagnosis Procedure

1. INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.

P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct and intake manifold

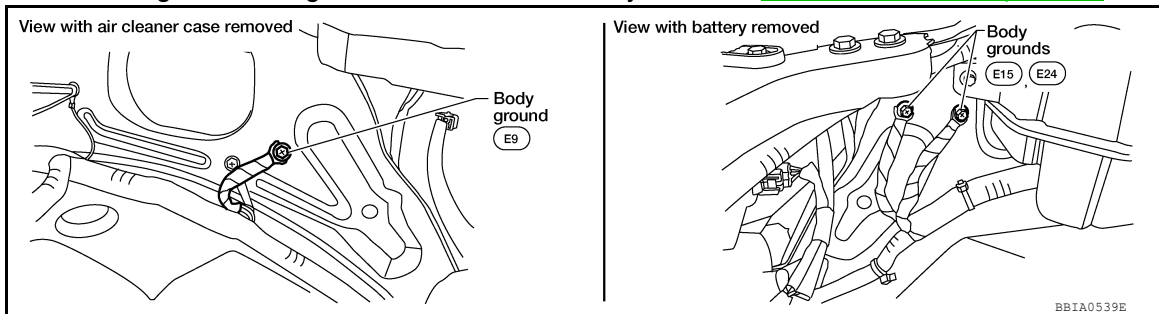
OK or NG

OK >> GO TO 3.

NG >> Reconnect the parts.

3. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).



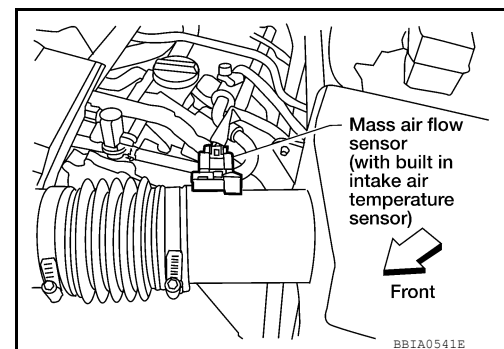
OK or NG

OK >> GO TO 4.

NG >> Repair or replace ground connections.

4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor harness connector.
2. Turn ignition switch ON.



P0102, P0103 MAF SENSOR

[VQ40DE]

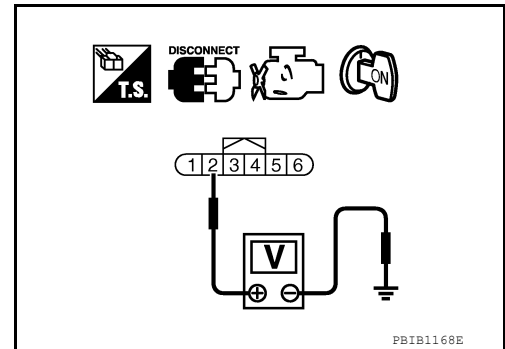
< DTC/CIRCUIT DIAGNOSIS >

3. Check voltage between MAF sensor terminal 2 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 6.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between IPDM E/R and mass air flow sensor
- Harness for open or short between mass air flow sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 67.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 4 and ECM terminal 51.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to [EC-116, "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
NG >> Replace mass air flow sensor. Refer to [EM-26, "Removal and Installation"](#).

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358024

MASS AIR FLOW SENSOR

P0102, P0103 MAF SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Ⓟ With CONSULT

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Connect CONSULT and select "DATA MONITOR" mode.
4. Select "MAS A/F SE-B1" and check indication under the following conditions.

Condition	MAS A/F SE-B1 (V)
Ignition switch ON (Engine stopped.)	Approx. 0.4
Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.2
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 1.8
Idle to about 4,000 rpm	0.9 - 1.2 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

5. If the voltage is out of specification, proceed the following.
 - a. Check for the cause of uneven air flow through mass air flow sensor. Refer to following.
 - Crushed air ducts
 - Malfunctioning seal of air cleaner element
 - Uneven dirt of air cleaner element
 - Improper specification of intake air system parts
 - b. If NG, repair or replace malfunctioning part and perform step 2 to 4 again. If OK, go to next step.
6. Turn ignition switch OFF.
7. Disconnect mass air flow sensor harness connector and reconnect it again.
8. Perform step 2 to 4 again.
9. If NG, clean or replace mass air flow sensor. Refer to [EM-26. "Removal and Installation"](#).

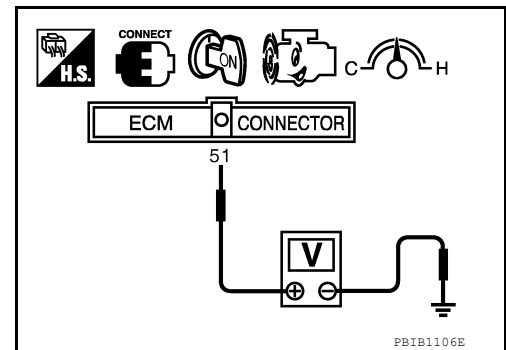
ⓧ Without CONSULT

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 51 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch ON (Engine stopped.)	Approx. 0.4
Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.2
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 1.8
Idle to about 4,000 rpm	0.9 - 1.2 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

4. If the voltage is out of specification, proceed the following.
 - a. Check for the cause of uneven air flow through mass air flow sensor. Refer to following.
 - Crushed air ducts
 - Malfunctioning seal of air cleaner element
 - Uneven dirt of air cleaner element
 - Improper specification of intake air system parts
 - b. If NG, repair or replace malfunctioning part and perform step 2 to 3 again. If OK, go to next step.
5. Turn ignition switch OFF.
6. Disconnect mass air flow sensor harness connector and reconnect it again.
7. Perform step 2 and 3 again.



P0102, P0103 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

-
8. If NG, clean or replace mass air flow sensor. Refer to [EM-26. "Removal and Installation"](#).

P0111 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

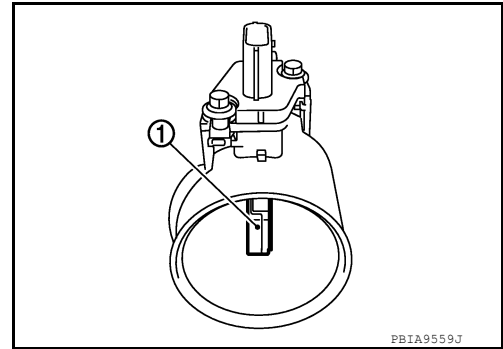
P0111 IAT SENSOR

Component Description

INFOID:000000007358025

The intake air temperature sensor is built-into the mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.

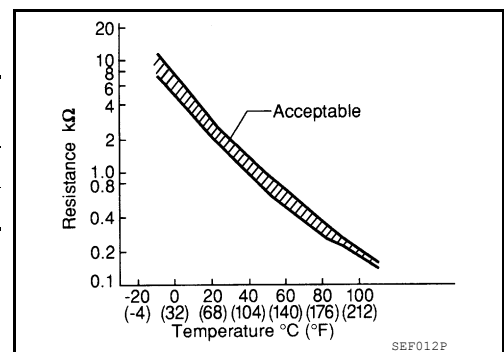
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



<Reference data>

Intake air temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
25 (77)	3.3	1.800 - 2.200
80 (176)	1.2	0.283 - 0.359

*: These data are reference values and are measured between ECM terminals 51 (Intake air temperature sensor) and 67 (Sensor ground).



On Board Diagnosis Logic

INFOID:000000007358026

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0111	IAT SENSOR 1 B1 [Intake air temperature (IAT) sensor circuit range/performance]	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, and FTT sensor) shows that the voltage signal of the IAT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.	<ul style="list-style-type: none"> • Harness or connectors (High or low resistance in the IAT sensor circuit) • IAT sensor

DTC Confirmation Procedure

INFOID:000000007358027

1. INSPECTION START

Is it necessary to erase permanent DTC?

YES >> GO TO 3.

NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-124, "Component Function Check"](#).

NOTE:

Use the component function check to check the overall function of the IAT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-124, "Diagnosis Procedure"](#).

P0111 IAT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.

NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

CAUTION:

Never turn ignition switch ON during soaking.

NOTE:

The vehicle must be cooled with the hood open.

4. Start engine and let it idle for 5 minutes or more.

CAUTION:

Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-124, "Diagnosis Procedure"](#).

NO >> INSPECTION END

Component Function Check

INFOID:000000007358028

1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as follows.

Terminals	Condition	Resistance (k Ω)
5 and 6	Temperature [$^{\circ}\text{C}$ ($^{\circ}\text{F}$)] 25 (77)	1.800 – 2.200

Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to [EC-124, "Diagnosis Procedure"](#).

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-37, "Intermittent Incident"](#).

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-124, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358029

1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

Check intake air temperature sensor. Refer to [EC-125, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 2.

P0111 IAT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-26. "Removal and Installation"](#).

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-37. "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000007358030

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as follows.

Terminals	Condition		Resistance (kΩ)
5 and 6	Temperature [°C (°F)]	25 (77)	1.800 – 2.200

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-26. "Removal and Installation"](#).

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P0112, P0113 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

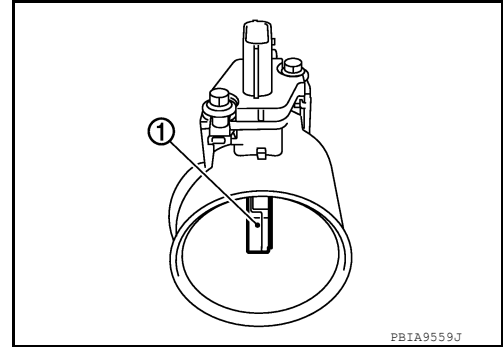
P0112, P0113 IAT SENSOR

Component Description

INFOID:000000007358031

The intake air temperature sensor is built-into the mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



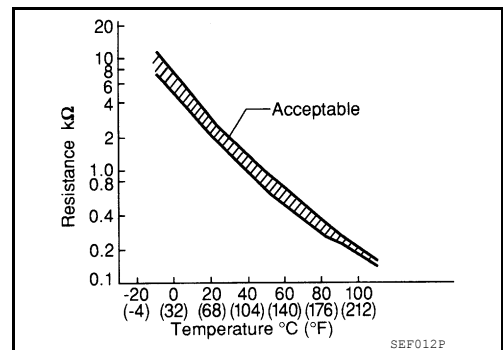
<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
25 (77)	3.3	1.800 - 2.200
80 (176)	1.2	0.283 - 0.359

*: This data is reference value and is measured between ECM terminal 34 (Intake air temperature sensor) and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



On Board Diagnosis Logic

INFOID:000000007358032

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0112 0112	Intake air temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Intake air temperature sensor
P0113 0113	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

INFOID:000000007358033

- If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.
 - Turn ignition switch OFF and wait at least 10 seconds.
 - Turn ignition switch ON.
 - Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON and wait at least 5 seconds.
- Check 1st trip DTC.
- If 1st trip DTC is detected, go to [EC-126, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358034

1. CHECK GROUND CONNECTIONS

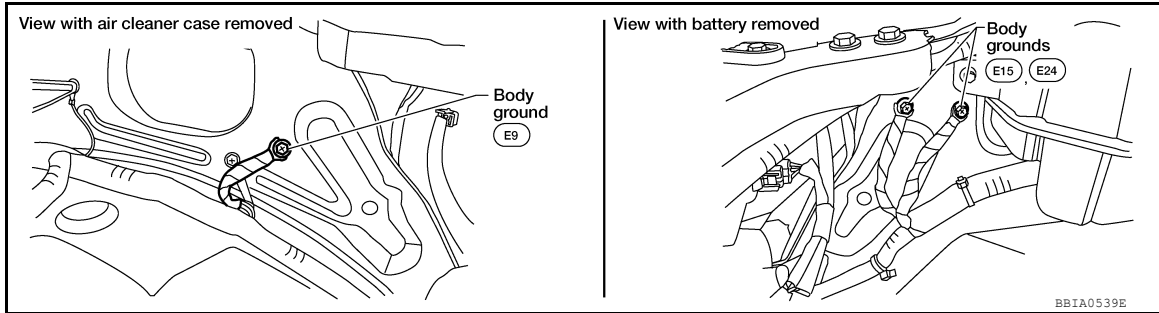
- Turn ignition switch OFF.

P0112, P0113 IAT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).

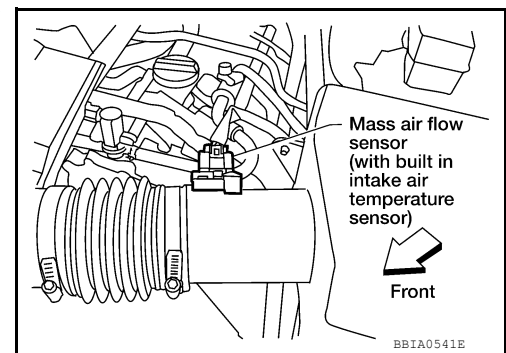


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- Disconnect mass air flow sensor (intake air temperature sensor is built-in) harness connector.
- Turn ignition switch ON.

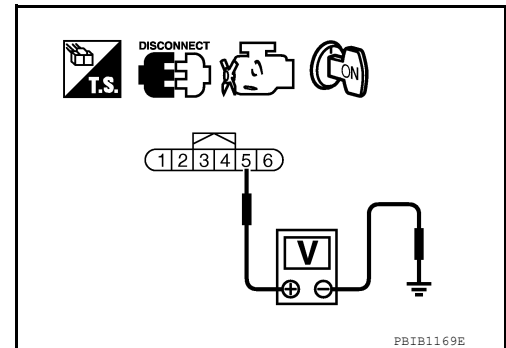


- Check voltage between mass air flow sensor terminal 5 and ground.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 3.
- NG >> Repair harness or connectors.



3. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between mass air flow sensor terminal 6 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

- Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to [EC-128. "Component Inspection"](#).

OK or NG

- OK >> GO TO 5.
- NG >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-26. "Removal and Installation"](#).

P0112, P0113 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

5. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

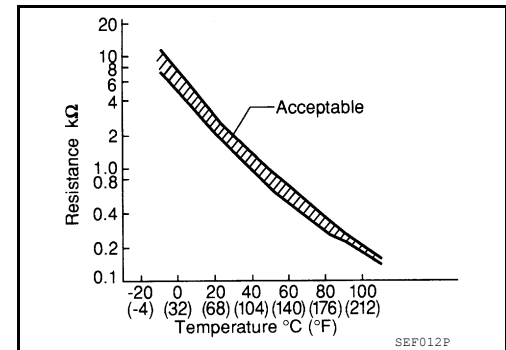
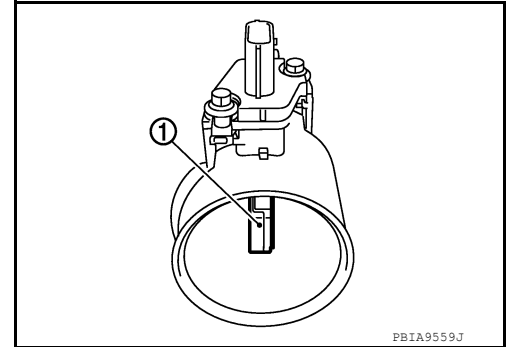
INFOID:000000007358035

INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between mass air flow sensor (1) terminals 5 and 6 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.800 - 2.200

2. If NG, replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-26. "Removal and Installation"](#).

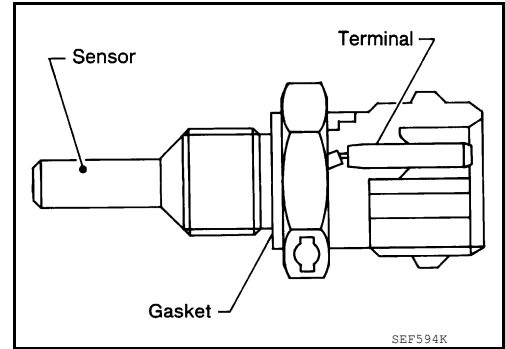


P0116 ECT SENSOR

Component Description

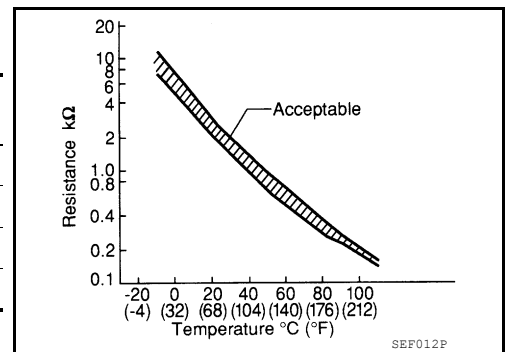
INFOID:000000007358036

The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)]	Voltage* (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260



*: This data is reference value and is measured between ECM terminal 73 (Engine coolant temperature sensor) and 67 (Sensor ground).

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

INFOID:000000007358037

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0116	ECT SEN/CIRC [Engine coolant temperature (ECT) sensor circuit range/performance]	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, and FTT sensor) shows that the voltage signal of the ECT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.	<ul style="list-style-type: none"> • Harness or connectors (High or low resistance in the ECT sensor circuit) • ECT sensor

DTC Confirmation Procedure

INFOID:000000007358038

1. INSPECTION START

Is it necessary to erase permanent DTC?

- YES >> GO TO 3.
- NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-130. "Component Function Check"](#).

NOTE:

Use the component function check to check the overall function of the ECT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

P0116 ECT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> INSPECTION END
NO >> Proceed to [EC-131, "Diagnosis Procedure"](#).

3. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.

NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

CAUTION:

Never turn ignition switch ON during soaking.

NOTE:

The vehicle must be cooled with the hood open.

4. Start engine and let it idle for 5 minutes or more.

CAUTION:

Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-131, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Component Function Check

INFOID:000000007358039

1. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect ECT sensor harness connector.
3. Remove ECT sensor. Refer to [CO-30, "Removal and Installation"](#).
4. Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance (k Ω)	
1 and 2	Temperature [$^{\circ}\text{C}$ ($^{\circ}\text{F}$)]	20 (68)	2.10 – 2.90
		50 (122)	0.68 – 1.00
		90 (194)	0.236 – 0.260

Is the inspection result normal?

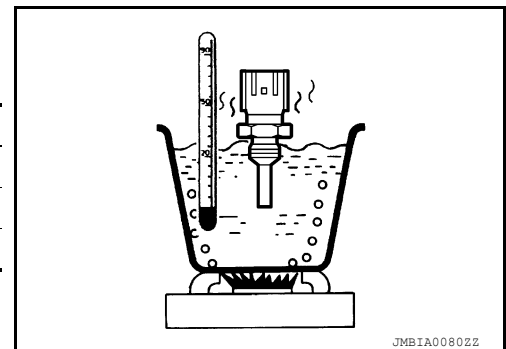
- YES >> GO TO 2.
NO >> Proceed to [EC-131, "Diagnosis Procedure"](#).

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-37, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-131, "Diagnosis Procedure"](#).



P0116 ECT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Diagnosis Procedure

INFOID:000000007358040

1. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Check ECT sensor. Refer to [EC-131, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace ECT sensor. Refer to [CO-30, "Removal and Installation"](#).

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-37, "Intermittent Incident"](#).

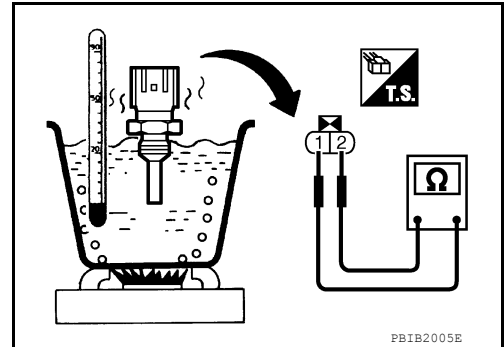
>> INSPECTION END

Component Inspection

INFOID:000000007358041

ENGINE COOLANT TEMPERATURE SENSOR

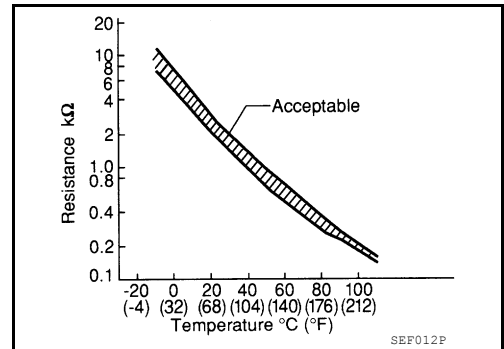
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



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Engine coolant temperature °C (°F)]	Resistance (kΩ)
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

2. If NG, replace engine coolant temperature sensor. Refer to [CO-30, "Removal and Installation"](#).



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P0117, P0118 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

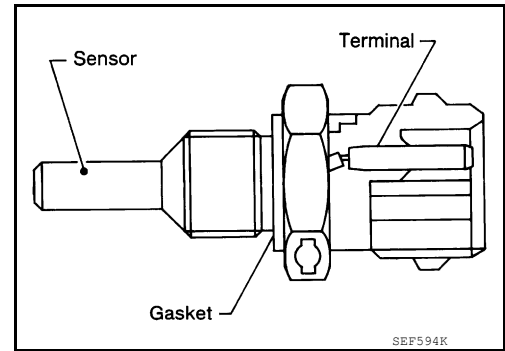
[VQ40DE]

P0117, P0118 ECT SENSOR

Component Description

INFOID:000000007358042

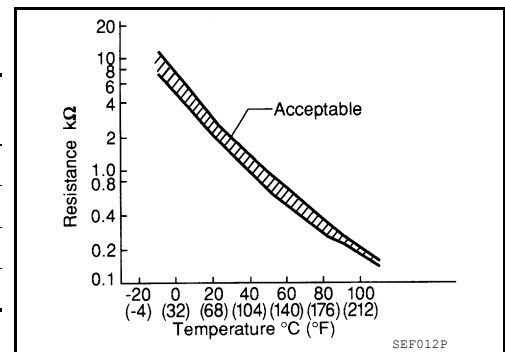
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: This data is reference value and is measured between ECM terminal 73 (Engine coolant temperature sensor) and ground.



CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

INFOID:000000007358043

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL illuminate.

P0117, P0118 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Detected items	Engine operating condition in fail-safe mode	
Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the following condition. CONSULT displays the engine coolant temperature decided by ECM.	
	Condition	Engine coolant temperature decided (CONSULT display)
	Just as ignition switch is turned ON or START	40°C (104°F)
	Approx. 4 minutes or more after engine starting	80°C (176°F)
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.		

DTC Confirmation Procedure

INFOID:000000007358044

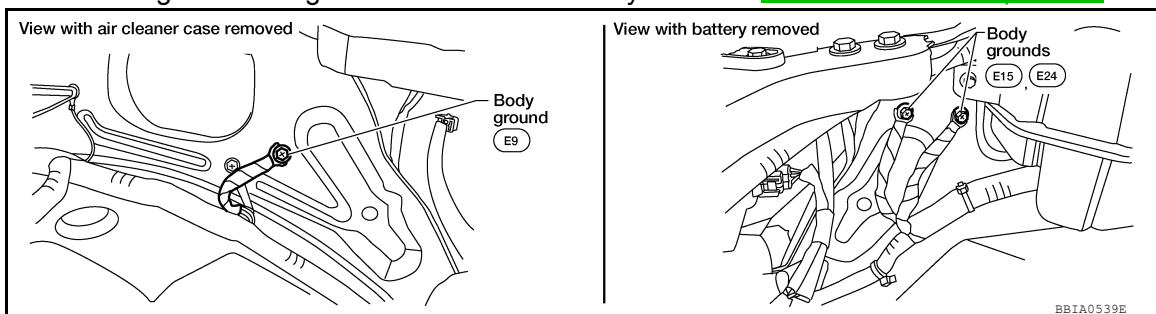
1. If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON and wait at least 5 seconds.
3. Check DTC.
4. If DTC is detected, go to [EC-133. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358045

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).

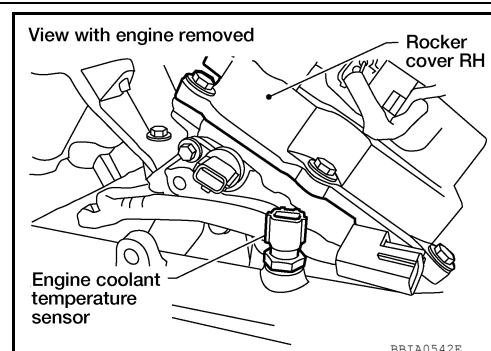


OK or NG

- OK >> GO TO 2.
 NG >> Repair or replace ground connections.

2. CHECK ECT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect engine coolant temperature (ECT) sensor harness connector.
2. Turn ignition switch ON.



P0117, P0118 ECT SENSOR

[VQ40DE]

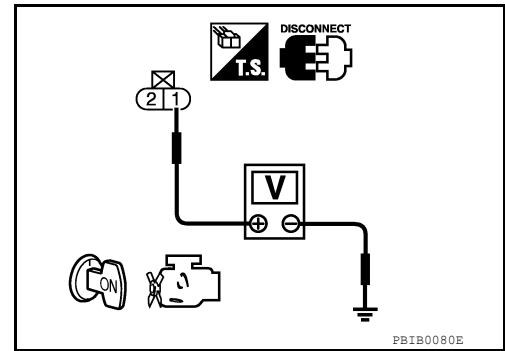
< DTC/CIRCUIT DIAGNOSIS >

3. Check voltage between ECT sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 3.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECT sensor terminal 2 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to [EC-134, "Component Inspection"](#).

OK or NG

- OK >> GO TO 5.
- NG >> Replace engine coolant temperature sensor. Refer to [CO-30, "Removal and Installation"](#).

5. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

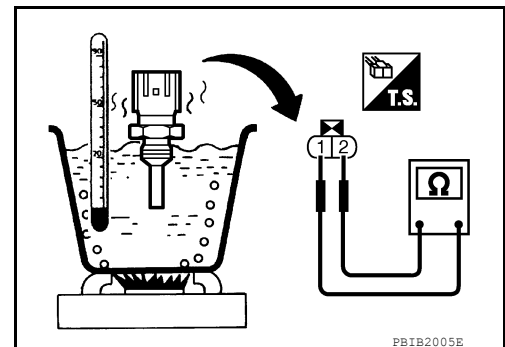
>> **INSPECTION END**

Component Inspection

INFOID:000000007358046

ENGINE COOLANT TEMPERATURE SENSOR

1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



P0117, P0118 ECT SENSOR

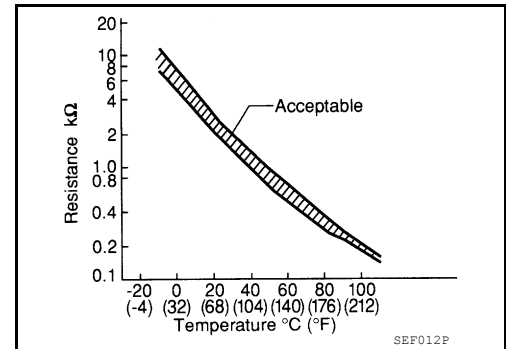
< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

<Reference data>

Engine coolant temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

2. If NG, replace engine coolant temperature sensor. Refer to [CO-30, "Removal and Installation"](#).



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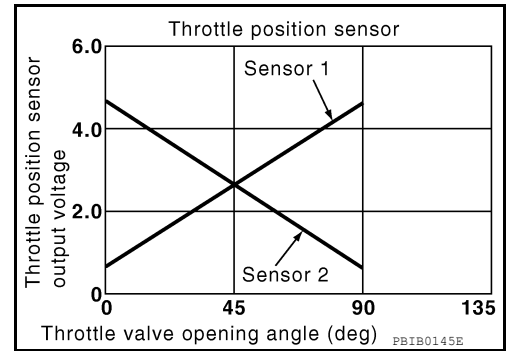
P0122, P0123 TP SENSOR

Component Description

INFOID:000000007358047

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle in response to driving conditions via the throttle control motor.



On Board Diagnosis Logic

INFOID:000000007358048

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0122 0122	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The TP sensor 2 circuit is open or shorted.) (The APP sensor 2 circuit is shorted.) • Electric throttle control actuator (TP sensor 2) • Accelerator pedal position sensor (APP sensor 2)
P0123 0123	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminate.

Engine operation condition in fail-safe mode

- The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
- The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
- So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:000000007358049

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to [EC-136, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358050

1. CHECK GROUND CONNECTIONS

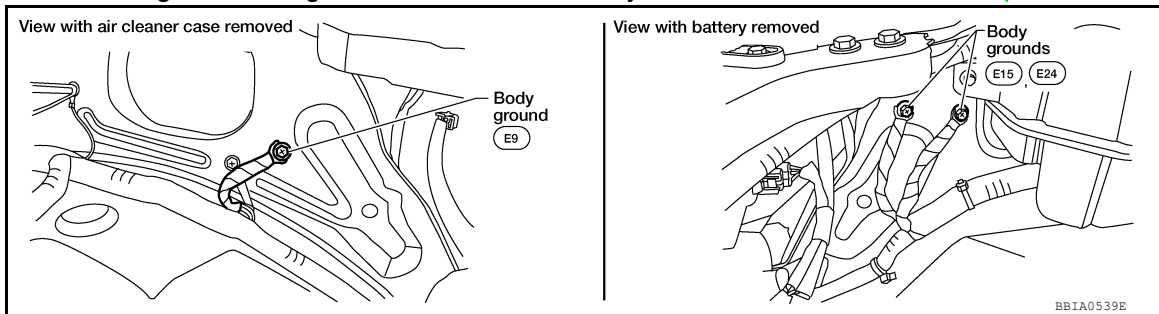
1. Turn ignition switch OFF.

P0122, P0123 TP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).

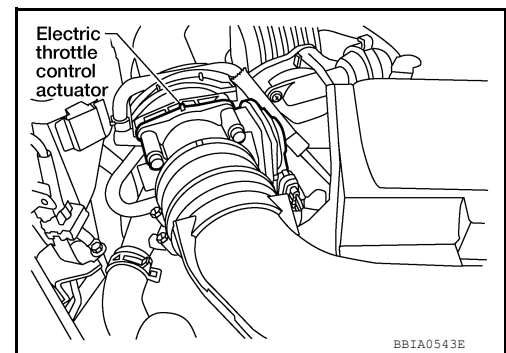


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2.CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-I

- Disconnect electric throttle control actuator harness connector.
- Turn ignition switch ON.

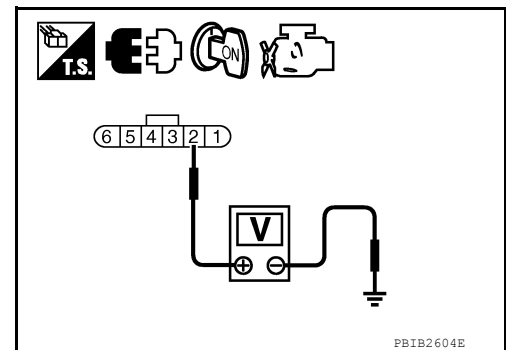


- Check voltage between electric throttle control actuator terminal 2 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 3.



3.CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between electric throttle control actuator terminal 2 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit.

4.CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-III

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 2	EC-455
91	APP sensor terminal 1	

P0122, P0123 TP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> GO TO 5.
- NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to [EC-378, "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to [ACC-4, "Removal and Installation"](#).

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 4 and ECM terminal 66.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 69 and electric throttle control actuator terminal 3.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to [EC-138, "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace the electric throttle control actuator. Refer to [EM-27, "Removal and Installation"](#).

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358051

THROTTLE POSITION SENSOR

P0122, P0123 TP SENSOR

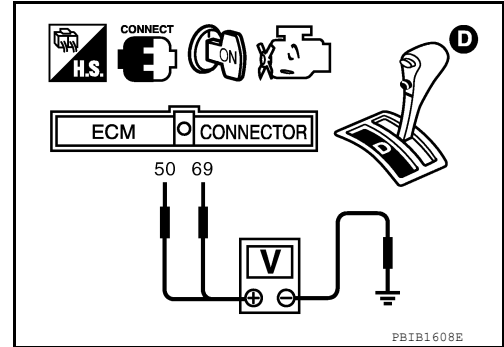
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Reconnect all harness connectors disconnected.
2. Perform [EC-25, "Throttle Valve Closed Position Learning"](#).
3. Turn ignition switch ON.
4. Set selector lever to D position.
5. Check voltage between ECM terminals 50 (TP sensor 1 signal), 69 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
69 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V

6. If NG, replace electric throttle control actuator. Refer to [EM-27, "Removal and Installation"](#).



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P0125 ECT SENSOR

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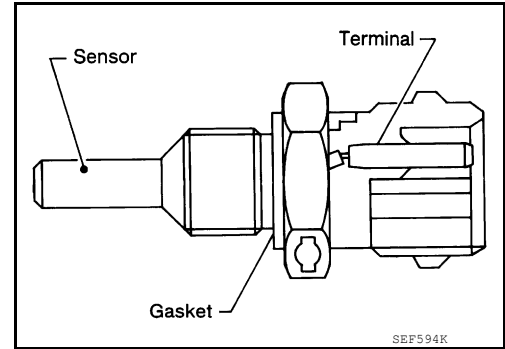
< DTC/CIRCUIT DIAGNOSIS >

P0125 ECT SENSOR

Component Description

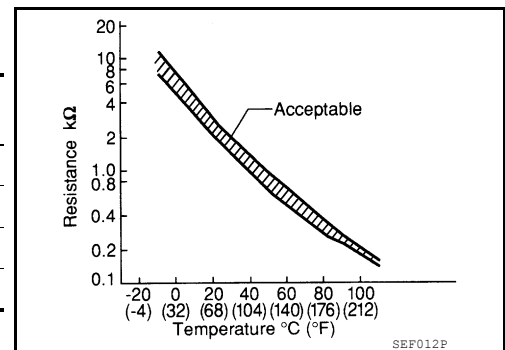
INFOID:000000007358052

The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260



*: This data is reference value and is measured between ECM terminal 73 (Engine coolant temperature sensor) and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

INFOID:000000007358053

NOTE:

If DTC P0125 is displayed with P0116, first perform the trouble diagnosis for DTC P0116. Refer to [EC-129, "Component Description"](#).

NOTE:

If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117 or P0118. Refer to [EC-132, "Component Description"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0125 0125	Insufficient engine coolant temperature for closed loop fuel control	<ul style="list-style-type: none"> Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine. Engine coolant temperature is insufficient for closed loop fuel control. 	<ul style="list-style-type: none"> Harness or connectors (High resistance in the circuit) Engine coolant temperature sensor Thermostat

DTC Confirmation Procedure

INFOID:000000007358054

CAUTION:

Never overheat engine.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Ⓟ WITH CONSULT

P0125 ECT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT.
3. Check that "COOLAN TEMP/S" is above 20°C (68°F).
**If the temperature is above 20°C (68°F), the test result will be OK.
If the temperature is below 20°C (68°F), go to following step.**
4. Start engine and run it for 65 minutes at idle speed.
If "COOLAN TEMP/S" increases to more than 20°C (68°F) within 65 minutes, stop engine because the test result will be OK.
5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to [EC-141. "Diagnosis Procedure"](#).

WITH GST

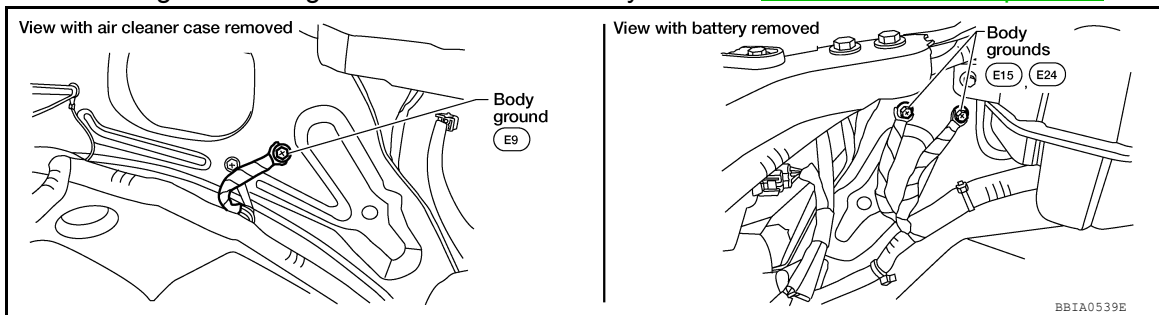
Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358055

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to [EC-141. "Component Inspection"](#).

OK or NG

- OK >> GO TO 3.
- NG >> Replace engine coolant temperature sensor. Refer to [CO-30. "Removal and Installation"](#).

3. CHECK THERMOSTAT OPERATION

When the engine is cold [lower than 70°C (158°F)] condition, grasp lower radiator hose and confirm that the engine coolant does not flow.

OK or NG

- OK >> GO TO 4.
- NG >> Repair or replace thermostat. Refer to [CO-28. "Removal and Installation"](#).

4. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358056

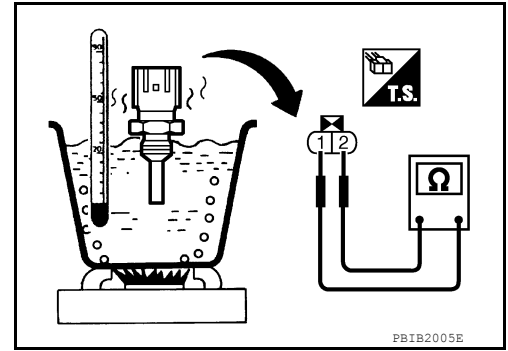
ENGINE COOLANT TEMPERATURE SENSOR

P0125 ECT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

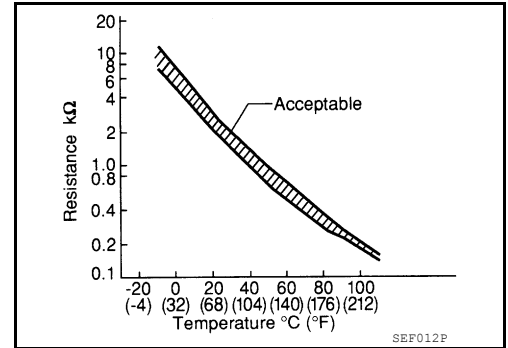
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure. Refer to [CO-30](#), "[Removal and Installation](#)".



<Reference data>

Engine coolant temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

2. If NG, replace engine coolant temperature sensor. Refer to [CO-30](#), "[Removal and Installation](#)".



P0127 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

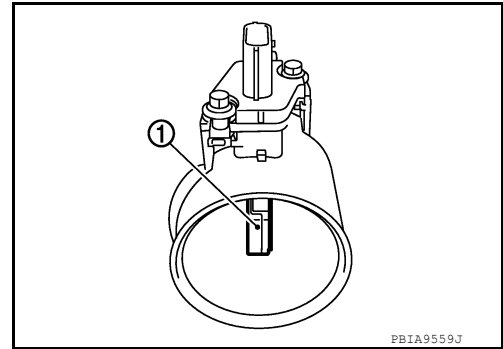
P0127 IAT SENSOR

Component Description

INFOID:000000007358057

The intake air temperature sensor is built into mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



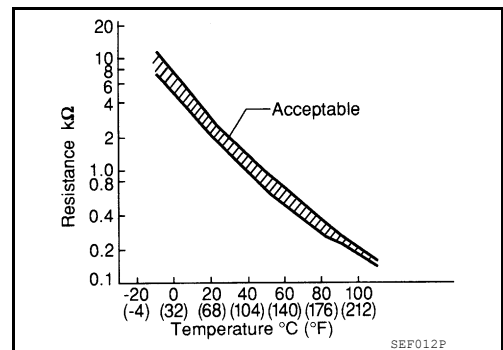
<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
25 (77)	3.3	1.800 - 2.200
80 (176)	1.2	0.283 - 0.359

*: This data is reference value and is measured between ECM terminal 34 (Intake air temperature sensor) and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



On Board Diagnosis Logic

INFOID:000000007358058

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0127 0127	Intake air temperature too high	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.	<ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted) Intake air temperature sensor

DTC Confirmation Procedure

INFOID:000000007358059

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Ⓟ WITH CONSULT

1. Wait until engine coolant temperature is less than 96°C (205°F)
 - a. Turn ignition switch ON.
 - b. Select "DATA MONITOR" mode with CONSULT.
 - c. Check the engine coolant temperature.

P0127 IAT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- d. If the engine coolant temperature is not less than 96°C (205°F), turn ignition switch OFF and cool down engine.
 - Perform the following steps before engine coolant temperature is above 96°C (205°F).
2. Turn ignition switch ON.
3. Select "DATA MONITOR" mode with CONSULT.
4. Start engine.
5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.
6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to [EC-144, "Diagnosis Procedure"](#).

WITH GST

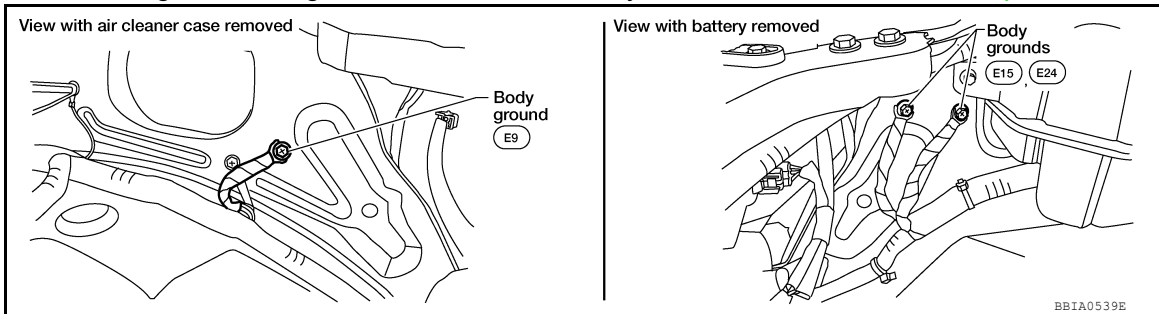
Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358060

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to [EC-144, "Component Inspection"](#).

OK or NG

- OK >> GO TO 3.
- NG >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-26, "Removal and Installation"](#).

3. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358061

INTAKE AIR TEMPERATURE SENSOR

P0127 IAT SENSOR

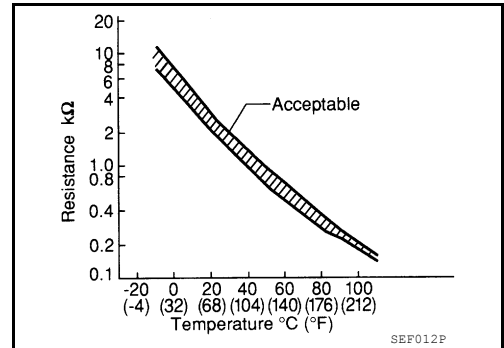
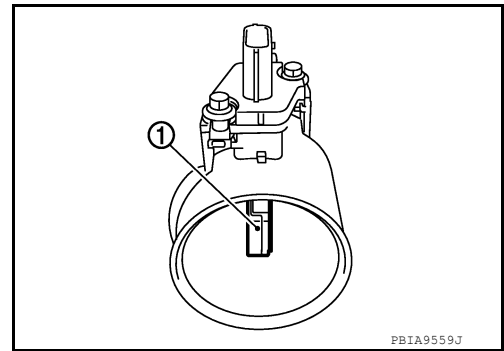
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Check resistance between intake air temperature sensor (1) terminals 5 and 6 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.800 - 2.200

2. If NG, replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-26. "Removal and Installation"](#).



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P0128 THERMOSTAT FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0128 THERMOSTAT FUNCTION

On Board Diagnosis Logic

INFOID:000000007358062

NOTE:

If DTC P0128 is displayed with DTC P0300, P0301, P0302, P0303, P0304, P0305 or P0306, first perform the trouble diagnosis for DTC P0300, P0301, P0302, P0303, P0304, P0305, P0306. Refer to [EC-209, "DTC Confirmation Procedure"](#).

Engine coolant temperature has not risen enough to open the thermostat even though the engine has run long enough.

This is due to a leak in the seal or the thermostat being stuck open.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0128 0128	Thermostat function	The engine coolant temperature does not reach to specified temperature even though the engine has run long enough.	<ul style="list-style-type: none">• Thermostat• Leakage from sealing portion of thermostat• Engine coolant temperature sensor

DTC Confirmation Procedure

INFOID:000000007358063

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

WITH CONSULT

TESTING CONDITION:

- For best results, perform at ambient temperature of -10°C (14°F) or higher.
- For best results, perform at engine coolant temperature of -10°C (14°F) to 52°C (126°F).
- Before performing the following procedure, do not add fuel.

1. Turn A/C switch OFF.
2. Turn blower fan switch OFF.
3. Turn ignition switch ON.
4. Select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
5. Check the indication of "COOLAN TEMP/S".
If it is below 52°C (126°F), go to following step.
If it is above 52°C (126°F), cool down the engine to less than 52°C (126°F). Then go to next steps.
6. Start engine and wait at idle for at least 10 minutes under the following conditions.

VHCL SPEED SE	More than 56 km/h (35MPH)
---------------	---------------------------

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "COOLAN TEMP/S" increases to more than 71°C (160°F) within 30 minutes, turn ignition switch OFF because the test result will be OK.

7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to [EC-146, "Diagnosis Procedure"](#).

WITH GST

Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358064

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to [EC-147, "Component Inspection"](#).

OK or NG

P0128 THERMOSTAT FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- OK >> GO TO 2.
- NG >> Replace engine coolant temperature sensor. Refer to [CO-30, "Removal and Installation"](#).

2. CHECK THERMOSTAT

Refer to [CO-28, "Removal and Installation"](#).

OK or NG

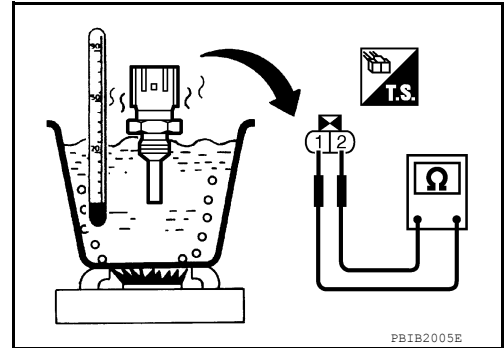
- OK >> INSPECTION END
- NG >> Replace thermostat.

Component Inspection

INFOID:000000007358065

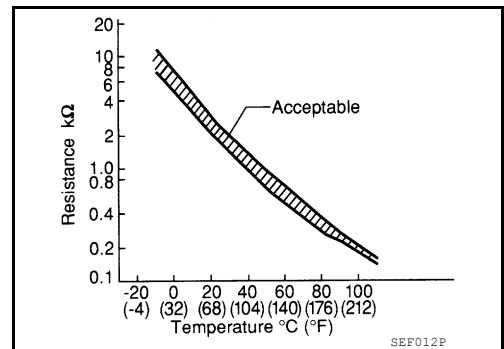
ENGINE COOLANT TEMPERATURE SENSOR

1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure. Refer to [CO-30, "Removal and Installation"](#).



<Reference data>

Engine coolant temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260



2. If NG, replace engine coolant temperature sensor. Refer to [CO-30, "Removal and Installation"](#).

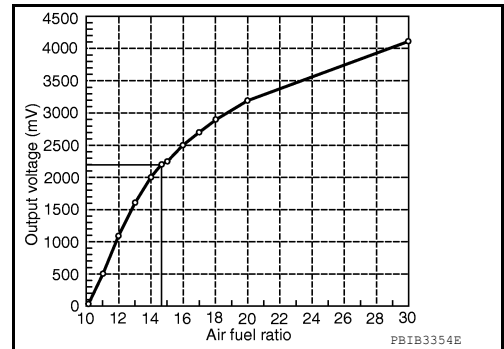
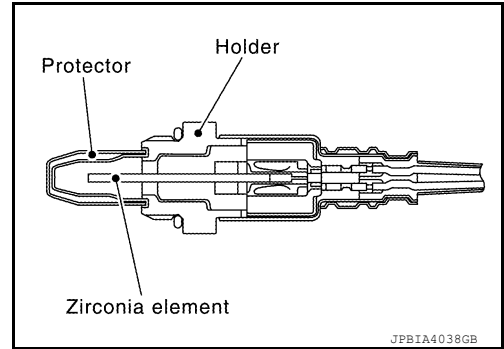
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P0130, P0150 A/F SENSOR 1

Component Description

INFOID:000000007358066

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element. The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich. Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).



On Board Diagnosis Logic

INFOID:000000007358067

To judge the malfunctions, the diagnosis checks that the A/F signal computed by ECM from the air fuel ratio (A/F) sensor 1 signal fluctuates according to fuel feedback control.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0130 0130 (Bank 1)	Air fuel ratio (A/F) sensor 1 circuit	A) The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 2.2V.	<ul style="list-style-type: none"> • Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • Air fuel ratio (A/F) sensor 1
P0150 0150 (Bank 2)		B) The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2V.	

DTC Confirmation Procedure

INFOID:000000007358068

Perform PROCEDURE FOR MALFUNCTION A first.

If the DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to normal operating temperature.
2. Let engine idle for 2 minutes.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to [EC-149. "Diagnosis Procedure"](#).

PROCEDURE FOR MALFUNCTION B

CAUTION:

Always drive vehicle at a safe speed.

Ⓟ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.
If the indication is constantly approx. 2.2V and does not fluctuates, go to [EC-149, "Diagnosis Procedure"](#).
If the indication fluctuate around 2.2V, go to next step.
4. Select "A/F SEN1 (B1) P1276" (for DTC P0130) or "A/F SEN1 (B2) P1286" (for DTC P0150) of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT.
5. Touch "START".
6. When the following conditions are met, "TESTING" will be displayed on the CONSULT screen.

ENG SPEED	1,100 - 3,200 rpm
VHCL SPEED SE	More than 64 km/h (40 MPH)
B/FUEL SCHDL	1.0 - 8.0 msec
Shift lever	D position with "OD" OFF

If "TESTING" is not displayed after 20 seconds, retry from step 2.

7. Release accelerator pedal fully.
NOTE:
Never apply brake when releasing the accelerator pedal.
8. Make sure that "TESTING" changes to "COMPLETED".
If "TESTING" changed to "OUT OF CONDITION", retry from step 6.
9. Make sure that "OK" is displayed after touching "SELF-DIAG RESULT".
If "NG" is displayed, go to [EC-149, "Diagnosis Procedure"](#).

Overall Function Check

INFOID:000000007358069

PROCEDURE FOR MALFUNCTION B

Use this procedure to check the overall function of the A/F sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

Ⓟ With GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in the suitable gear position.
3. Set D position with "OD" OFF, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).
NOTE:
Never apply brake during releasing the accelerator pedal.
4. Repeat steps 2 and 3 for five times.
5. Stop the vehicle and turn ignition switch OFF.
6. Turn ignition switch ON.
7. Turn ignition switch OFF and wait at least 10 seconds.
8. Restart engine.
9. Repeat steps 2 and 3 for five times.
10. Stop the vehicle and connect GST to the vehicle.
11. Make sure that no 1st trip DTC is displayed.
If the 1st trip DTC is displayed, go to [EC-149, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358070

1. CHECK GROUND CONNECTIONS

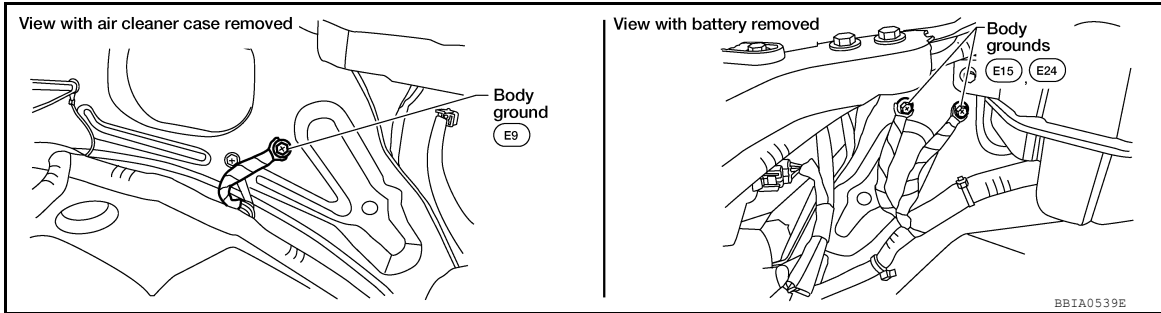
1. Turn ignition switch OFF.

P0130, P0150 A/F SENSOR 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).

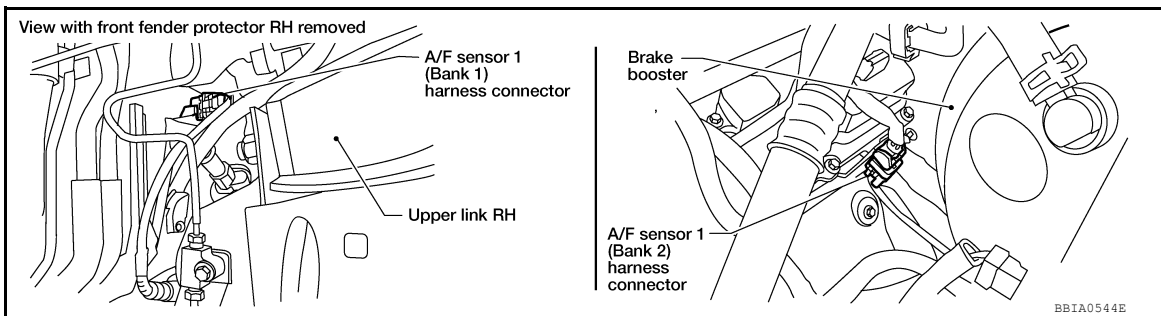


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect A/F sensor 1 harness connector.

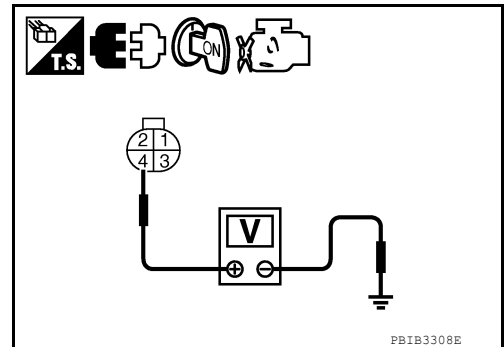


- Turn ignition switch ON.
- Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R connector E119
- 15 A fuse (No.54)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

4. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between A/F sensor 1 terminal and ECM terminal as follows. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56

P0130, P0150 A/F SENSOR 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Bank 2	1	16
	2	75

Continuity should exist.

4. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Perform [GI-37. "Intermittent Incident"](#).

OK or NG

OK >> GO TO 6.

NG >> Repair or replace.

6. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to [EX-6. "Exploded View"](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

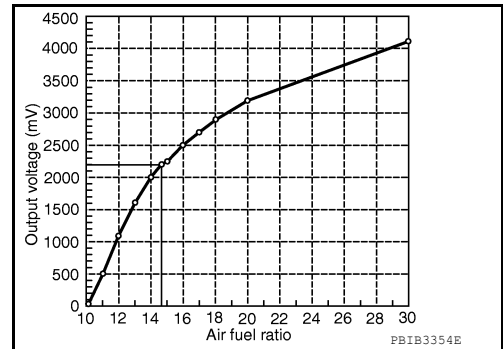
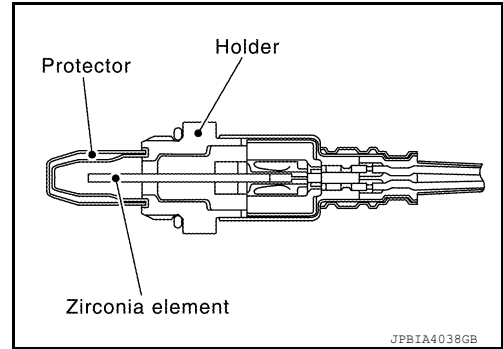
>> INSPECTION END

P0131, P0151 A/F SENSOR 1

Component Description

INFOID:000000007358071

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element. The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich. Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).



On Board Diagnosis Logic

INFOID:000000007358072

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the air fuel ratio (A/F) sensor 1 signal is not inordinately low.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0131 0131 (Bank 1)	Air fuel ratio (A/F) sensor 1 circuit low voltage	• The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 0V.	<ul style="list-style-type: none"> • Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
P0151 0151 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358073

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

Ⓜ WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.
If the indication is constantly approx. 0V, go to [EC-153. "Diagnosis Procedure"](#).
If the indication is not constantly approx. 0V, go to next step.
4. Turn ignition switch OFF and wait at least 10 seconds.

P0131, P0151 A/F SENSOR 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Restart engine.
8. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
9. Maintain the following conditions for about 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 MPH)
B/FUEL SCHDL	1.5 - 9.0 msec
Gear position	Suitable position

NOTE:

- Keep the accelerator pedal as steady as possible during cruising.
- If this procedure is not completed within 1 minute after restarting engine at step 4, return to step 4.

10. Check 1st trip DTC.
11. If 1st trip DTC is displayed, go to [EC-153. "Diagnosis Procedure"](#).

Ⓢ WITH GST

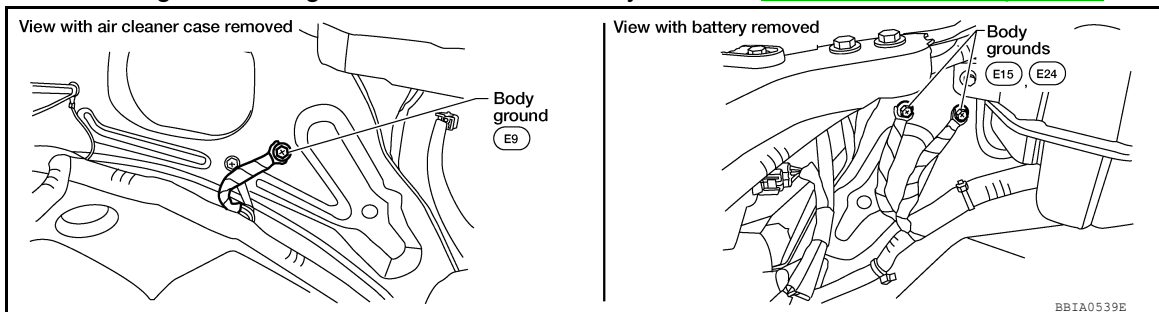
Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358074

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).

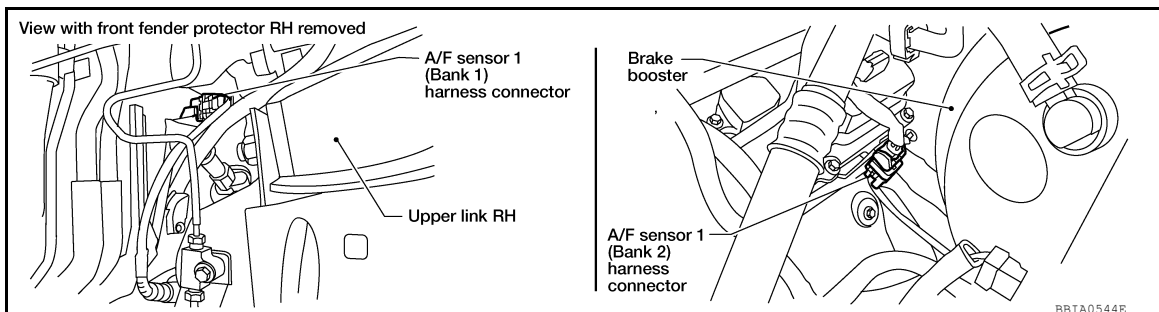


OK or NG

- OK >> GO TO 2.
 NG >> Repair or replace ground connections.

2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect A/F sensor 1 harness connector.



2. Turn ignition switch ON.

P0131, P0151 A/F SENSOR 1

[VQ40DE]

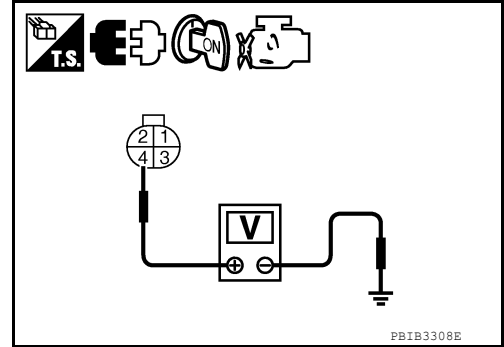
< DTC/CIRCUIT DIAGNOSIS >

3. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R connector E119
- 15 A fuse (No.54)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

4. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between A/F sensor 1 terminal and ECM terminal as follows. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

4. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

- OK >> GO TO 5.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Perform [GI-37. "Intermittent Incident"](#).

OK or NG

- OK >> GO TO 6.
- NG >> Repair or replace.

P0131, P0151 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

6. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to [EX-6. "Exploded View"](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

>> INSPECTION END

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P0132, P0152 A/F SENSOR 1

Component Description

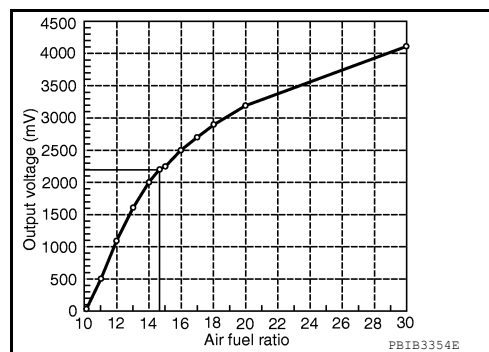
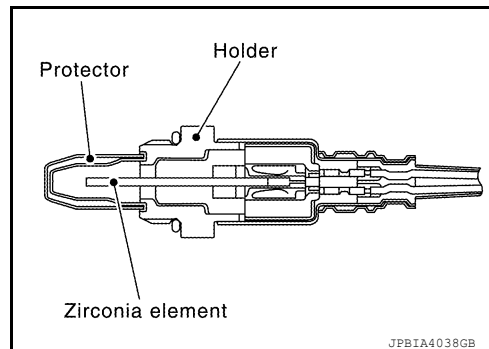
INFOID:000000007358075

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).



On Board Diagnosis Logic

INFOID:000000007358076

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal is not inordinately high.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0132 0132 (Bank 1)	Air fuel ratio (A/F) sensor 1 circuit high voltage	• The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 5V.	<ul style="list-style-type: none"> • Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
P0152 0152 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358077

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

Ⓜ WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.
If the indication is constantly approx. 5V, go to [EC-157. "Diagnosis Procedure"](#).
If the indication is not constantly approx. 5V, go to next step.
4. Turn ignition switch OFF and wait at least 10 seconds.

P0132, P0152 A/F SENSOR 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Restart engine.
8. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
9. Maintain the following conditions for about 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 MPH)
B/FUEL SCHDL	1.5 - 9.0 msec
Gear position	Suitable position

NOTE:

- Keep the accelerator pedal as steady as possible during the cruising.
- If this procedure is not completed within 1 minute after restarting engine at step 4, return to step 4.

10. Check 1st trip DTC.
11. If 1st trip DTC displayed, go to [EC-157. "Diagnosis Procedure"](#).

Ⓢ WITH GST

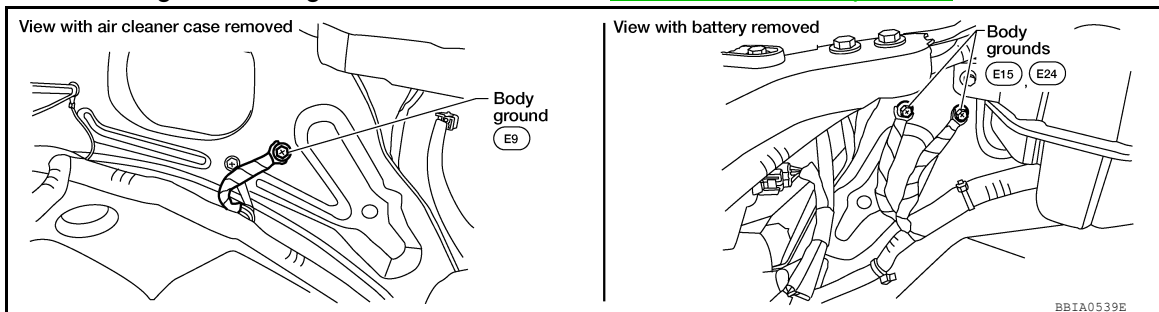
Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358078

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws. Refer to [EC-97. "Ground Inspection"](#).

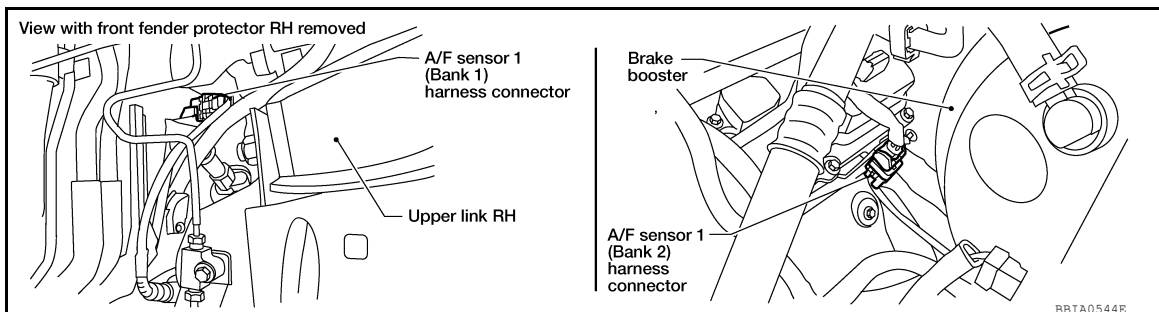


OK or NG

- OK >> GO TO 2.
 NG >> Repair or replace ground connections.

2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect A/F sensor 1 harness connector.



2. Turn ignition switch ON.

P0132, P0152 A/F SENSOR 1

[VQ40DE]

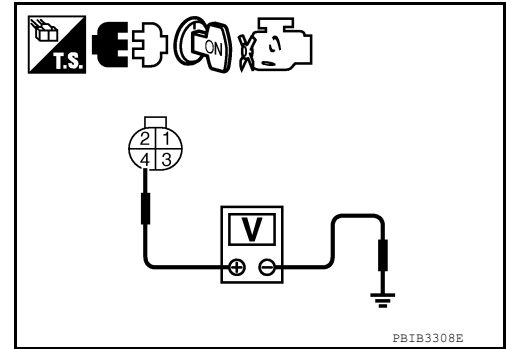
< DTC/CIRCUIT DIAGNOSIS >

3. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R connector E119
- 15 A fuse (No.54)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

4. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between A/F sensor 1 terminal and ECM terminal as follows. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

4. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

- OK >> GO TO 5.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Perform [GI-37. "Intermittent Incident"](#).

OK or NG

- OK >> GO TO 6.
- NG >> Repair or replace.

P0132, P0152 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

6. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to [EX-6. "Exploded View"](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

>> INSPECTION END

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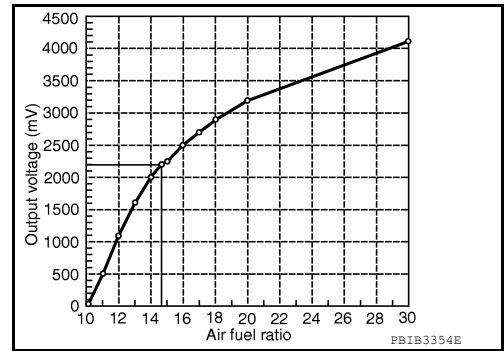
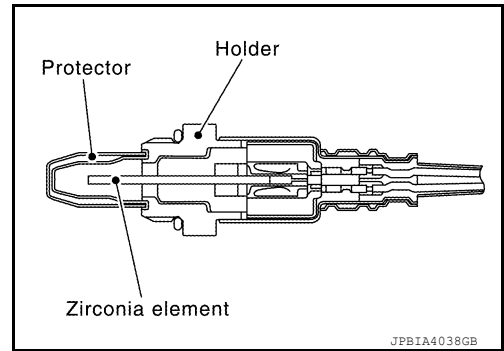
P

P0133, P0153 A/F SENSOR 1

Component Description

INFOID:000000007358079

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element. The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich. Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).



On Board Diagnosis Logic

INFOID:000000007358080

To judge the malfunction of A/F sensor 1, this diagnosis measures response time of the A/F signal computed by ECM from the A/F sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and the A/F sensor 1 temperature index. Judgment is based on whether the compensated time (the A/F signal cycling time index) is inordinately long or not.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0133 0133 (Bank 1)	Air fuel ratio (A/F) sensor 1 circuit slow response	<ul style="list-style-type: none"> The response of the A/F signal computed by ECM from A/F sensor 1 signal takes more than the specified time. 	<ul style="list-style-type: none"> Harness or connectors (The A/F sensor 1 circuit is open or shorted.) A/F sensor 1 A/F sensor 1 heater Fuel pressure Fuel injector Intake air leaks Exhaust gas leaks PCV Mass air flow sensor
P0153 0153 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358081

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

Ⓜ WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.

P0133, P0153 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

4. Turn ignition switch OFF and wait at least 10 seconds. A
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Select "A/F SEN1(B1) P1278/P1279" (for DTC P0133) or "A/F SEN1(B2) P1288/P1289" (for DTC P0153) of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT. EC
8. Touch "START".
If "COMPLETED" appears on CONSULT screen, go to step 10.
If "COMPLETED" does not appear on CONSULT screen, go to the following step. C
9. After perform the following procedure, "TESTING" will be displayed on the CONSULT screen.
 - a. Increase the engine speed up to between 4,000 to 5,000 rpm and maintain that speed it for 10 seconds. D
 - b. Fully release accelerator pedal and then let engine idle for about 10 seconds.
If "TESTING" is not displayed after 10 seconds, refer to [EC-86, "Description"](#).
10. Wait for about 20 seconds idle under the condition that "TESTING" is displayed on the CONSULT screen. E
11. Make sure that "TESTING" changes to "COMPLETED".
If "TESTING" changed to "OUT OF CONDITION", refer to [EC-86, "Description"](#).
12. Make sure that "OK" is displayed after touching "SELF-DIAG RESULT".
If "NG" is displayed, go to [EC-161, "Diagnosis Procedure"](#). F

WITH GST

1. Start engine and warm it up to normal operating temperature. G
2. Select Service \$01 with GST.
3. Calculate the total value of "Short term fuel trim" and "Long term fuel trim" indications.
Make sure that the total percentage should be within $\pm 15\%$.
If OK, go to the following step.
If NG, check the following. H
 - Intake air leaks I
 - Exhaust gas leaks
 - Incorrect fuel pressure
 - Lack of fuel
 - Fuel injector J
 - Incorrect PCV hose connection
 - PCV valve
 - Mass air flow sensor K
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds. L
7. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
8. Let engine idle for 1 minute.
9. Increase the engine speed up to between 4,000 to 5,000 rpm and keep it for 10 seconds. M
10. Fully release accelerator pedal and then let engine idle for about 1 minute.
11. Select Service \$03 with GST and make sure that no DTC is displayed.
If the DTC is displayed, go to [EC-161, "Diagnosis Procedure"](#). N

Diagnosis Procedure

INFOID:000000007358082

1. CHECK GROUND CONNECTIONS

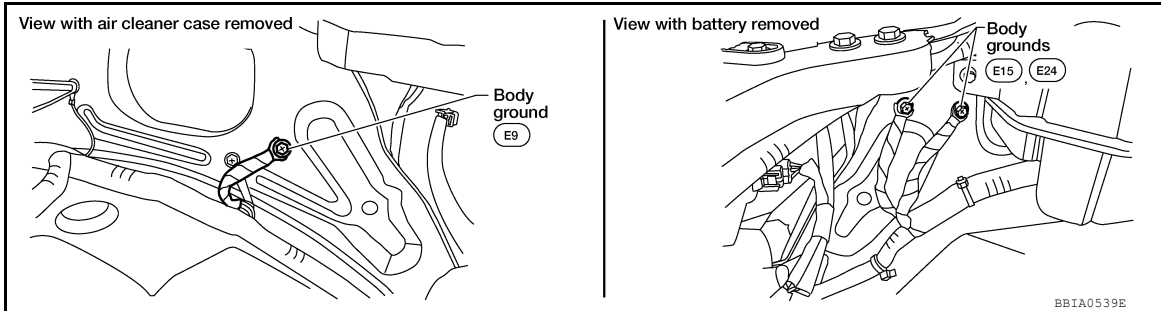
1. Turn ignition switch OFF. P

P0133, P0153 A/F SENSOR 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. RETIGHTEN AIR FUEL RATIO (A/F) SENSOR 1

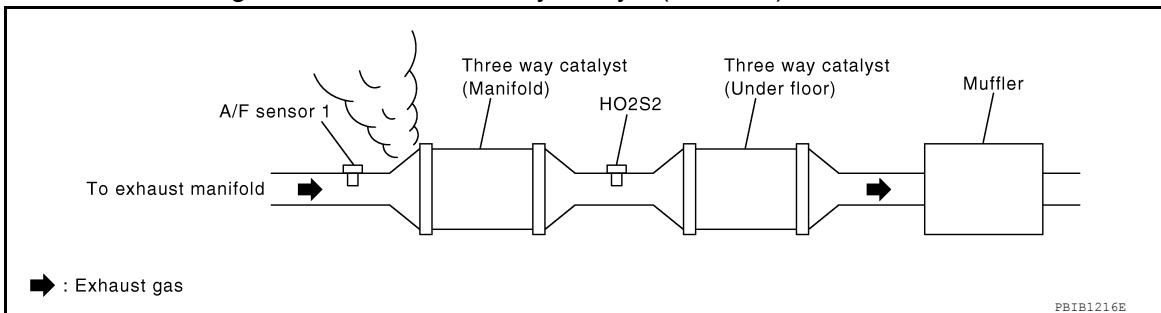
Loosen and retighten A/F sensor 1.

Refer to [EM-33, "Removal and Installation \(Exhaust Manifold\)"](#).

>> GO TO 3.

3. CHECK EXHAUST GAS LEAK

- Start engine and run it at idle.
- Listen for an exhaust gas leak before three way catalyst (manifold).



OK or NG

- OK >> GO TO 4.
- NG >> Repair or replace.

4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

- OK >> GO TO 5.
- NG >> Repair or replace.

5. CLEAR THE SELF-LEARNING DATA

Ⓟ With CONSULT

- Start engine and warm it up to normal operating temperature.
- Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
- Clear the self-learning control coefficient by touching "CLEAR" or "START".
- Run engine for at least 10 minutes at idle speed.
Is the 1st trip DTC P0171, P172, P0174 or P0175 detected? Is it difficult to start engine?

ⓧ Without CONSULT

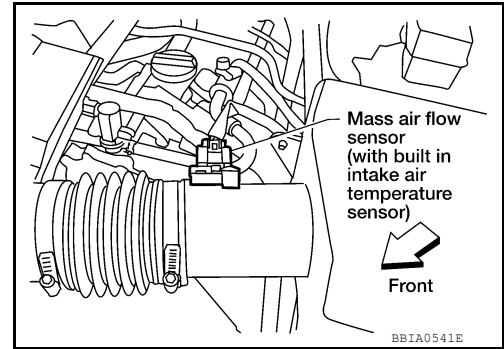
- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF.

P0133, P0153 A/F SENSOR 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Disconnect mass air flow sensor harness connector.
4. Restart engine and let it idle for at least 3 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Make sure DTC P0102 is displayed.
7. Erase the DTC memory. Refer to [EC-74, "On Board Diagnosis Function"](#).
8. Make sure DTC P0000 is displayed.
9. Run engine for at least 10 minutes at idle speed.
**Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
 Is it difficult to start engine?**

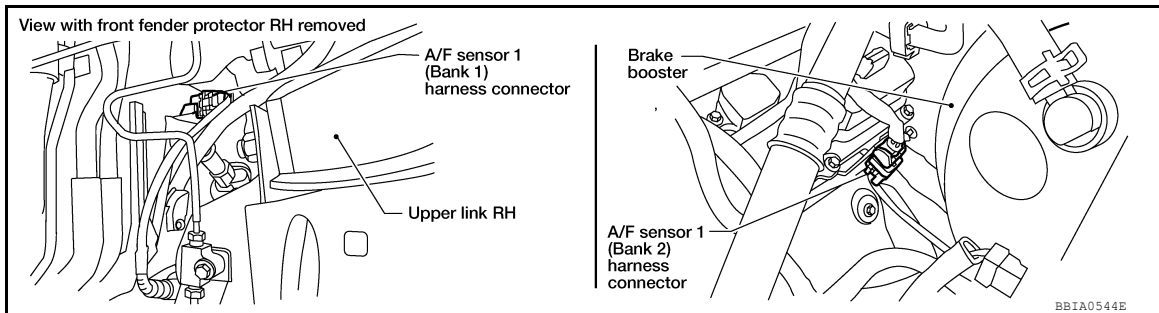


Yes or No

- Yes >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to [EC-185](#) or [EC-191](#).
 No >> GO TO 6.

6. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.

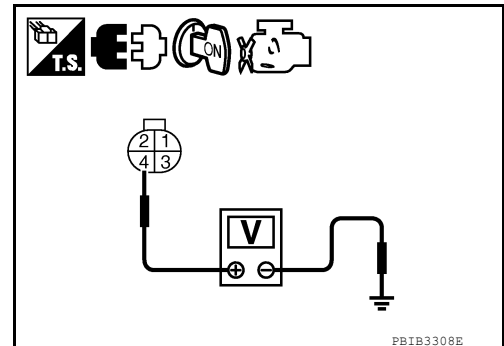


3. Turn ignition switch ON.
4. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 8.
 NG >> GO TO 7.



7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R connector E119
- 15 A fuse (No.54)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

8. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between A/F sensor 1 terminal and ECM terminal as follows. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal

P0133, P0153 A/F SENSOR 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

4. Check harness continuity between the following terminals and ground.
Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 9.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK A/F SENSOR 1 HEATER

Refer to [EC-105. "Component Inspection"](#).

OK or NG

OK >> GO TO 10.

NG >> GO TO 13.

10. CHECK MASS AIR FLOW SENSOR

Refer to [EC-116. "Component Inspection"](#).

OK or NG

OK >> GO TO 11.

NG >> Replace mass air flow sensor. Refer to [EM-26. "Removal and Installation"](#).

11. CHECK PCV VALVE

Refer to [EC-421. "Component Inspection"](#).

OK or NG

OK >> GO TO 12.

NG >> Repair or replace PCV valve. Refer to [EM-43. "Exploded View"](#).

12. CHECK INTERMITTENT INCIDENT

Perform [GI-37. "Intermittent Incident"](#).

OK or NG

OK >> GO TO 13.

NG >> Repair or replace.

13. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to [EX-6. "Exploded View"](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

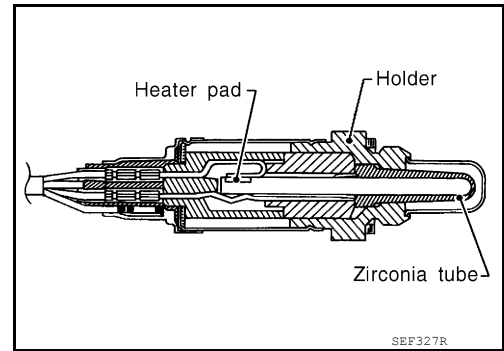
>> INSPECTION END

P0137, P0157 HO2S2

Component Description

INFOID:000000007358083

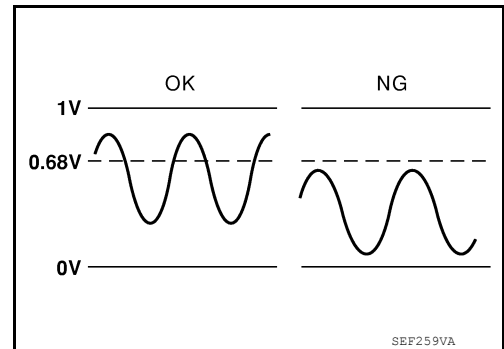
The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank. Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2. This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



On Board Diagnosis Logic

INFOID:000000007358084

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during various driving conditions such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0137 0137 (Bank 1)	Heated oxygen sensor 2 circuit low voltage	The maximum voltage from the sensor does not reach the specified voltage.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector • Intake air leaks
P0157 0157 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358085

NOTE:

If DTC confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

WITH CONSULT

TESTING CONDITION:

For better results, perform DTC WORK SUPPORT at a temperature of 0 to 30 °C (32 to 86 °F).

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.

< DTC/CIRCUIT DIAGNOSIS >

7. Let engine idle for 1 minute.
8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
9. Open engine hood.
10. Select "HO2S2 (B1) P1147" (for DTC P0137) or "HO2S2 (B2) P1167" (for DTC P0157) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
11. Follow the instruction of CONSULT.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
If "NG" is displayed, refer to [EC-166, "Diagnosis Procedure"](#).
If "CAN NOT BE DIAGNOSED" is displayed, perform the following.
 - a. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
 - b. Return to step 1.

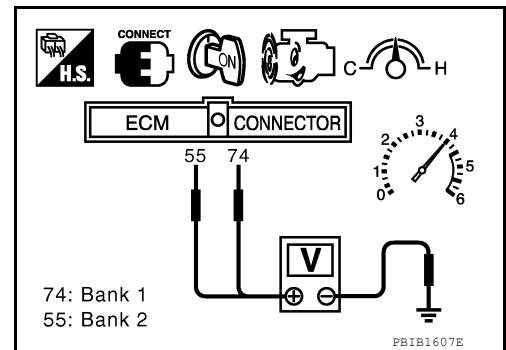
Overall Function Check

INFOID:000000007358086

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

 WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
The voltage should be above 0.68V and below 0.18V at least once during this procedure.
If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Set voltmeter probes between ECM terminal 74 [HO2S2 (B1) signal] or 55 [HO2S2 (B2) signal] and ground.
8. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)
The voltage should be above 0.68V and 0.18V at least once during this procedure.
9. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with "OD" OFF.
The voltage should be above 0.68V and 0.18V at least once during this procedure.
10. If NG, go to [EC-166, "Diagnosis Procedure"](#).



INFOID:000000007358087

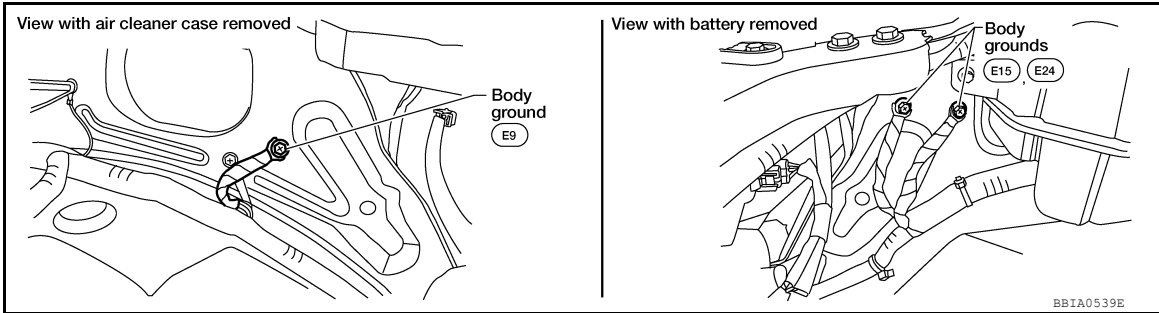
Diagnosis Procedure

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.

< DTC/CIRCUIT DIAGNOSIS >

2. Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
 NG >> Repair or replace ground connections.

2. CLEAR THE SELF-LEARNING DATA

With CONSULT

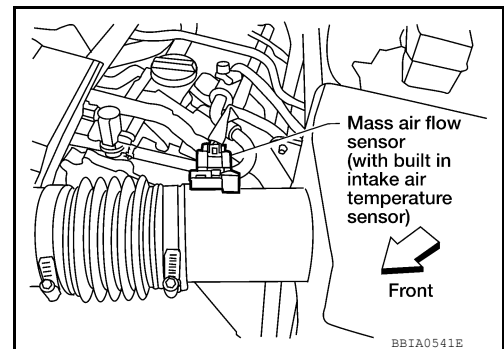
1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.

**Is the 1st trip DTC P0171 or P0174 detected?
 Is it difficult to start engine?**

Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to [EC-74. "On Board Diagnosis Function"](#).
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.

**Is the 1st trip DTC P0171 or P0174 detected?
 Is it difficult to start engine?**



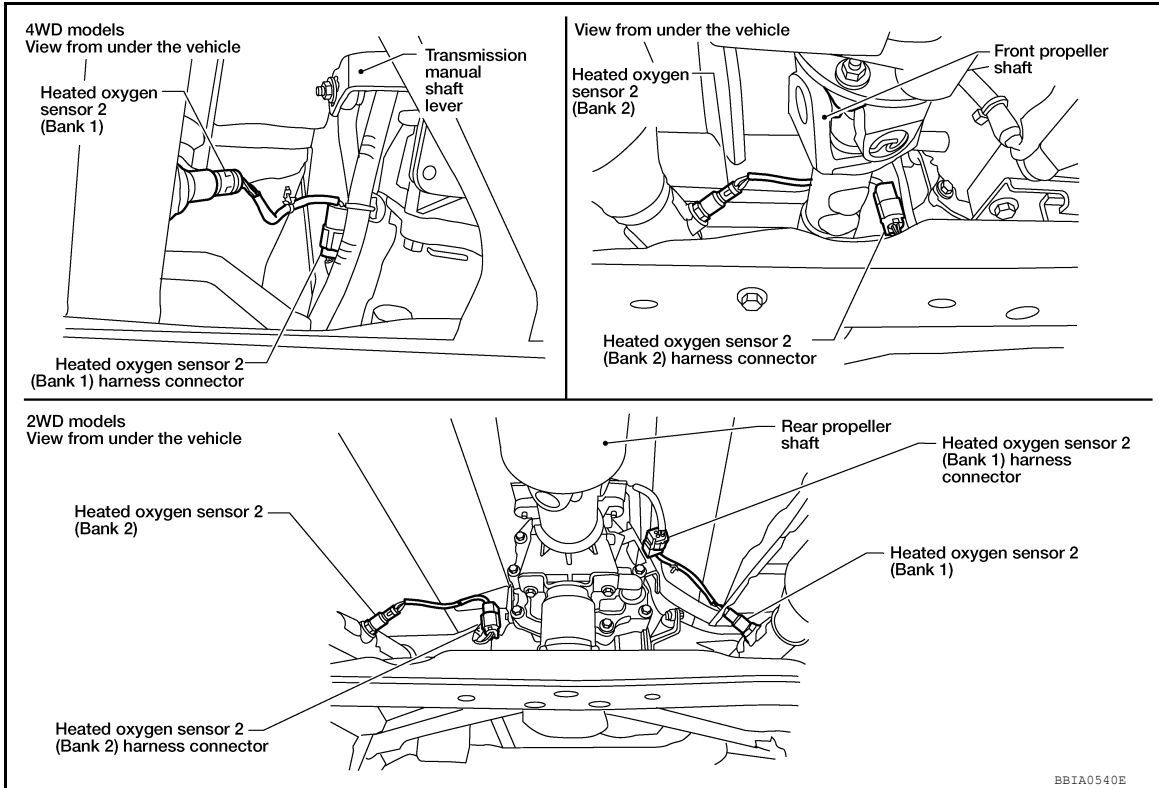
Yes or No

- Yes >> Perform trouble diagnosis for DTC P0171 or P0174. Refer to [EC-185](#).
 No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect heated oxygen sensor 2 harness connector.



3. Disconnect ECM harness connector.

4. Check harness continuity between HO2S2 terminal 4 and ECM terminal 78.
Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows.
Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0137	74	1	1
P0157	55	1	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground.
Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0137	74	1	1
P0157	55	1	2

Continuity should not exist.

< DTC/CIRCUIT DIAGNOSIS >

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to [EC-169, "Component Inspection"](#).

OK or NG

OK >> GO TO 6.

NG >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-6, "Exploded View"](#).

6. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

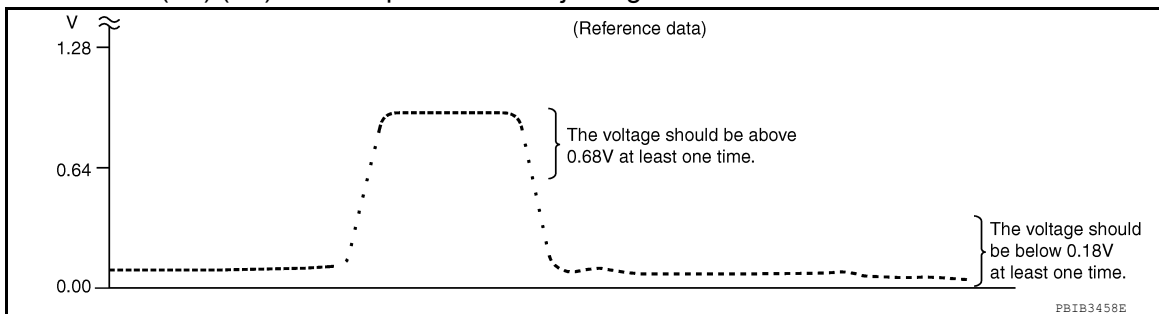
Component Inspection

INFOID:000000007358088

HEATED OXYGEN SENSOR 2

 With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.
7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.



"HO2S2 (B1)/(B2)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
 "HO2S2 (B1)/(B2)" should be below 0.18V at least once when the "FUEL INJECTION" is -25%.

CAUTION:

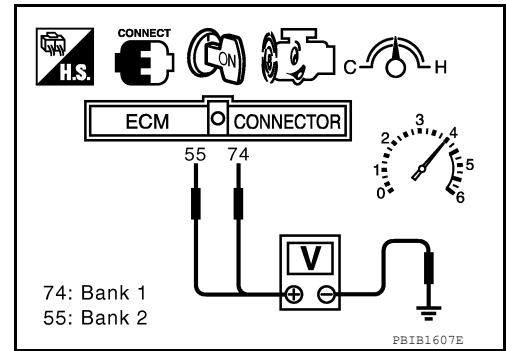
- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

 Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Set voltmeter probes between ECM terminal 74 [HO2S2 (B1) signal] or 55 [HO2S2 (B2) signal] and ground.

< DTC/CIRCUIT DIAGNOSIS >

6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)
The voltage should be above 0.68V and below 0.18V at least once during this procedure.
If the voltage can be confirmed at step 6, step 7 is not necessary.
7. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with "OD" OFF.
The voltage should be above 0.68V and below 0.18V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2. Refer to [EX-7. "Removal and Installation"](#).

**CAUTION:**

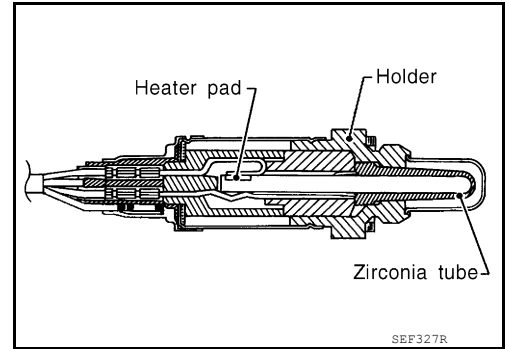
- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

P0138, P0158 HO2S2

Component Description

INFOID:000000007358089

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank. Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2. This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



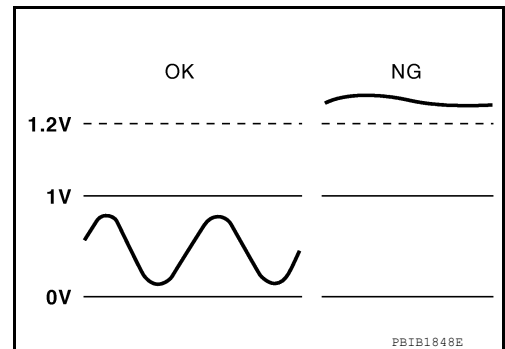
On Board Diagnosis Logic

INFOID:000000007358090

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time.

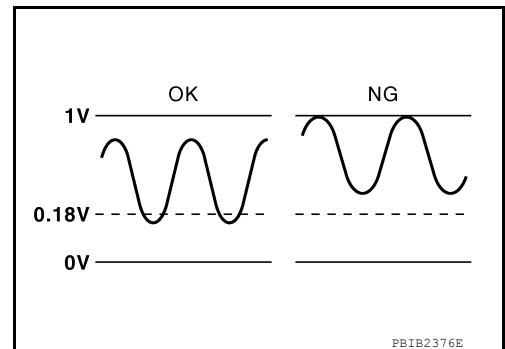
MALFUNCTION A

To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during various driving conditions such as fuelcut.



MALFUNCTION B

To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during various driving conditions such as fuelcut.



DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0138 0138 (Bank 1)	Heated oxygen sensor 2 circuit high voltage	A)	An excessively high voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2
P0158 0158 (Bank 2)		B)	The minimum voltage from the sensor is not reached to the specified voltage.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector

DTC Confirmation Procedure

INFOID:000000007358091

Perform PROCEDURE FOR MALFUNCTION A first.

If DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

PROCEDURE FOR MALFUNCTION A

Ⓟ With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 2 minutes.
8. Check 1st trip DTC.
9. If 1st trip DTC is detected, go to [EC-173. "Diagnosis Procedure"](#).

Ⓞ With GST

Follow the procedure "WITH CONSULT" above.

PROCEDURE FOR MALFUNCTION B

Ⓟ With CONSULT

TESTING CONDITION:

For better results, perform DTC WORK SUPPORT at a temperature of 0 to 30 °C (32 to 86 °F).

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
9. Open engine hood.
10. Select "HO2S2 (B1) P1146" (for DTC P138) or "HO2S2 (B2) P1166" (for DTC P0158) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
11. Follow the instruction of CONSULT.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
If "NG" is displayed, refer to [EC-173. "Diagnosis Procedure"](#).
If "CAN NOT BE DIAGNOSED" is displayed, perform the following.
 - a. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
 - b. Return to step 1.

Overall Function Check

INFOID:000000007358092

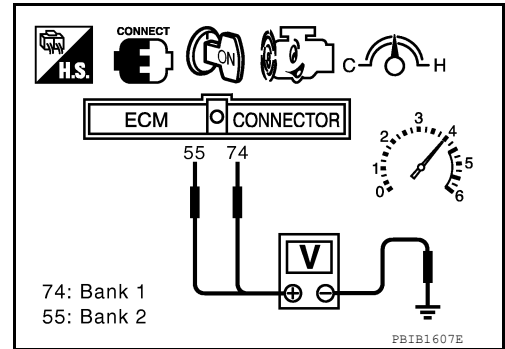
PROCEDURE FOR MALFUNCTION B

< DTC/CIRCUIT DIAGNOSIS >

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

With GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Set voltmeter probes between ECM terminal 74 [HO2S2 (B1) signal] or 55 [HO2S2 (B2) signal] and ground.
The voltage should be below 0.18V at least once during this procedure.
If the voltage can be confirmed in step 6, step 7 is not necessary.
9. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with "OD" OFF.
The voltage should be below 0.18V at least once during this procedure.
10. If NG, go to [EC-173. "Diagnosis Procedure"](#).



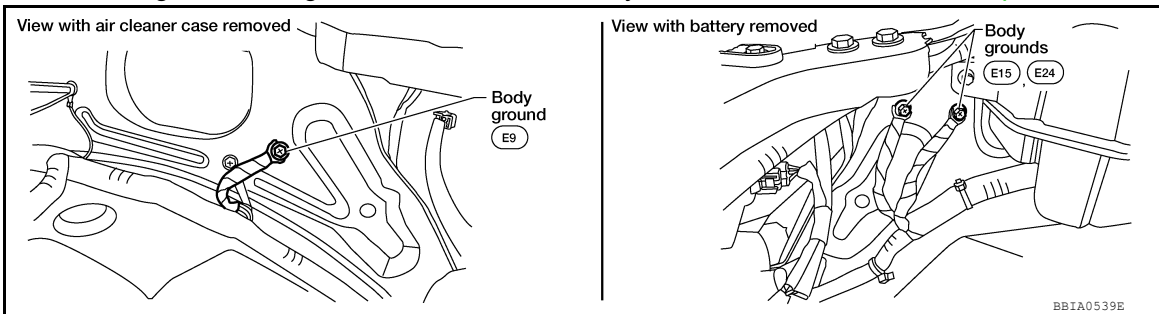
Diagnosis Procedure

INFOID:000000007358093

PROCEDURE FOR MALFUNCTION A

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).

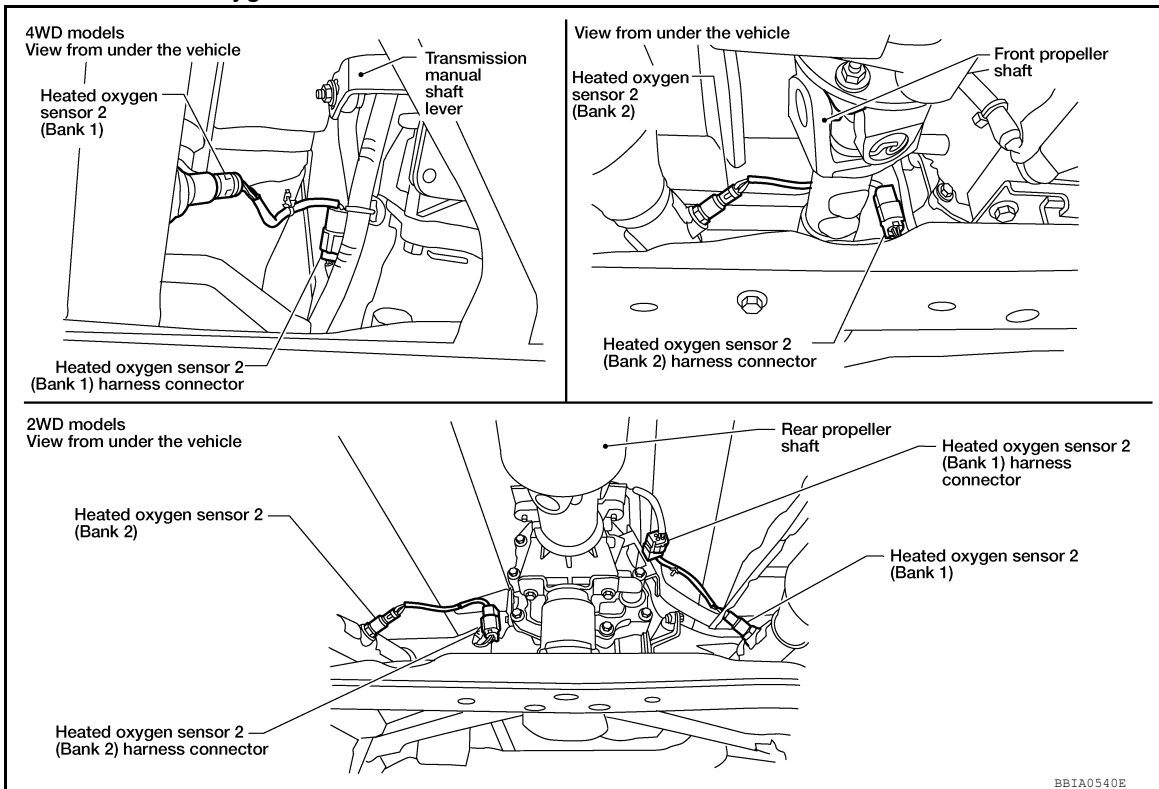


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 2 harness connector.



2. Disconnect ECM harness connector.
3. Check harness continuity between HO2S2 terminal 4 and ECM terminal 78. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	74	1	1
P0158	55	1	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	74	1	1
P0158	55	1	2

Continuity should not exist.

< DTC/CIRCUIT DIAGNOSIS >

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4.CHECK HO2S2 CONNECTOR FOR WATER

Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.

NG >> Repair or replace harness or connectors.

5.CHECK HEATED OXYGEN SENSOR 2

Refer to [EC-177, "Component Inspection"](#).

OK or NG

OK >> GO TO 6.

NG >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-6, "Exploded View"](#).

6.CHECK INTERMITTENT INCIDENT

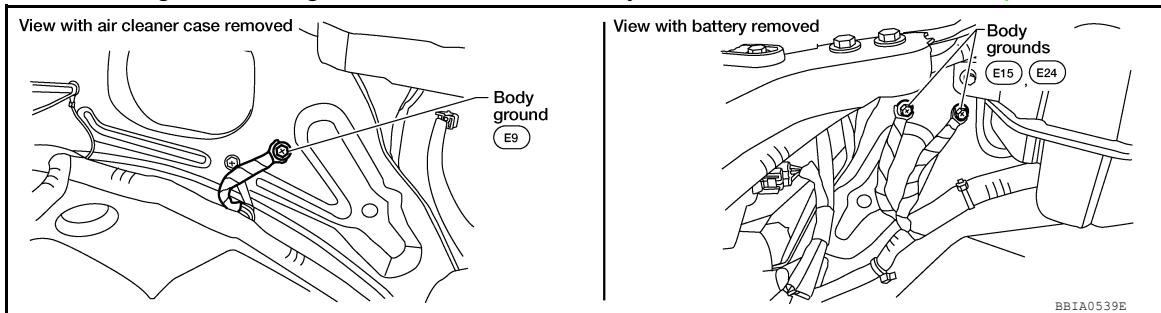
Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

PROCEDURE FOR MALFUNCTION B

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).



OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2.CLEAR THE SELF-LEARNING DATA

☑ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.

**Is the 1st trip DTC P0172 or P0175 detected?
Is it difficult to start engine?**

☒ Without CONSULT

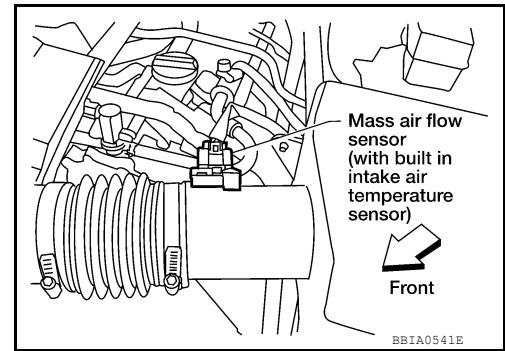
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.

P0138, P0158 HO2S2

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to [EC-74, "On Board Diagnosis Function"](#).
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
Is the 1st trip DTC P0172 or P0175 detected?
Is it difficult to start engine?

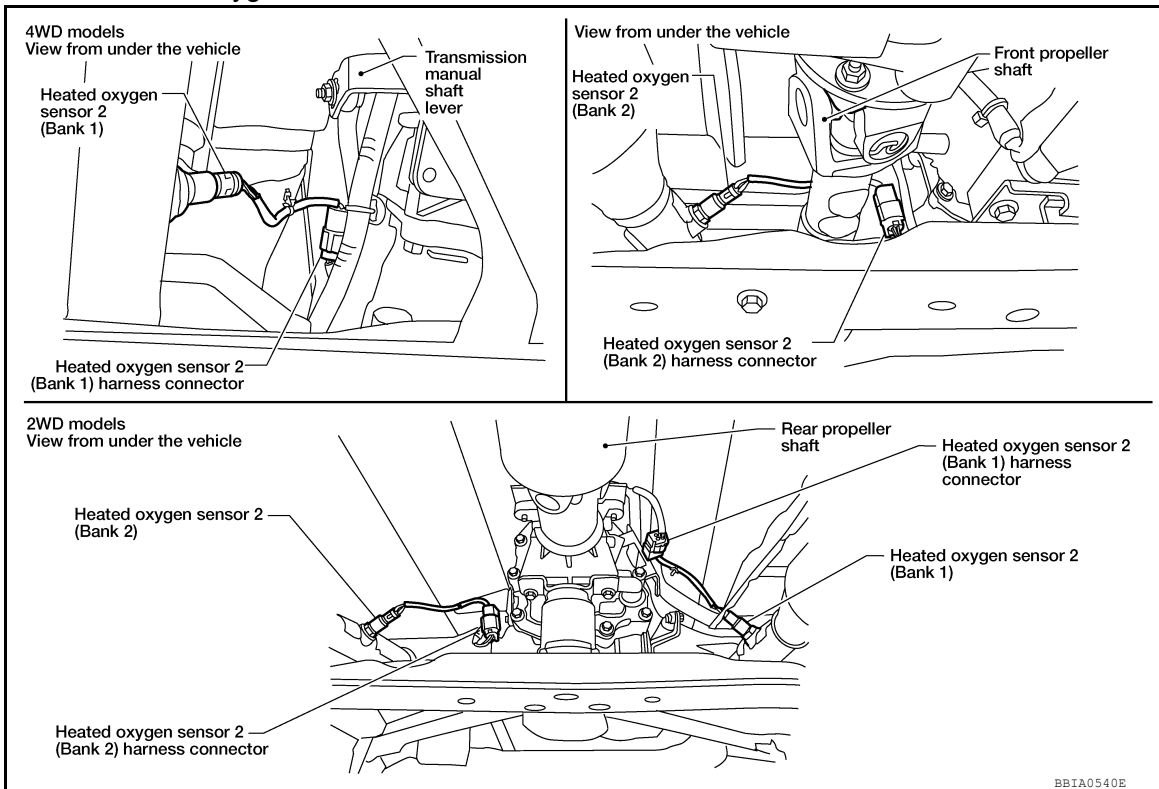


Yes or No

- Yes >> Perform trouble diagnosis for DTC P0172, P0175. Refer to [EC-191, "On Board Diagnosis Logic"](#).
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.



3. Disconnect ECM harness connector.
4. Check harness continuity between HO2S2 terminal 4 and ECM terminal 78.
Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows.
Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	74	1	1
P0158	55	1	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	74	1	1
P0158	55	1	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to [EC-177. "Component Inspection"](#).

OK or NG

OK >> GO TO 6.

NG >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-6. "Exploded View"](#).

6. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

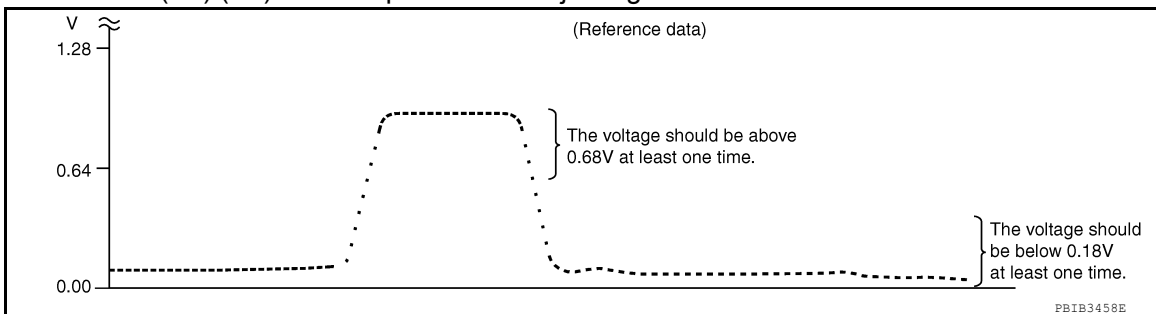
INFOID:000000007358094

HEATED OXYGEN SENSOR 2

Ⓟ With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.

7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.



"HO2S2 (B1)/(B2)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.

"HO2S2 (B1)/(B2)" should be below 0.18V at least once when the "FUEL INJECTION" is -25%.

CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

⊗ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Set voltmeter probes between ECM terminal 74 [HO2S2 (B1) signal] or 55 [HO2S2 (B2) signal] and ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)

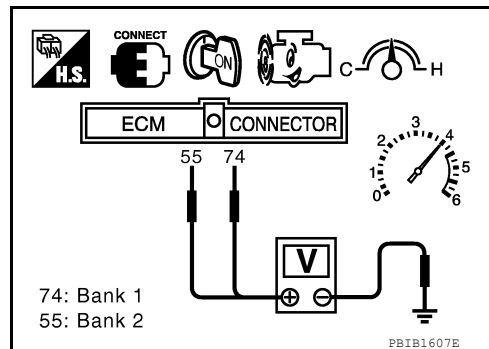
The voltage should be above 0.68V and below 0.18V at least once during this procedure.

If the voltage can be confirmed at step 6, step 7 is not necessary.

7. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with "OD" OFF.

The voltage should be above 0.68V and below 0.18V at least once during this procedure.

8. If NG, replace heated oxygen sensor 2. Refer to [EX-6, "Exploded View"](#).



CAUTION:

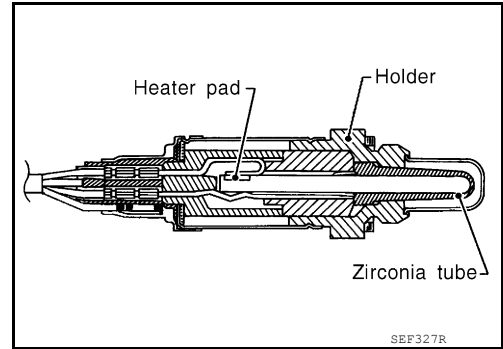
- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

P0139, P0159 HO2S2

Component Description

INFOID:000000007358095

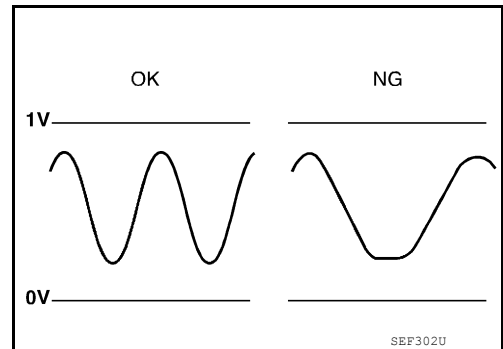
The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank. Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2. This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



On Board Diagnosis Logic

INFOID:000000007358096

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139	Heated oxygen sensor 2 (bank 1) circuit slow response	The switching time between rich and lean of a heated oxygen sensor 2 signal delays more than the specified time computed by ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel system • EVAP system • Intake air system
P0159	Heated oxygen sensor 2 (bank 2) circuit slow response		

DTC Confirmation Procedure

INFOID:000000007358097

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 7.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

>> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

Ⓟ With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
9. Drive the vehicle at a speed of 60 km/h (38 MPH) on the suitable gear position and keep the speed.

CAUTION:

Always drive vehicle at a safe speed.

10. Release the accelerator pedal fully at least 5 seconds.

CAUTION:

- **Make it the condition that engine brake operates.**
- **Always drive vehicle safely.**
- **Never apply brake when releasing the accelerator pedal.**

11. Repeat step 9 and 10 at least 8 times.
12. Check the following item of "DATA MONITOR".

DTC	Data monitor item	Status
P0139	HO2 S2 DIAG1 (B1)	CMPLT
	HO2 S2 DIAG2 (B1)	
P0159	HO2 S2 DIAG1 (B2)	
	HO2 S2 DIAG2 (B2)	

Is "CMPLT" displayed on CONSULT screen?

YES >> GO TO 6.

NO-1: "CMPLT" are not displayed on DIAG 1>>Perform DTC confirmation procedure again.

NO-2: "CMPLT" are not displayed on DIAG 2>>GO TO 4.

4. PERFORM DTC WORK SUPPORT

1. Open engine hood.
2. Select "HO2S2 (B1) P0139" or "HO2S2 (B2) P0159" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
3. Start engine and follow the instruction of CONSULT display.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

Is "COMPLETED" displayed on CONSULT screen?

YES >> GO TO 6.

NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 3.

6. PERFORM SELF-DIAGNOSIS

Ⓟ With CONSULT

Perform ECM self-diagnosis.

Is DTC "P0139" or "P0159" detected?

YES >> Proceed to [EC-181, "Diagnosis Procedure"](#).

NO >> INSPECTION END

7. PERFORM COMPONENT FUNCTION CHECK

< DTC/CIRCUIT DIAGNOSIS >

Perform component function check. Refer to [EC-181. "Overall Function Check"](#).

NOTE:

Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-181. "Diagnosis Procedure"](#).

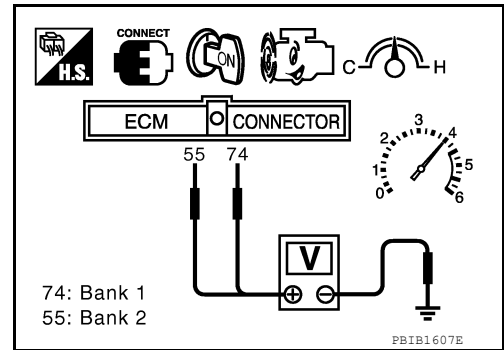
Overall Function Check

INFOID:000000007358098

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

 WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Set voltmeter probes between ECM terminal 74 [HO2S2 (B1) signal] or 55 [HO2S2 (B2) signal] and ground.
8. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)
A change of voltage should be more than 0.8 V for 1 second during this procedure.
If the voltage can be confirmed in step 6, step 7 is not necessary.
9. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with "OD" OFF.
A change of voltage should be more than 0.8 V for 1 second during this procedure.
10. If NG, go to [EC-181. "Diagnosis Procedure"](#).

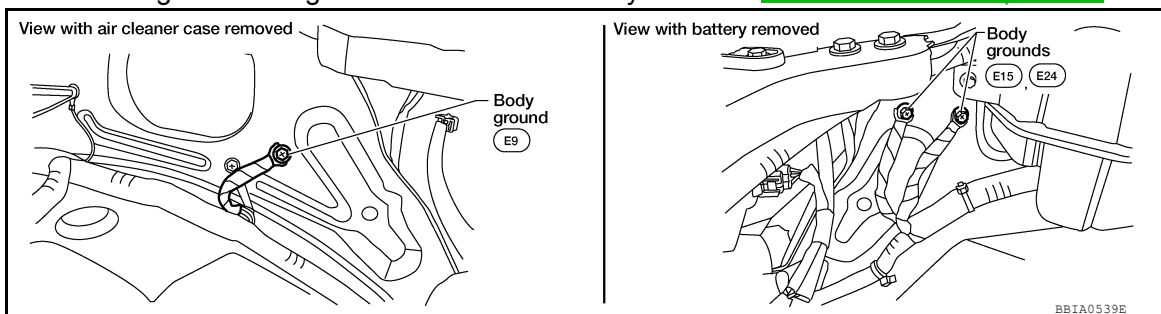


Diagnosis Procedure

INFOID:000000007358099

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CLEAR THE SELF-LEARNING DATA

 With CONSULT

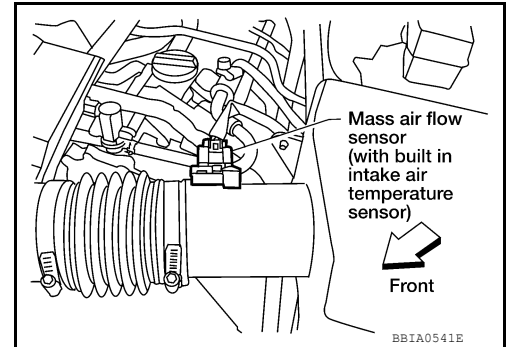
A
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< DTC/CIRCUIT DIAGNOSIS >

1. Start engine and warm it up to normal operating temperature.
 2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
 3. Clear the self-learning control coefficient by touching "CLEAR".
 4. Run engine for at least 10 minutes at idle speed.
- Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
Is it difficult to start engine?**

⊗ **Without CONSULT**

1. Start engine and warm it up to normal operating temperature.
 2. Turn ignition switch OFF.
 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
 4. Stop engine and reconnect mass air flow sensor harness connector.
 5. Make sure DTC P0102 is displayed.
 6. Erase the DTC memory. Refer to [EC-74, "On Board Diagnosis Function"](#).
 7. Make sure DTC P0000 is displayed.
 8. Run engine for at least 10 minutes at idle speed.
- Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
Is it difficult to start engine?**



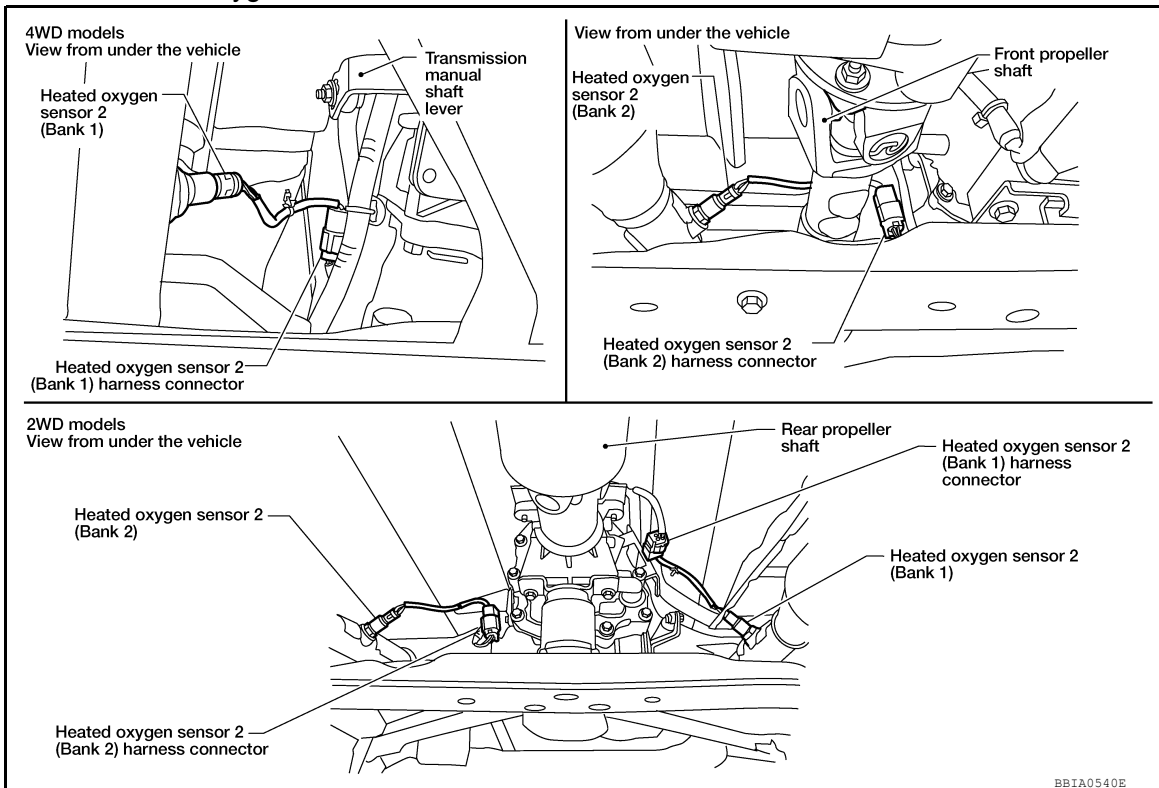
Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to [EC-185, "On Board Diagnosis Logic"](#) or [EC-191, "On Board Diagnosis Logic"](#).

No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.



3. Disconnect ECM harness connector.
4. Check harness continuity between HO2S2 terminal 4 and ECM terminal 78. Refer to Wiring Diagram.

Continuity should exist.

< DTC/CIRCUIT DIAGNOSIS >

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows.
Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0139	74	1	1
P0159	55	1	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground.
Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0139	74	1	1
P0159	55	1	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5.CHECK HEATED OXYGEN SENSOR 2

Refer to [EC-183, "Component Inspection"](#).

OK or NG

OK >> GO TO 6.

NG >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-7, "Removal and Installation"](#).

6.CHECK INTERMITTENT INCIDENT

Refer to [GI-33, "Work Flow"](#).

>> **INSPECTION END**

Component Inspection

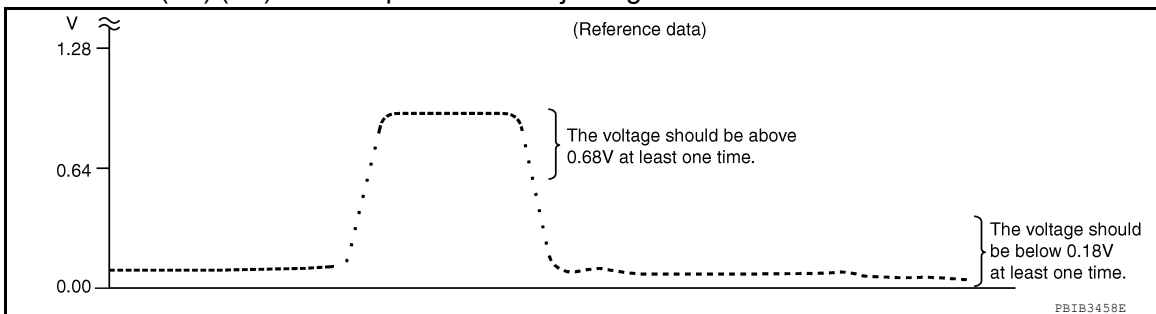
INFOID:000000007358100

HEATED OXYGEN SENSOR 2

Ⓟ With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.

7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.



"HO2S2 (B1)/(B2)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.

"HO2S2 (B1)/(B2)" should be below 0.18V at least once when the "FUEL INJECTION" is -25%.

CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

⊗ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Set voltmeter probes between ECM terminal 74 [HO2S2 (B1) signal] or 55 [HO2S2 (B2) signal] and ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)

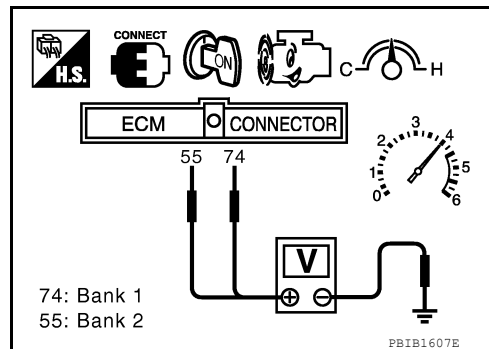
The voltage should be above 0.68V and below 0.18V at least once during this procedure.

If the voltage can be confirmed at step 6, step 7 is not necessary.

7. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with "OD" OFF.

The voltage should be above 0.68V and below 0.18V at least once during this procedure.

8. If NG, replace heated oxygen sensor 2. Refer to [EX-7, "Removal and Installation"](#).



CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

On Board Diagnosis Logic

INFOID:000000007358101

With the Air-Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the air fuel ratio (A/F) sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (the actual mixture ratio is too lean), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0171 0171 (Bank 1)	Fuel injection system too lean	<ul style="list-style-type: none"> Fuel injection system does not operate properly. The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.) 	<ul style="list-style-type: none"> Intake air leaks Air fuel ratio (A/F) sensor 1 Fuel injector Exhaust gas leaks Incorrect fuel pressure Lack of fuel Mass air flow sensor Incorrect PCV hose connection
P0174 0174 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358102

NOTE:

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
4. Clear the self-learning control coefficient by touching "CLEAR".
5. Start engine.
If it is difficult to start engine, the fuel injection system has a malfunction.
Performing the following procedure is advised.
 - a. Crank engine while depressing accelerator pedal.

NOTE:
When depressing accelerator pedal three-fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.
 - b. If engine starts, go to [EC-186, "Diagnosis Procedure"](#).
If engine does not start, check exhaust and intake air leakage visually.
6. Keep engine at idle for at least 5 minutes.
7. Check 1st trip DTC.
8. The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to [EC-186, "Diagnosis Procedure"](#).

NOTE:

If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

- a. Turn ignition switch OFF and wait at least 10 seconds.
- b. Start engine.
- c. Maintain the following conditions for at least 10 consecutive minutes.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Hold the accelerator pedal as steady as possible.

VHCL SPEED SE	50 - 120 km/h (31 - 75 MPH)
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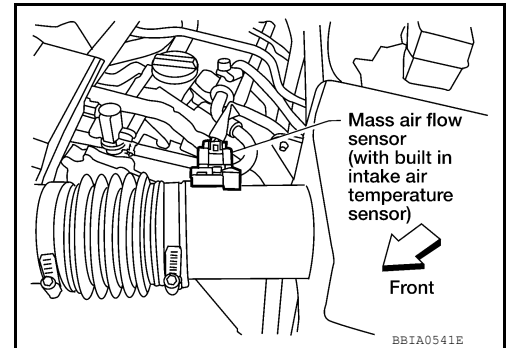
CAUTION:

Always drive vehicle at a safe speed.

- d. Check 1st trip DTC.
- e. If 1st trip DTC is detected, go to [EC-186, "Diagnosis Procedure"](#).

WITH GST

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Disconnect mass air flow sensor harness connector.
- 4. Restart engine and let it idle for at least 5 seconds.
- 5. Stop engine and reconnect mass air flow sensor harness connector.
- 6. Select Service \$03 with GST. Check that DTC P0102 is detected.
- 7. Select Service \$04 with GST and erase the DTC P0102.
- 8. Start engine.
If it is difficult to start engine, the fuel injection system has a malfunction.
Performing the following procedure is advised.



- a. Crank engine while depressing accelerator pedal.

NOTE:

When depressing accelerator pedal three-fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

- b. If engine starts, go to [EC-186, "Diagnosis Procedure"](#)
If engine does not start, check exhaust and intake air leakage visually.
- 9. Keep engine at idle for at least 5 minutes.
- 10. Check 1st trip DTC.
- 11. The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to [EC-186, "Diagnosis Procedure"](#).

NOTE:

If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

- a. Turn ignition switch OFF and wait at least 10 seconds.
- b. Start engine.
- c. Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

VHCL SPEED SE	50 - 120 km/h (31 - 75 MPH)
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CAUTION:

Always drive vehicle at a safe speed.

- d. Check 1st trip DTC.
- e. If 1st trip DTC is detected, go to [EC-186, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358103

1. CHECK EXHAUST GAS LEAK

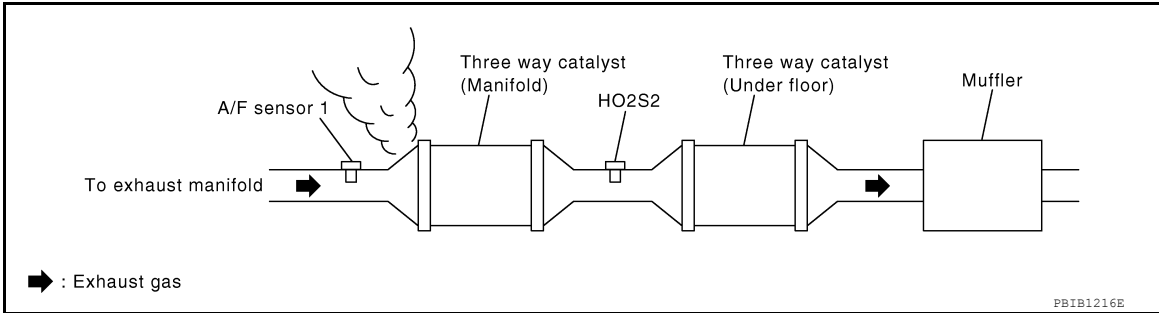
- 1. Start engine and run it at idle.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

- Listen for an exhaust gas leak before three way catalyst (manifold).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK

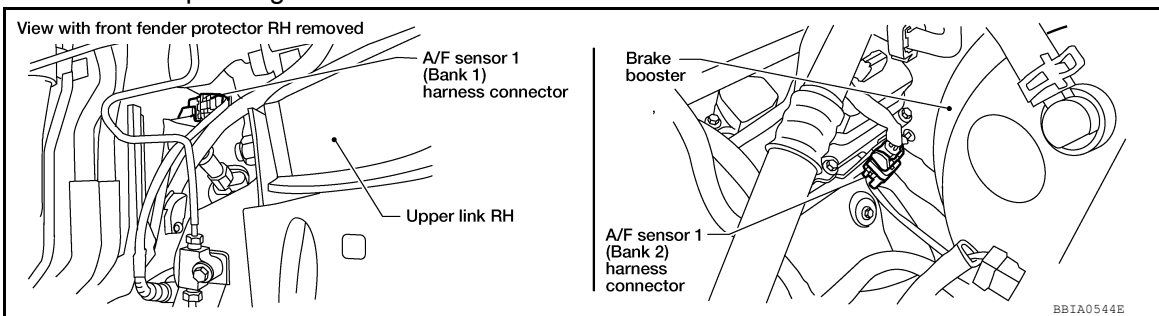
- Listen for an intake air leak after the mass air flow sensor.
- Check PCV hose connection.

OK or NG

- OK >> GO TO 3.
- NG >> Repair or replace.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

- Turn ignition switch OFF.
- Disconnect corresponding A/F sensor 1 harness connector.



- Disconnect ECM harness connector.
- Check harness continuity between A/F sensor 1 terminal and ECM terminal as follows. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

- Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to [EC-487, "Fuel Pressure Check"](#).

2. Install fuel pressure gauge and check fuel pressure. Refer to [EC-487, "Fuel Pressure Check"](#).

At idling: 350 kPa (3.57 kg/cm², 51 psi)

OK or NG

OK (With CONSULT)>>GO TO 6.

OK (Without CONSULT)>>GO TO 7.

NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit (Refer to [EC-406, "Diagnosis Procedure"](#).)
- Fuel pressure regulator (Refer to [EC-487, "Fuel Pressure Check"](#).)
- Fuel lines
- Fuel filter for clogging

>> Repair or replace.

6. CHECK MASS AIR FLOW SENSOR

 **With CONSULT**

1. Install all removed parts.

2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.

2.0 - 6.0 g/s: at idling

7.0 - 20.0 g/s: at 2,500 rpm

OK or NG

OK >> GO TO 8.

NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to [EC-118, "Component Description"](#).

7. CHECK MASS AIR FLOW SENSOR

 **With GST**

1. Install all removed parts.

2. Check mass air flow sensor signal in Service \$01 with GST.

2.0 - 6.0 g/s: at idling

7.0 - 20.0 g/s: at 2,500 rpm

OK or NG

OK (P0171)>>GO TO 9.

OK (P0174)>>GO TO 11.

NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to [EC-118, "Component Description"](#).

8. CHECK FUNCTION OF FUEL INJECTOR

 **With CONSULT**

1. Start engine.

2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.

3. Make sure that each circuit produces a momentary engine speed drop.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

OK >> GO TO 12.

NG >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-402. "Component Description"](#).

9. CHECK FUNCTION OF FUEL INJECTOR-I

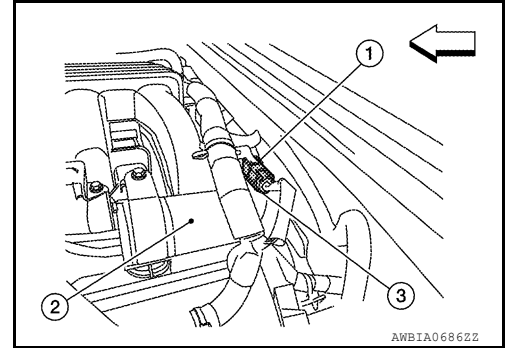
Without CONSULT

1. Stop engine.
2. Disconnect harness connector F44 (3), F201 (1)

2 : Vacuum tank

↔ : Front

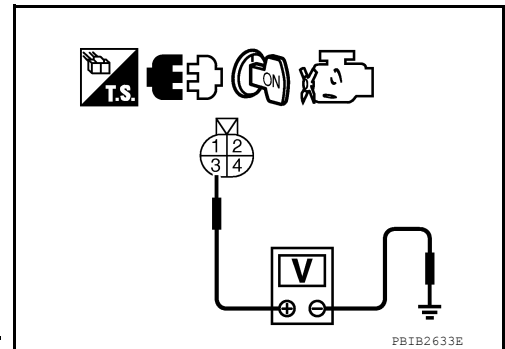
3. Turn ignition switch ON.



4. Check voltage between harness connector F44 terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

5. Turn ignition switch OFF.
6. Disconnect ECM harness connector.
7. Check harness continuity between harness connector F44 and ECM as follows.
Refer to Wiring Diagram.



Cylinder	Harness connector F44 terminal	ECM terminal
1	2	23
3	1	22
5	4	21

Continuity should exist.

8. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.

NG >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-402. "Component Description"](#).

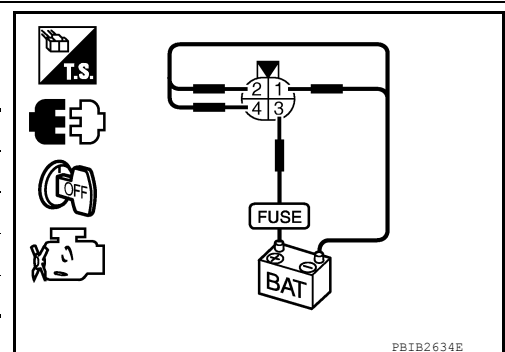
10. CHECK FUNCTION OF FUEL INJECTOR-II

Provide battery voltage between harness connector F201 as follows and then interrupt it. Listen to each fuel injector operating sound.

Cylinder	Harness connector F201 terminal	
	(+)	(-)
1	3	2
3	3	1
5	3	4

Operating sound should exist.

OK or NG



P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK >> GO TO 12.

NG >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-402, "Component Description"](#).

11. CHECK FUNCTION OF FUEL INJECTOR

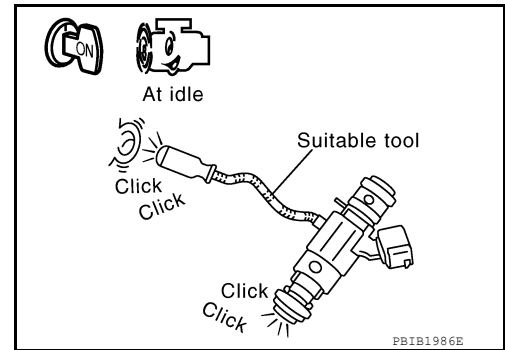
1. Start engine.
2. Listen to fuel injectors No.2, No.4, No.6 operating sound.

Clicking noise should exist.

OK or NG

OK >> GO TO 12.

NG >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-402, "Component Description"](#).



12. CHECK FUEL INJECTOR

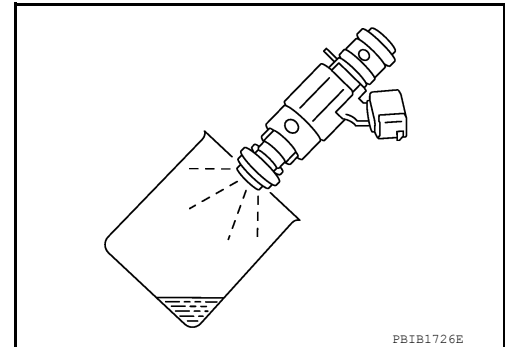
1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch OFF.
3. Disconnect all injector harness connectors.
4. Remove fuel tube assembly. Refer to [EM-47, "Removal and Installation"](#). Keep fuel hose and all fuel injectors connected to fuel tube.
5. For DTC P0171, reconnect fuel injector harness connectors on bank 1. For DTC P0174, reconnect fuel injector harness connectors on bank 2.
6. Disconnect all ignition coil harness connectors.
7. Prepare pans or saucers under each fuel injector.
8. Crank engine for about 3 seconds. For DTC P0171, make sure that fuel sprays out from fuel injectors on bank 1. For DTC P0174, make sure that fuel sprays out from fuel injectors on bank 2.

Fuel should be sprayed evenly for each fuel injector.

OK or NG

OK >> GO TO 13.

NG >> Replace fuel injectors from which fuel does not spray out. Refer to [EM-47, "Removal and Installation"](#). Always replace O-ring with new ones.



13. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

On Board Diagnosis Logic

INFOID:000000007358104

With the Air-Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from air fuel ratio (A/F) sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios. In case the amount of the compensation value is extremely large (the actual mixture ratio is too rich), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0172 0172 (Bank 1)	Fuel injection system too rich	<ul style="list-style-type: none"> Fuel injection system does not operate properly. The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.) 	<ul style="list-style-type: none"> Air fuel ratio (A/F) sensor 1 Fuel injector Exhaust gas leaks Incorrect fuel pressure Mass air flow sensor
P0175 0175 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358105

NOTE:

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

④ WITH CONSULT

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
- Clear the self-learning control coefficient by touching "CLEAR".
- Start engine.
If it is difficult to start engine, the fuel injection system has a malfunction. Performing the following procedure is advised.
 - Crank engine while depressing accelerator pedal.

NOTE:
When depressing accelerator pedal three-fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.
 - If engine starts, go to [EC-192, "Diagnosis Procedure"](#).
If engine does not start, remove ignition plugs and check for fouling, etc. Refer to [EM-42, "Removal and Installation"](#).
- Keep engine at idle for at least 5 minutes.
- Check 1st trip DTC.
- The 1st trip DTC P0172 or P0175 should be detected at this stage, if a malfunction exists. If so, go to [EC-192, "Diagnosis Procedure"](#).

NOTE:
If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

 - Turn ignition switch OFF and wait at least 10 seconds.
 - Start engine.
 - Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

VHCL SPEED SE	50 - 120 km/h (31 - 75 MPH)
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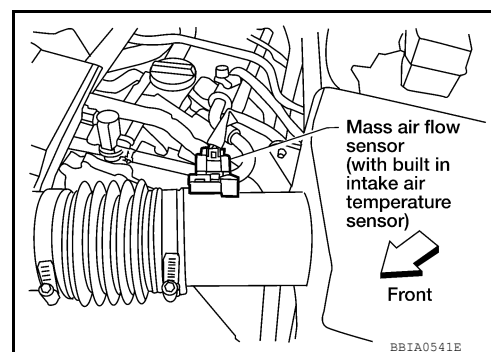
CAUTION:

Always drive vehicle at a safe speed.

- d. Check 1st trip DTC.
- e. If 1st trip DTC is detected, go to [EC-192, "Diagnosis Procedure"](#).

Ⓜ WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Disconnect mass air flow sensor harness connector.
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Select Service \$03 with GST. Check that DTC P0102 is detected.
7. Select Service \$04 with GST and erase the DTC P0102.
8. Start engine.
If it is difficult to start engine, the fuel injection system has a malfunction.
Performing the following procedure is advised.



- a. Crank engine while depressing accelerator pedal.

NOTE:

When depressing accelerator pedal three-fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

- b. If engine starts, go to [EC-192, "Diagnosis Procedure"](#)
If engine does not start, remove ignition plugs and check for fouling, etc. Refer to [EM-42, "Removal and Installation"](#).
9. Keep engine at idle for at least 5 minutes.
10. Check 1st trip DTC.
11. The 1st trip DTC P0172 or P0175 should be detected at this stage, if a malfunction exists. If so, go to [EC-192, "Diagnosis Procedure"](#).

NOTE:

If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

- a. Turn ignition switch OFF and wait at least 10 seconds.
- b. Start engine.
- c. Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

VHCL SPEED SE	50 - 120 km/h (31 - 75 MPH)
---------------	-----------------------------

CAUTION:

Always drive vehicle at a safe speed.

- d. Check 1st trip DTC.
- e. If 1st trip DTC is detected, go to [EC-192, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358106

1. CHECK EXHAUST GAS LEAK

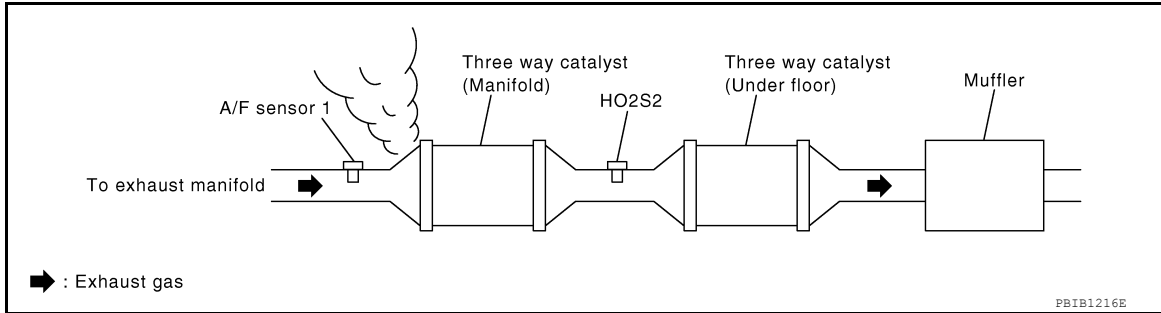
1. Start engine and run it at idle.

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

- Listen for an exhaust gas leak before three way catalyst (manifold).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK

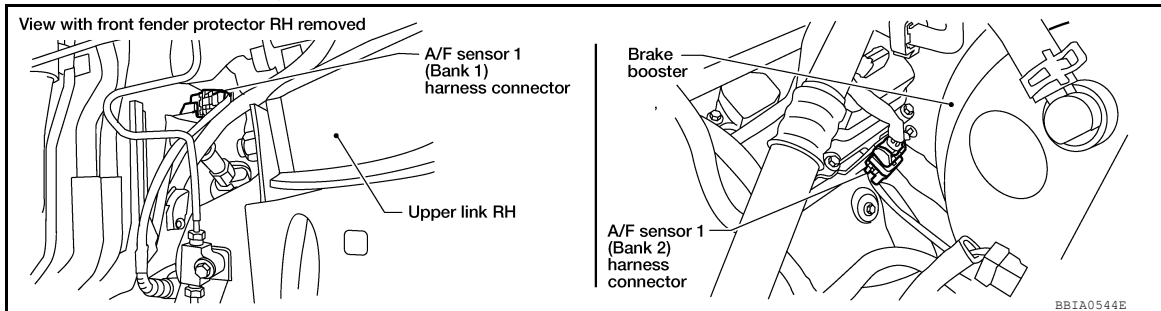
Listen for an intake air leak after the mass air flow sensor.

OK or NG

- OK >> GO TO 3.
- NG >> Repair or replace.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

- Turn ignition switch OFF.
- Disconnect corresponding A/F sensor 1 harness connector.



- Disconnect ECM harness connector.
- Check harness continuity between A/F sensor 1 terminal and ECM terminal as follows. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

- Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

- Also check harness for short to power.

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to [EC-487, "Fuel Pressure Check"](#).
2. Install fuel pressure gauge and check fuel pressure. Refer to [EC-487, "Fuel Pressure Check"](#).

At idling: 350 kPa (3.57 kg/cm², 51 psi)

OK or NG

- OK (With CONSULT)>>GO TO 6.
- OK (Without CONSULT)>>GO TO 7.
- NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit (Refer to [EC-406, "Diagnosis Procedure"](#).)
- Fuel pressure regulator (Refer to [EC-487, "Fuel Pressure Check"](#).)

>> Repair or replace.

6. CHECK MASS AIR FLOW SENSOR

With CONSULT

1. Install all removed parts.
2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.

2.0 - 6.0 g/s: at idling
7.0 - 20.0 g/s: at 2,500 rpm

OK or NG

- OK >> GO TO 8.
- NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to [EC-113, "Component Description"](#).

7. CHECK MASS AIR FLOW SENSOR

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in Service \$01 with GST.

2.0 - 6.0 g/s: at idling
7.0 - 20.0 g/s: at 2,500 rpm

OK or NG

- OK (P0172)>>GO TO 9.
- OK (P0175)>>GO TO 11.
- NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to [EC-113, "Component Description"](#).

8. CHECK FUNCTION OF FUEL INJECTOR

With CONSULT

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

OK or NG

- OK >> GO TO 12.
- NG >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-402, "Component Description"](#).

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

9. CHECK FUNCTION OF FUEL INJECTOR-I

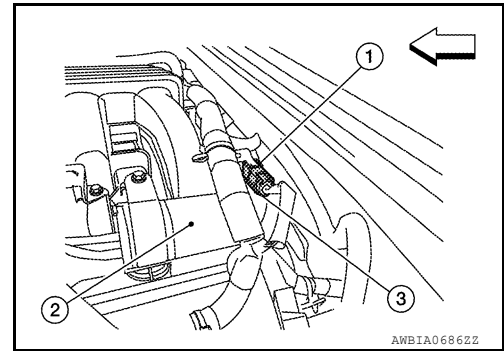
⊗ Without CONSULT

1. Stop engine.
2. Disconnect harness connector F44 (3), F201 (1)

2 : Vacuum tank

↔ : Front

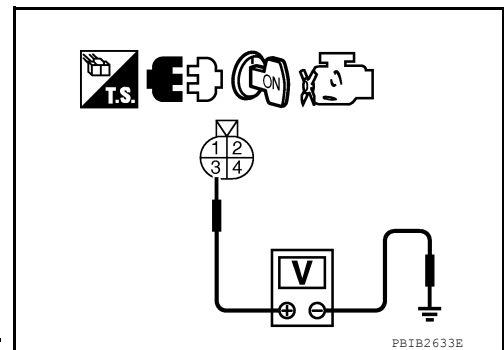
3. Turn ignition switch ON.



4. Check voltage between harness connector F44 terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

5. Turn ignition switch OFF.
6. Disconnect ECM harness connector.
7. Check harness continuity between harness connector F44 and ECM as follows.
Refer to Wiring Diagram.



Cylinder	Harness connector F44 terminal	ECM terminal
1	2	23
3	1	22
5	4	21

Continuity should exist.

8. Also check harness for short to ground and short to power.

OK or NG

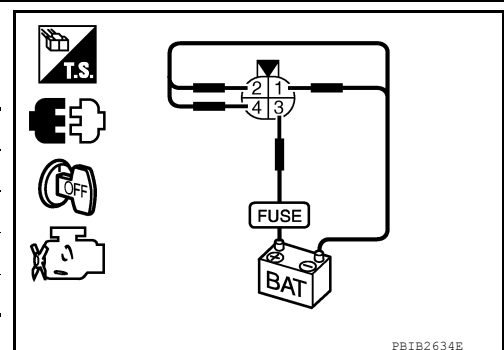
OK >> GO TO 10.

NG >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-402, "Component Description"](#).

10. CHECK FUNCTION OF FUEL INJECTOR-II

Provide battery voltage between harness connector F201 as follows and then interrupt it. Listen to each fuel injector operating sound.

Cylinder	Harness connector F201 terminal	
	(+)	(-)
1	3	2
3	3	1
5	3	4



Operating sound should exist.

OK or NG

OK >> GO TO 12.

NG >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-402, "Component Description"](#).

11. CHECK FUNCTION OF FUEL INJECTOR

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

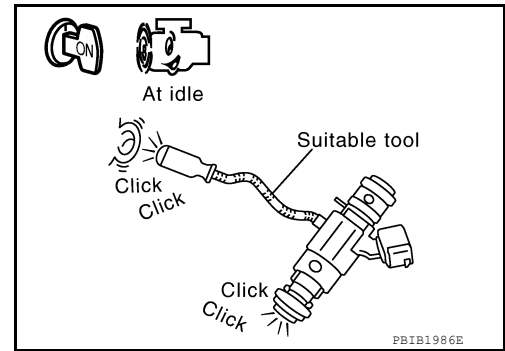
1. Start engine.
2. Listen to fuel injectors No.2, No.4, No.6 operating sound.

Clicking noise should exist.

OK or NG

OK >> GO TO 12.

NG >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-402, "Component Description"](#).



12.CHECK FUEL INJECTOR

1. Remove fuel injector assembly. Refer to [EM-47, "Removal and Installation"](#).
Keep fuel hose and all fuel injectors connected to fuel tube.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect all fuel injector harness connectors.
4. Disconnect all ignition coil harness connectors.
5. Prepare pans or saucers under each fuel injector.
6. Crank engine for about 3 seconds.
Make that sure fuel does not drip from fuel injector.

OK or NG

OK (Does not drip.)>>GO TO 13.

NG (Drips.)>>Replace the fuel injectors from which fuel is dripping. Refer to [EM-47, "Removal and Installation"](#). Always replace O-ring with new one.

13.CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

P0181 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

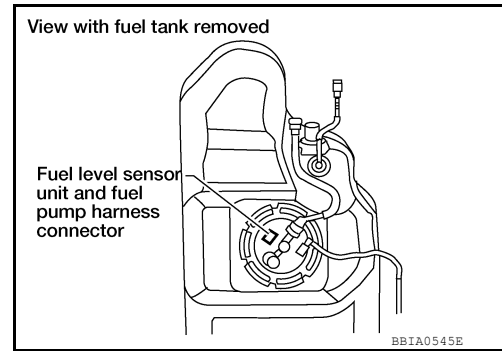
[VQ40DE]

P0181 FTT SENSOR

Component Description

INFOID:000000007358107

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



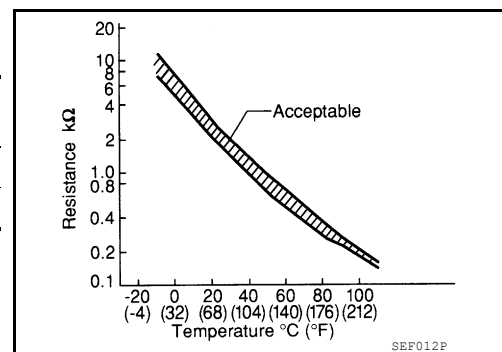
<Reference data>

Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: This data is reference value and is measured between ECM terminal 107 (fuel tank temperature sensor) and 116 (ECM ground).

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



On Board Diagnosis Logic

INFOID:000000007358108

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0181	Fuel tank temperature sensor circuit range/performance	A) Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.	<ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted) Fuel tank temperature sensor
		B) The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, and FTT sensor) shows that the voltage signal of the FTT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.	<ul style="list-style-type: none"> Harness or connectors (High or low resistance in the FTT sensor circuit) FTT sensor

DTC Confirmation Procedure

INFOID:000000007358109

1.INSPECTION START

Is it necessary to erase permanent DTC?

- YES >> GO TO 7.
- NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-I

1. Turn ignition switch ON and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Go to [EC-199, "Diagnosis Procedure"](#).
 NO >> GO TO 4.

4. CHECK ENGINE COOLANT TEMPERATURE

 **With CONSULT**

1. Select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
2. Check "COOLAN TEMP/S" indication.

 **With GST**

Follow the procedure "With CONSULT" above.

Is "COOLAN TEMP/S" indication less than 60°C (140°F)?

- YES >> INSPECTION END
 NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-II

 **With CONSULT**

1. Cool engine down until "COOLAN TEMP/S" indication is less than 60°C (140°F).
2. Wait at least 10 seconds.
3. Check 1st trip DTC.

 **With GST**

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

- YES >> Go to [EC-199, "Diagnosis Procedure"](#).
 NO >> GO TO 6.

6. PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B)

Perform component function check. Refer to [EC-199, "Component Function Check"](#).

NOTE:

Use the component function check to check the overall function of the FTT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Proceed to [EC-199, "Diagnosis Procedure"](#).

7. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 8.

8. PERFORM DTC CONFIRMATION PROCEDURE B

1. Start engine and let it idle for 60 minutes.

P0181 FTT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Move the vehicle to a cool place.

NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

CAUTION:

Never turn ignition switch ON during soaking.

NOTE:

The vehicle must be cooled with the hood open.

4. Start engine and let it idle for 5 minutes or more.

CAUTION:

Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-199, "Diagnosis Procedure"](#).
NO >> INSPECTION END

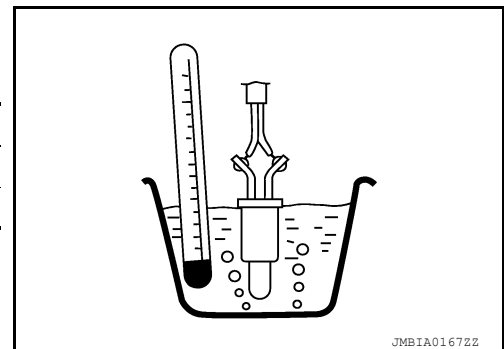
Component Function Check

INFOID:000000007358110

1. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Remove fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).
4. Check resistance between fuel level sensor unit and fuel pump terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance (k Ω)	
2 and 4	Temperature [$^{\circ}\text{C}$ ($^{\circ}\text{F}$)]	20 (68)	2.3 – 2.7
		50 (122)	0.79 – 0.90



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Is the inspection result normal?

- YES >> GO TO 2.
NO >> Proceed to [EC-199, "Diagnosis Procedure"](#).

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-37, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-199, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358111

1. INSPECTION START

Confirm the detected malfunction (A or B). Refer to [EC-197, "On Board Diagnosis Logic"](#).

Which malfunction is detected?

- A >> GO TO 2.
B >> GO TO 7.

2. CHECK COMBINATION METER FUNCTION

Refer to [GI-33, "Work Flow"](#).

OK or NG

- OK >> GO TO 3.
NG >> Go to [MWI-34, "Component Function Check"](#).

3. CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

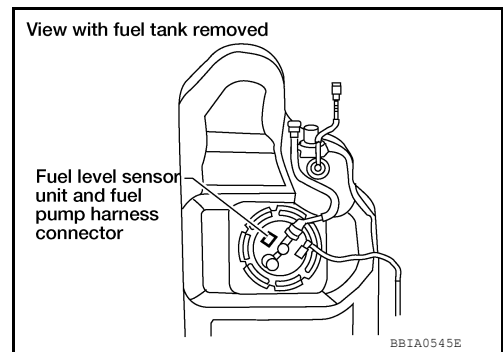
1. Turn ignition switch OFF.

P0181 FTT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
3. Turn ignition switch ON.

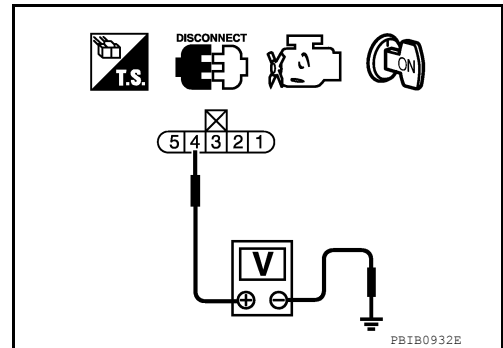


4. Check voltage between "fuel level sensor unit and fuel pump" terminal 4 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E41, C1
- Harness for open or short between ECM and "fuel level sensor unit and fuel pump"

>> Repair harness or connector.

5. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between "fuel level sensor unit and fuel pump" terminal 3 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

- OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E41, C1
- Harness for open or short between "fuel level sensor unit and fuel pump" ground

>> Repair open circuit or short to power in harness or connector.

7. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to [EC-201, "Component Inspection"](#).

OK or NG

- OK >> GO TO 8.
NG >> Replace fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).

8. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

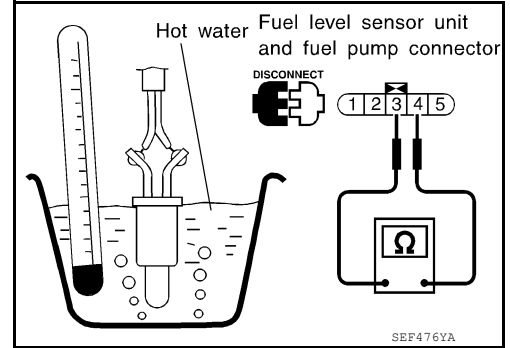
Component Inspection

INFOID:000000007358112

FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).
2. Check resistance between "fuel level sensor unit and fuel pump" terminals 3 and 4 by heating with hot water or heat gun as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90



A
EC
C
D
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P0182, P0183 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

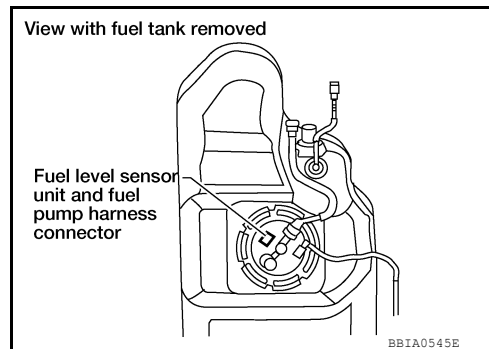
[VQ40DE]

P0182, P0183 FTT SENSOR

Component Description

INFOID:000000007358113

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



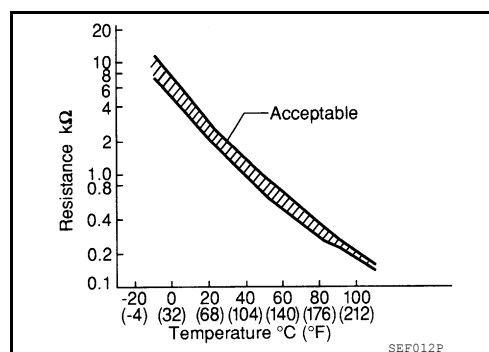
<Reference data>

Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: This data is reference value and is measured between ECM terminal 107 (fuel tank temperature sensor) and 116 (ECM ground).

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



On Board Diagnosis Logic

INFOID:000000007358114

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0182 0182	Fuel tank temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Fuel tank temperature sensor
P0183 0183	Fuel tank temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

INFOID:000000007358115

1. If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON and wait at least 5 seconds.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to [EC-202. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358116

1. CHECK COMBINATION METER FUNCTION

Refer to [GI-33. "Work Flow"](#).

OK or NG

OK >> GO TO 2.

P0182, P0183 FTT SENSOR

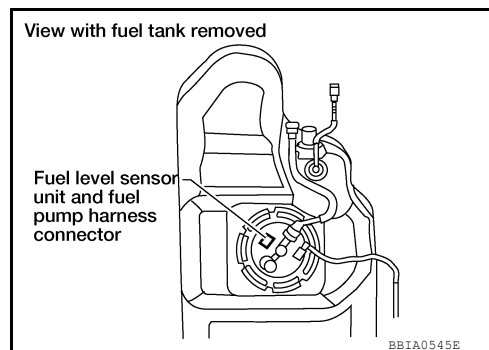
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NG >> Go to [MWI-34. "Component Function Check"](#).

2. CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
3. Turn ignition switch ON.

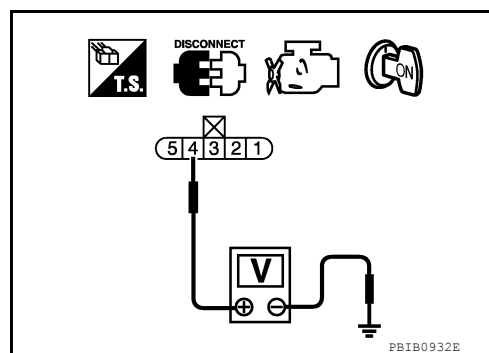


4. Check voltage between "fuel level sensor unit and fuel pump" terminal 4 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E41, C1
- Harness for open or short between ECM and "fuel level sensor unit and fuel pump"

>> Repair harness or connector.

4. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between "fuel level sensor unit and fuel pump" terminal 3 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

- OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E41, C1
- Harness for open or short between "fuel level sensor unit and fuel pump" and ground

>> Repair open circuit or short to ground or short to power in harness or connector.

6. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to [EC-204. "Component Inspection"](#).

OK or NG

- OK >> GO TO 7.

P0182, P0183 FTT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NG >> Replace fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).

7. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

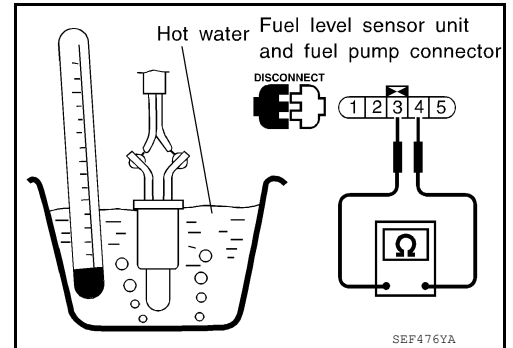
Component Inspection

INFOID:000000007358117

FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).
2. Check resistance between "fuel level sensor unit and fuel pump" terminals 3 and 4 by heating with hot water or heat gun as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90



P0222, P0223 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

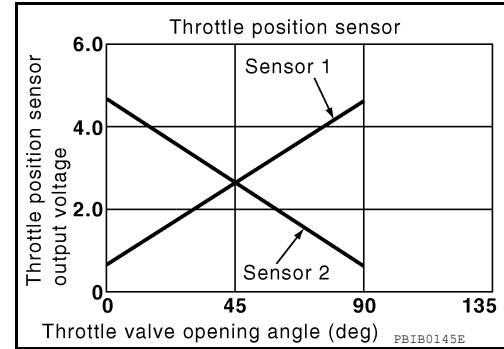
P0222, P0223 TP SENSOR

Component Description

INFOID:000000007358118

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

INFOID:000000007358119

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222 0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	<ul style="list-style-type: none"> Harness or connectors (The TP sensor 1 circuit is open or shorted.) (The APP sensor 2 circuit is shorted.) Electric throttle control actuator (TP sensor 1) Accelerator pedal position sensor. (APP sensor 2)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operation condition in fail-safe mode

- The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
- The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
- So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:000000007358120

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

- Start engine and let it idle for 1 second.
- Check DTC.
- If DTC is detected, go to [EC-205, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358121

1. CHECK GROUND CONNECTIONS

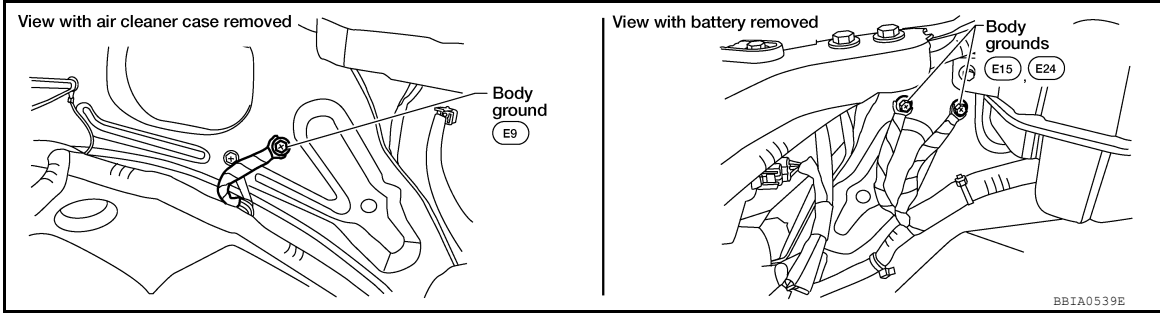
- Turn ignition switch OFF.

P0222, P0223 TP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).

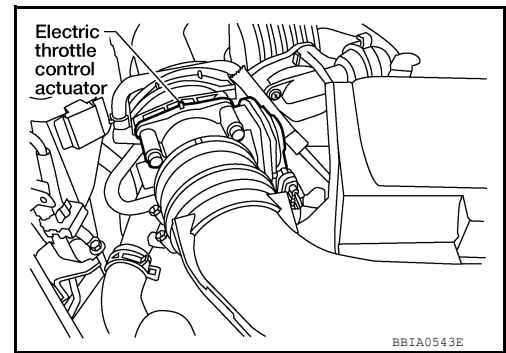


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-I

- Disconnect electric throttle control actuator harness connector.
- Turn ignition switch ON.

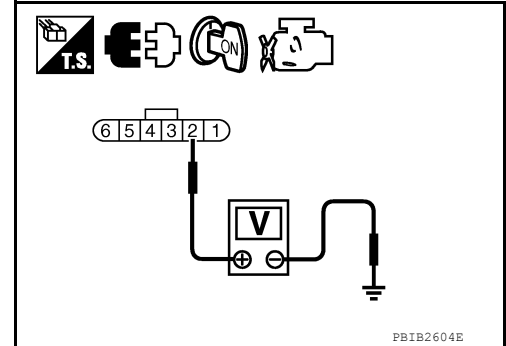


- Check voltage between electric throttle control actuator terminal 2 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 3.



3. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between electric throttle control actuator terminal 2 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit.

4. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-III

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 2	EC-455
91	APP sensor terminal 1	

P0222, P0223 TP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> GO TO 5.
- NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to [EC-378, "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to [ACC-4, "Removal and Installation"](#).

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 4 and ECM terminal 66. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 50 and electric throttle control actuator terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to [EC-207, "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace the electric throttle control actuator. Refer to [EM-27, "Removal and Installation"](#).

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358122

THROTTLE POSITION SENSOR

P0222, P0223 TP SENSOR

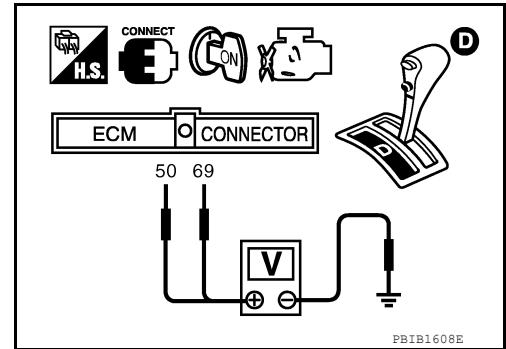
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Reconnect all harness connectors disconnected.
2. Perform [EC-25, "Throttle Valve Closed Position Learning"](#).
3. Turn ignition switch ON.
4. Set selector lever to D position.
5. Check voltage between ECM terminals 50 (TP sensor 1 signal), 69 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
69 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V

6. If NG, replace electric throttle control actuator. Refer to [EM-27, "Removal and Installation"](#).



PB1B1608E

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

On Board Diagnosis Logic

INFOID:000000007358123

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input Signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

- One Trip Detection Logic (Three Way Catalyst Damage)**
 On the first trip, when a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.
 When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.
 When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off.
 If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink.
 When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain on.
 If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
- Two Trip Detection Logic (Exhaust quality deterioration)**
 For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
 A misfire malfunction can be detected in any one cylinder or in multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300 0300	Multiple cylinder misfire detected	Multiple cylinder misfires.	<ul style="list-style-type: none"> • Improper spark plug • Insufficient compression • Incorrect fuel pressure • The fuel injector is open or shorted • Fuel injector • Intake air leak • The ignition signal circuit is open or shorted • Lack of fuel • Signal plate • Air fuel ratio (A/F) sensor 1 • Incorrect PCV hose connection
P0301 0301	No. 1 cylinder misfire detected	No. 1 cylinder misfires.	
P0302 0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	
P0303 0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	
P0304 0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	
P0305 0305	No. 5 cylinder misfire detected	No. 5 cylinder misfires.	
P0306 0306	No. 6 cylinder misfire detected	No. 6 cylinder misfires.	

DTC Confirmation Procedure

INFOID:000000007358124

CAUTION:

Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws when driving.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

WITH CONSULT

1. Turn ignition switch ON, and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to normal operating temperature.

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Restart engine and let it idle for about 15 minutes.
7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to [EC-210. "Diagnosis Procedure"](#).

NOTE:

If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

- a. Turn ignition switch OFF and wait at least 10 seconds.
- b. Turn ignition switch ON.
- c. Turn ignition switch OFF and wait at least 10 seconds.
- d. Start engine and drive the vehicle under similar conditions to (1st trip) Freeze Frame Data for a certain time. Refer to the table below.

Hold the accelerator pedal as steady as possible.

Similar conditions to (1st trip) Freeze Frame Data mean that the following conditions should be satisfied at the same time.

Engine speed	Engine speed in the freeze frame data \pm 400 rpm
Basic fuel schedule	Basic fuel schedule in freeze frame data \times (1 \pm 0.1)
Engine coolant temperature (T) condition	When the freeze frame data shows lower than 70 °C (158 °F), T should be lower than 70 °C (158 °F).
	When the freeze frame data shows higher than or equal to 70 °C (158 °F), T should be higher than or equal to 70 °C (158 °F).

Driving time varies according to the engine speed in the freeze frame data.

Engine speed	Time
Around 1,000 rpm	Approximately 10 minutes
Around 2,000 rpm	Approximately 5 minutes
More than 3,000 rpm	Approximately 3.5 minutes

WITH GST

Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358125

1. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leak.
3. Check PCV hose connection.

OK or NG

- OK >> GO TO 2.
NG >> Discover air leak location and repair.

2. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

OK or NG

- OK (With CONSULT)>>GO TO 3.
OK (Without CONSULT)>>GO TO 4.
NG >> Repair or replace it.

3. PERFORM POWER BALANCE TEST

With CONSULT

< DTC/CIRCUIT DIAGNOSIS >

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

Yes or No

- Yes >> GO TO 4.
 No >> GO TO 10.

4.CHECK FUNCTION OF FUEL INJECTOR-I

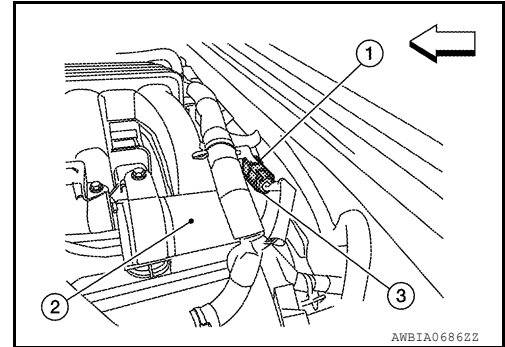
Stop engine.

1. Disconnect harness connector F44 (3), F201 (1)

2 : Vacuum tank

↔ : Front

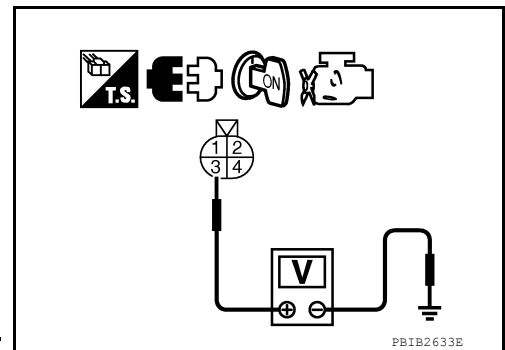
2. Turn ignition switch ON.



3. Check voltage between harness connector F44 terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

4. Turn ignition switch OFF.
5. Disconnect ECM harness connector.
6. Check harness continuity between harness connector F44 and ECM as follows.
Refer to Wiring Diagram.



Cylinder	Harness connector F44 terminal	ECM terminal
1	2	23
3	1	22
5	4	21

Continuity should exist.

7. Also check harness for short to ground and short to power.

OK or NG

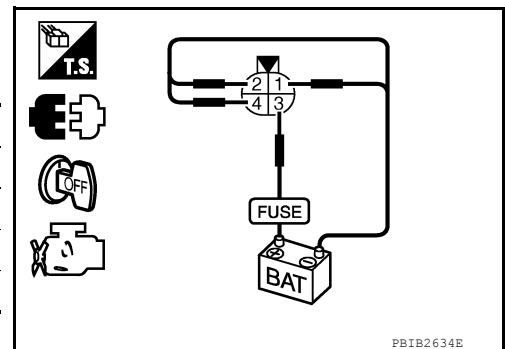
OK >> GO TO 5.

NG >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-402. "Diagnosis Procedure"](#).

5.CHECK FUNCTION OF FUEL INJECTOR-II

Provide battery voltage between harness connector F201 as follows and then interrupt it. Listen to each fuel injector operating sound.

Cylinder	Harness connector F201 terminal	
	(+)	(-)
1	3	2
3	3	1
5	3	4



Operating sound should exist.

OK or NG

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK >> GO TO 6.

NG >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-402, "Diagnosis Procedure"](#).

6. CHECK FUNCTION OF FUEL INJECTOR-III

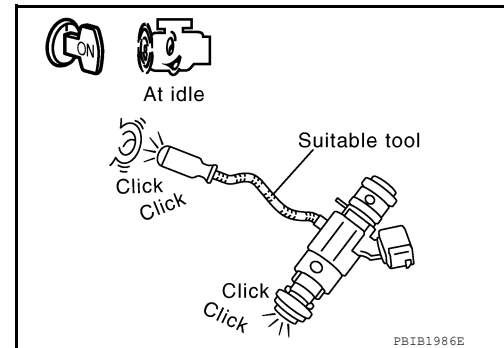
1. Reconnect all harness connector disconnected.
2. Start engine.
3. Listen to fuel injectors No. 2, No. 4, No.6 operating sound.

Clicking noise should exist.

OK or NG

OK >> GO TO 7.

NG >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-402, "Diagnosis Procedure"](#).



7. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse (No.48) in IPDM E/R to release fuel pressure.

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked. Refer to [EM-42, "Removal and Installation"](#).
8. Crank engine for five seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for about three seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

- Never place to the spark plug and the ignition coil within 50cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.

NOTE:

When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

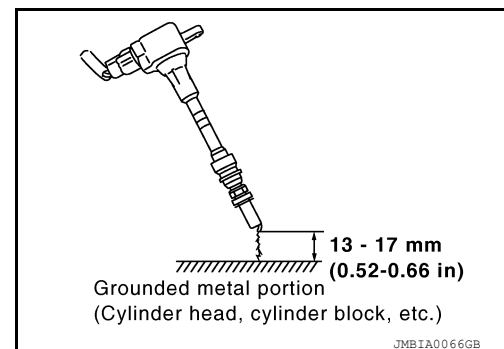
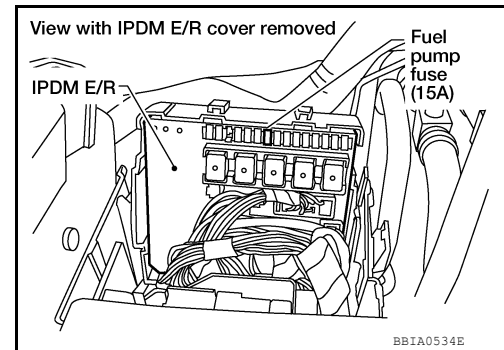
OK or NG

OK >> GO TO 11.

NG >> GO TO 8.

8. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.



P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

2. Disconnect spark plug and connect a known-good spark plug.
3. Crank engine for about three seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

OK or NG

OK >> GO TO 9.

NG >> Check ignition coil, power transistor and their circuits. Refer to [EC-410, "Diagnosis Procedure"](#).

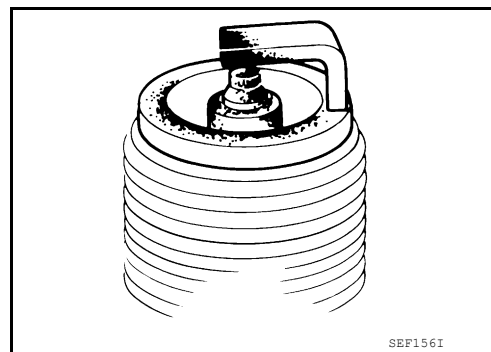
9. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

OK or NG

OK >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-17, "Removal and Installation"](#).

NG >> 1. Repair or clean spark plug.
2. GO TO 10.



10. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for about three seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

OK or NG

OK >> **INSPECTION END**

NG >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-17, "Removal and Installation"](#).

11. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to [EM-23, "Compression Pressure"](#).

OK or NG

OK >> GO TO 12.

NG >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

12. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to [EC-487, "Fuel Pressure Check"](#).
3. Install fuel pressure gauge and check fuel pressure. Refer to [EC-487, "Fuel Pressure Check"](#).

At idle: Approx. 350 kPa (3.57 kg/cm², 51 psi)

OK or NG

OK >> GO TO 14.

NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit (Refer to [EC-402, "Diagnosis Procedure"](#).)
- Fuel pressure regulator (Refer to [EC-487, "Fuel Pressure Check"](#).)
- Fuel lines
- Fuel filter for clogging

>> Repair or replace.

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

14.CHECK IGNITION TIMING

Check the following items. Refer to [EC-20. "Basic Inspection"](#).

Items	Specifications
Target idle speed	625 ± 50 rpm (in P or N position)
Ignition timing	15 ± 5° BTDC (in P or N position)

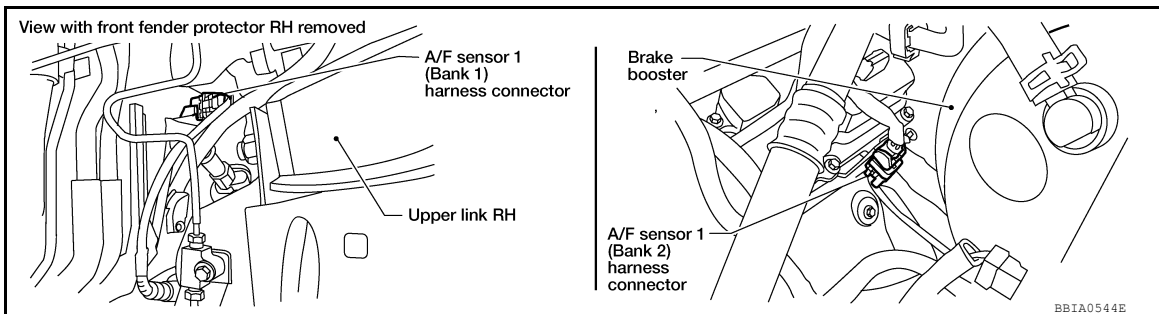
OK or NG

OK >> GO TO 15.

NG >> Follow the [EC-20. "Basic Inspection"](#).

15.CHECK A/F SENSOR 1 INPUT SIGNAL

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.



3. Disconnect ECM harness connector.
4. Check harness continuity between A/F sensor 1 terminal and ECM terminal as follows. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

5. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

6. Also check harness for short to power.

OK or NG

OK >> GO TO 16.

NG >> Repair open circuit or short to ground or short to power in harness or connectors between ECM and A/F sensor 1.

16.CHECK A/F SENSOR 1 HEATER

Refer to [EC-105. "Component Inspection"](#).

OK or NG

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

- OK >> GO TO 18.
NG >> GO TO 17.

17. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to [EX-6, "Exploded View"](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

>> INSPECTION END

18. CHECK MASS AIR FLOW SENSOR

With CONSULT

Check mass air flow sensor signal in "DATA MONITOR" mode with CONSULT.

2.0 - 6.0 g/s: **at idling**
7.0 - 20.0 g/s: **at 2,500 rpm**

With GST

Check mass air flow sensor signal in Service \$01 with GST.

2.0 - 6.0 g/s: **at idling**
7.0 - 20.0 g/s: **at 2,500 rpm**

OK or NG

- OK >> GO TO 19.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to [EC-116, "Component Inspection"](#).

19. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in [EC-475, "Symptom Matrix Chart"](#).

OK or NG

- OK >> GO TO 20.
NG >> Repair or replace.

20. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.

Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to [EC-74, "On Board Diagnosis Function"](#) (Without CONSULT) or [EC-77, "CONSULT Function"](#) (With CONSULT).

>> GO TO 21.

21. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

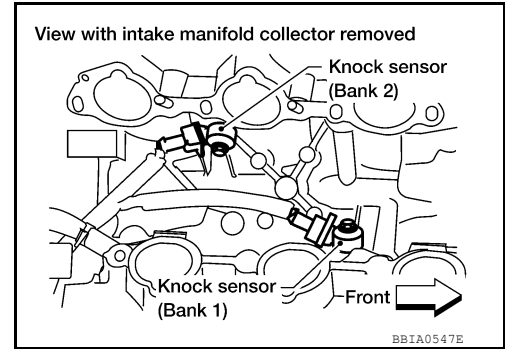
>> INSPECTION END

P0327, P0328, P0332, P0333 KS

Component Description

INFOID:000000007358126

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



On Board Diagnosis Logic

INFOID:000000007358127

The MIL will not illuminate for these diagnoses.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0327 0327 (Bank 1)	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Knock sensor
P0332 0332 (Bank 2)			
P0328 0328 (Bank 1)	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	
P0333 0333 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358128

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

4. Start engine and run it for at least 5 seconds at idle speed.
5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to [EC-216. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358129

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminals 15, 36 and ground. Refer to Wiring Diagram.

NOTE:

It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Resistance: Approximately 532 - 588 kΩ [at 20°C (68°F)]

< DTC/CIRCUIT DIAGNOSIS >

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 2.

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 15 and knock sensor (bank1) terminal 1, ECM terminal 36 and knock sensor (bank 2) terminal 1.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F67, F250
- Harness for open or short between ECM and knock sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK KNOCK SENSOR

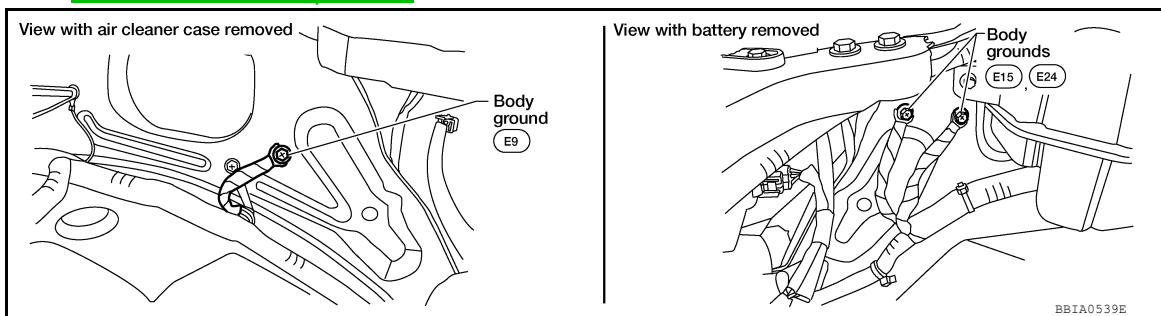
Refer to [EC-218. "Component Inspection"](#).

OK or NG

- OK >> GO TO 5.
- NG >> Replace malfunctioning knock sensor. Refer to [EM-104. "Exploded View"](#).

5. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body.
Refer to [EC-97. "Ground Inspection"](#).



OK or NG

- OK >> GO TO 6.
- NG >> Repair or replace ground connections.

6. CHECK KNOCK SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT

1. Disconnect knock sensor harness connector.
2. Check harness continuity between knock sensor terminal 2 and ground. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.

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7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F67, F250
- Harness connectors F14, E5
- Harness for open or short between knock sensor and ground

>> Repair open circuit or short power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358130

KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

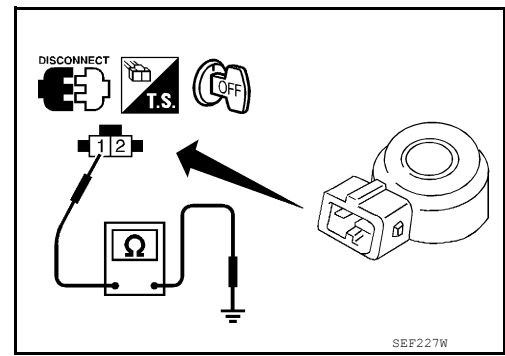
NOTE:

It is necessary to use an ohmmeter which can measure more than 10 M Ω .

Resistance: Approximately 532 - 588 k Ω [at 20°C (68°F)]

CAUTION:

Never use any knock sensors that have been dropped or physically damaged. Use only new ones.



SEP227W

P0335 CKP SENSOR (POS)

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0335 CKP SENSOR (POS)

Component Description

INFOID:000000007358131

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate. It detects the fluctuation of the engine revolution.

The sensor consists of a permanent magnet and Hall IC.

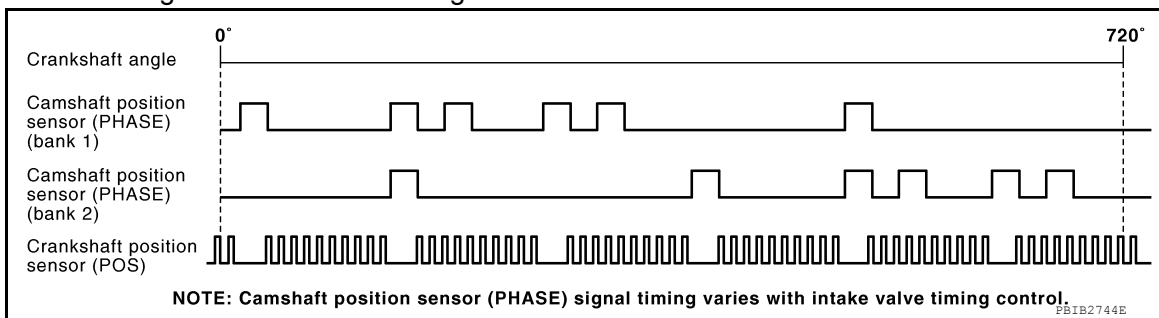
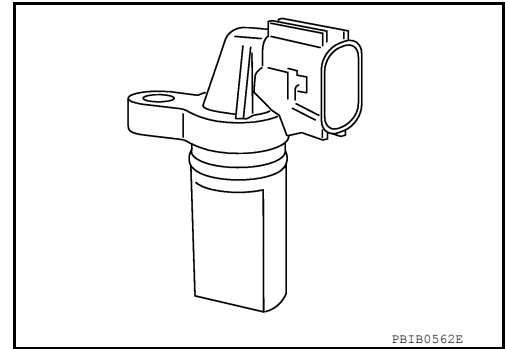
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes.

The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

ECM receives the signals as shown in the figure.



On Board Diagnosis Logic

INFOID:000000007358132

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	<ul style="list-style-type: none"> The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. The crankshaft position sensor (POS) signal is not in the normal pattern during engine running. 	<ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted) Crankshaft position sensor (POS) Signal plate

DTC Confirmation Procedure

INFOID:000000007358133

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.

1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-219, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358134

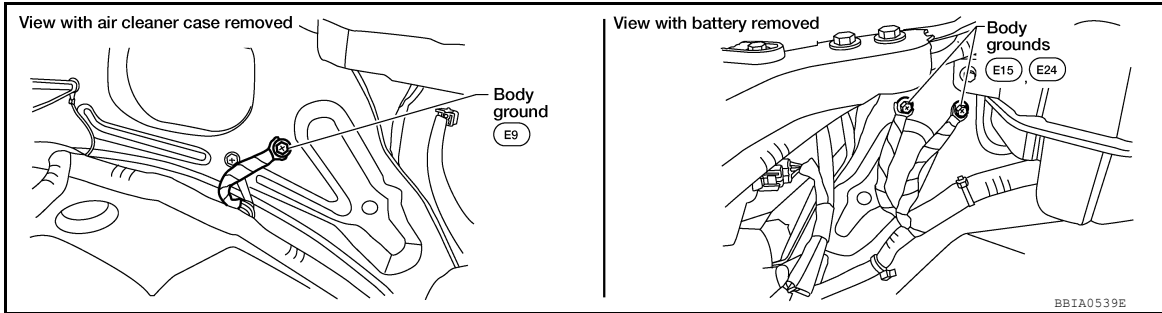
1. CHECK GROUND CONNECTIONS

P0335 CKP SENSOR (POS)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).

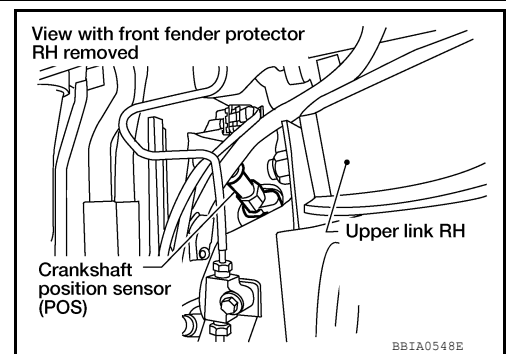


OK or NG

- OK >> GO TO 2.
NG >> Repair or replace ground connections.

2. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT

1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
2. Turn ignition switch ON.

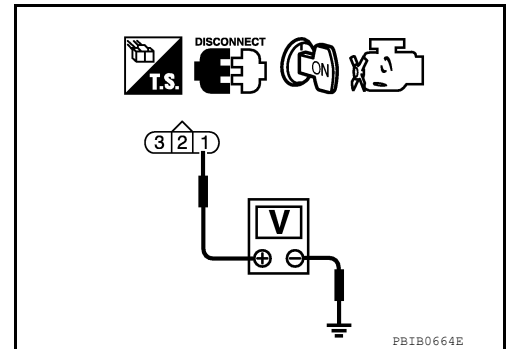


3. Check voltage between CKP sensor (POS) terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F32, E2
- Harness for open or short between crankshaft position sensor (POS) and ECM
- Harness for open or short between crankshaft position sensor (POS) and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between CKP sensor (POS) terminal 3 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

- OK >> GO TO 6.
NG >> GO TO 5.

P0335 CKP SENSOR (POS)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F32, E2
- Harness for open or short between crankshaft position sensor (POS) and ground

>> Repair open circuit or short to power in harness or connectors.

6. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 13 and CKP sensor (POS) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to [EC-221, "Component Inspection"](#).

OK or NG

OK >> GO TO 8.

NG >> Replace crankshaft position sensor (POS). Refer to [EM-72, "Exploded View"](#).

8. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

OK or NG

OK >> GO TO 9.

NG >> Replace the signal plate. Refer to [EM-104, "Exploded View"](#).

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

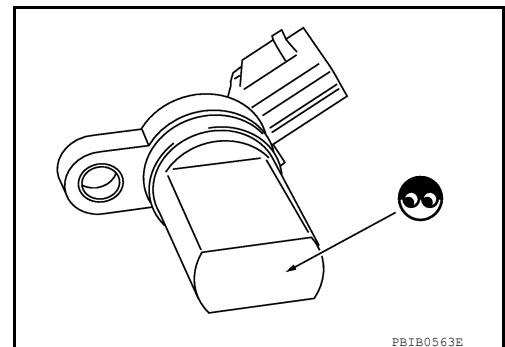
>> **INSPECTION END**

Component Inspection

INFOID:000000007358135

CRANKSHAFT POSITION SENSOR (POS)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor. Refer to [EM-72, "Exploded View"](#).
4. Visually check the sensor for chipping.



PBIB0563E

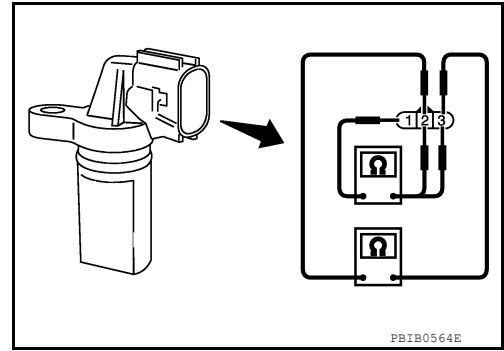
P0335 CKP SENSOR (POS)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
1 (+) - 2 (-)	Except 0 or ∞
1 (+) - 3 (-)	
2 (+) - 3 (-)	



P0340, P0345 CMP SENSOR (PHASE)

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0340, P0345 CMP SENSOR (PHASE)

Component Description

INFOID:000000007358136

The camshaft position sensor (PHASE) senses the retraction of intake valve camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.

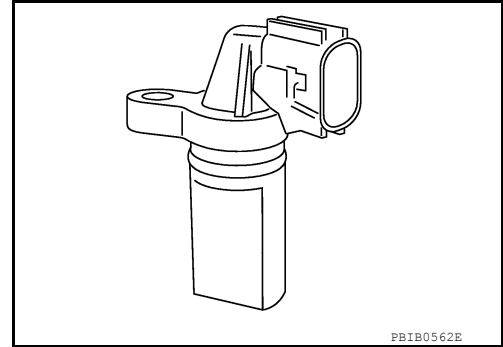
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.

The sensor consists of a permanent magnet and Hall IC.

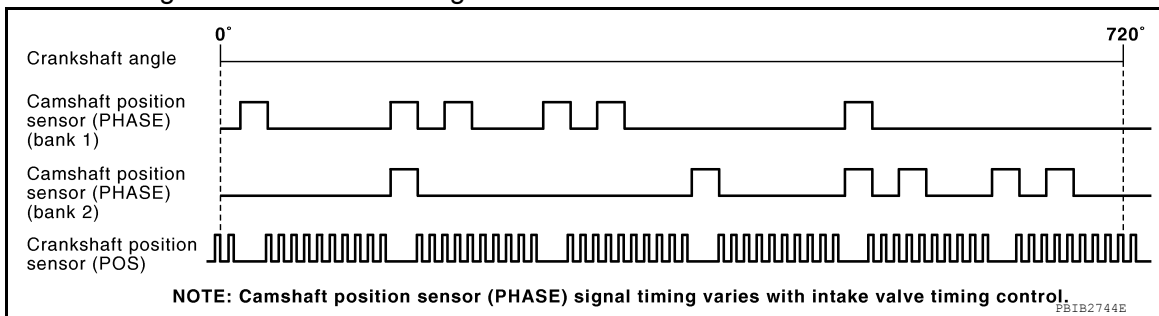
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes. ECM receives the signals as shown in the figure.



PBIB0562E



PBIB2744E

On Board Diagnosis Logic

INFOID:000000007358137

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340 (Bank 1)	Camshaft position sensor (PHASE) circuit	<ul style="list-style-type: none"> The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. The cylinder No. signal is not sent to ECM during engine running. The cylinder No. signal is not in the normal pattern during engine running. 	<ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted) Camshaft position sensor (PHASE) Camshaft (Intake) Starter motor Starting system circuit Dead (Weak) battery
P0345 0345 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358138

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.

1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-224, "Diagnosis Procedure"](#).
If 1st trip DTC is not detected, go to next step.
4. Maintaining engine speed at more than 800 rpm for at least 5 seconds.
5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to [EC-224, "Diagnosis Procedure"](#).

P0340, P0345 CMP SENSOR (PHASE)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

INFOID:000000007358139

Diagnosis Procedure

1. CHECK STARTING SYSTEM

Turn ignition switch to START position.

Does the engine turn over?

Does the starter motor operate?

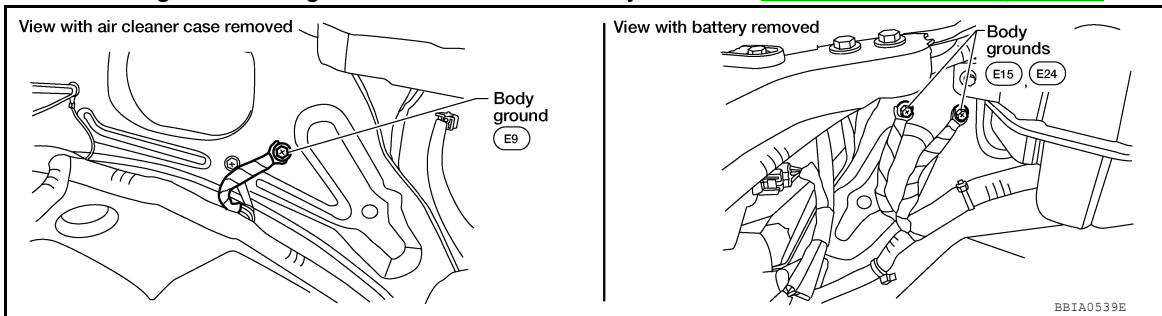
Yes or No

Yes >> GO TO 2.

No >> Check starting system. (Refer to [GI-33. "Work Flow"](#).)

2. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).



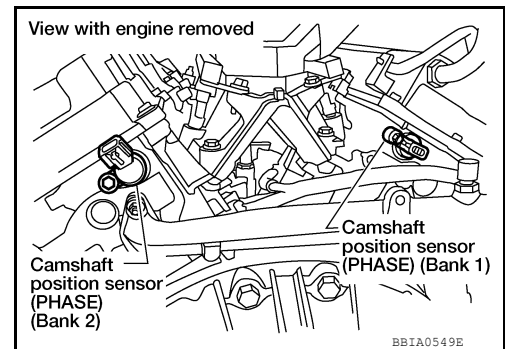
OK or NG

OK >> GO TO 3.

NG >> Repair or replace ground connections.

3. CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch ON.



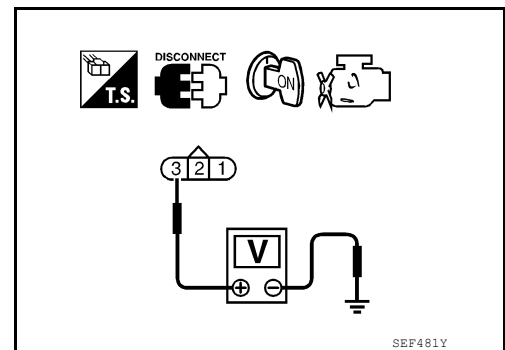
3. Check voltage between CMP sensor (PHASE) terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between camshaft position sensor (PHASE) and ECM

P0340, P0345 CMP SENSOR (PHASE)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Harness for open or short between camshaft position sensor (PHASE) and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between CMP sensor (PHASE) terminal 1 and ground.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F32, E2
- Harness for open or short between CMP sensor (PHASE) and ground

>> Repair open circuit or short to power in harness or connectors.

7. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 33 (bank 1) or 14 (bank 2) and CMP sensor (PHASE) terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to [EC-226. "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace malfunctioning camshaft position sensor (PHASE). Refer to [EM-77. "Exploded View"](#).

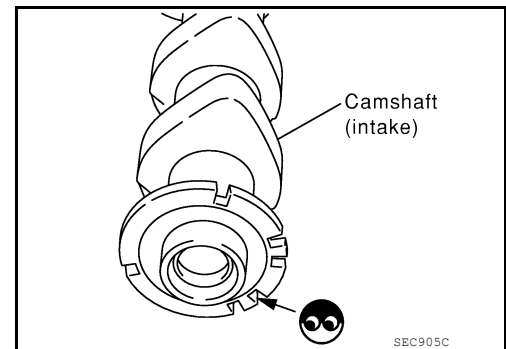
9. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

- OK >> GO TO 10.
- NG >> Remove debris and clean the signal plate of camshaft rear end or replace malfunctioning camshaft. Refer to [EM-78. "Removal and Installation"](#).



10. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

P0340, P0345 CMP SENSOR (PHASE)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

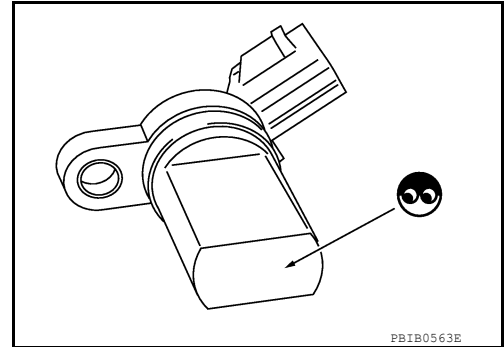
>> INSPECTION END

Component Inspection

INFOID:000000007358140

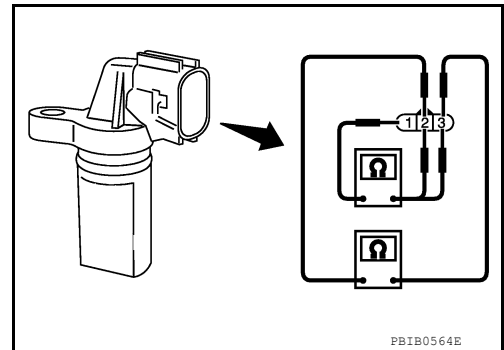
CAMSHAFT POSITION SENSOR (PHASE)

1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor. Refer to [EM-77. "Exploded View"](#).
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
1 (+) - 2 (-)	Except 0 or ∞
1 (+) - 3 (-)	
2 (+) - 3 (-)	



P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0420, P0430 THREE WAY CATALYST FUNCTION

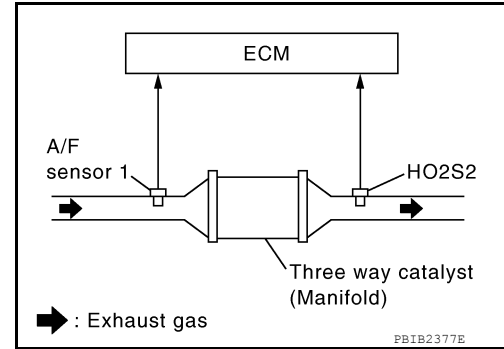
On Board Diagnosis Logic

INFOID:000000007358141

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.

A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.

When the frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420 0420 (Bank 1)	Catalyst system efficiency below threshold	<ul style="list-style-type: none"> • Three way catalyst (manifold) does not operate properly. • Three way catalyst (manifold) does not have enough oxygen storage capacity. 	<ul style="list-style-type: none"> • Three way catalyst (manifold) • Exhaust tube • Intake air leaks • Fuel injector • Fuel injector leaks • Spark plug • Improper ignition timing
P0430 0430 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358142

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Ⓜ WITH CONSULT

TESTING CONDITION:

Never maintain engine speed for more than the specified minutes below.

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches to 70°C (158°F).
9. Open engine hood.
10. Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT.
11. Rev engine between 2,000 and 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
If "INCMP" of "CATALYST" changed to "CMPLT", go to step 12.
12. Wait 5 seconds at idle.
13. Rev engine between 2,000 and 3,000 rpm and maintain it until "INCMP" of "CATALYST" changes to "CMPLT" (It will take approximately 5 minutes).
If not "CMPLT", stop engine and cool it down to less than 70°C (158°F) and then retest from step 1.
14. Select "SELF-DIAG RESULTS" mode with CONSULT.

P0420, P0430 THREE WAY CATALYST FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

15. Confirm that the 1st trip DTC is not detected.

If the 1st trip DTC is detected, go to [EC-228, "Diagnosis Procedure"](#).

Overall Function Check

INFOID:000000007358143

Use this procedure to check the overall function of the three way catalyst (manifold). During this check, a 1st trip DTC might not be confirmed.

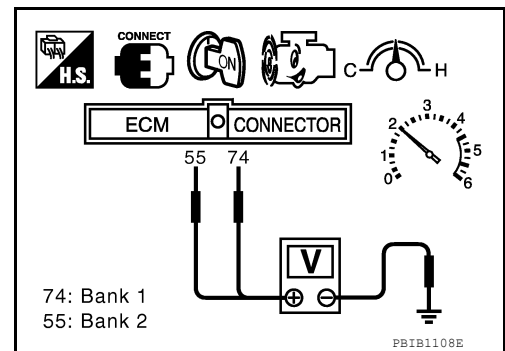
Ⓢ WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Open engine hood.

8. Set voltmeter probe between ECM terminals 74 [HO2S2 (bank 1) signal], 55 [HO2S2 (bank 2) signal] and ground.
9. Keep engine speed at 2,500 rpm constant under no load.
10. Make sure that the voltage does not vary for more than 5 seconds.

If the voltage fluctuation cycle takes less than 5 seconds, go to [EC-228, "Diagnosis Procedure"](#).

- 1 cycle: 0.6 - 1.0 → 0 - 0.3 → 0.6 - 1.0



Diagnosis Procedure

INFOID:000000007358144

1. CHECK EXHAUST SYSTEM

Visually check exhaust tubes and muffler for dent.

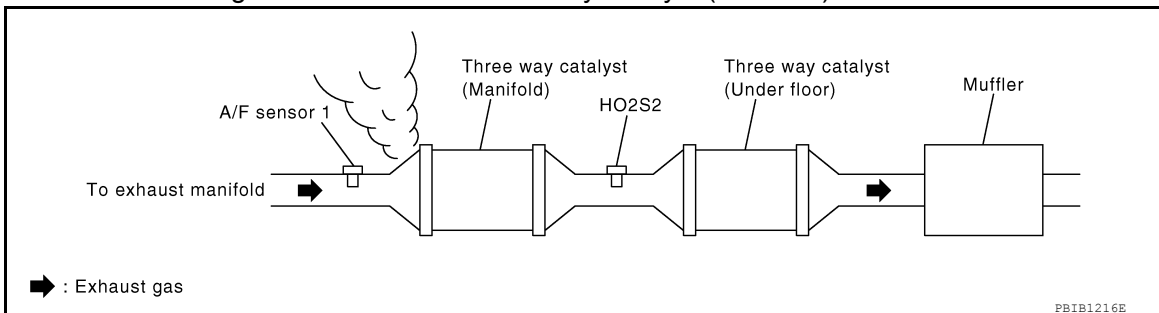
OK or NG

OK >> GO TO 2.

NG >> Repair or replace.

2. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before the three way catalyst (manifold).



OK or NG

OK >> GO TO 3.

NG >> Repair or replace.

3. CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 4.

P0420, P0430 THREE WAY CATALYST FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NG >> Repair or replace.

4. CHECK IGNITION TIMING

Check the following items. Refer to [EC-20, "Basic Inspection"](#).

Items	Specifications
Target idle speed	625 ± 50 rpm (in P or N position)
Ignition timing	15 ± 5° BTDC (in P or N position)

OK or NG

OK >> GO TO 5.

NG >> Follow the [EC-20, "Basic Inspection"](#).

5. CHECK FUEL INJECTOR

1. Stop engine and then turn ignition switch ON.
2. Check voltage between ECM terminals 21, 22, 23, 40, 41, 42 and ground with CONSULT or tester.

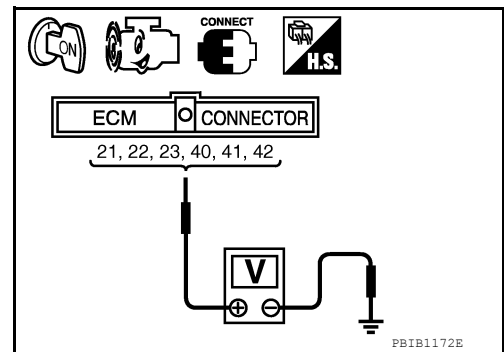
Refer to Wiring Diagram for FUEL INJECTOR, [EC-455, "Wiring Diagram"](#).

Battery voltage should exist.

OK or NG

OK >> GO TO 6.

NG >> Perform [EC-402, "Diagnosis Procedure"](#).



6. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse (No.48) in IPDM E/R to release fuel pressure.

NOTE:

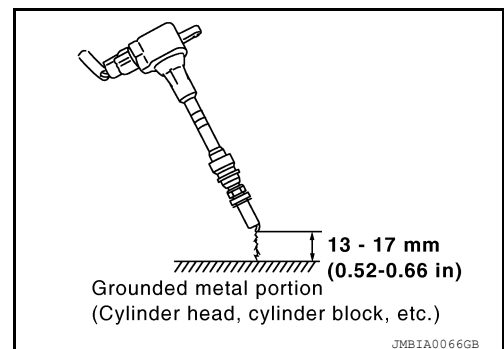
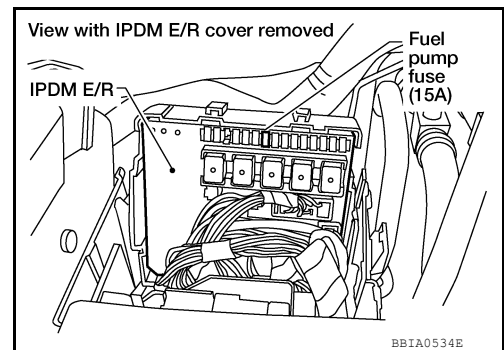
Never use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked. Refer to [EM-42, "Removal and Installation"](#).
8. Crank engine for five seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for about three seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

- Never place to the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.



P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

- It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.

NOTE:

When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

OK or NG

- OK >> GO TO 10.
NG >> GO TO 7.

7. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a known-good spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

OK or NG

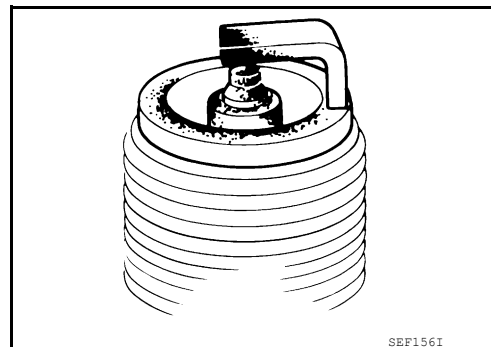
- OK >> GO TO 8.
NG >> Check ignition coil, power transistor and their circuits. Refer to [EC-410](#).

8. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

OK or NG

- OK >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-17, "Removal and Installation"](#).
NG >> 1. Repair or clean spark plug.
2. GO TO 9.



9. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

OK or NG

- OK >> **INSPECTION END**
NG >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-17, "Removal and Installation"](#).

10. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Remove fuel injector assembly.
Refer to [EM-47, "Removal and Installation"](#).
Keep fuel hose and all fuel injectors connected to fuel tube.
3. Reconnect all fuel injector harness connectors.
4. Disconnect all ignition coil harness connectors.
5. Turn ignition switch ON.
Check that fuel does not drip from fuel injector.

OK or NG

- OK (Does not drip.)>>GO TO 11.
NG (Drips.)>>Replace the fuel injector(s) from which fuel is dripping. Refer to [EM-47, "Removal and Installation"](#).

11. CHECK INTERMITTENT INCIDENT

P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Refer to [GI-37. "Intermittent Incident"](#).

A

Trouble is fixed.>>**INSPECTION END**

Trouble is not fixed.>>Replace three way catalyst (manifold). Refer to [EM-33. "Removal and Installation \(Exhaust Manifold\)"](#).

EC

C

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P

P0441 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

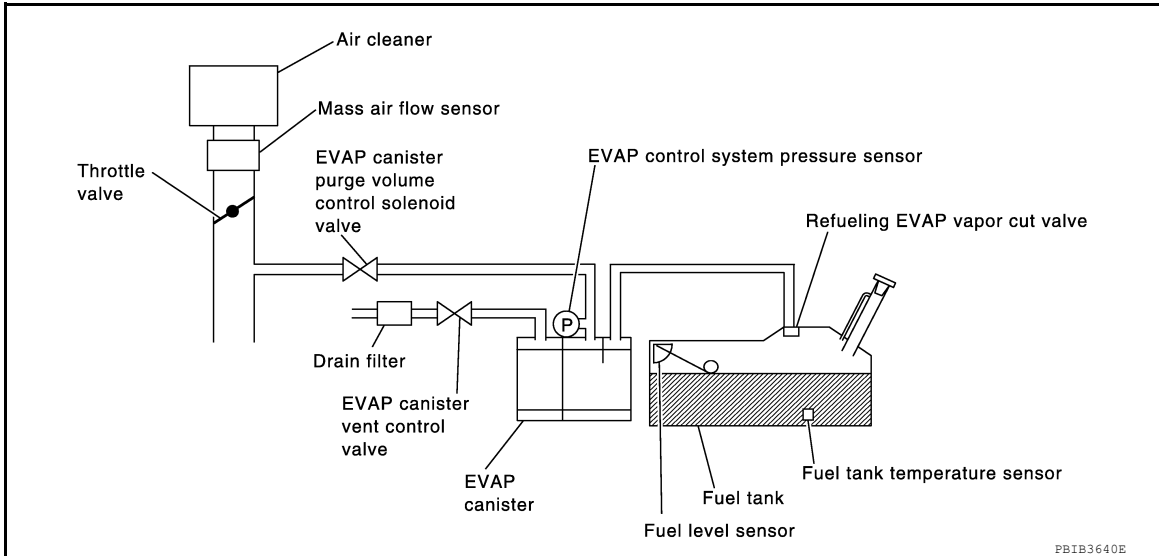
P0441 EVAP CONTROL SYSTEM

System Description

INFOID:000000007358145

NOTE:

If DTC P0441 is displayed with other DTC such as P2122, P2123, P2127, P2128 or P2138, first perform trouble diagnosis for other DTC.



In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

On Board Diagnosis Logic

INFOID:000000007358146

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a malfunction is determined.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0441 0441	EVAP control system incorrect purge flow	EVAP control system does not operate properly, EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.	<ul style="list-style-type: none"> • EVAP canister purge volume control solenoid valve stuck closed • EVAP control system pressure sensor and the circuit • Loose, disconnected or improper connection of rubber tube • Blocked rubber tube • Cracked EVAP canister • EVAP canister purge volume control solenoid valve circuit • Accelerator pedal position sensor • Blocked purge port • EVAP canister vent control valve • Drain filter

DTC Confirmation Procedure

INFOID:000000007358147

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.

P0441 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and let it idle for at least 70 seconds.
6. Select "PURG FLOW P0441" of "EVAPORATIVE SYSTEM" in "DTC CONFIRMATION" mode with CONSULT.
7. Touch "START".
If "COMPLETED" is displayed, go to step 7.
8. When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 35 seconds.)

Selector lever	Suitable position
VHCL SPEED SE	32 - 120 km/h (20 - 75 MPH)
ENG SPEED	500 - 3,000 rpm
B/FUEL SCHDL	1.3 - 9.0 msec
COOLAN TEMP/S	More than 0 °C (32 °F)

If "TESTING" does not change for a long time, retry from step 2.

9. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to [EC-233, "Diagnosis Procedure"](#).

Overall Function Check

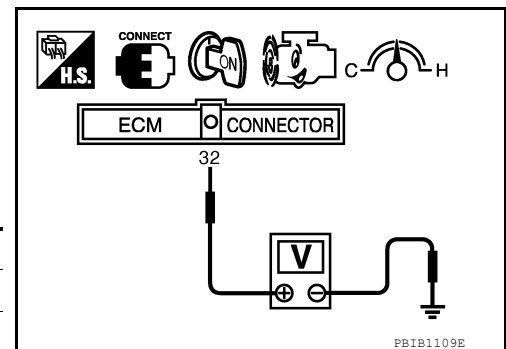
INFOID:000000007358148

Use this procedure to check the overall monitoring function of the EVAP control system purge flow monitoring. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Lift up drive wheels.
2. Start engine (TCS switch or VDC switch OFF) and warm it up to normal operating temperature.
3. Turn ignition switch OFF, wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF, wait at least 10 seconds.
6. Start engine and wait at least 70 seconds.
7. Set voltmeter probes to ECM terminals 32 (EVAP control system pressure sensor signal) and ground.
8. Check EVAP control system pressure sensor value at idle speed and note it.
9. Establish and maintain the following conditions for at least 1 minute.

Air conditioner switch	ON
Headlamp switch	ON
Rear window defogger switch	ON
Engine speed	Approx. 3,000 rpm
Gear position	Any position other than P, N or R



10. Verify that EVAP control system pressure sensor value stays 0.1V less than the value at idle speed (measured at step 6) for at least 1 second.
11. If NG, go to [EC-233, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358149

1. CHECK EVAP CANISTER

P0441 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.
2. Check EVAP canister for cracks.

OK or NG

OK (With CONSULT)>>GO TO 2.

OK (Without CONSULT)>>GO TO 3.

NG >> Replace EVAP canister. Refer to [FL-16, "Removal and Installation"](#).

2.CHECK PURGE FLOW

With CONSULT

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge. For the location of EVAP service port, refer to [EC-57, "Description"](#).
2. Start engine and let it idle.
3. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT.
4. Rev engine up to 2,000 rpm.
5. Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL CONT/V" opening and check vacuum existence.

PURG VOL CONT/V	Vacuum
100%	Should exist.
0%	Should not exist.

OK or NG

OK >> GO TO 7.

NG >> GO TO 4.

3.CHECK PURGE FLOW

Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge. For the location of EVAP service port, refer to [EC-57, "Description"](#).
4. Start engine and let it idle.
Do not depress accelerator pedal even slightly.
5. Check vacuum gauge indication before 60 seconds pass after starting engine.

Vacuum should not exist.

6. Rev engine up to 2,000 rpm after 100 seconds pass after starting engine.

Vacuum should exist.

OK or NG

OK >> GO TO 7.

NG >> GO TO 4.

4.CHECK EVAP PURGE LINE

1. Turn ignition switch OFF.
2. Check EVAP purge line for improper connection or disconnection.
Refer to [EC-57, "Description"](#).

OK or NG

OK >> GO TO 5.

NG >> Repair it.

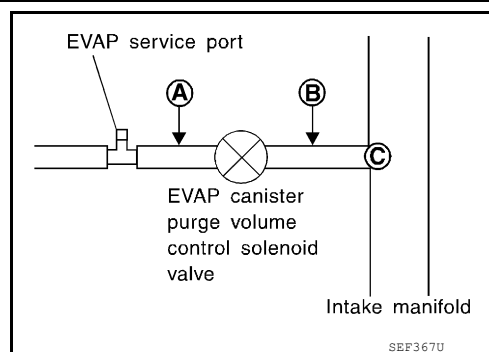
5.CHECK EVAP PURGE HOSE AND PURGE PORT

P0441 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

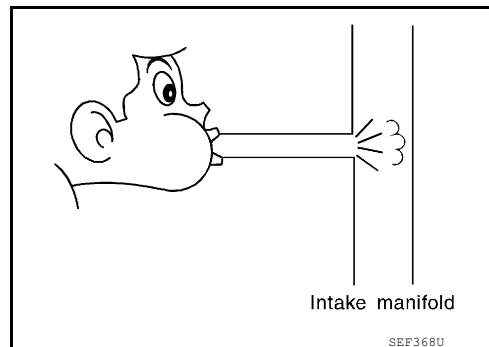
1. Disconnect purge hoses connected to EVAP service port (A) and EVAP canister purge volume control solenoid valve (B).
2. Blow air into each hose and EVAP purge port (C).



3. Check that air flows freely.

OK or NG

- OK (With CONSULT)>>GO TO 6.
- OK (Without CONSULT)>>GO TO 7.
- NG >> Repair or clean hoses and/or purge port.



6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-252, "Component Inspection"](#).

OK or NG

- OK >> GO TO 8.
- NG >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-27, "Exploded View"](#).

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

- OK >> GO TO 9.
- NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to [EC-266, "DTC Confirmation Procedure"](#) for DTC P0452, [EC-270, "DTC Confirmation Procedure"](#) for P0453.

OK or NG

- OK >> GO TO 10.
- NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

10. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.

P0441 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 11.

NG >> Clean the rubber tube using an air blower.

11. CHECK DRAIN FILTER

Refer to [EC-236, "Component Inspection"](#).

OK or NG

OK >> GO TO 10.

NG >> Replace drain filter. Refer to [EC-57, "Description"](#).

12. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to [EC-255, "Component Inspection"](#).

OK or NG

OK >> GO TO 13.

NG >> Replace EVAP canister vent control valve. Refer to [FL-16, "Removal and Installation"](#).

13. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.

Refer to [EC-57, "Description"](#).

OK or NG

OK >> GO TO 14.

NG >> Replace it.

14. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 15.

15. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

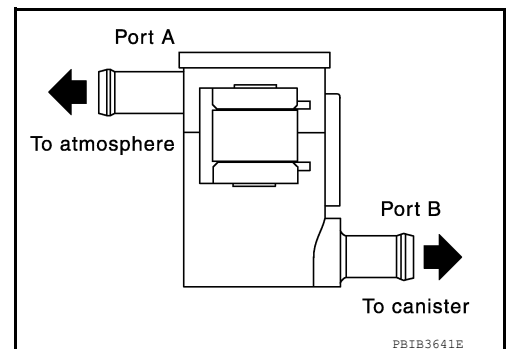
>> **INSPECTION END**

Component Inspection

INFOID:000000007358150

DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter. Refer to [EC-57, "Description"](#).



P0442 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

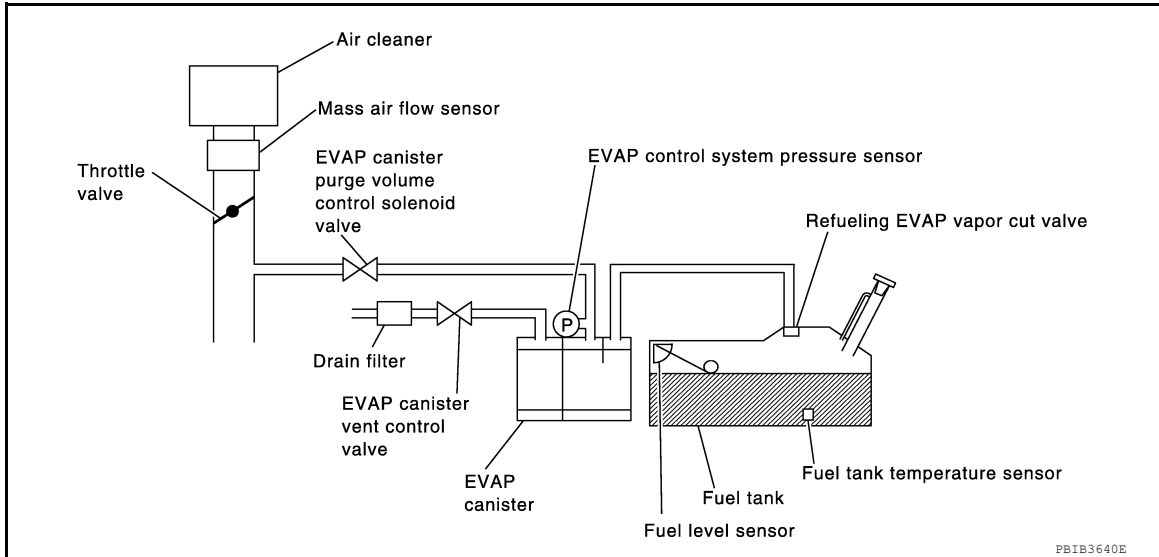
[VQ40DE]

P0442 EVAP CONTROL SYSTEM

On Board Diagnosis Logic

INFOID:000000007358151

This diagnosis detects leaks in the EVAP purge line using engine intake manifold vacuum. If pressure does not increase, the ECM will check for leaks in the line between the fuel tank and EVAP canister purge volume control solenoid valve, under the following Vacuum test conditions. The EVAP canister vent control valve is closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve will then be opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid valve will be closed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0442 0442	EVAP control system small leak detected (negative pressure)	EVAP control system has a leak, EVAP control system does not operate properly.	<ul style="list-style-type: none"> • Incorrect fuel tank vacuum relief valve • Incorrect fuel filler cap used • Fuel filler cap remains open or fails to close. • Foreign matter caught in fuel filler cap. • Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. • Foreign matter caught in EVAP canister vent control valve. • EVAP canister or fuel tank leaks • EVAP purge line (pipe and rubber tube) leaks • EVAP purge line rubber tube bent • Loose or disconnected rubber tube • EVAP canister vent control valve and the circuit • EVAP canister purge volume control solenoid valve and the circuit • Fuel tank temperature sensor • O-ring of EVAP canister vent control valve is missing or damaged • Drain filter • EVAP canister is saturated with water • EVAP control system pressure sensor • Fuel level sensor and the circuit • Refueling EVAP vapor cut valve • ORVR system leaks

CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.
- If the fuel filler cap is not tightened properly, the MIL may illuminate.
- Use only a genuine NISSAN rubber tube as a replacement.

P0442 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

DTC Confirmation Procedure

INFOID:000000007358152

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Perform "DTC WORK SUPPORT" when the fuel level is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.
- Always perform test at a temperature of 0 to 30°C (32 to 86°F).

CONSULT WITH CONSULT

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
4. Make sure that the following conditions are met.
COOLANT TEMP/S: 0 - 70°C (32 - 158°F)
INT/A TEMP SE: 0 - 30°C (32 - 86°F)
5. Select "EVP V/S LEAK P0456/P1456" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
Follow the instructions displayed.

NOTE:

If the engine speed cannot be maintained within the range displayed on the CONSULT screen, go to [EC-20, "Basic Inspection"](#).

6. Make sure that "OK" is displayed.
If "NG" is displayed, refer to [EC-238, "Diagnosis Procedure"](#).

NOTE:

Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

GST WITH GST

NOTE:

Be sure to read the explanation of Driving Pattern ON [EC-29, "SRT Set Driving Pattern"](#) before driving vehicle.

1. Start engine.
2. Drive vehicle according to Driving Pattern, [EC-71, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).
3. Stop vehicle.
4. Turn ignition switch OFF, wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
7. Select Service \$07 with GST.
 - If P0442 is displayed on the screen, go to [EC-238, "Diagnosis Procedure"](#).
 - If P0441 is displayed on the screen, go to [EC-233, "Diagnosis Procedure"](#).

Diagnosis Procedure

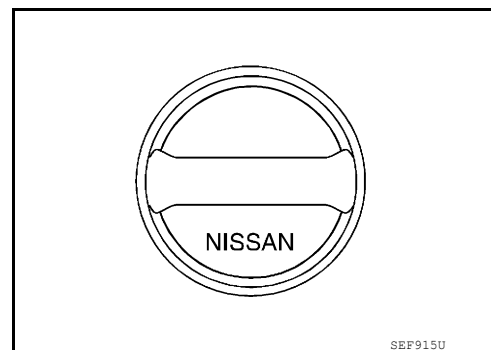
INFOID:000000007358153

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

- OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap. Refer to [FL-6, "Removal and Installation"](#).



SEP915U

P0442 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.

- NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to [EC-243, "Component Inspection"](#).

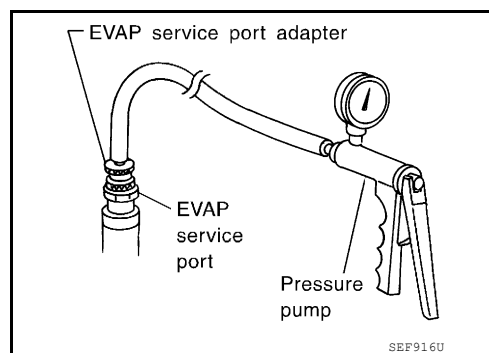
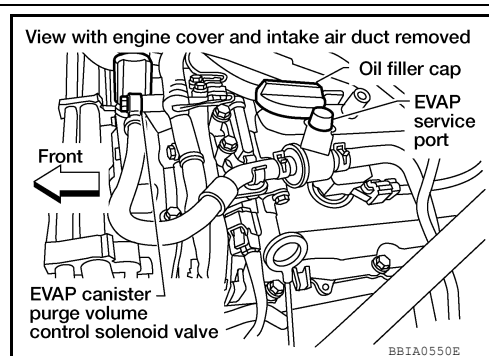
OK or NG

OK >> GO TO 5.

NG >> Replace fuel filler cap with a genuine one. Refer to [FL-6, "Removal and Installation"](#).

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely. For the location of EVAP service port, refer to [EC-57, "Description"](#).



NOTE:

Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.

With CONSULT>>GO TO 6.

Without CONSULT>>GO TO 7.

6. CHECK FOR EVAP LEAK

With CONSULT

1. Turn ignition switch ON.
2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

CAUTION:

P0442 EVAP CONTROL SYSTEM

[VQ40DE]

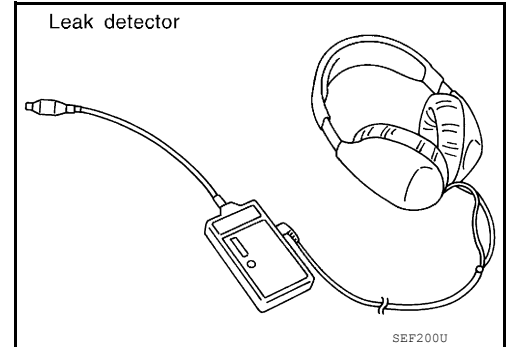
< DTC/CIRCUIT DIAGNOSIS >

- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to [EC-57. "Description"](#).

OK or NG

- OK >> GO TO 8.
NG >> Repair or replace.



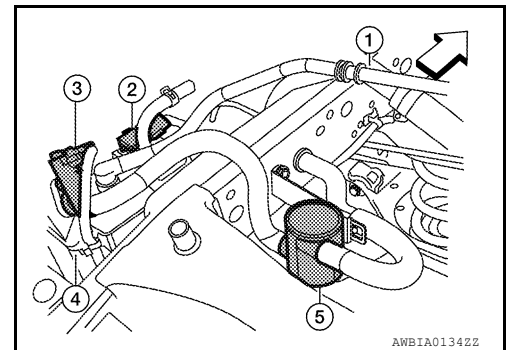
7. CHECK FOR EVAP LEAK

Without CONSULT

1. Turn ignition switch OFF.
2. Apply 12 volts DC to EVAP canister vent control valve (3). The valve will close. (Continue to apply 12 volts until the end of test.)
 - Fuel filler pipe (top of frame view) (1)
 - EVAP control system pressure sensor (2)
 - EVAP canister (4)
 - Drain filter (5)
 - ⇐: Vehicle front
3. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

CAUTION:

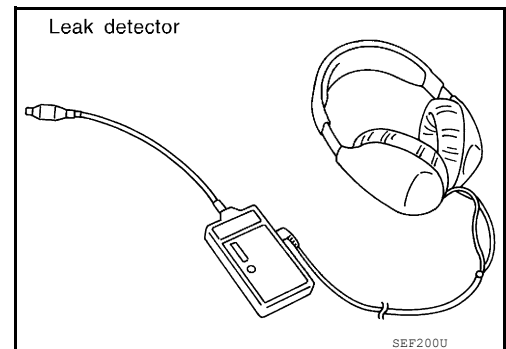
- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to [EC-57. "Description"](#).

OK or NG

- OK >> GO TO 8.
NG >> Repair or replace.



8. CHECK DRAIN FILTER

Refer to [EC-243. "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
NG >> Replace drain filter. Refer to [EC-57. "Description"](#).

9. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

- EVAP canister vent control valve is installed properly. Refer to [FL-16. "Removal and Installation"](#).
- EVAP canister vent control valve. Refer to [EC-255. "Component Inspection"](#).

OK or NG

- OK >> GO TO 10.

P0442 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NG >> Repair or replace EVAP canister vent control valve and O-ring. Refer to [FL-16. "Removal and Installation"](#).

10. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

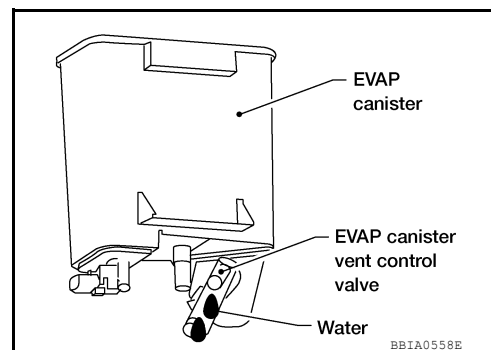
1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16. "Removal and Installation"](#).
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 11.

No (With CONSULT)>>GO TO 13.

No (Without CONSULT)>>GO TO 14.



11. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

OK (With CONSULT)>>GO TO 13.

OK (Without CONSULT)>>GO TO 14.

NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and drain filter for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-16. "Removal and Installation"](#).

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

1. Disconnect vacuum hose from EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qu" on CONSULT screen to increase "PURG VOL CONT/V" opening to 100%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

OK or NG

OK >> GO TO 17.

NG >> GO TO 15.

14. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose from EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 16.

NG >> GO TO 15.

P0442 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

15. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to [EC-57, "Description"](#).

OK or NG

OK >> GO TO 16.

NG >> Repair or reconnect the hose.

16. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-252, "Component Inspection"](#).

OK or NG

OK >> GO TO 17.

NG >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-27, "Exploded View"](#).

17. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to [EC-201, "Component Inspection"](#).

OK or NG

OK >> GO TO 18.

NG >> Replace fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).

18. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-269, "Component Inspection"](#).

OK or NG

OK >> GO TO 19.

NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

19. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.

Refer to [EC-57, "Description"](#).

OK or NG

OK >> GO TO 20.

NG >> Repair or reconnect the hose.

20. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 21.

21. CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kinks, looseness and improper connection. For location, refer to [EC-416, "System Description"](#).

OK or NG

OK >> GO TO 22.

NG >> Repair or replace hoses and tubes.

22. CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kinks, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 23.

NG >> Repair or replace hose, tube or filler neck tube.

23. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to [EC-419, "Component Inspection"](#).

OK or NG

OK >> GO TO 24.

NG >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6, "Removal and Installation"](#).

24. CHECK FUEL LEVEL SENSOR

Refer to [MWI-35, "Component Inspection"](#).

OK or NG

OK >> GO TO 25.

NG >> Replace fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).

25. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

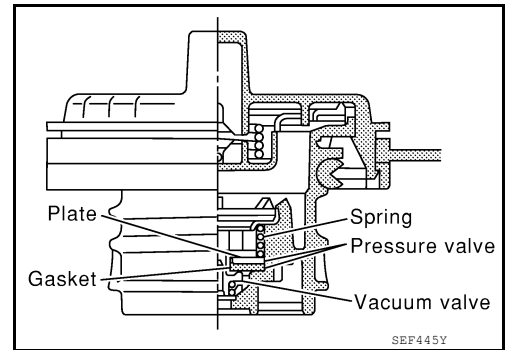
>> **INSPECTION END**

Component Inspection

INFOID:000000007358154

FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.



2. Check valve opening pressure and vacuum.

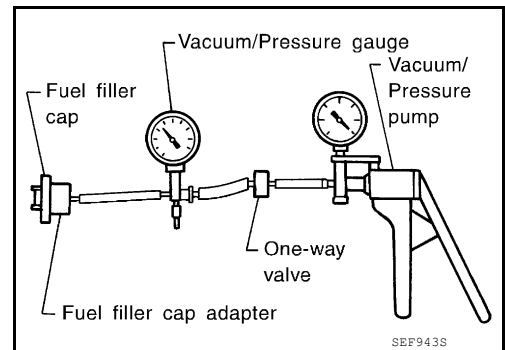
Pressure: 15.3 - 20.0 kPa (0.156 - 0.204 kg/cm², 2.22 - 2.90 psi)

Vacuum: -6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm², -0.87 to -0.48 psi)

3. If out of specification, replace fuel filler cap as an assembly. Refer to [FL-6, "Removal and Installation"](#).

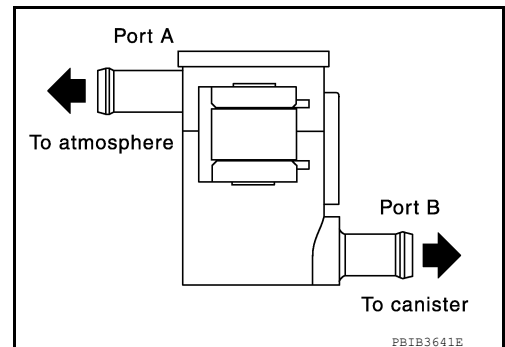
CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.



DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter. Refer to [EC-57, "Description"](#).



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P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

INFOID:000000007358155

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	EVAP canister purge flow control	EVAP canister purge vol- ume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
Wheel sensor	Vehicle speed*2		

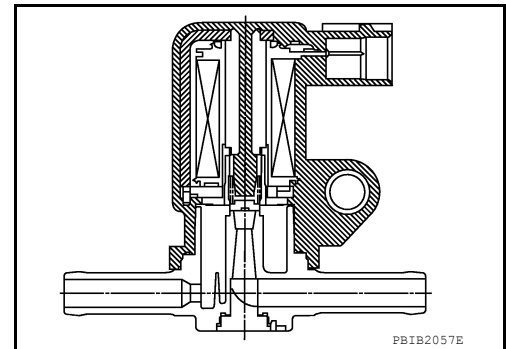
*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to the ECM through CAN communication line.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve is used to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



On Board Diagnosis Logic

INFOID:000000007358156

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0443 0443	EVAP canister purge volume control solenoid valve	A The canister purge flow is detected during the vehicle is stopped while the engine is running, even when EVAP canister purge volume control solenoid valve is completely closed.	<ul style="list-style-type: none"> • EVAP control system pressure sensor • EVAP canister purge volume control solenoid valve (EVAP canister purge volume control solenoid valve is stuck open.) • EVAP canister vent control valve • Drain filter • EVAP canister • Hoses (Hoses are connected incorrectly or clogged.)
		B The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.	

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

DTC Confirmation Procedure

INFOID:000000007358157

Perform **PROCEDURE FOR MALFUNCTION A** first.

If the DTC cannot be confirmed, perform **PROCEDURE FOR MALFUNCTION B**.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A

TESTING CONDITION:

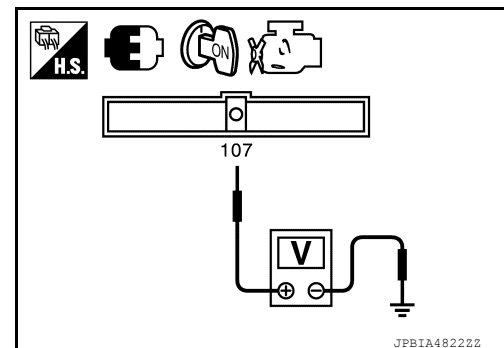
- Perform "DTC Confirmation Procedure" when the fuel level is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.
- Always perform test at a temperature of 5 to 60°C (41 to 140°F).
- Cool the vehicle so that engine coolant temperature becomes same level as ambient temperature.

With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Check that the following condition are met.
FUEL T/TMP SE: 0 – 35°C (32 – 95°F)
3. Start engine and wait at least 60 seconds.
4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to [EC-246. "Diagnosis Procedure"](#).

With GST

1. Turn ignition switch ON.
2. Set voltmeter probes to ECM terminal 107 (FTT sensor signal) and ground.
3. Check that the voltage is 3.1 – 4.2 V.
4. Start engine and wait at least 60 seconds.
5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to [EC-246. "Diagnosis Procedure"](#).



PROCEDURE FOR MALFUNCTION B

NOTE:

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Select "PURG VOL CN/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
5. Touch "START".
6. Start engine and let it idle until "TESTING" on CONSULT changes to "COMPLETED". (It will take approximately 10 seconds.)
If "TESTING" is not displayed after 5 minutes, retry from step 2.
7. Check that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to [EC-246. "Diagnosis Procedure"](#).

With GST

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

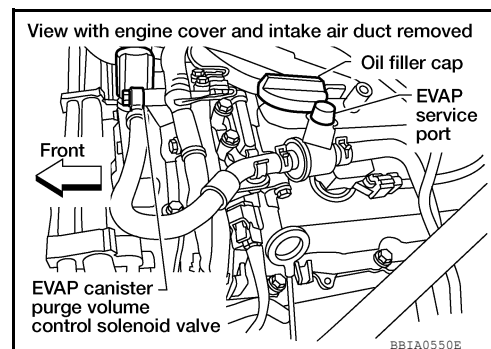
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and let it idle for at least 20 seconds.
4. Select Service \$07 with GST.
5. If 1st trip DTC is detected, go to [EC-246, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358158

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch ON.

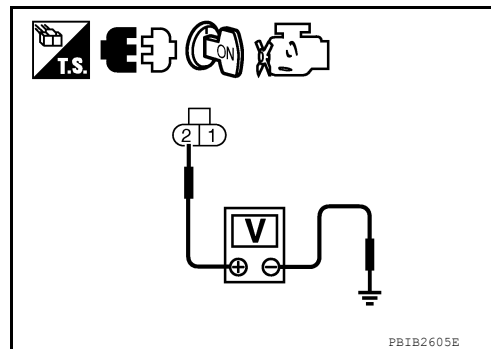


4. Check voltage between EVAP canister purge volume control solenoid valve terminal 2 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 45 and EVAP canister purge volume control solenoid valve terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.

NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-269, "Component Inspection"](#).

OK or NG

OK (With CONSULT)>>GO TO 6.

OK (Without CONSULT)>>GO TO 7.

NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

 **With CONSULT**

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Start engine.
4. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 8.

NG >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-248, "Component Inspection"](#).

OK or NG

OK >> GO TO 8.

NG >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-27, "Exploded View"](#).

8. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 9.

NG >> Clean the rubber tube using an air blower.

9. CHECK DRAIN FILTER

Refer to [EC-243, "Component Inspection"](#).

OK or NG

OK >> GO TO 10.

NG >> Replace drain filter. Refer to [EC-57, "Description"](#).

10. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to [EC-255, "Component Inspection"](#).

OK or NG

OK >> GO TO 11.

NG >> Replace EVAP canister vent control valve. Refer to [FL-16, "Removal and Installation"](#).

11. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16, "Removal and Installation"](#).

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

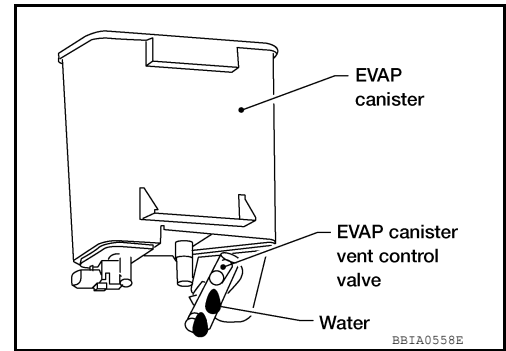
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check if water will drain from the EVAP canister.

Yes or No

- Yes >> GO TO 12.
- No >> GO TO 14.



12. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

- OK >> GO TO 14.
- NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and drain filter for clogging or poor connection

>> Repair hose or replace EVAP canister.

14. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

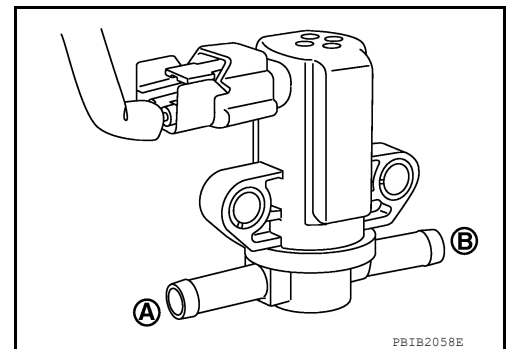
INFOID:000000007358159

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Ⓟ With CONSULT

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition (PURG VOL CONT/V value)	Air passage continuity between (A) and (B)
100%	Yes
0%	No



ⓧ Without CONSULT

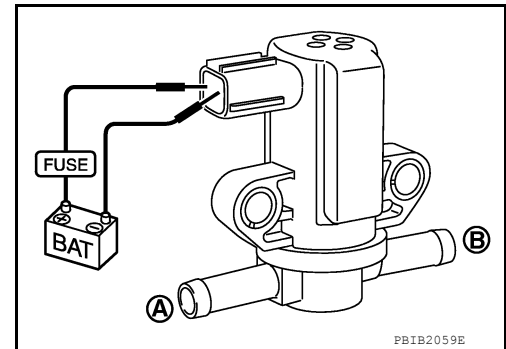
P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

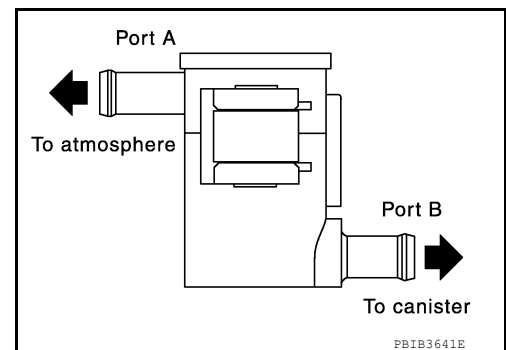
Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals 1 and 2	Yes
No supply	No



DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter. Refer to [EC-57. "Description"](#).



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P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

INFOID:000000007358160

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed* ¹	EVAP canister purge flow control	EVAP canister purge vol- ume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage* ¹		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
Wheel sensor	Vehicle speed* ²		

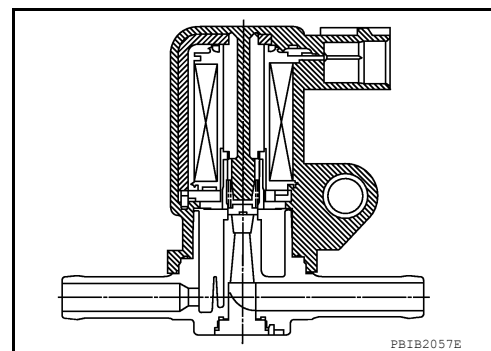
*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to the ECM through CAN communication line.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



On Board Diagnosis Logic

INFOID:000000007358161

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444 0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve	<ul style="list-style-type: none"> Harness or connectors (The solenoid valve circuit is open or shorted.) EVAP canister purge volume control solenoid valve
P0445 0445	EVAP canister purge volume control solenoid valve circuit shorted	An excessively high voltage signal is sent to ECM through the valve	<ul style="list-style-type: none"> Harness or connectors (The solenoid valve circuit is shorted.) EVAP canister purge volume control solenoid valve

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

DTC Confirmation Procedure

INFOID:000000007358162

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11V at idle.

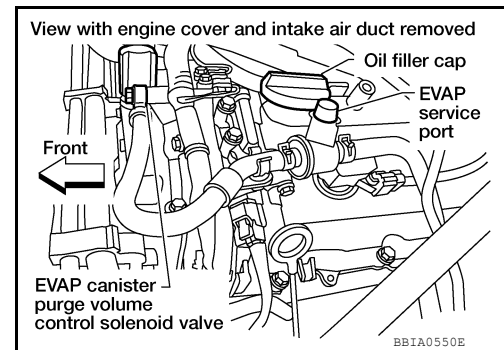
1. Start engine and let it idle for at least 13 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-251. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358163

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch ON.

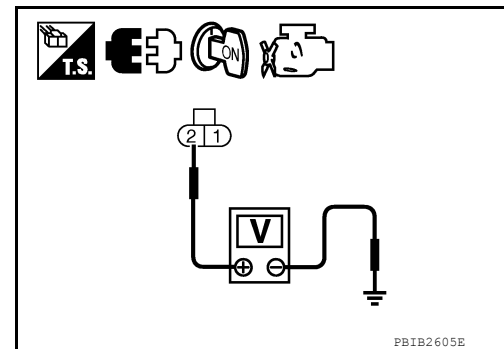


4. Check voltage between EVAP canister purge volume control solenoid valve terminal 2 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 45 and EVAP canister purge volume control solenoid valve terminal 1. Refer to Wiring Diagram.

Continuity should exist.

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Also check harness for short to ground and short to power.

OK or NG

OK (With CONSULT)>>GO TO 4.

OK (Without CONSULT)>>GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

1. Reconnect all harness connectors disconnected.

2. Start engine.

3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

5.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-252, "Component Inspection"](#).

OK or NG

OK >> GO TO 6.

NG >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-27, "Exploded View"](#).

6.CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

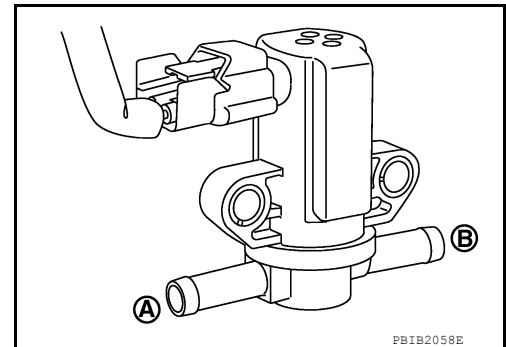
INFOID:000000007358164

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

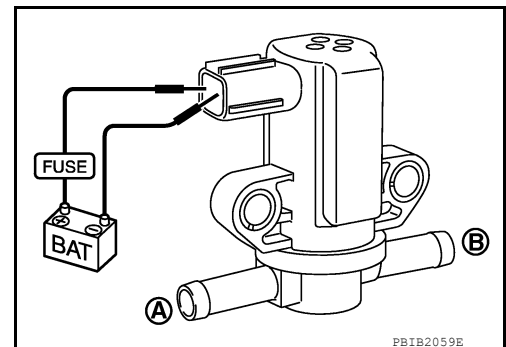
Condition (PURG VOL CONT/V value)	Air passage continuity between (A) and (B)
100%	Yes
0%	No



Without CONSULT

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals 1 and 2	Yes
No supply	No



P0447 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0447 EVAP CANISTER VENT CONTROL VALVE

Component Description

INFOID:000000007358165

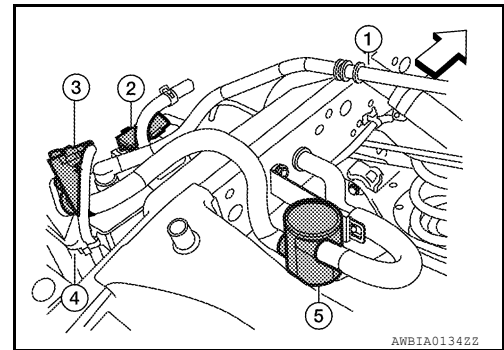
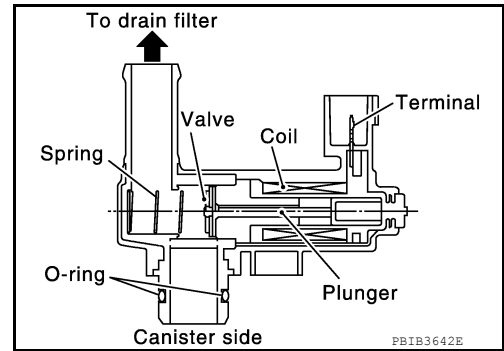
The EVAP canister vent control valve (3) is located on the EVAP canister (4) and is used to seal the canister vent.

This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows EVAP Control System diagnosis.

- Fuel filler pipe (top of frame view) (1)
- EVAP control system pressure sensor (2)
- Drain filter (5)
- ⇐: Vehicle front



On Board Diagnosis Logic

INFOID:000000007358166

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0447 0447	EVAP canister vent control valve circuit open	An improper voltage signal is sent to ECM through EVAP canister vent control valve.	<ul style="list-style-type: none"> • Harness or connectors (The valve circuit is open or shorted.) • EVAP canister vent control valve • Drain filter

DTC Confirmation Procedure

INFOID:000000007358167

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11V at idle.

1. Start engine and wait at least 8 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-253, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358168

1. INSPECTION START

Do you have CONSULT?

Yes or No

Yes >> GO TO 2.

P0447 EVAP CANISTER VENT CONTROL VALVE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

No >> GO TO 3.

2. CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT

1. Turn ignition switch OFF and then ON.
2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.
3. Touch "ON/OFF" on CONSULT screen.
4. Check for operating sound of the valve.

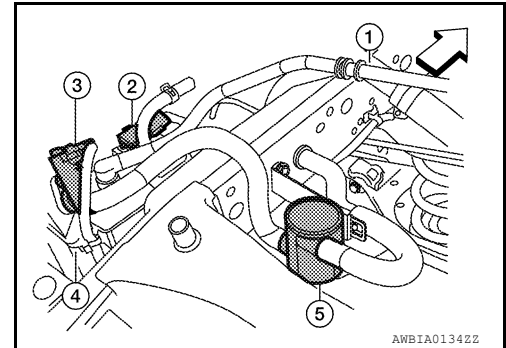
Clicking noise should be heard.

OK or NG

- OK >> GO TO 7.
NG >> GO TO 3.

3. CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister vent control valve (3) harness connector.
 - Fuel filler pipe (top of frame view) (1)
 - EVAP control system pressure sensor (2)
 - EVAP canister (4)
 - Drain filter (5)
3. Turn ignition switch ON.

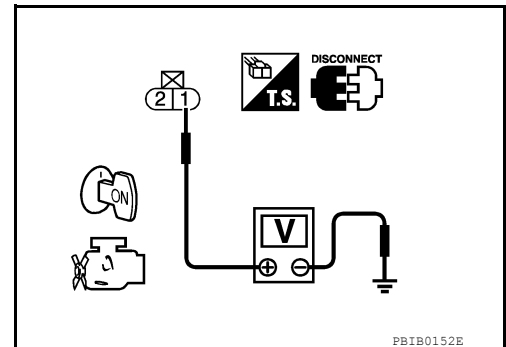


4. Check voltage between EVAP canister vent control valve terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E41, C1
- Harness for open or short between EVAP canister vent control valve and IPDM E/R

>> Repair harness or connectors.

5. CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 117 and EVAP canister vent control valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
NG >> GO TO 6.

P0447 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness for open or short between EVAP canister vent control valve and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

- OK >> GO TO 8.
- NG >> Clean the rubber tube using an air blower.

8. CHECK DRAIN FILTER

Refer to [EC-255, "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace drain filter. Refer to [EC-57, "Description"](#).

9. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to [EC-255, "Component Inspection"](#).

OK or NG

- OK >> GO TO 10.
- NG >> Replace EVAP canister vent control valve. Refer to [FL-16, "Removal and Installation"](#).

10. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

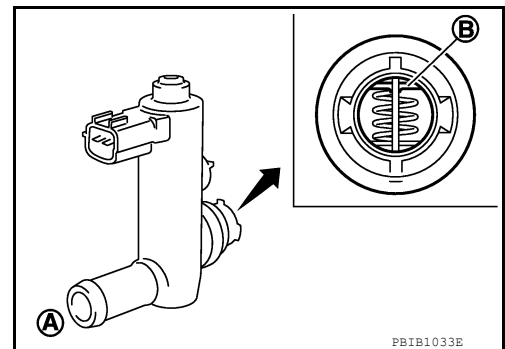
Component Inspection

INFOID:000000007358169

EVAP CANISTER VENT CONTROL VALVE

Ⓟ With CONSULT

1. Remove EVAP canister vent control valve from EVAP canister. Refer to [FL-16, "Removal and Installation"](#).
2. Check portion **B** of EVAP canister vent control valve for rust. If NG, replace EVAP canister vent control valve. If OK, go to next step.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch ON.
5. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
6. Check air passage continuity and operation delay time. **Check that new O-ring is installed properly.**



Condition VENT CONTROL/V	Air passage continuity between (A) and (B)
ON	No
OFF	Yes

Operation takes less than 1 second.

If NG, go to next step.

7. Clean the air passage (portion **A** to **B**) of EVAP canister vent control valve using an air blower.
8. Perform step 6 again.

P0447 EVAP CANISTER VENT CONTROL VALVE

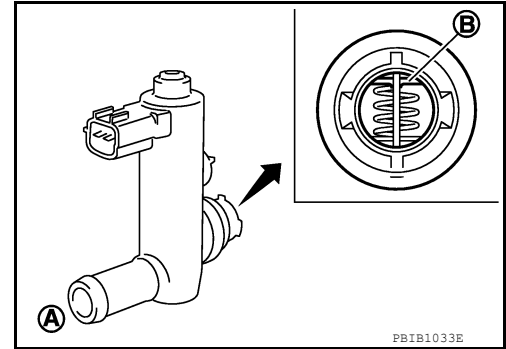
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

9. If NG, replace EVAP canister vent control valve. Refer to [FL-16. "Removal and Installation"](#).

⊗ Without CONSULT

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



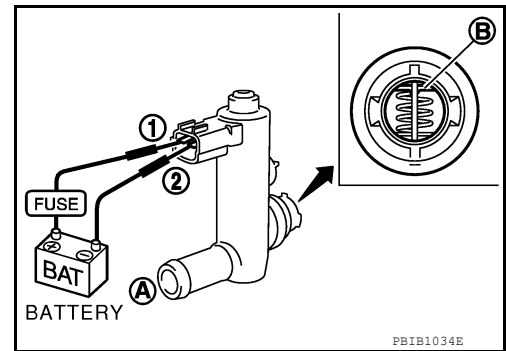
3. Check air passage continuity and operation delay time under the following conditions.
Check that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals 1 and 2	No
OFF	Yes

Operation takes less than 1 second.

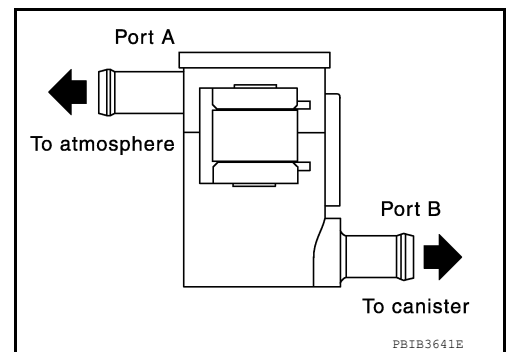
If NG, go to next step.

4. Clean the air passage (portion **A** to **B**) of EVAP canister vent control valve using an air blower.
5. Perform step 3 again.
6. If NG, replace EVAP canister vent control valve. Refer to [FL-16. "Removal and Installation"](#).



DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter. Refer to [EC-57. "Description"](#).



P0448 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0448 EVAP CANISTER VENT CONTROL VALVE

Component Description

INFOID:000000007358170

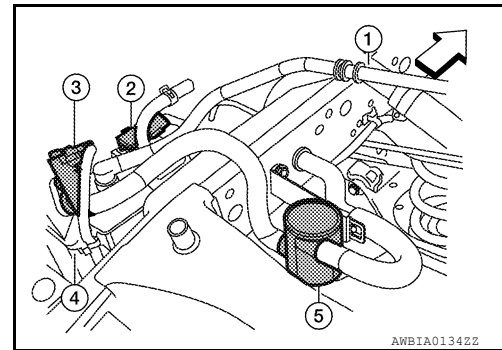
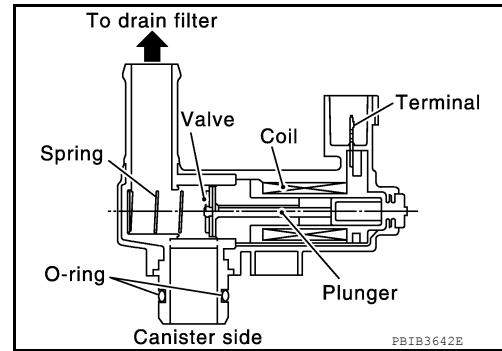
The EVAP canister vent control valve (3) is located on the EVAP canister (4) and is used to seal the canister vent.

This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows EVAP Control System diagnosis.

- Fuel filler pipe (top of frame view) (1)
- EVAP control system pressure sensor (2)
- Drain filter (5)
- ⇐: Vehicle front



On Board Diagnosis Logic

INFOID:000000007358171

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0448 0448	EVAP canister vent control valve close	EVAP canister vent control valve remains closed under specified driving conditions.	<ul style="list-style-type: none"> • EVAP canister vent control valve • EVAP control system pressure sensor and the circuit • Blocked rubber tube to EVAP canister vent control valve • Drain filter • EVAP canister is saturated with water

DTC Confirmation Procedure

INFOID:000000007358172

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

WITH CONSULT

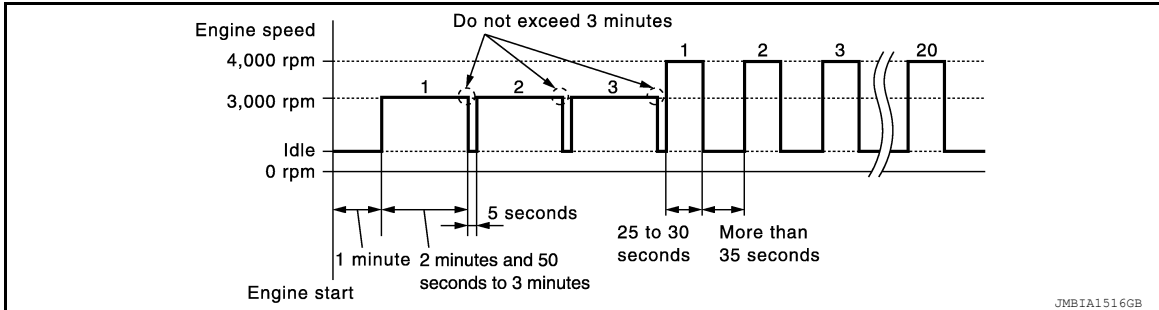
1. Turn ignition switch ON and wait at least 5 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
4. Start engine and let it idle for at least 1 minute.
5. Repeat next procedures 3 times.

P0448 EVAP CANISTER VENT CONTROL VALVE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- a. Increase the engine speed between 3,000 and 3,500 rpm and maintain that speed for 2 minutes and 50 seconds to 3 minutes.
Never exceed 3 minutes.
- b. Fully released accelerator pedal and keep engine idle for about 5 seconds.
6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to [EC-258. "Diagnosis Procedure"](#).
If 1st trip DTC is not detected, go to the next step.
8. Repeat next procedure 20 times.
 - a. Quickly increase the engine speed between 4,000 and 4,500 rpm or more and maintain that speed for 25 to 30 seconds.
 - b. Fully released accelerator pedal and keep engine idle for at least 35 seconds.



9. Check 1st trip DTC.
10. If 1st trip DTC is detected, go to [EC-258. "Diagnosis Procedure"](#).

Ⓢ WITH GST

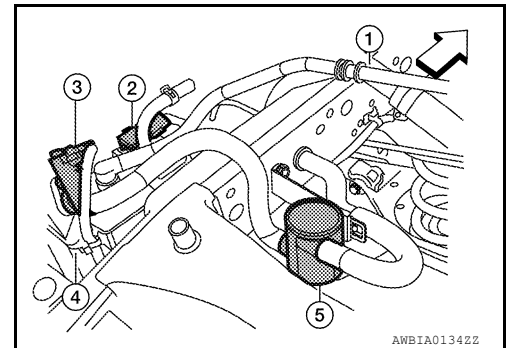
Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358173

1. CHECK RUBBER TUBE

1. Turn ignition switch OFF.
2. Disconnect rubber tube connected to EVAP canister vent control valve (3).
 - Fuel filler pipe (top of frame view) (1)
 - EVAP control system pressure sensor (2)
 - EVAP canister (4)
 - Drain filter (5)
 - ↵: Vehicle front
3. Check the rubber tube for clogging.



OK or NG

- OK >> GO TO 2.
- NG >> Clean rubber tube using an air blower.

2. CHECK DRAIN FILTER

Refer to [EC-255. "Component Inspection"](#).

OK or NG

- OK >> GO TO 3.
- NG >> Replace drain filter. Refer to [EC-57. "Description"](#).

3. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to [EC-259. "Component Inspection"](#).

OK or NG

- OK >> GO TO 4.
- NG >> Replace EVAP canister vent control valve. Refer to [FL-16. "Removal and Installation"](#).

4. CHECK IF EVAP CANISTER SATURATED IS WITH WATER

P0448 EVAP CANISTER VENT CONTROL VALVE

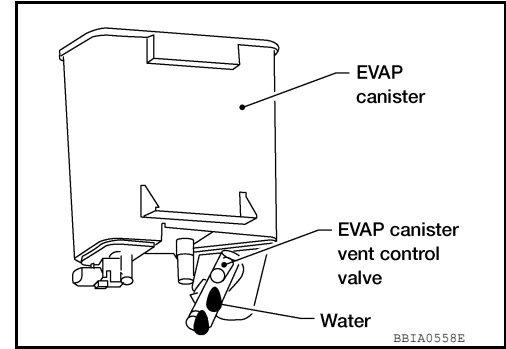
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16, "Removal and Installation"](#).
2. Check if water will drain from the EVAP canister.

Yes or No

- Yes >> GO TO 5.
No >> GO TO 7.



5. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

- OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and drain filter for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-16, "Removal and Installation"](#).

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

- OK >> GO TO 8.
NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-269, "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358174

EVAP CANISTER VENT CONTROL VALVE

ⓐ With CONSULT

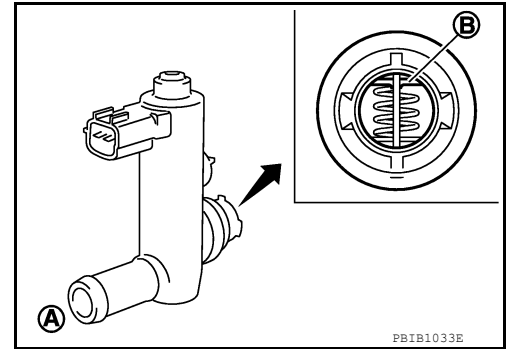
1. Remove EVAP canister vent control valve from EVAP canister. Refer to [FL-16, "Removal and Installation"](#).

P0448 EVAP CANISTER VENT CONTROL VALVE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check portion of **B** EVAP canister vent control valve for being rusted.
If NG, replace EVAP canister vent control valve.
If OK, go to next step.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch ON.



5. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
6. Check air passage continuity and operation delay time.
Check that new O-ring is installed properly.

Condition VENT CONTROL/V	Air passage continuity between (A) and (B)
ON	No
OFF	Yes

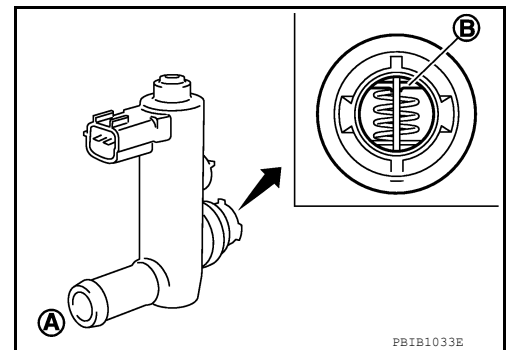
Operation takes less than 1 second.

If NG, go to next step.

7. Clean the air passage (portion **A** to **B**) of EVAP canister vent control valve using an air blower.
8. Perform step 6 again.
9. If NG, replace EVAP canister vent control valve. Refer to [FL-16, "Removal and Installation"](#).

⊗ Without CONSULT

1. Remove EVAP canister vent control valve from EVAP canister. Refer to [FL-16, "Removal and Installation"](#).
2. Check portion **B** of EVAP canister vent control valve for being rusted.



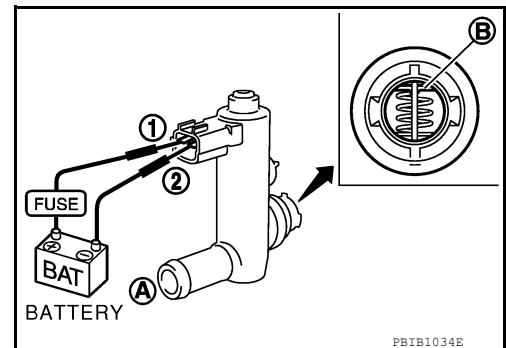
3. Check air passage continuity and operation delay time under the following conditions.
Check that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals 1 and 2	No
OFF	Yes

Operation takes less than 1 second.

If NG, go to next step.

4. Clean the air passage (portion **A** to **B**) of EVAP canister vent control valve using an air blower.
5. Perform step 3 again.
6. If NG, replace EVAP canister vent control valve. Refer to [FL-16, "Removal and Installation"](#).



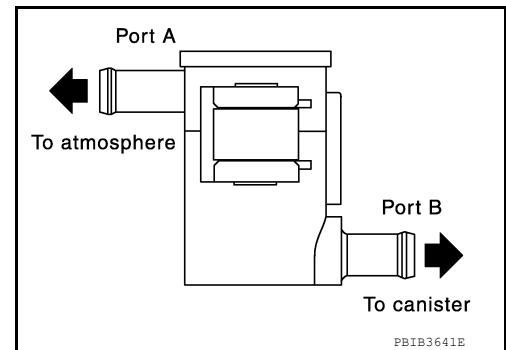
P0448 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter. Refer to [EC-57. "Description"](#).



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P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

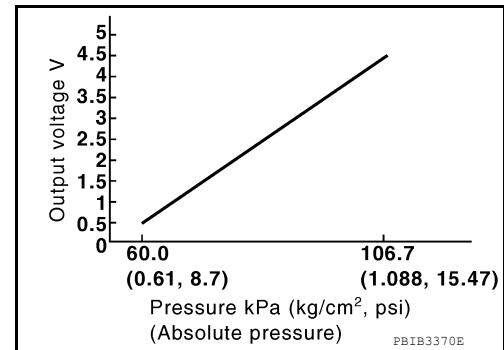
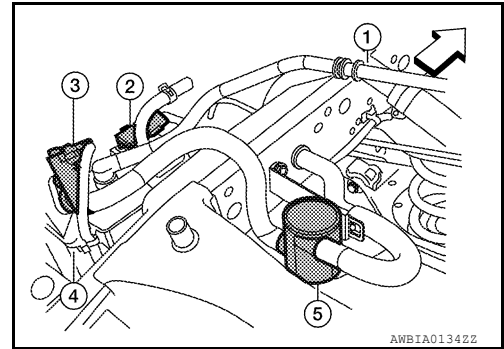
P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

Component Description

INFOID:000000007358175

The EVAP control system pressure sensor (2) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- Fuel filler pipe (top of frame view) (1)
- EVAP canister vent control valve (3)
- EVAP canister (4)
- Drain filter (5)
- ↖: Vehicle front



On Board Diagnosis Logic

INFOID:000000007358176

If DTC P0451 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-312](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0451 0451	EVAP control system pressure sensor performance	ECM detects a sloshing signal from the EVAP control system pressure sensor	<ul style="list-style-type: none"> • Harness or connectors • EVAP control system pressure sensor

DTC Confirmation Procedure

INFOID:000000007358177

DTC CONFIRMATION PROCEDURE

NOTE:

Never remove fuel filler cap during DTC confirmation procedure.

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

With CONSULT>>GO TO 2.

Without CONSULT>>GO TO 5.

2. PERFORM DTC CONFIRMATION PROCEDURE-1

Ⓟ With CONSULT

1. Start engine and let it idle for least 40 seconds.

NOTE:

Do not depress accelerator pedal even slightly.

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-263, "Diagnosis Procedure"](#).
- NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-2

 With CONSULT

1. Select "EVAP DIAG READY" in "DATA MONITOR" mode of "ENGINE".
2. Let it idle until "OFF" of "EVAP DIAG READY" changes to "ON".

NOTE:

It will take at most 2 hours until "OFF" of "EVAP DIAG READY" changes to "ON".

3. Turn ignition switch OFF and wait at least 90 minutes.

NOTE:

Never turn ignition switch ON during 90 minutes.

4. Turn ignition switch ON.
5. Select "EVAP LEAK DIAG" in "DATA MONITOR" mode of "ENGINE".
6. Check that "EVAP LEAK DIAG" indication.

Which is displayed on CONSULT?

- CMPLT >> GO TO 4.
- YET >> 1. Perform DTC CONFIRMATION PROCEDURE again.
2. GO TO 1.

4.PERFORM DTC CONFIRMATION PROCEDURE-3

 With CONSULT

Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-263, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

5.PERFORM DTC CONFIRMATION PROCEDURE-4

 With GST

1. Start engine and let it idle for least 40 seconds.

NOTE:

Do not depress accelerator pedal even slightly.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-263, "Diagnosis Procedure"](#).
- NO >> GO TO 6.

6.PERFORM DTC CONFIRMATION PROCEDURE-5

 With GST

1. Let it idle for at least 2 hours.
2. Turn ignition switch OFF and wait at least 90 minutes.

NOTE:

Never turn ignition switch ON during 90 minutes.

3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-263, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007358178

1.CHECK GROUND CONNECTIONS

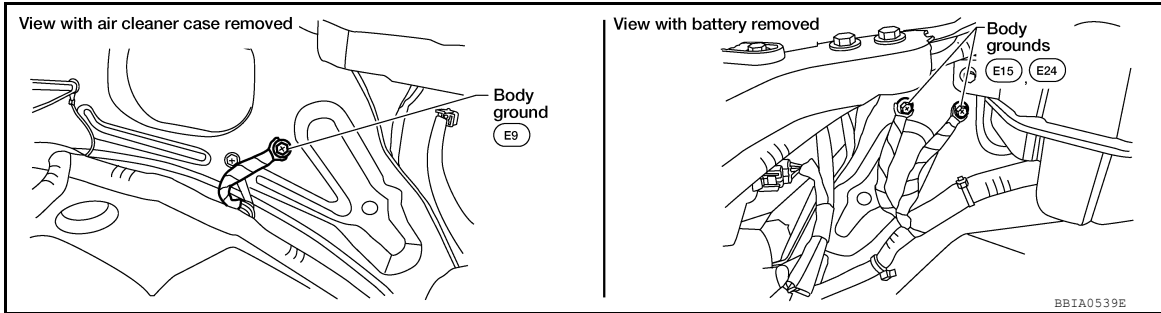
1. Turn ignition switch OFF.

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).

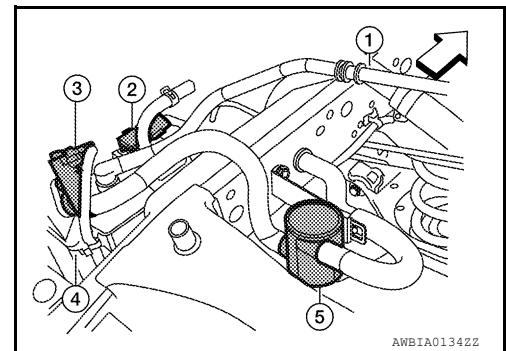


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

1. Disconnect EVAP control system pressure sensor (2) harness connector.
- Fuel filler pipe (top of frame view) (1)
 - EVAP canister vent control valve (3)
 - EVAP canister (4)
 - Drain filter (5)
 - ↙: Vehicle front
2. Check sensor harness connector for water.



Water should not exist.

OK or NG

- OK >> GO TO 3.
- NG >> Repair or replace harness connector.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-264, "Component Inspection"](#).

OK or NG

- OK >> GO TO 4.
- NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

4. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000007358179

EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister. Refer to [FL-16, "Removal and Installation"](#).
Do not reuse the O-ring, replace it with a new one.
2. Install a vacuum pump to EVAP control system pressure sensor.

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VQ40DE]

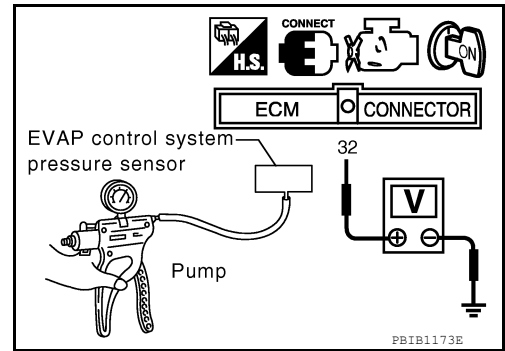
< DTC/CIRCUIT DIAGNOSIS >

- Turn ignition switch ON and check output voltage between ECM terminal 32 and ground under the following conditions.

Applied vacuum kPa (kg/cm ² , psi)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-0.272, -3.87)	2.1 to 2.5V lower than above value

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm², 14.69 psi).
- If NG, replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).



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P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

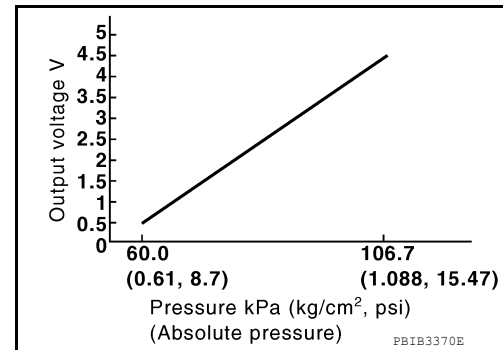
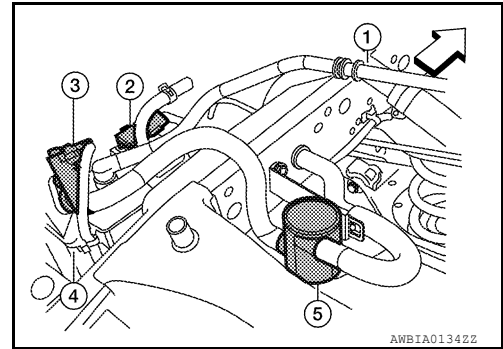
P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

Component Description

INFOID:000000007358180

The EVAP control system pressure sensor (2) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- Fuel filler pipe (top of frame view) (1)
- EVAP canister vent control valve (3)
- EVAP canister (4)
- Drain filter (5)
- ↖: Vehicle front



On Board Diagnosis Logic

INFOID:000000007358181

If DTC P0452 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-312](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0452 0452	EVAP control system pressure sensor low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • EVAP control system pressure sensor

DTC Confirmation Procedure

INFOID:000000007358182

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

Ⓟ WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds and then turn ON.
5. Select "DATA MONITOR" mode with CONSULT.
6. Make sure that "FUEL T/TMP SE" is more than 0°C (32°F).
7. Start engine and wait at least 20 seconds.
8. Check 1st trip DTC.

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

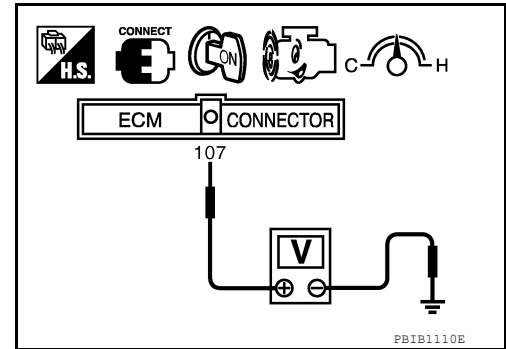
< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

9. If 1st trip DTC is detected, go to [EC-267, "Diagnosis Procedure"](#).

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal 107 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and wait at least 20 seconds.
7. Select Service \$07 with GST.
If 1st trip DTC is detected, go to [EC-267, "Diagnosis Procedure"](#).

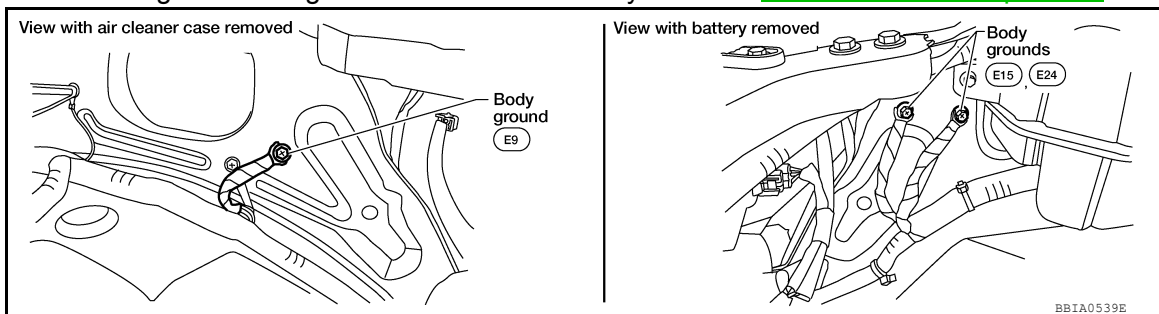


Diagnosis Procedure

INFOID:000000007358183

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).

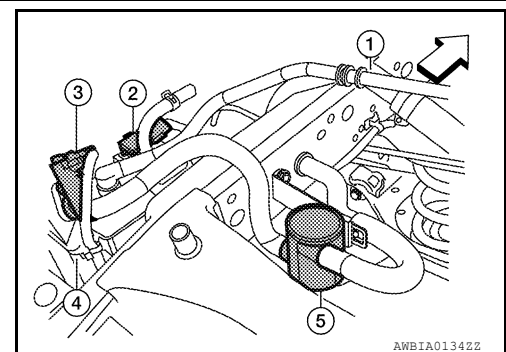


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor (2) harness connector.
 - Fuel filler pipe (top of frame view) (1)
 - EVAP canister vent control valve (3)
 - EVAP canister (4)
 - Drain filter (5)
 - ↖: Vehicle front
2. Check sensor harness connector for water.



Water should not exist.

OK or NG

- OK >> GO TO 3.
- NG >> Repair or replace harness connector.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VQ40DE]

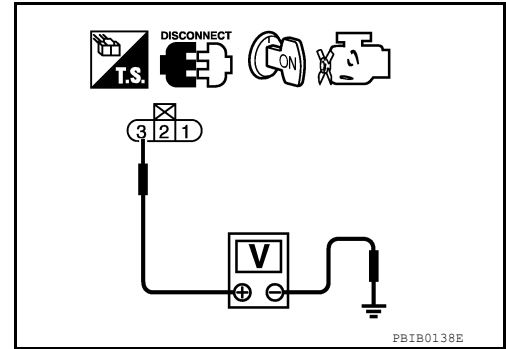
< DTC/CIRCUIT DIAGNOSIS >

2. Check voltage between EVAP control system pressure sensor terminal 3 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness connectors E5, F14
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between EVAP control system pressure sensor terminal 1 and ECM terminal 67.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness connectors E5, F14
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 32 and EVAP control system pressure sensor terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness connectors E5, F14

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-269. "Component Inspection"](#).

OK or NG

OK >> GO TO 10.

NG >> Replace EVAP control system pressure sensor. Refer to [FL-16. "Removal and Installation"](#).

10. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000007358184

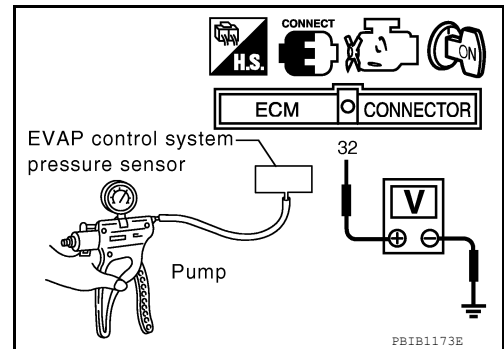
EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister. Refer to [FL-16. "Removal and Installation"](#).
Never reuse the O-ring, replace it with a new one.
2. Install a vacuum pump to EVAP control system pressure sensor.
3. Turn ignition switch ON and check output voltage between ECM terminal 32 and ground under the following conditions.

Applied vacuum kPa (kg/cm ² , psi)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-0.272, -3.87)	2.1 to 2.5V lower than above value

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 spi) or pressure over 101.3 kPa (1.033 kg/cm², 14.59 psi).
4. If NG, replace EVAP control system pressure sensor. Refer to [FL-16. "Removal and Installation"](#).



P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

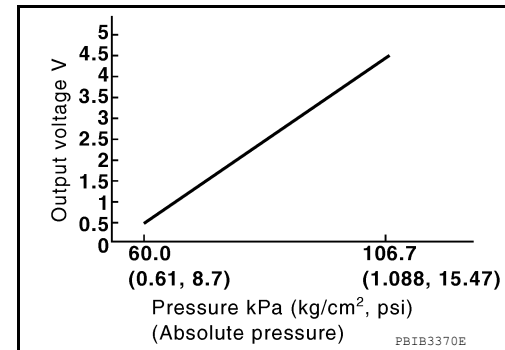
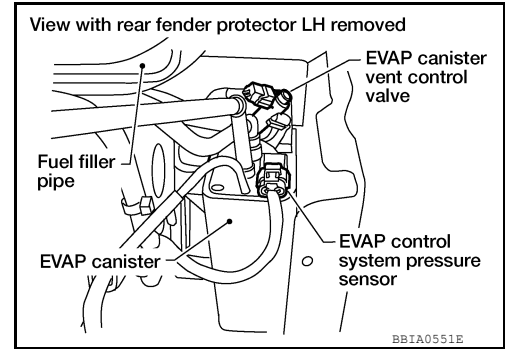
P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

Component Description

INFOID:000000007358185

The EVAP control system pressure sensor (2) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- Fuel filler pipe (top of frame view) (1)
- EVAP canister vent control valve (3)
- EVAP canister (4)
- Drain filter (5)
- ↶: Vehicle front



On Board Diagnosis Logic

INFOID:000000007358186

If DTC P0453 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-312](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0453 0453	EVAP control system pressure sensor high input	An excessively high voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • EVAP control system pressure sensor • EVAP canister vent control valve • EVAP canister • drain filter • Rubber hose from EVAP canister vent control valve to vehicle frame

DTC Confirmation Procedure

INFOID:000000007358187

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

④ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds and then turn ON.

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

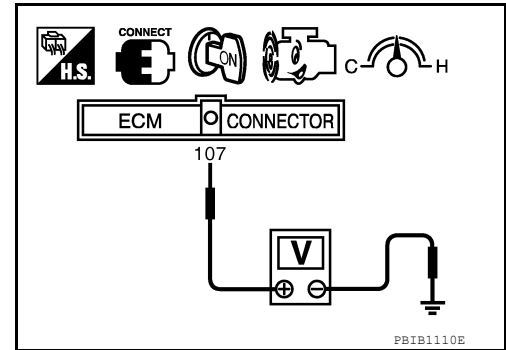
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Select "DATA MONITOR" mode with CONSULT.
6. Make sure that "FUEL T/TMP SE" is more than 0°C (32°F).
7. Start engine and wait at least 20 seconds.
8. Check 1st trip DTC.
9. If 1st trip DTC is detected, go to [EC-271, "Diagnosis Procedure"](#).

Ⓢ With GST

1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal 107 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and wait at least 20 seconds.
7. Select Service \$07 with GST.
If 1st trip DTC is detected, go to [EC-271, "Diagnosis Procedure"](#).

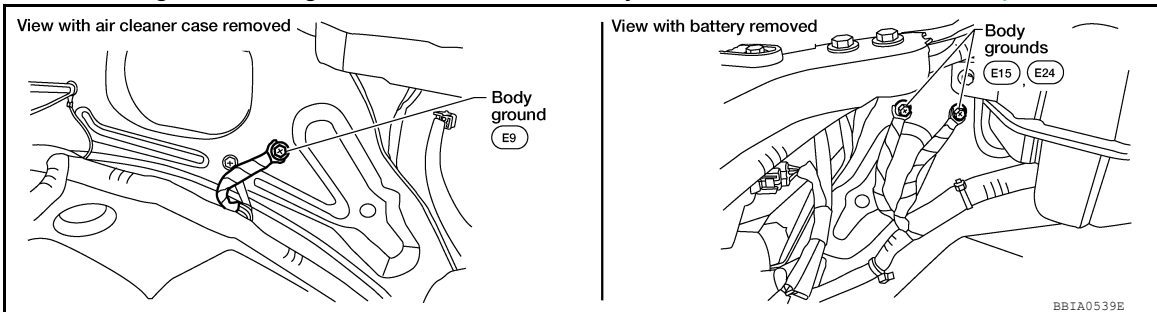


INFOID:000000007358188

Diagnosis Procedure

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).

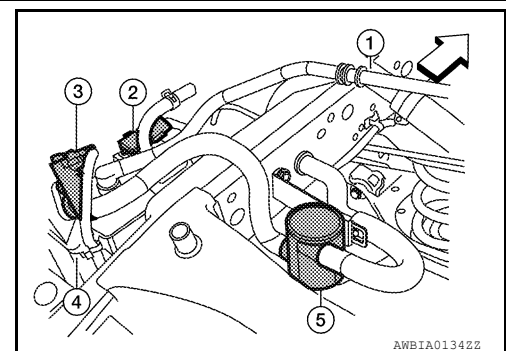


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor (2) harness connector.
 - Fuel filler pipe (top of frame view) (1)
 - EVAP canister vent control valve (3)
 - EVAP canister (4)
 - Drain filter (5)
 - ⇐: Vehicle front
2. Check sensor harness connector for water.



Water should not exist.

OK or NG

- OK >> GO TO 3.
- NG >> Repair or replace harness connector.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VQ40DE]

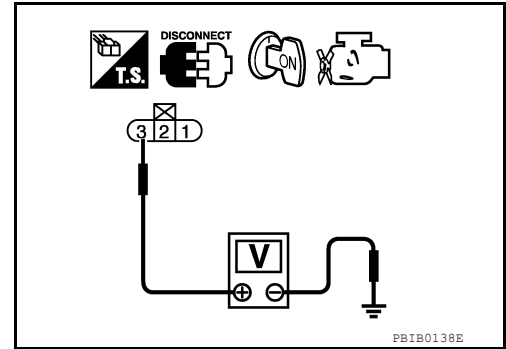
< DTC/CIRCUIT DIAGNOSIS >

2. Check voltage between EVAP control system pressure sensor terminal 3 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness connectors E5, F14
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between EVAP control system pressure sensor terminal 1 and ECM terminal 67.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness connectors E5, F14
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 32 and EVAP control system pressure sensor terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness connectors E5, F14

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK RUBBER TUBE

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging, vent and kinked.

OK or NG

- OK >> GO TO 10.
- NG >> Clean the rubber tube using an air blower, repair or replace rubber tube.

10. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to [EC-255, "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> Replace EVAP canister vent control valve. Refer to [FL-16, "Removal and Installation"](#).

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-274, "Component Inspection"](#).

OK or NG

- OK >> GO TO 12.
- NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

12. CHECK DRAIN FILTER

Refer to [EC-274, "Component Inspection"](#).

OK or NG

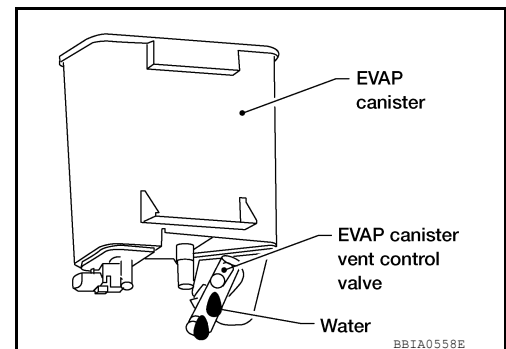
- OK >> GO TO 13.
- NG >> Replace drain filter. Refer to [EC-57, "Description"](#).

13. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16, "Removal and Installation"](#).
2. Check if water will drain from the EVAP canister.

Yes or No

- Yes >> GO TO 14.
- No >> GO TO 16.



14. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

- OK >> GO TO 16.
- NG >> GO TO 15.

15. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and drain filter for clogging or poor connection

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

>> Repair hose or replace EVAP canister. Refer to [FL-16, "Removal and Installation"](#).

16.CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358189

EVAP CONTROL SYSTEM PRESSURE SENSOR

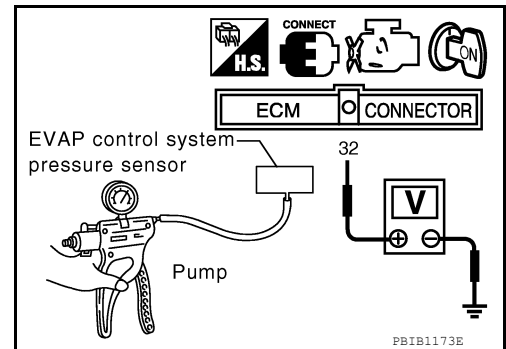
1. Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister. Refer to [FL-16, "Removal and Installation"](#).
Always replace O-ring with a new one.
2. Install a vacuum pump to EVAP control system pressure sensor.
3. Turn ignition switch ON and check output voltage between ECM terminal 32 and ground under the following conditions.

Applied vacuum kPa (kg/cm ² , psi)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-0.272, -3.87)	2.1 to 2.5V lower than above value

CAUTION:

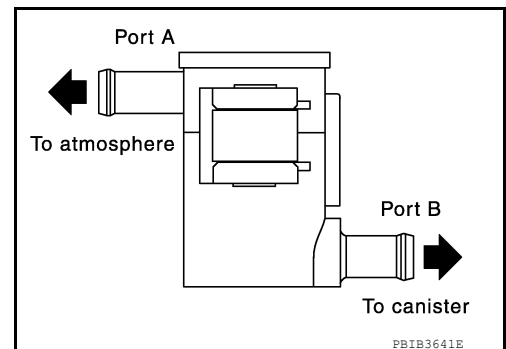
- Always calibrate the vacuum pump gauge when using it.
- Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm², 14.59 psi).

4. If NG, replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).



DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter. Refer to [EC-57, "Description"](#).



P0455 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

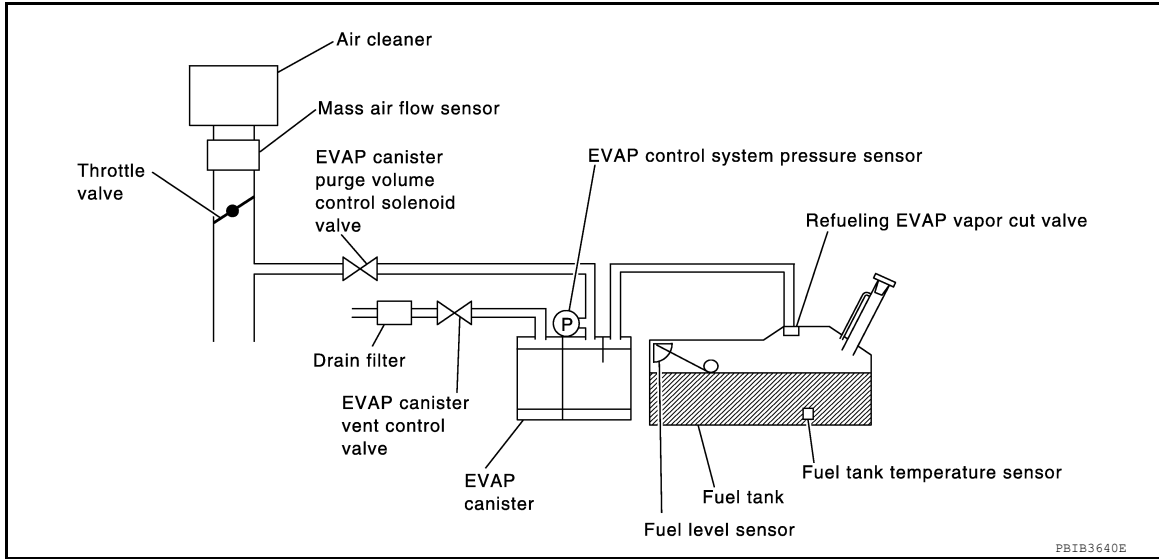
[VQ40DE]

P0455 EVAP CONTROL SYSTEM

On Board Diagnosis Logic

INFOID:000000007358190

This diagnosis detects a very large leak (fuel filler cap fell off etc.) in EVAP system between the fuel tank and EVAP canister purge volume control solenoid valve.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0455 0455	EVAP control system gross leak detected	EVAP control system has a very large leak such as fuel filler cap fell off, EVAP control system does not operate properly.	<ul style="list-style-type: none"> Fuel filler cap remains open or fails to close. Incorrect fuel tank vacuum relief valve Incorrect fuel filler cap used Foreign matter caught in fuel filler cap. Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. Foreign matter caught in EVAP canister vent control valve. EVAP canister or fuel tank leaks EVAP purge line (pipe and rubber tube) leaks EVAP purge line rubber tube bent. Loose or disconnected rubber tube EVAP canister vent control valve and the circuit EVAP canister purge volume control solenoid valve and the circuit Fuel tank temperature sensor O-ring of EVAP canister vent control valve is missing or damaged. EVAP control system pressure sensor Refueling EVAP vapor cut valve ORVR system leaks

CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine NISSAN rubber tube as a replacement.

DTC Confirmation Procedure

INFOID:000000007358191

CAUTION:

Never remove fuel filler cap during the DTC Confirmation Procedure.

NOTE:

P0455 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**
- If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.
 1. Turn ignition switch OFF and wait at least 10 seconds.
 2. Turn ignition switch ON.
 3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- **Perform "DTC WORK SUPPORT" when the fuel level is between 1/4 and 3/4 full and vehicle is placed on flat level surface.**
- **Open engine hood before conducting the following procedures.**

Ⓟ WITH CONSULT

1. Tighten fuel filler cap securely until ratcheting sound is heard.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
5. Make sure that the following conditions are met.
COOLANT TEMP/S: 0 - 70°C (32 - 158°F)
INT/A TEMP SE: 0 - 60°C (32 - 140°F)
6. Select "EVP V/S LEAK P0456/P1456" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
Follow the instruction displayed.
NOTE:
If the engine speed cannot be maintained within the range displayed on the CONSULT screen, go to [EC-20, "Basic Inspection"](#).
7. Make sure that "OK" is displayed.
If "NG" is displayed, select "SELF-DIAG RESULTS" mode and make sure that "EVAP GROSS LEAK [P0455]" is displayed. If it is displayed, refer to [EC-276, "Diagnosis Procedure"](#).
If P0442 is displayed, perform Diagnostic Procedure for DTC P0442 [EC-238, "Diagnosis Procedure"](#).

Ⓢ WITH GST

NOTE:

Be sure to read the explanation of [EC-29, "SRT Set Driving Pattern"](#) before driving vehicle.

1. Start engine.
2. Drive vehicle according to [EC-71, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).
3. Stop vehicle.
4. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
5. Select Service \$07 with GST.
 - If P0455 is displayed on the screen, go to [EC-276, "Diagnosis Procedure"](#).
 - If P0442 is displayed on the screen, go to [EC-238, "Diagnosis Procedure"](#).
 - If P0441 is displayed on the screen, go to [EC-233, "Diagnosis Procedure"](#).

Diagnosis Procedure

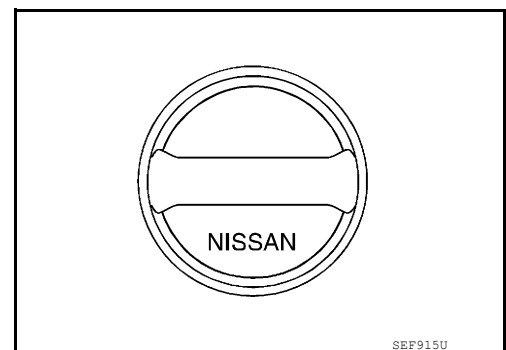
INFOID:000000007358192

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

- OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap. Refer to [FL-6, "Removal and Installation"](#).



SEP915U

P0455 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.

- NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to [EC-57, "Description"](#).

OK or NG

OK >> GO TO 5.

NG >> Replace fuel filler cap with a genuine one. Refer to [FL-6, "Removal and Installation"](#).

5. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks, improper connection or disconnection.

Refer to [EC-57, "Description"](#).

OK or NG

OK >> GO TO 6.

NG >> Repair or reconnect the hose.

6. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 7.

7. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

- EVAP canister vent control valve is installed properly.
Refer to [FL-16, "Removal and Installation"](#).
- EVAP canister vent control valve.
Refer to [FL-16, "Removal and Installation"](#).

OK or NG

OK >> GO TO 8.

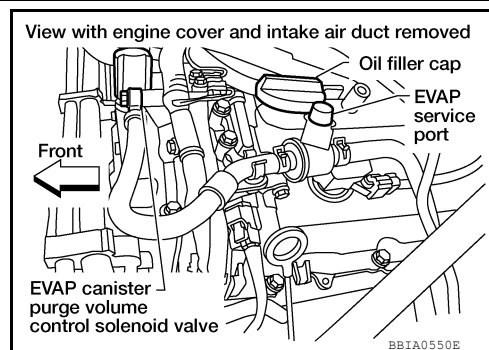
NG >> Repair or replace EVAP canister vent control valve and O-ring. Refer to [FL-16, "Removal and Installation"](#).

8. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

NOTE:

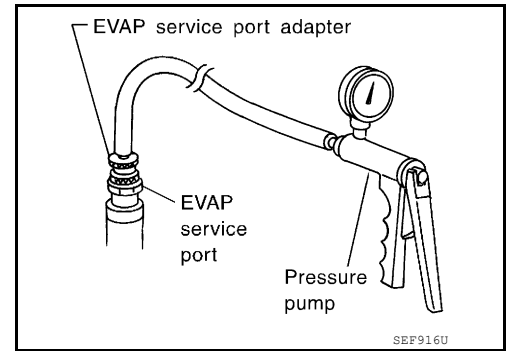
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.



P0455 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]



With CONSULT>>GO TO 9.
Without CONSULT>>GO TO 10.

9. CHECK FOR EVAP LEAK

With CONSULT

1. Turn ignition switch ON.
2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

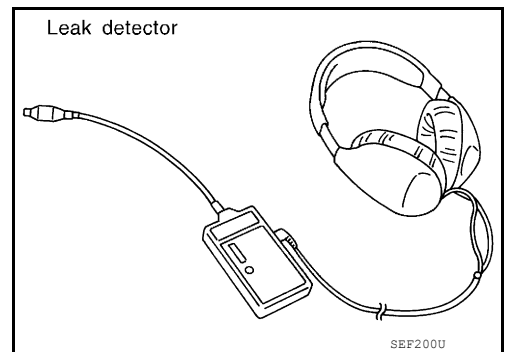
CAUTION:

- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
Refer to [EC-57, "Description"](#).

OK or NG

- OK >> GO TO 11.
NG >> Repair or replace.



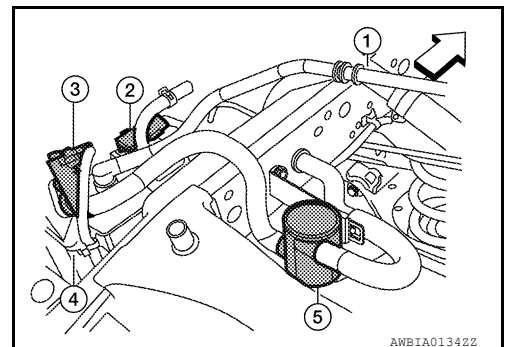
10. CHECK FOR EVAP LEAK

Without CONSULT

1. Turn ignition switch OFF.
2. Apply 12 volts DC to EVAP canister vent control valve (3). The valve will close. (Continue to apply 12 volts until the end of test.)
 - Fuel filler pipe (top of frame view) (1)
 - EVAP control system pressure sensor (2)
 - EVAP canister (4)
 - Drain filter (5)
 - ⇐: Vehicle front
3. Pressurize the EVAP line using pressure pump with 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm², 0.29 to 0.4 psi), then remove pump and EVAP service port adapter.

CAUTION:

- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.



P0455 EVAP CONTROL SYSTEM

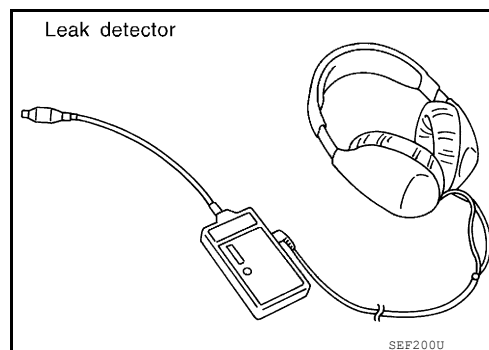
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to [EC-57. "Description"](#).

OK or NG

- OK >> GO TO 12.
NG >> Repair or replace.



11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

- Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- Start engine.
- Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
- Touch "Qu" on CONSULT screen to increase "PURG VOL CONT/V" opening to 100%.
- Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

OK or NG

- OK >> GO TO 14.
NG >> GO TO 13.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT

- Start engine and warm it up to normal operating temperature.
- Stop engine.
- Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- Start engine and let it idle for at least 80 seconds.
- Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

- OK >> GO TO 15.
NG >> GO TO 13.

13. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to [EC-57. "Description"](#).

OK or NG

- OK (With CONSULT) >> GO TO 14.
OK (Without CONSULT) >> GO TO 15.
NG >> Repair or reconnect the hose.

14. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

- Start engine.
- Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

OK or NG

- OK >> GO TO 16.
NG >> GO TO 15.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-252. "Component Inspection"](#).

OK or NG

- OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-27. "Exploded View"](#).

P0455 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to [EC-201, "Component Inspection"](#).

OK or NG

OK >> GO TO 17.

NG >> Replace fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-269, "Component Inspection"](#).

OK or NG

OK >> GO TO 18.

NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

18. CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to [EC-416, "System Description"](#).

OK or NG

OK >> GO TO 19.

NG >> Repair or replace hoses and tubes.

19. CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 20.

NG >> Repair or replace hose, tube or filler neck tube.

20. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to [EC-419, "Component Inspection"](#).

OK or NG

OK >> GO TO 21.

NG >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6, "Removal and Installation"](#).

21. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

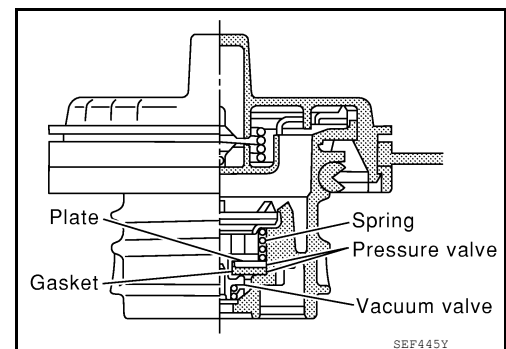
>> **INSPECTION END**

Component Inspection

INFOID:000000007358193

FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.



P0455 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

2. Check valve opening pressure and vacuum.

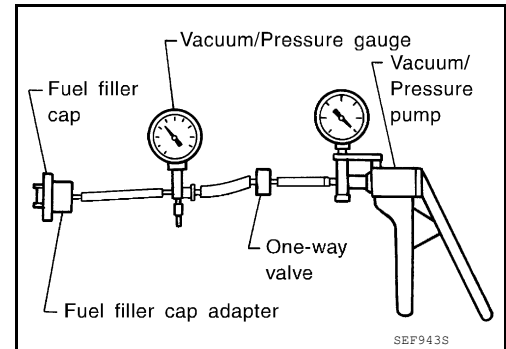
Pressure: 15.3 - 20.0 kPa (0.156 - 0.204 kg/cm², 2.22 - 2.90 psi)

Vacuum: -6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm², -0.87 to -0.48 psi)

3. If out of specification, replace fuel filler cap as an assembly. Refer to [FL-6, "Removal and Installation"](#).

CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.



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P0456 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0456 EVAP CONTROL SYSTEM

On Board Diagnosis Logic

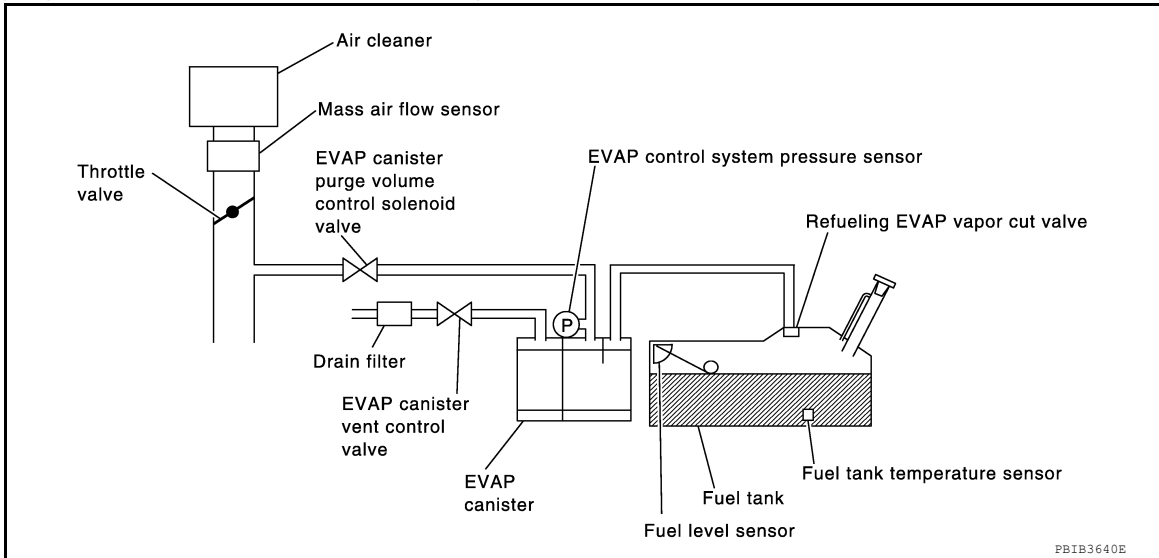
INFOID:000000007358194

This diagnosis detects very small leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using the negative pressure.

If ECM judges a leak which corresponds to a very small leak, the very small leak P0456 will be detected.

If ECM judges a leak equivalent to a small leak, EVAP small leak P0442 will be detected.

If ECM judges that there are no leaks, the diagnosis will be OK.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0456 0456	Evaporative emission control system very small leak (negative pressure check)	<ul style="list-style-type: none"> • EVAP system has a very small leak. • EVAP system does not operate properly. 	<ul style="list-style-type: none"> • Incorrect fuel tank vacuum relief valve • Incorrect fuel filler cap used • Fuel filler cap remains open or fails to close. • Foreign matter caught in fuel filler cap. • Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. • Foreign matter caught in EVAP canister vent control valve. • EVAP canister or fuel tank leaks • EVAP purge line (pipe and rubber tube) leaks • EVAP purge line rubber tube bent • Loose or disconnected rubber tube • EVAP canister vent control valve and the circuit • EVAP canister purge volume control solenoid valve and the circuit • Fuel tank temperature sensor • O-ring of EVAP canister vent control valve is missing or damaged • EVAP canister is saturated with water • EVAP control system pressure sensor • Refueling EVAP vapor cut valve • ORVR system leaks • Fuel level sensor and the circuit • Foreign matter caught in EVAP canister purge volume control solenoid valve

CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.
- If the fuel filler cap is not tightened properly, the MIL may illuminate.
- Use only a genuine NISSAN rubber tube as a replacement.

P0456 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

DTC Confirmation Procedure

INFOID:000000007358195

NOTE:

- If DTC P0456 is displayed with P0442, first perform trouble diagnosis for DTC P0456.
- After repair, make sure that the hoses and clips are installed properly.
- If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Open engine hood before conducting the following procedure.
- If any of following conditions are met just before the DTC confirmation procedure, leave the vehicle for more than 1 hour.
 - Fuel filler cap is removed.
 - Fuel is refilled or drained.
 - EVAP component part/parts is/are removed.
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

CONSULT WITH CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Check that the following conditions are met.
 - FUEL LEVEL SE: 0.25 - 1.4V**
 - COOLAN TEMP/S: 0 - 32°C (32 - 90°F)**
 - FUEL T/TMP SE: 0 - 35°C (32 - 95°F)**
 - INT A/TEMP SE: More than 0°C (32°F)**If NG, turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle), or refill/drain fuel until the output voltage of the "FUEL LEVEL SE" meets within the range above and leave the vehicle for more than 1 hour. Then start from step 1.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "EVP V/S LEAK P0456/P1456" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
Follow the instructions displayed.
6. Check that "OK" is displayed.
If "NG" is displayed, refer to [EC-284, "Diagnosis Procedure"](#).

NOTE:

- If the engine speed cannot be maintained within the range displayed on CONSULT screen, go to [EC-20, "Basic Inspection"](#).
- Check that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

Overall Function Check

INFOID:000000007358196

CONSULT WITH GST

Use this procedure to check the overall function of the EVAP very small leak function. During this check, a 1st trip DTC might not be confirmed.

CAUTION:

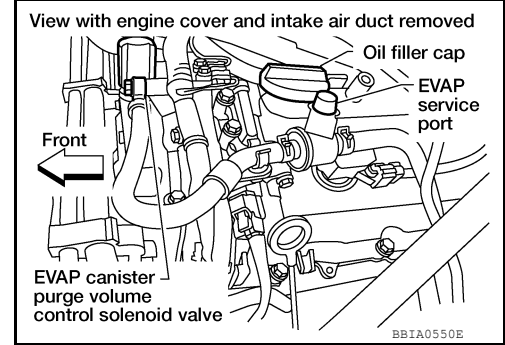
- Never use compressed air, doing so may damage the EVAP system.
- Never start engine.
- Never exceeded 4.12 kPa (0.042 kg/cm², 0.6 psi).

P0456 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Attach the EVAP service port adapter securely to the EVAP service port.



2. Set the pressure pump and a hose.
3. Also set a vacuum gauge via 3-way connector and a hose.
4. Turn ignition switch ON.
5. Connect GST and select Service \$08.
6. Using Service \$08 control the EVAP canister vent control valve (close).
7. Apply pressure and make sure the following conditions are satisfied.

Pressure to be applied: 2.7 kPa (0.028 kg/cm², 0.39 psi)
Time to be waited after the pressure drawn in to the EVAP system and the pressure to be dropped: 60 seconds and the pressure should not be dropped more than 0.4 kPa (0.004 kg/cm², 0.06 psi).

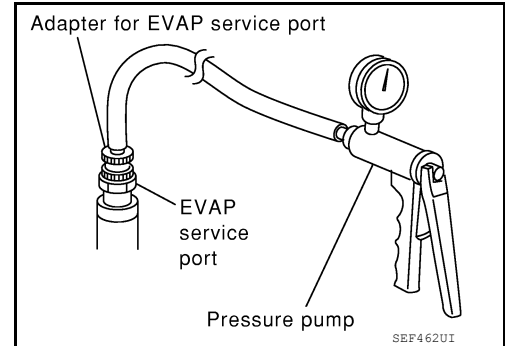
If NG, go to [EC-284, "Diagnosis Procedure"](#).

If OK, go to next step.

8. Disconnect GST.
9. Start engine and warm it up to normal operating temperature.
10. Turn ignition switch OFF and wait at least 10 seconds.
11. Turn ignition switch ON.
12. Turn ignition switch OFF and wait at least 10 seconds.
13. Restart engine and let it idle for 90 seconds.
14. Keep engine speed at 2,000 rpm for 30 seconds.
15. Turn ignition switch OFF.

NOTE:

For more information, refer to GST instruction manual.



Diagnosis Procedure

INFOID:000000007358197

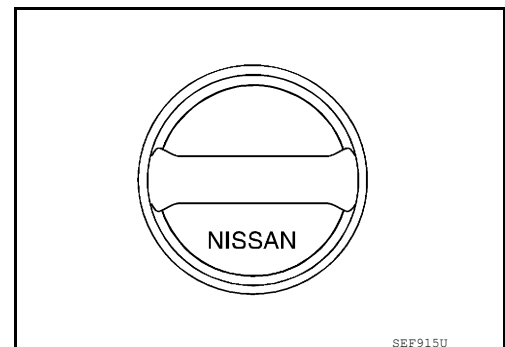
1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.

NG >> Replace with genuine NISSAN fuel filler cap. Refer to [FL-6, "Removal and Installation"](#).



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.

NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.

P0456 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to [EC-243. "Component Inspection"](#).

OK or NG

OK >> GO TO 5.

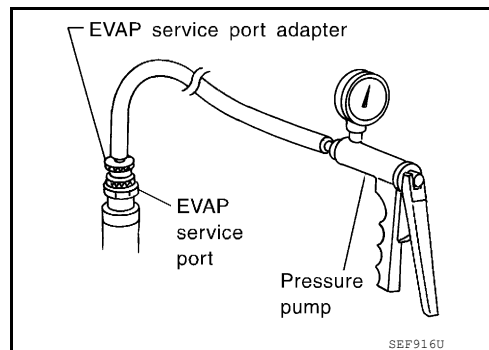
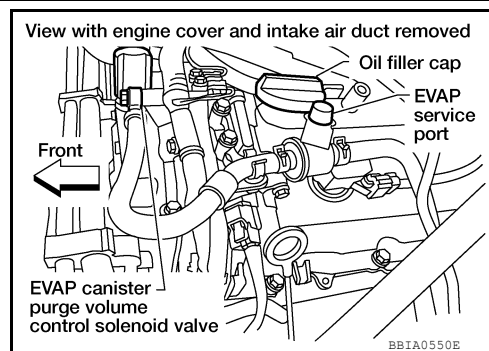
NG >> Replace fuel filler cap with a genuine one. Refer to [FL-6. "Removal and Installation"](#).

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely. For the location of EVAP service port, refer to [EC-57. "Description"](#).

NOTE:

Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.



With CONSULT>>GO TO 6.

Without CONSULT>>GO TO 7.

6. CHECK FOR EVAP LEAK

 **With CONSULT**

1. Turn ignition switch ON.
2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

CAUTION:

- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

P0456 EVAP CONTROL SYSTEM

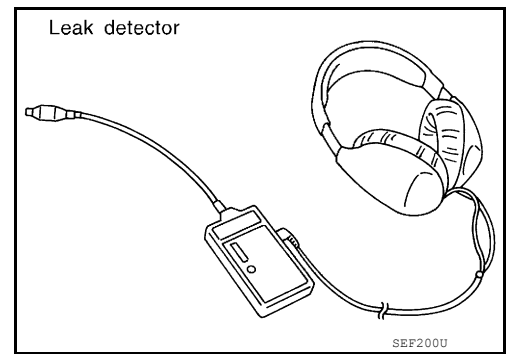
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to [EC-57, "Description"](#).

OK or NG

- OK >> GO TO 8.
NG >> Repair or replace.



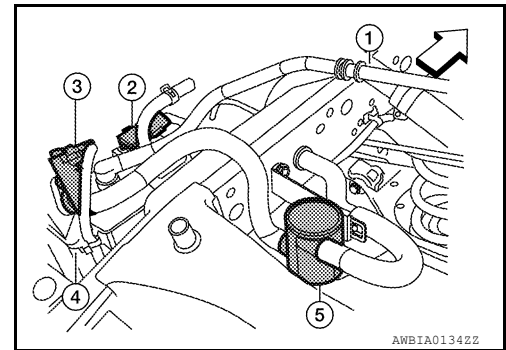
7. CHECK FOR EVAP LEAK

⊗ Without CONSULT

- Turn ignition switch OFF.
- Apply 12 volts DC to EVAP canister vent control valve (3). The valve will close. (Continue to apply 12 volts until the end of test.)
 - Fuel filler pipe (top of frame view) (1)
 - EVAP control system pressure sensor (2)
 - EVAP canister (4)
 - Drain filter (5)
 - ↔: Vehicle front
- Pressurize the EVAP line using pressure pump with 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm², 0.2 to 0.4 psi), then remove pump and EVAP service port adapter.

CAUTION:

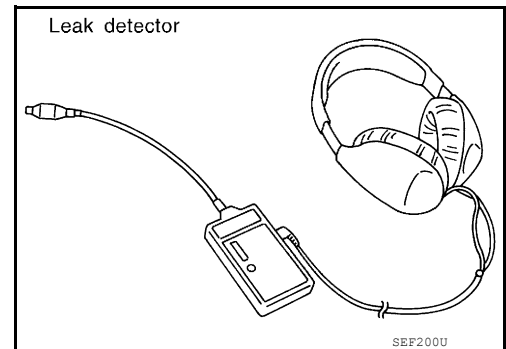
- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.



- Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to [EC-57, "Description"](#).

OK or NG

- OK >> GO TO 8.
NG >> Repair or replace.



8. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

- EVAP canister vent control valve is installed properly. Refer to [FL-16, "Component Inspection"](#).
- EVAP canister vent control valve. Refer to [FL-16, "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
NG >> Repair or replace EVAP canister vent control valve and O-ring. Refer to [FL-16, "Removal and Installation"](#).

9. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

- Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16, "Removal and Installation"](#).

P0456 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

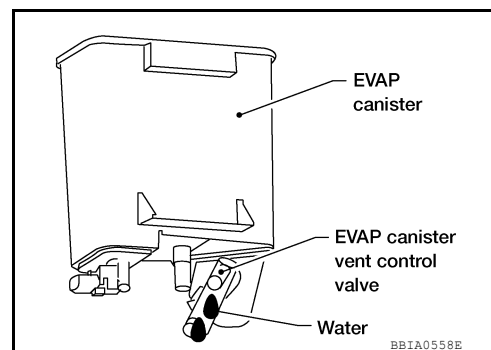
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 10.

No (With CONSULT)>>GO TO 12.

No (Without CONSULT)>>GO TO 13.



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

OK (With CONSULT)>>GO TO 12.

OK (Without CONSULT)>>GO TO 13.

NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-16, "Removal and Installation"](#).

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

1. Disconnect vacuum hose connected to EVAP service port and EVAP canister purge volume control solenoid valve from EVAP canister purge volume control solenoid valve.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qu" on CONSULT screen to increase "PURG VOL CONT/V" opening to 100%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

OK or NG

OK >> GO TO 16.

NG >> GO TO 14.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP service port and EVAP canister purge volume control solenoid valve from EVAP canister purge volume control solenoid valve.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 15.

NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to [EC-57, "Description"](#).

OK or NG

OK >> GO TO 15.

P0456 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NG >> Repair or reconnect the hose.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-252, "Component Inspection"](#).

OK or NG

OK >> GO TO 16.

NG >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-27, "Exploded View"](#).

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to [EC-201, "Component Inspection"](#).

OK or NG

OK >> GO TO 17.

NG >> Replace fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-269, "Component Inspection"](#).

OK or NG

OK >> GO TO 18.

NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

18. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to [EC-57, "Description"](#).

OK or NG

OK >> GO TO 19.

NG >> Repair or reconnect the hose.

19. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 20.

20. CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kinks, looseness and improper connection. For location, refer to [EC-416, "System Description"](#).

OK or NG

OK >> GO TO 21.

NG >> Repair or replace hoses and tubes.

21. CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kinks, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 22.

NG >> Repair or replace hose, tube or filler neck tube.

22. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to [EC-419, "Component Inspection"](#).

OK or NG

OK >> GO TO 23.

NG >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6, "Removal and Installation"](#).

23. CHECK FUEL LEVEL SENSOR

Refer to [MWI-35, "Component Inspection"](#).

OK or NG

OK >> GO TO 24.

NG >> Replace fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).

P0456 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

24. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

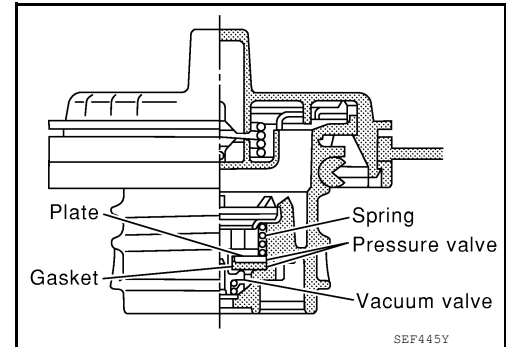
>> INSPECTION END

Component Inspection

INFOID:000000007358198

FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.



2. Check valve opening pressure and vacuum.

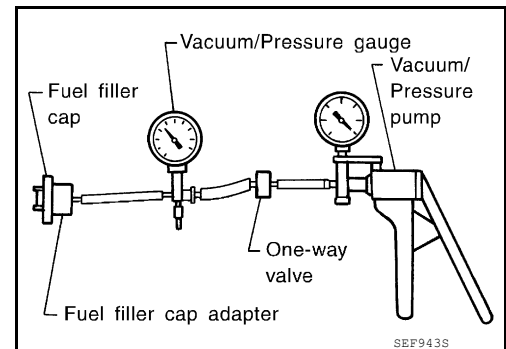
Pressure: 15.3 - 20.0 kPa (0.156 - 0.204 kg/cm², 2.22 - 2.90 psi)

Vacuum: -6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm², -0.87 to -0.48 psi)

3. If out of specification, replace fuel filler cap as an assembly. Refer to [FL-6, "Removal and Installation"](#).

CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.



P0460 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

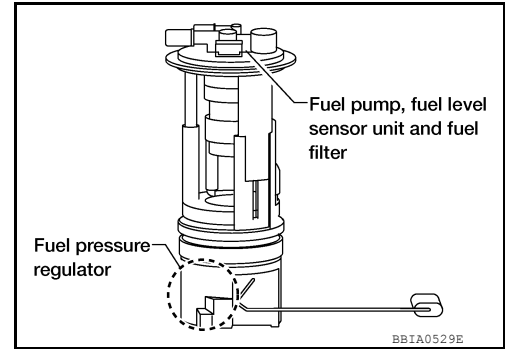
[VQ40DE]

P0460 FUEL LEVEL SENSOR

Component Description

INFOID:000000007358199

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM through the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

INFOID:000000007358200

NOTE:

- If DTC P0460 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0460 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-311, "Description"](#).

When the vehicle is parked, the fuel level in the fuel tank is naturally stable. It means that output signal of the fuel level sensor does not change. If ECM senses sloshing signal from the sensor, fuel level sensor malfunction is detected.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0460 0460	Fuel level sensor circuit noise	Even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM.	<ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted)• Harness or connectors (The sensor circuit is open or shorted)• Combination meter• Fuel level sensor

DTC Confirmation Procedure

INFOID:000000007358201

1. If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and wait maximum of 2 consecutive minutes.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to [EC-290, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358202

1. CHECK COMBINATION METER FUNCTION

Refer to [GI-33, "Work Flow"](#).

OK or NG

OK >> GO TO 2.

NG >> Go to [MWI-34, "Component Function Check"](#).

2. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

P0460 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

>> INSPECTION END

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P0461 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

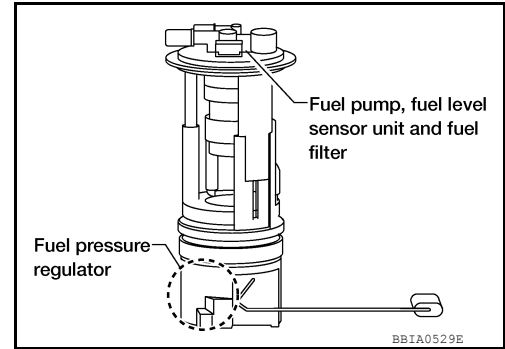
[VQ40DE]

P0461 FUEL LEVEL SENSOR

Component Description

INFOID:000000007358203

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM through CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

INFOID:000000007358204

NOTE:

- If DTC P0461 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0461 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-311, "Description"](#).

Driving long distances naturally affect fuel gauge level.

This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0461 0461	Fuel level sensor circuit range/performance	The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long distance.	<ul style="list-style-type: none"> • Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (The sensor circuit is open or shorted) • Combination meter • Fuel level sensor

Overall Function Check

INFOID:000000007358205

Use this procedure to check the overall function of the fuel level sensor. During this check, a 1st trip DTC might not be confirmed.

WARNING:

When performing the following procedure, always observe the handling of the fuel. Refer to [FL-11, "Removal and Installation"](#).

TESTING CONDITION:

Before starting overall function check, preparation of draining fuel and refilling fuel is required.

Ⓜ WITH CONSULT

NOTE:

Start from step 10, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line, refer to [EC-487, "Fuel Pressure Check"](#).
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch OFF and wait at least 10 seconds then turn ON.
6. Select "FUEL LEVEL SE" in "DATA MONITOR" mode with CONSULT.
7. Check "FUEL LEVEL SE" output voltage and note it.
8. Select "FUEL PUMP" in "ACTIVE TEST" mode with CONSULT.
9. Touch ON and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
10. Check "FUEL LEVEL SE" output voltage and note it.
11. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
12. Check "FUEL LEVEL SE" output voltage and note it.

P0461 FUEL LEVEL SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

13. Confirm whether the voltage changes more than 0.03V during step 7 to 10 and 10 to 12.
If NG, go to [EC-293, "Diagnosis Procedure"](#).

 WITH GST

NOTE:

Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line. Refer to [EC-487, "Fuel Pressure Check"](#).
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch ON.
6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
7. Confirm that the fuel gauge indication varies.
8. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
9. Confirm that the fuel gauge indication varies.
10. If NG, go to [EC-293, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358206

1. CHECK COMBINATION METER FUNCTION

Refer to [GI-33, "Work Flow"](#).

OK or NG

- OK >> GO TO 2.
NG >> Go to [MWI-34, "Component Function Check"](#).

2. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

P0462, P0463 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

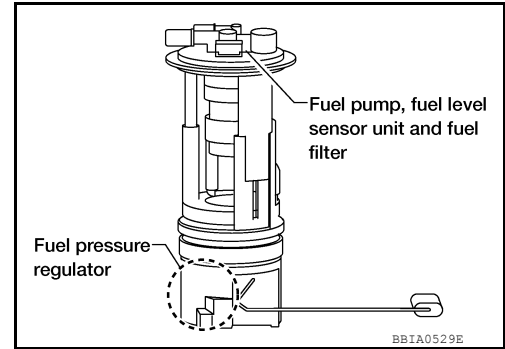
[VQ40DE]

P0462, P0463 FUEL LEVEL SENSOR

Component Description

INFOID:000000007358207

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM through CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

INFOID:000000007358208

NOTE:

- If DTC P0462 or P0463 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0462 or P0463 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-311, "Description"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0462 0462	Fuel level sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted)• Harness or connectors (The sensor circuit is open or shorted)• Combination meter• Fuel level sensor
P0463 0463	Fuel level sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

INFOID:000000007358209

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V at ignition switch ON.

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-294, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358210

1. CHECK COMBINATION METER FUNCTION

Refer to [GI-33, "Work Flow"](#).

OK or NG

- OK >> GO TO 2.
- NG >> Go to [MWI-34, "Component Function Check"](#).

2. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

P0462, P0463 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

>> INSPECTION END

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P0500 VSS

Description

INFOID:000000007358211

NOTE:

- If DTC P0500 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0500 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-311, "Description"](#).

The vehicle speed signal is sent to the combination meter from the “ABS actuator and electric unit (control unit)” by CAN communication line. The combination meter then sends a signal to the ECM by CAN communication line.

On Board Diagnosis Logic

INFOID:000000007358212

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500 0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	<ul style="list-style-type: none"> • Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (The vehicle speed signal circuit is open or shorted) • Wheel sensor • Combination meter • ABS actuator and electric unit (control unit)

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode.

Detected item	Engine operating condition in fail-safe mode
Vehicle speed sensor	When the fail-safe system for vehicle speed sensor is activated, the cooling fan operates (High) while engine is running.

DTC Confirmation Procedure

INFOID:000000007358213

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Steps 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Ⓟ WITH CONSULT

1. Start engine (VDC switch OFF).
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT. The vehicle speed on CONSULT should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
If NG, go to [EC-297, "Diagnosis Procedure"](#).
If OK, go to following step.
3. Select “DATA MONITOR” mode with CONSULT.
4. Warm engine up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	1,700 - 6,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	6.3 - 31.8 msec

P0500 VSS

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Selector lever	Except P or N position
PW/ST SIGNAL	OFF

6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to [EC-297. "Diagnosis Procedure"](#).

Overall Function Check

INFOID:000000007358214

Use this procedure to check the overall function of the vehicle speed sensor circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Lift up drive wheels.
2. Start engine.
3. Read vehicle speed sensor signal in Service \$01 with GST.
The vehicle speed sensor on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4. If NG, go to [EC-297. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358215

1. CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"

Refer to [BRC-117. "Work Flow"](#).

OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace.

2. CHECK COMBINATION METER FUNCTION

Refer to [GI-33. "Work Flow"](#).

>> **INSPECTION END**

P0506 ISC SYSTEM

Description

INFOID:000000007358216

NOTE:

If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.

The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration, and engine load (air conditioner, power steering and cooling fan operation, etc.).

On Board Diagnosis Logic

INFOID:000000007358217

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0506 0506	Idle speed control system RPM lower than expected	The idle speed is less than the target idle speed by 100 rpm or more.	<ul style="list-style-type: none"> • Electric throttle control actuator • Intake air leak

DTC Confirmation Procedure

INFOID:000000007358218

NOTE:

- **If the target idle speed is out of the specified value, perform, [EC-25, "Idle Air Volume Learning"](#), before conducting DTC Confirmation Procedure. For the target idle speed, refer to the [EC-490](#).**
- If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**
- **Always perform the test at a temperature above -10°C(14°F).**

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and run it for at least 1 minute at idle speed.
6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to [EC-298, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358219

1. CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

OK or NG

- OK >> GO TO 2.
- NG >> Discover air leak location and repair.

2. REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to [SEC-10, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#)

P0506 ISC SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

(with Intelligent Key system) [SEC-120. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (without Intelligent Key system).

4. Perform [EC-25. "VIN Registration"](#).
5. Perform [EC-25. "Accelerator Pedal Released Position Learning"](#).
6. Perform [EC-25. "Throttle Valve Closed Position Learning"](#).
7. Perform [EC-25. "Idle Air Volume Learning"](#).

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>> INSPECTION END

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P0507 ISC SYSTEM

Description

INFOID:000000007358220

NOTE:

If DTC P0507 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.

The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

On Board Diagnosis Logic

INFOID:000000007358221

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0507 0507	Idle speed control system RPM higher than expected	The idle speed is more than the target idle speed by 200 rpm or more.	<ul style="list-style-type: none"> • Electric throttle control actuator • Intake air leak • PCV system

DTC Confirmation Procedure

INFOID:000000007358222

NOTE:

- **If the target idle speed is out of the specified value, perform, [EC-25, "Idle Air Volume Learning"](#), before conducting DTC Confirmation Procedure. For the target idle speed, refer to the [EC-490](#).**
- If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**
- **Always perform the test at a temperature above -10°C(14°F).**

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and run it for at least 1 minute at idle speed.
6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to [EC-300, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358223

1.CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace.

2.CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

OK or NG

- OK >> GO TO 3.
- NG >> Discover air leak location and repair.

P0507 ISC SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

3. REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform initialization of NVIS(NATS) system and registration of all NVIS(NATS) ignition key IDs. Refer to [SEC-10, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (with Intelligent Key system) or [SEC-120, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (without Intelligent Key System).
4. Perform [EC-25, "VIN Registration"](#).
5. Perform [EC-25, "Accelerator Pedal Released Position Learning"](#).
6. Perform [EC-25, "Throttle Valve Closed Position Learning"](#).
7. Perform [EC-25, "Idle Air Volume Learning"](#).

>> INSPECTION END

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P050A, P050E COLD START CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P050A, P050E COLD START CONTROL

Description

INFOID:000000007358224

ECM controls ignition timing and engine idle speed when engine is started with pre-warming up condition. This control promotes the activation of three way catalyst by heating the catalyst and reduces emissions.

On Board Diagnosis Logic

INFOID:000000007358225

NOTE:

If DTC P050A or P050E is displayed with other DTC, first perform the trouble diagnosis for other DTC.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P050A	Cold start idle air control system performance	ECM does not control engine idle speed properly when engine is started with pre-warming up condition.	<ul style="list-style-type: none">• Lack of intake air volume• Fuel injection system• ECM
P050E	Cold start engine exhaust temperature too low	The temperature of the catalyst inlet does not rise to the proper temperature when the engine is started with pre-warming up condition.	

DTC Confirmation Procedure

INFOID:000000007358226

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Select "DATA MONITOR" mode with CONSULT.
4. Check the indication of "COOLAN TEMP/S".

With GST

Follow the procedure "With CONSULT" above.

Is the value of "COOLAN TEMP/S" between 15°C (59°F) and 36°C (97°F)?

YES >> GO TO 3.

NO-1 [If it is below 15°C (59°F)]>>Warm up the engine until the value of "COOLAN TEMP/S" reaches 15°C (59°F) or more. Retry from step 1.

NO-2 [If it is above 36°C (97°F)]>>Cool engine down to less than 36°C (97°F). Retry from step 1.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT

1. Set the select lever in N range.
2. Start the engine and warm up in idle with the value of "COOLAN TEMP/S" between 15°C (59°F) and 40°C (104°F) for more than 15 seconds.
3. Check 1st trip DTC.

With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

P050A, P050E COLD START CONTROL

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> Go to [EC-303. "Diagnosis Procedure"](#).
NO >> INSPECTION END

A

Diagnosis Procedure

INFOID:000000007358227

1. PERFORM IDLE AIR VOLUME LEARNING

EC

Perform [EC-25. "Idle Air Volume Learning"](#).

Is Idle Air Volume Learning carried out successfully?

C

- YES >> GO TO 2.
NO >> Follow the instruction of Idle Air Volume Learning.

2. CHECK INTAKE SYSTEM

D

Check for the cause of intake air volume lacking. Refer to the following.

- Crushed intake air passage
- Intake air passage clogging
- Clogging of throttle body

E

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Repair or replace malfunctioning part

F

3. CHECK FUEL INJECTION SYSTEM FUNCTION

Perform DTC Confirmation Procedure for DTC P0171, P0174. Refer to [EC-185. "DTC Confirmation Procedure"](#).

G

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Go to [EC-186. "Diagnosis Procedure"](#) for DTC P0171, P0174.

H

4. PERFORM DTC CONFIRMATION PROCEDURE

I

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
See [EC-302. "DTC Confirmation Procedure"](#).

J

Is the 1st trip DTC P050A or P050E displayed again?

- YES >> GO TO 5.
NO >> INSPECTION END

K

5. REPLACE ECM

L

1. Replace ECM.
2. Go to [EC-24. "Procedure After Replacing ECM"](#).

>> INSPECTION END

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P0550 PSP SENSOR

[VQ40DE]

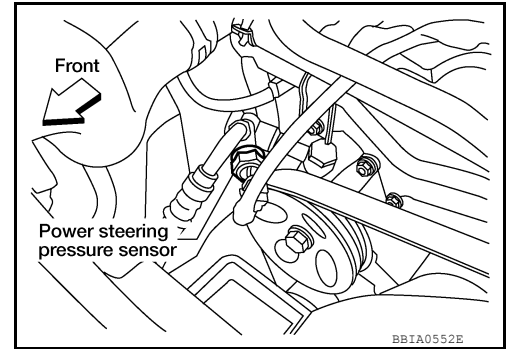
< DTC/CIRCUIT DIAGNOSIS >

P0550 PSP SENSOR

Component Description

INFOID:000000007358228

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load. This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.



On Board Diagnosis Logic

INFOID:000000007358229

The MIL will not illuminate for this diagnosis.

NOTE:

If DTC P0550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-312](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0550 0550	Power steering pressure sensor circuit	An excessively low or high voltage from the sensor is sent to ECM.	<ul style="list-style-type: none">• Harness or connectors (The sensor circuit is open or shorted)• Power steering pressure sensor

DTC Confirmation Procedure

INFOID:000000007358230

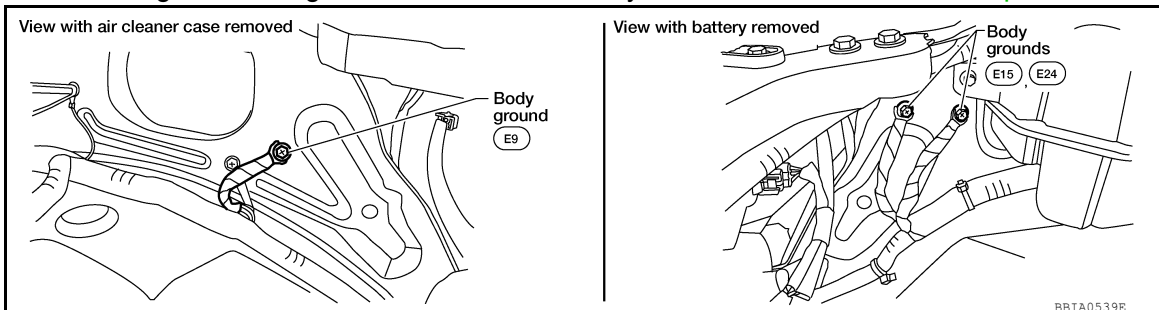
1. If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and let it idle for at least 5 seconds.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to [EC-304. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358231

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
NG >> Repair or replace ground connections.

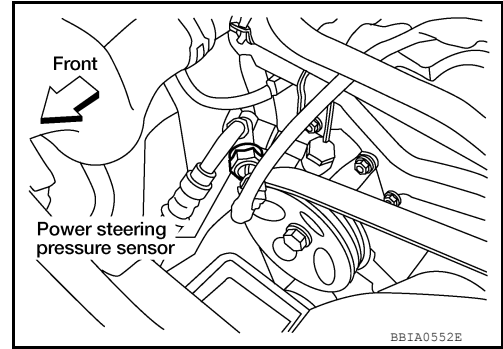
P0550 PSP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect power steering pressure (PSP) sensor harness connector.
2. Turn ignition switch ON.



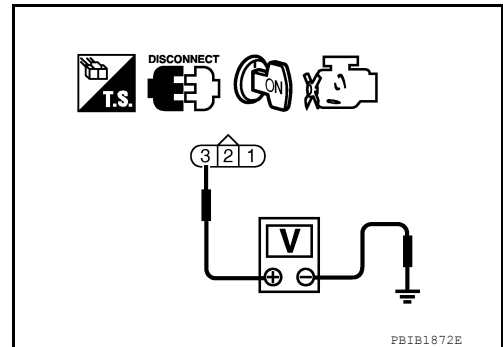
3. Check voltage between PSP sensor terminal 3 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between PSP sensor terminal 1 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 12 and PSP sensor terminal 2.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK PSP SENSOR

Refer to [EC-306, "Component Inspection"](#).

OK or NG

OK >> GO TO 6.

NG >> Replace PSP sensor. Refer to [ST-25, "Removal and Installation"](#).

6. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

P0550 PSP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

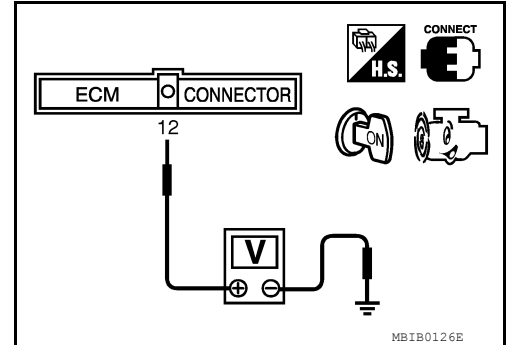
Component Inspection

INFOID:000000007358232

POWER STEERING PRESSURE SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and let it idle.
3. Check voltage between ECM terminal 12 and ground under the following conditions.

Condition	Voltage
Steering wheel: being turned	0.5 - 4.5V
Steering wheel: not being turned	0.4 - 0.8V



P0603 ECM POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

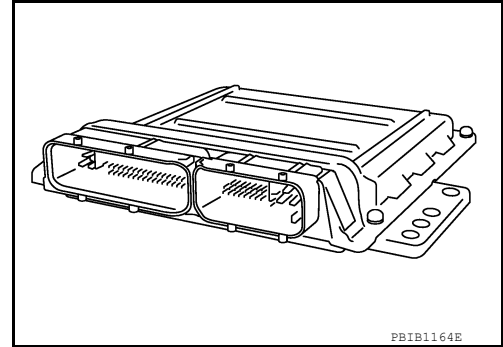
[VQ40DE]

P0603 ECM POWER SUPPLY

Component Description

INFOID:000000007358233

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.



On Board Diagnosis Logic

INFOID:000000007358234

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0603 0603	ECM power supply circuit	ECM back up RAM system does not function properly.	<ul style="list-style-type: none">• Harness or connectors [ECM power supply (back up) circuit is open or shorted.]• ECM

DTC Confirmation Procedure

INFOID:000000007358235

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON, wait at least 10 seconds.
3. Turn ignition switch OFF, wait at least 5 minutes.
4. Turn ignition switch ON, wait at least 10 seconds.
5. Repeat steps 2 to 3 for 5 times.
6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to [EC-307, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358236

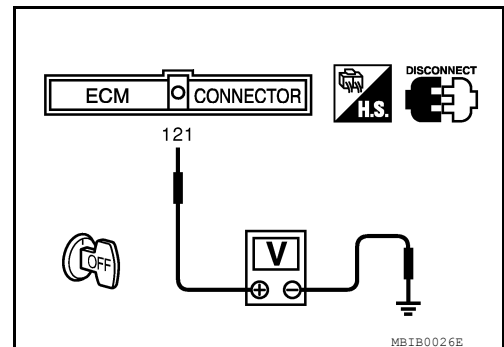
1. CHECK ECM POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 121 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

< DTC/CIRCUIT DIAGNOSIS >

Check the following.

- 20 A fuse(No.53)
- IPDM E/R harness connector E121
- Harness for open or short between ECM and battery

>> Repair open circuit in harness or connectors.

3.CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

OK or NG

- OK >> GO TO 4.
- NG >> Repair or replace harness or connectors.

4.PERFORM DTC CONFIRMATION PROCEDURE

 **With CONSULT**

1. Turn ignition switch ON.
2. Select "SELF DIAG RESULTS" mode with CONSULT.
3. Touch "ERASE".
4. **Perform DTC Confirmation Procedure.**
See [EC-307. "DTC Confirmation Procedure"](#).
5. Is the 1st trip DTC P0603 displayed again?

 **With GST**

1. Turn ignition switch ON.
2. Select Service \$04 with GST.
3. **Perform DTC Confirmation Procedure.**
See [EC-307. "DTC Confirmation Procedure"](#).
4. Is the 1st trip DTC P0603 displayed again?

Yes or No

- Yes >> GO TO 5.
- No >> **INSPECTION END**

5.REPLACE ECM

1. Replace ECM.
2. Perform initialization of NVIS(NATS) system and registration of all NVIS(NATS) ignition key IDs. Refer to [SEC-10. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (with Intelligent Key system) or [SEC-120. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (without Intelligent Key system).
3. Perform [EC-25. "VIN Registration"](#).
4. Perform [EC-25. "Accelerator Pedal Released Position Learning"](#).
5. Perform [EC-25. "Throttle Valve Closed Position Learning"](#).
6. Perform [EC-25. "Idle Air Volume Learning"](#).

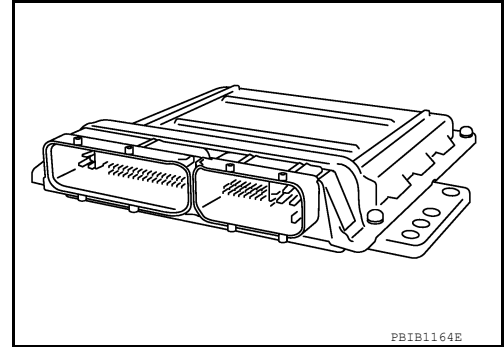
>> **INSPECTION END**

P0605 ECM

Component Description

INFOID:000000007358237

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.



On Board Diagnosis Logic

INFOID:000000007358238

This self-diagnosis has one or two trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 0605	Engine control module	A)	ECM calculation function is malfunctioning.	• ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	

FAIL-SAFE MODE

ECM enters fail-safe mode when the malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode
Malfunction A	<ul style="list-style-type: none"> • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. • ECM deactivates ASCD operation.

DTC Confirmation Procedure

INFOID:000000007358239

Perform PROCEDURE FOR MALFUNCTION A first. If the 1st trip DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B. If there is no malfunction on PROCEDURE FOR MALFUNCTION B, perform PROCEDURE FOR MALFUNCTION C.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

PROCEDURE FOR MALFUNCTION A

1. Turn ignition switch ON.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-310. "Diagnosis Procedure"](#).

PROCEDURE FOR MALFUNCTION B

ⓐ With CONSULT

1. Turn ignition switch ON and wait at least 1 second.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-310. "Diagnosis Procedure"](#).

PROCEDURE FOR MALFUNCTION C

ⓐ With CONSULT

1. Turn ignition switch ON and wait at least 1 second.

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< DTC/CIRCUIT DIAGNOSIS >

2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
3. Repeat step 2 for 32 times.
4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to [EC-310. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358240

1.INSPECTION START

 With CONSULT

1. Turn ignition switch ON.
2. Select "SELF DIAG RESULTS" mode with CONSULT.
3. Touch "ERASE".
4. **Perform DTC Confirmation Procedure.**
See [EC-309. "DTC Confirmation Procedure"](#).
5. Is the 1st trip DTC P0605 displayed again?

 With GST

1. Turn ignition switch ON.
2. Select Service \$04 with GST.
3. **Perform DTC Confirmation Procedure.**
See [EC-309. "DTC Confirmation Procedure"](#).
4. Is the 1st trip DTC P0605 displayed again?

Yes or No

Yes >> GO TO 2.

No >> **INSPECTION END**

2.REPLACE ECM

1. Replace ECM.
2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to [SEC-10. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (with Intelligent Key system) or [SEC-120. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (without Intelligent Key system).
3. Perform [EC-25. "VIN Registration"](#).
4. Perform [EC-25. "Accelerator Pedal Released Position Learning"](#).
5. Perform [EC-25. "Throttle Valve Closed Position Learning"](#).
6. Perform [EC-25. "Idle Air Volume Learning"](#).

>> **INSPECTION END**

P0607 ECM

Description

INFOID:000000007358241

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

INFOID:000000007358242

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U0607 0607	CAN communication bus	When detecting error during the initial diagnosis of CAN controller of ECM.	• ECM

DTC Confirmation Procedure

INFOID:000000007358243

1. Turn ignition switch ON.
2. Check DTC.
3. If DTC is detected, go to [EC-311, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358244

1.INSPECTION START

 With CONSULT

1. Turn ignition switch ON.
2. Select "SELF-DIAG RESULTS" mode with CONSULT.
3. Touch "ERASE".
4. **Perform DTC Confirmation Procedure.**
See [EC-311, "DTC Confirmation Procedure"](#).
5. Is the DTC P0607 displayed again?

 With GST

1. Turn ignition switch ON.
2. Select "Service \$04" with GST.
3. **Perform DTC Confirmation Procedure.**
See [EC-311, "DTC Confirmation Procedure"](#).
4. Is the DTC P0607 displayed again?

Yes or No

- Yes >> GO TO 2.
- No >> **INSPECTION END**

2.REPLACE ECM

1. Replace ECM.
2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to [SEC-10, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (with Intelligent Key system) or [SEC-120, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#) (without Intelligent Key system).
3. Perform [EC-25, "VIN Registration"](#).
4. Perform [EC-25, "Accelerator Pedal Released Position Learning"](#).
5. Perform [EC-25, "Throttle Valve Closed Position Learning"](#).
6. Perform [EC-25, "Idle Air Volume Learning"](#).

>> **INSPECTION END**

P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0643 SENSOR POWER SUPPLY

On Board Diagnosis Logic

INFOID:000000007358245

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0643 0643	Sensor power supply circuit short	ECM detects that the voltage of power source for sensor is excessively low or high.	<ul style="list-style-type: none"> • Harness or connectors (APP sensor 1 circuit is shorted.) (PSP sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (Battery current sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 1) • EVAP control system pressure sensor • Power steering pressure sensor • Refrigerant pressure sensor • Battery current sensor

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operation condition in fail-safe mode

ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

INFOID:000000007358246

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

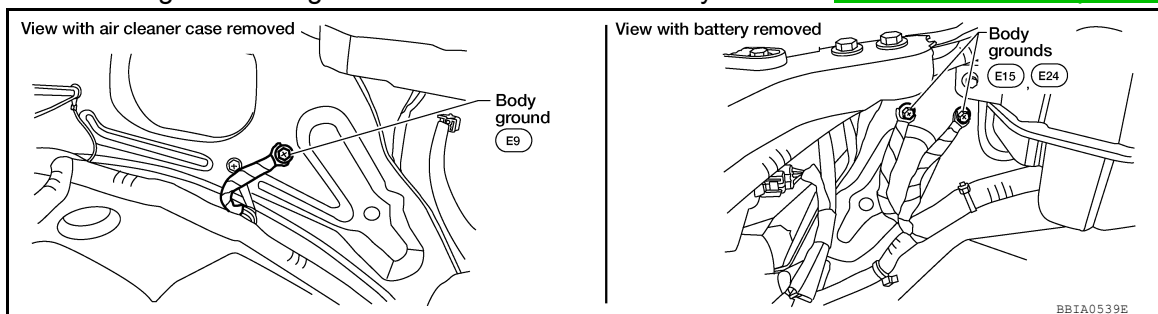
1. Start engine and let it idle for 1 second.
2. Check 1st trip DTC.
3. If DTC is detected, go to [EC-312, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358247

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground three screws on the body. Refer to [EC-97, "Ground Inspection"](#).



P0643 SENSOR POWER SUPPLY

[VQ40DE]

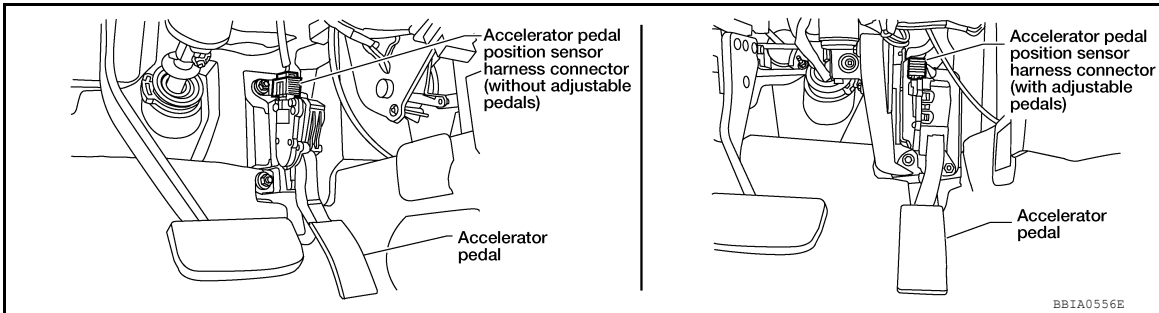
< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.

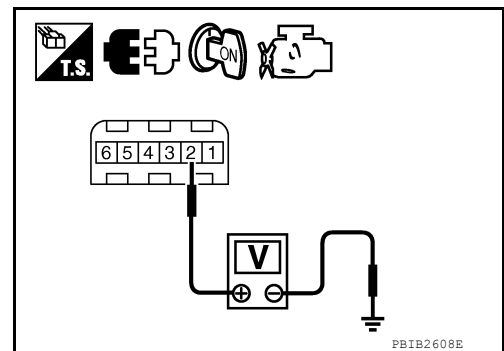


- 2. Turn ignition switch ON.
- 3. Check voltage between APP sensor terminal 2 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 3.



3.CHECK SENSOR POWER SUPPLY CIRCUITS

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
48	EVAP control system pressure sensor terminal 3	EC-455
49	Refrigerant pressure sensor terminal 3	
	Battery current sensor terminal 1	
68	PSP sensor terminal 3	
90	APP sensor terminal 2	

OK or NG

- OK >> GO TO 4.
- NG >> Repair short to ground or short to power in harness or connectors.

4.CHECK COMPONENTS

Check the following.

- EVAP control system pressure sensor (Refer to [EC-264, "Component Inspection"](#).)
- Refrigerant pressure sensor (Refer to [EC-423, "Component Description"](#).)
- Battery current sensor (Refer to [EC-330, "Component Inspection"](#).)
- Power steering pressure sensor (Refer to [EC-306, "Component Inspection"](#).)

OK or NG

- OK >> GO TO 5.
- NG >> Replace malfunctioning component.

5.CHECK APP SENSOR

Refer to [EC-375, "Component Inspection"](#).

OK or NG

- OK >> GO TO 7.

P0643 SENSOR POWER SUPPLY

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to [ACC-4, "Removal and Installation"](#).

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0850 PNP SWITCH

Component Description

INFOID:000000007358248

When the selector lever position is P or N, park/neutral position (PNP) signal is sent to ECM from TCM via combination meter (unified meter control unit).

ECM detects the position because the continuity of the line (the ON signal) exists.

On Board Diagnosis Logic

INFOID:000000007358249

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0850 0850	Park/neutral position switch	The park/neutral position (PNP) signal not change during driving after the engine is started.	<ul style="list-style-type: none">• Harness or connectors [The park/neutral position (PNP) signal circuit is open or shorted.]• Transmission range switch• Combination meter• TCM

DTC Confirmation Procedure

INFOID:000000007358250

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Ⓜ WITH CONSULT

1. Turn ignition switch ON.
2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT. Then check the "P/N POSI SW" signal under the following conditions.

Position (Selector lever)	Known-good signal
P or N position	ON
Except above position	OFF

If NG, go to [EC-316. "Diagnosis Procedure"](#).

If OK, go to following step.

3. Select "DATA MONITOR" mode with CONSULT.
4. Start engine and warm it up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	1,400 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	2.0 - 31.8 msec
VHCL SPEED SE	More than 64 km/h (40 MPH)
Selector lever	Suitable position

6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to [EC-316. "Diagnosis Procedure"](#).

Overall Function Check

INFOID:000000007358251

Use this procedure to check the overall function of the park/neutral position (PNP) signal circuit. During this check, a 1st trip DTC might not be confirmed.

Ⓜ WITH GST

P0850 PNP SWITCH

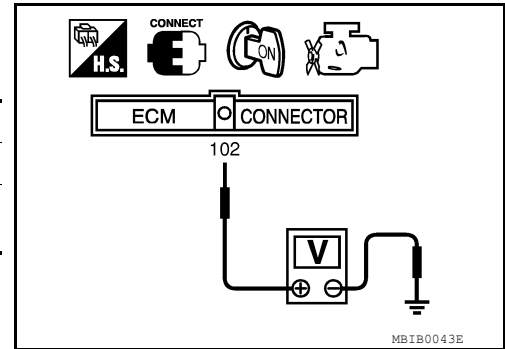
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 102 (PNP signal) and ground under the following conditions.

Condition (Gear position)	Voltage V (Known-good data)
P or N position	Approx. 0
Except above position	BATTERY VOLTAGE (11 - 14V)

3. If NG, go to [EC-316. "Diagnosis Procedure"](#).



INFOID:000000007358252

Diagnosis Procedure

1. CHECK DTC WITH TCM

Refer to [TM-114. "DTC Inspection Priority Chart"](#).

OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace.

2. CHECK STARTING SYSTEM

Turn ignition switch OFF, then turn it to START.

Does starter motor operate?

Yes or No

- Yes >> GO TO 3.
- No >> Refer to [STR-11. "System Diagram"](#).

3. CHECK PNP INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 102 and combination meter terminal 7.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E152, M31
- Harness for open or short between ECM and combination meter

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

OK or NG

- OK >> GO TO 6.
- NG >> Repair or replace.

6. REPLACE COMBINATION METER

Refer to [MWI-89. "Removal and Installation"](#).

>> **INSPECTION END**

P1148, P1168 CLOSED LOOP CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1148, P1168 CLOSED LOOP CONTROL

On Board Diagnosis Logic

INFOID:000000007358253

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1148 1148 (Bank 1)	Closed loop control function	The closed loop control function for bank 1 does not operate even when vehicle is being driven in the specified condition.	<ul style="list-style-type: none">• Harness or connectors [The air fuel ratio (A/F) sensor 1 circuit is open or shorted.]• Air fuel ratio (A/F) sensor 1• Air fuel ratio (A/F) sensor 1 heater
P1168 1168 (Bank 2)		The closed loop control function for bank 2 does not operate even when vehicle is being driven in the specified condition.	

DTC P1148 or P1168 is displayed with another DTC for air fuel ratio (A/F) sensor 1.
Perform the trouble diagnosis for the corresponding DTC.

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P1211 TCS CONTROL UNIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1211 TCS CONTROL UNIT

Description

INFOID:000000007358254

The malfunction information related to TCS is transferred through the CAN communication line from “ABS actuator and electric unit (control unit)” to ECM.

Be sure to erase the malfunction information such as DTC not only for “ABS actuator and electric unit (control unit)” but also for ECM after TCS related repair.

On Board Diagnosis Logic

INFOID:000000007358255

Freeze frame data is not stored in the ECM for this self-diagnosis. The MIL will not illuminate for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1211 1211	TCS control unit	ECM receives malfunction information from “ABS actuator and electric unit (Control unit)”.	<ul style="list-style-type: none">• ABS actuator and electric unit (control unit)• TCS related parts

DTC Confirmation Procedure

INFOID:000000007358256

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

1. Start engine and let it idle for at least 60 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-318, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358257

Go to [BRC-117, "Work Flow"](#).

P1212 TCS COMMUNICATION LINE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1212 TCS COMMUNICATION LINE

Description

INFOID:000000007358258

NOTE:

- If DTC P1212 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1212 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-311, "On Board Diagnosis Logic"](#).

This CAN communication line is used to control the smooth engine operation during the TCS operation. Pulse signals are exchanged between ECM and "ABS actuator and electric unit (control unit)".

Be sure to erase the malfunction information such as DTC not only for "ABS actuator and electric unit (control unit)" but also for ECM after TCS related repair.

On Board Diagnosis Logic

INFOID:000000007358259

Freeze frame data is not stored in the ECM for this self-diagnosis. The MIL will not illuminate for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1212 1212	TCS communication line	ECM cannot receive the information from "ABS actuator and electric unit (control unit)".	<ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted.)• ABS actuator and electric unit (control unit)• Dead (Weak) battery

DTC Confirmation Procedure

INFOID:000000007358260

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-319, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358261

Go to [BRC-117, "Work Flow"](#).

P1217 ENGINE OVER TEMPERATURE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1217 ENGINE OVER TEMPERATURE

On Board Diagnosis Logic

INFOID:000000007358262

NOTE:

- If DTC P1217 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1217 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-311, "On Board Diagnosis Logic"](#).

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217 1217	Engine over temperature (Overheat)	<ul style="list-style-type: none">• Cooling fan does not operate properly (Overheat).• Cooling fan system does not operate properly (Overheat).• Engine coolant level was not added to the system using the proper filling method.• Engine coolant is not within the specified range.	<ul style="list-style-type: none">• Harness or connectors (The cooling fan circuit is open or shorted.)• IPDM E/R• Cooling fan• Cooling fan (Crankshaft driven)• Radiator hose• Radiator• Radiator cap• Reservoir tank• Reservoir tank cap• Water pump• Thermostat <p>For more information, refer to EC-322, "Main 12 Causes of Overheating".</p>

CAUTION:

When a malfunction is indicated, always replace the coolant. Refer to [CO-12, "Changing Engine Coolant"](#). Also, replace the engine oil. Refer to [LU-9, "Changing Engine Oil"](#).

1. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. always use coolant with the proper mixture ratio. Refer to [MA-20, "FOR MEXICO : SAE Viscosity Number"](#) (for USA and Canada) or [MA-20, "FOR MEXICO : SAE Viscosity Number"](#) (for Mexico).
2. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

Overall Function Check

INFOID:000000007358263

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

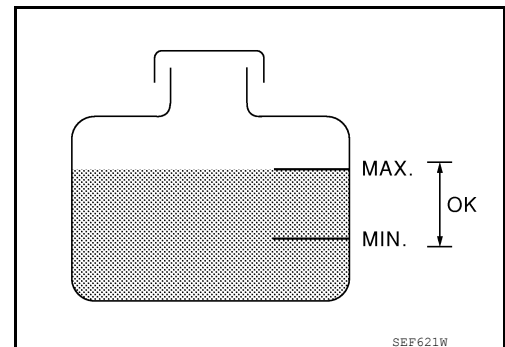
WARNING:

Never remove the radiator cap and/or reservoir tank cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator and/or reservoir tank.

Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT

1. Check the coolant level in the reservoir tank and radiator.
Allow engine to cool before checking coolant level.
If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to [EC-321, "Diagnosis Procedure"](#).
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to [EC-321, "Diagnosis Procedure"](#).
3. Turn ignition switch ON.
4. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.



P1217 ENGINE OVER TEMPERATURE

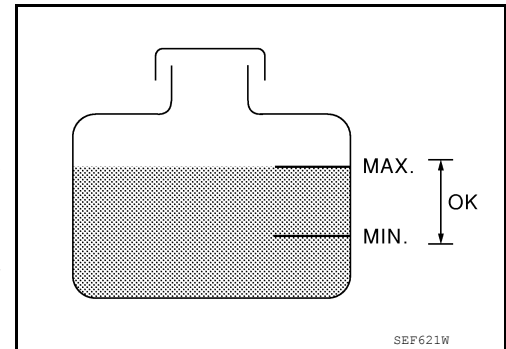
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

5. If the results are NG, go to [EC-321, "Diagnosis Procedure"](#).

Ⓜ WITH GST

1. Check the coolant level in the reservoir tank and radiator.
Allow engine to cool before checking coolant level.
If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to [EC-321, "Diagnosis Procedure"](#).
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to [EC-321, "Diagnosis Procedure"](#).
3. Perform IPDM E/R auto active test and check cooling fan motor operation, refer to [EC-321, "Diagnosis Procedure"](#).
4. If NG, go to [EC-321, "Diagnosis Procedure"](#).



INFOID:000000007358264

Diagnosis Procedure

1. CHECK COOLING FAN (CRANKSHAFT DRIVEN) OPERATION

1. Start engine and let it idle.
2. Make sure that cooling fan (crankshaft driven) operates normally.

OK or NG

OK (With CONSULT)>>GO TO 2.

OK (Without CONSULT)>>GO TO 3.

NG >> Check cooling fan (crankshaft driven). Refer to [CO-20, "Removal and Installation \(Crankshaft driven type\)"](#)

2. CHECK COOLING FAN OPERATION

Ⓜ With CONSULT

1. Start engine and let it idle.
2. Select "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.
3. Make sure that cooling fan operates at each speed (LOW/HI).

OK or NG

OK >> GO TO 4.

NG >> Check cooling fan control circuit. (Go to "PROCEDURE A".)

3. CHECK COOLING FAN OPERATION

⊗ Without CONSULT

1. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to [PCS-9, "Diagnosis Description"](#).
2. Make sure that cooling fan operates at each speed (Low/High).

OK or NG

OK >> GO TO 4.

NG >> Check cooling fan control circuit. (Go to "PROCEDURE A".)

4. CHECK COOLING SYSTEM FOR LEAK

Refer to [CO-11, "System Inspection"](#).

OK or NG

OK >> GO TO 5.

NG >> Check the following for leak. Refer to [CO-11, "System Inspection"](#).

- Hose
- Radiator
- Radiator cap
- Reservoir tank
- Water pump

5. CHECK RESERVOIR TANK CAP

Refer to [CO-11, "System Inspection"](#).

P1217 ENGINE OVER TEMPERATURE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

OK >> GO TO 6.

NG >> Replace reservoir tank cap. Refer to [CO-17. "Exploded View"](#).

6. CHECK COMPONENT PARTS

Check the following

- Thermostat. Refer to [CO-28. "Removal and Installation"](#).
- Engine coolant temperature sensor. Refer to [EC-134. "Component Inspection"](#).

OK or NG

OK >> GO TO 7.

NG >> Replace malfunctioning component.

7. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, go to [EC-322. "Main 12 Causes of Overheating"](#).

>> **INSPECTION END**

Main 12 Causes of Overheating

INFOID:000000007358265

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	<ul style="list-style-type: none"> • Blocked radiator • Blocked condenser • Blocked radiator grille • Blocked bumper 	• Visual	No blocking	—
	2	• Coolant mixture	• Coolant tester	CO-12. "Changing Engine Coolant"	
	3	• Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	CO-12. "Changing Engine Coolant"
	4	• Reservoir tank cap	• Pressure tester	59 - 98 kPa (0.6 - 1.0 kg/cm ² , 9 - 14 psi) (Limit)	CO-11. "System Inspection"
ON*2	5	• Coolant leaks	• Visual	No leaks	CO-11. "System Inspection"
ON*2	6	• Thermostat	• Touch the upper and lower radiator hoses	Both hoses should be hot	CO-28. "Removal and Installation"
ON*1	7	• Cooling fan	• CONSULT	Operating	See trouble diagnosis for DTC P1217 (EC-398. "Diagnosis Procedure").
ON*2	7	• Cooling fan (Crankshaft driven)	• Visual	Operating	See CO-20. "Removal and Installation (Crankshaft driven type)" .
OFF	8	• Combustion gas leak	• Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	• Coolant temperature gauge	• Visual	Gauge less than 3/4 when driving	—
		• Coolant overflow to reservoir tank	• Visual	No overflow during driving and idling	CO-12. "Changing Engine Coolant"
OFF*4	10	• Coolant return from reservoir tank to radiator	• Visual	Should be initial level in reservoir tank	CO-12. "Changing Engine Coolant"
OFF	11	• Cylinder head	• Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	EM-96. "Inspection After Disassembly"
	12	• Cylinder block and pistons	• Visual	No scuffing on cylinder walls or piston	EM-96. "Inspection After Disassembly"

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

P1217 ENGINE OVER TEMPERATURE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.

For more information, refer to [CO-9. "Troubleshooting Chart"](#)

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P1225 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

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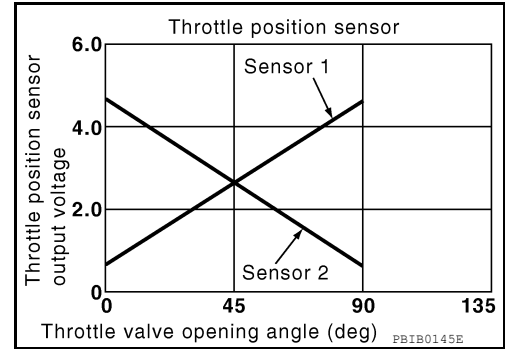
P1225 TP SENSOR

Component Description

INFOID:000000007358266

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

INFOID:000000007358267

The MIL will not illuminate for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225 1225	Closed throttle position learning performance	Closed throttle position learning value is excessively low.	• Electric throttle control actuator (TP sensor 1 and 2)

DTC Confirmation Procedure

INFOID:000000007358268

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to [EC-324. "Diagnosis Procedure"](#).

Diagnosis Procedure

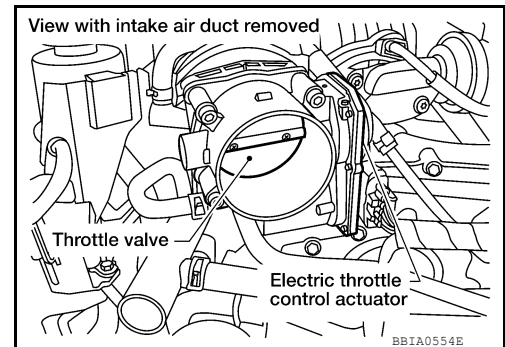
INFOID:000000007358269

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct. Refer to [EM-26. "Removal and Installation"](#).
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

- OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to [EC-25. "Throttle Valve Closed Position Learning"](#).



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

P1225 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Replace the electric throttle control actuator. Refer to [EM-27. "Removal and Installation"](#).

>> INSPECTION END

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P1226 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

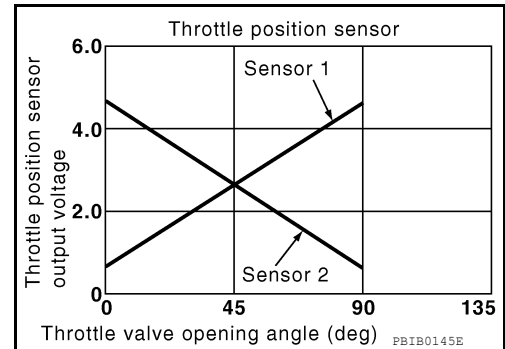
P1226 TP SENSOR

Component Description

INFOID:000000007358270

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

INFOID:000000007358271

The MIL will not illuminate for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226 1226	Closed throttle position learning performance	Closed throttle position learning is not performed successfully, repeatedly.	• Electric throttle control actuator (TP sensor 1 and 2)

DTC Confirmation Procedure

INFOID:000000007358272

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Repeat steps 2 and 3 for 32 times.
5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to [EC-326, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358273

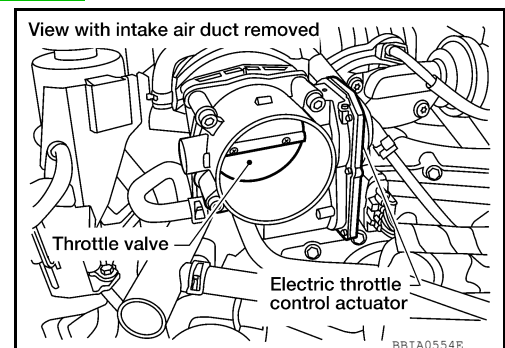
1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct. Refer to [EM-26, "Removal and Installation"](#).
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.

NG >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to [EC-25, "Throttle Valve Closed Position Learning"](#).



P1226 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace the electric throttle control actuator. Refer to [EM-27. "Removal and Installation"](#).

>> INSPECTION END

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P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

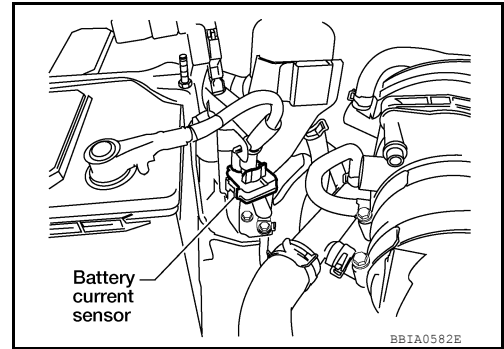
[VQ40DE]

P1550 BATTERY CURRENT SENSOR

Component Description

INFOID:000000007358274

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to [CHG-12, "System Description"](#).



CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then battery discharge may occur.

On Board Diagnosis Logic

INFOID:000000007358275

The MIL will not illuminate for this diagnosis.

NOTE:

If DTC P1550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-312](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1550 1550	Battery current sensor circuit range/performance	The output voltage of the battery current sensor remains within the specified range while engine is running.	<ul style="list-style-type: none">• Harness or connectors (The sensor circuit is open or shorted.)• Battery current sensor

DTC Confirmation Procedure

INFOID:000000007358276

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

1. Start engine and wait at least 10 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-328, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358277

1. CHECK GROUND CONNECTIONS

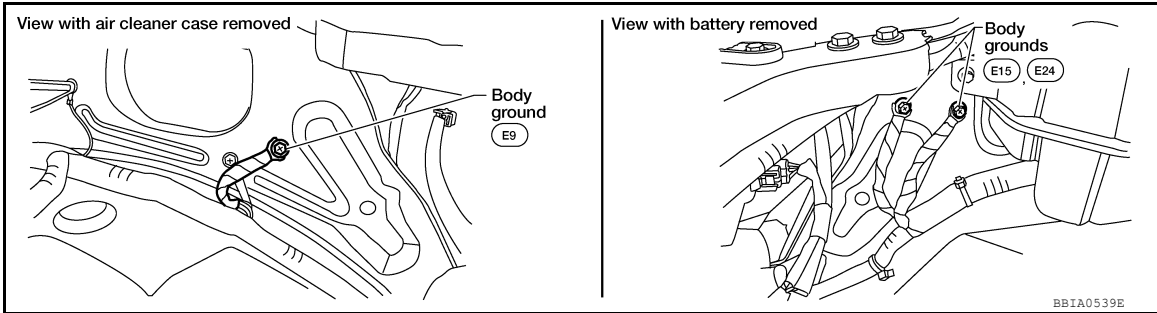
1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body.

P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Refer to [EC-97. "Ground Inspection"](#).

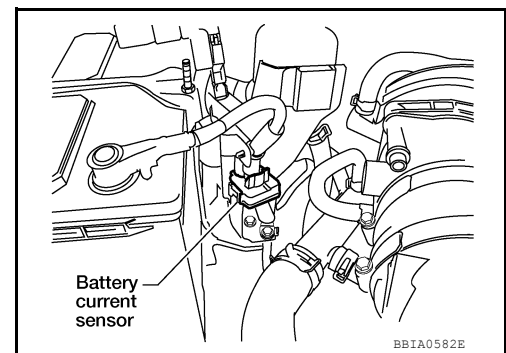


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.

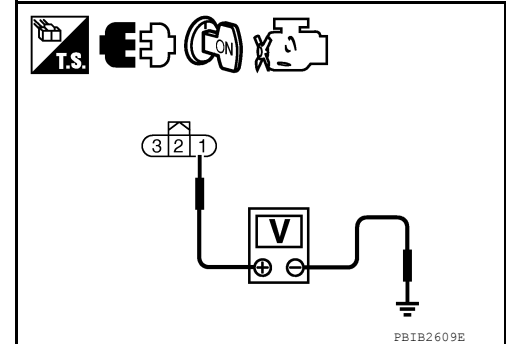


3. Check voltage between battery current sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between battery current sensor terminal 2 and ECM terminal 67.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 6.
- NG >> GO TO 5.

P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between battery current sensor terminal 3 and ECM terminal 71.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK BATTERY CURRENT SENSOR

Refer to [EC-330. "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

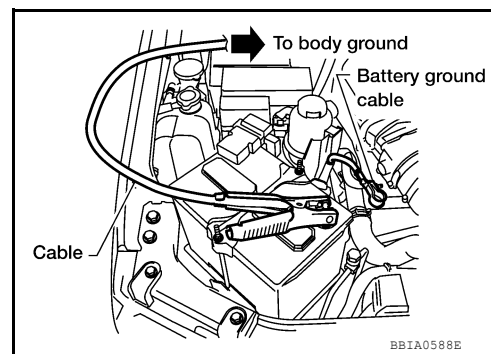
>> **INSPECTION END**

Component Inspection

INFOID:000000007358278

BATTERY CURRENT SENSOR

1. Reconnect harness connectors disconnected.
2. Disconnect battery negative cable.
3. Install jumper cable between battery negative terminal and body ground.
4. Turn ignition switch ON.



P1550 BATTERY CURRENT SENSOR

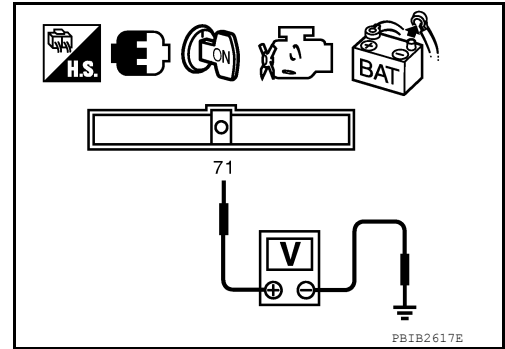
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Check voltage between ECM terminal 71 (battery current sensor signal) and ground.

Voltage: Approximately 2.5V

6. If NG, replace battery negative cable assembly.



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P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

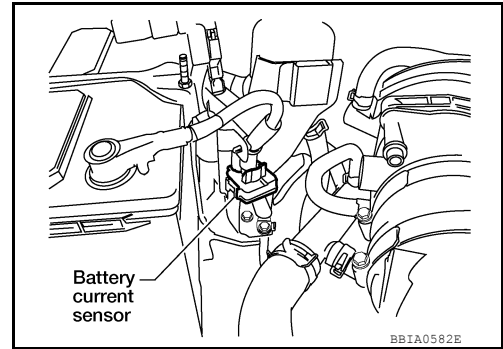
[VQ40DE]

P1551, P1552 BATTERY CURRENT SENSOR

Component Description

INFOID:000000007358279

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to [CHG-12, "System Description"](#).



CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

On Board Diagnosis Logic

INFOID:000000007358280

The MIL will not illuminate for this diagnosis.

NOTE:

If DTC P1551 or P1552 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-312](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1551 1551	Battery current sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Battery current sensor
P1552 1552	Battery current sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

INFOID:000000007358281

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8V with ignition switch ON

1. Turn ignition switch ON and wait at least 10 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-332, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358282

1. CHECK GROUND CONNECTIONS

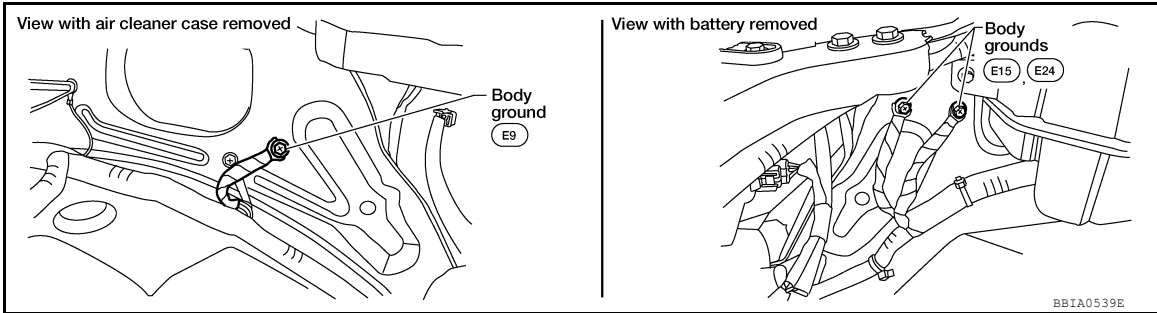
1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body.

P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Refer to [EC-97. "Ground Inspection"](#).



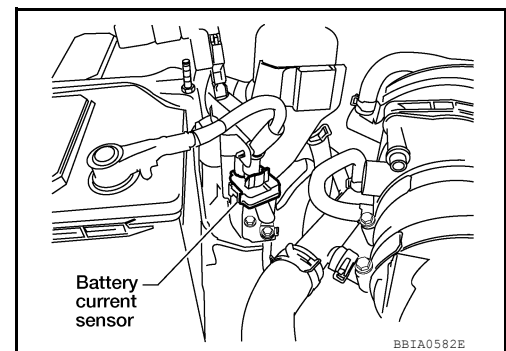
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.



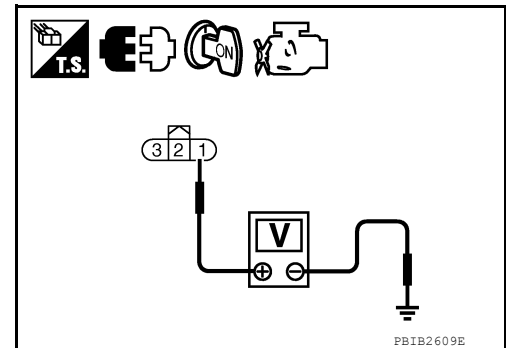
3. Check voltage between battery current sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair circuit or short to ground or short to power in harness or connectors.

4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between battery current sensor terminal 2 and ECM terminal 67.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair circuit or short to ground or short to power in harness or connectors.

6. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between battery current sensor terminal 3 and ECM terminal 71.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair circuit or short to ground or short to power in harness or connectors.

8. CHECK BATTERY CURRENT SENSOR

Refer to [EC-334. "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

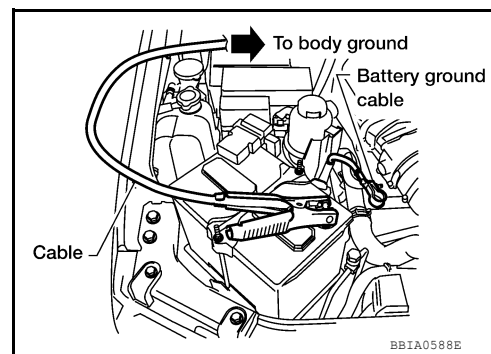
>> **INSPECTION END**

Component Inspection

INFOID:000000007358283

BATTERY CURRENT SENSOR

1. Reconnect harness connectors disconnected.
2. Disconnect battery negative cable.
3. Install jumper cable between battery negative terminal and body ground.
4. Turn ignition switch ON.



P1551, P1552 BATTERY CURRENT SENSOR

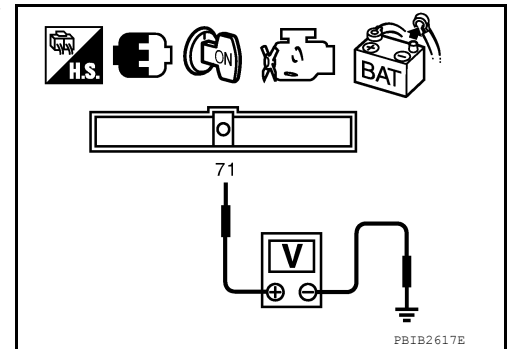
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Check voltage between ECM terminal 71 (battery current sensor signal) and ground.

Voltage: Approximately 2.5V

6. If NG, replace battery negative cable assembly.



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P1553 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

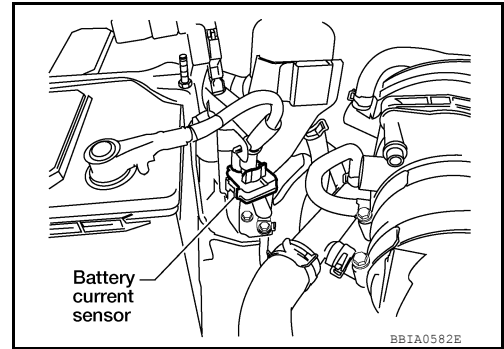
[VQ40DE]

P1553 BATTERY CURRENT SENSOR

Component Description

INFOID:000000007358284

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to [CHG-12, "System Description"](#).



CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

On Board Diagnosis Logic

INFOID:000000007358285

The MIL will not illuminate for this diagnosis.

NOTE:

If DTC P1553 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-312](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1553 1553	Battery current sensor performance	The signal voltage transmitted from the sensor to ECM is higher than the amount of the maximum power generation.	<ul style="list-style-type: none">• Harness or connectors (The sensor circuit is open or shorted.)• Battery current sensor

DTC Confirmation Procedure

INFOID:000000007358286

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

1. Start engine and wait at least 10 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-336, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358287

1. CHECK GROUND CONNECTIONS

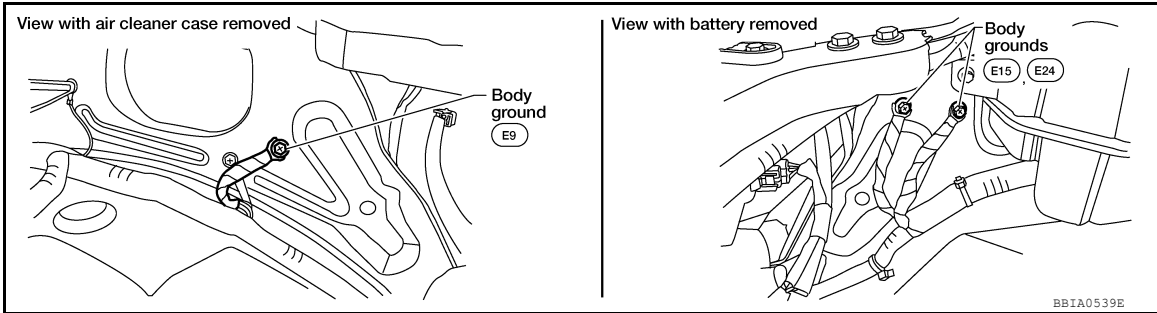
1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body.

P1553 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Refer to [EC-97. "Ground Inspection"](#).



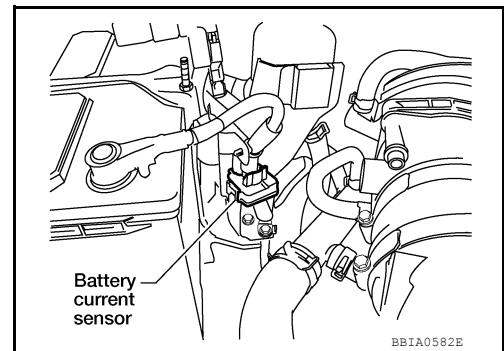
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.



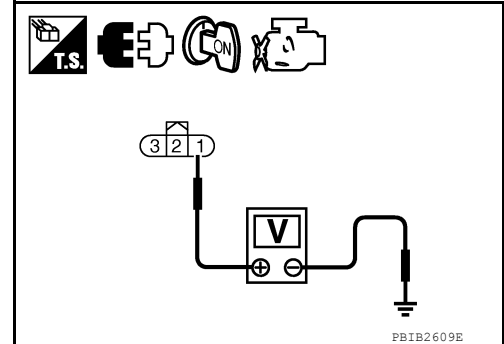
3. Check voltage between battery current sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between battery current sensor terminal 2 and ECM terminal 67.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

P1553 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between battery current sensor terminal 3 and ECM terminal 71.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK BATTERY CURRENT SENSOR

Refer to [EC-338. "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

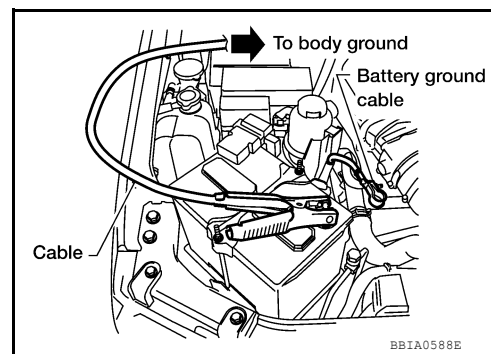
>> **INSPECTION END**

Component Inspection

INFOID:000000007358288

BATTERY CURRENT SENSOR

1. Reconnect harness connectors disconnected.
2. Disconnect battery negative cable.
3. Install jumper cable between battery negative terminal and body ground.
4. Turn ignition switch ON.



P1553 BATTERY CURRENT SENSOR

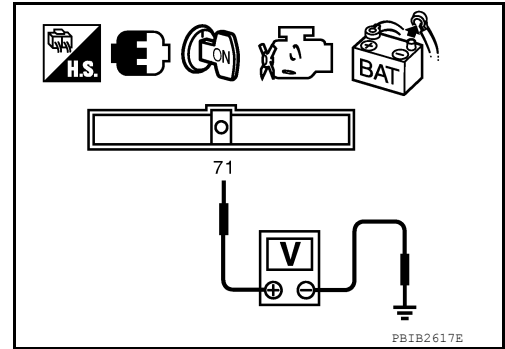
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Check voltage between ECM terminal 71 (battery current sensor signal) and ground.

Voltage: Approximately 2.5V

6. If NG, replace battery negative cable assembly.



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P1554 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

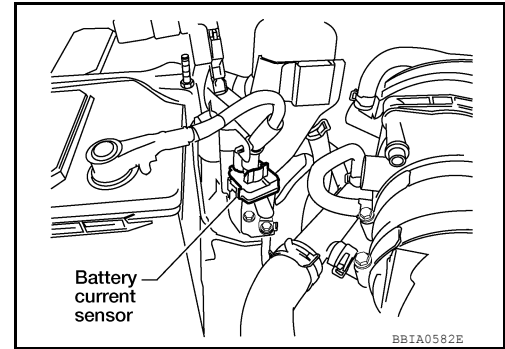
[VQ40DE]

P1554 BATTERY CURRENT SENSOR

Component Description

INFOID:000000007358289

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to [CHG-12, "System Description"](#).



CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

On Board Diagnosis Logic

INFOID:000000007358290

The MIL will not illuminate for this diagnosis.

NOTE:

If DTC P1554 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-312](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1554 1554	Battery current sensor performance	The output voltage of the battery current sensor is lower than the specified value while the battery voltage is high enough.	<ul style="list-style-type: none">• Harness or connectors (The sensor circuit is open or shorted.)• Battery current sensor

Overall Function Check

INFOID:000000007358291

Use this procedure to check the overall function of the battery current sensor circuit. During this check, a 1st trip DTC might not be confirmed.

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is more than 12.8V at idle.
- Before performing the following procedure, confirm that all load switches and A/C switch are turned OFF.

④ WITH CONSULT

1. Start engine and let it idle.
2. Select "BAT CUR SEN" in "DATA MONITOR" mode with CONSULT.
3. Check "BAT CUR SEN" indication for 10 seconds.
"BAT CUR SEN" should be above 2,300mV at least once.
4. If NG, go to [EC-341, "Diagnosis Procedure"](#).

④ WITH GST

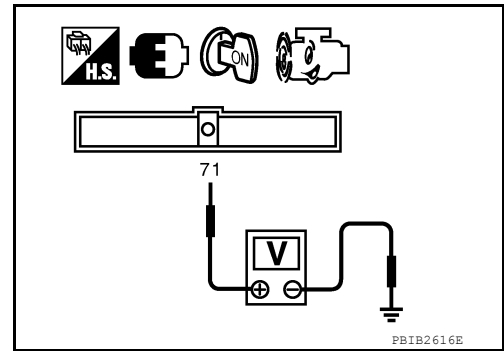
1. Start engine and let it idle.

P1554 BATTERY CURRENT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

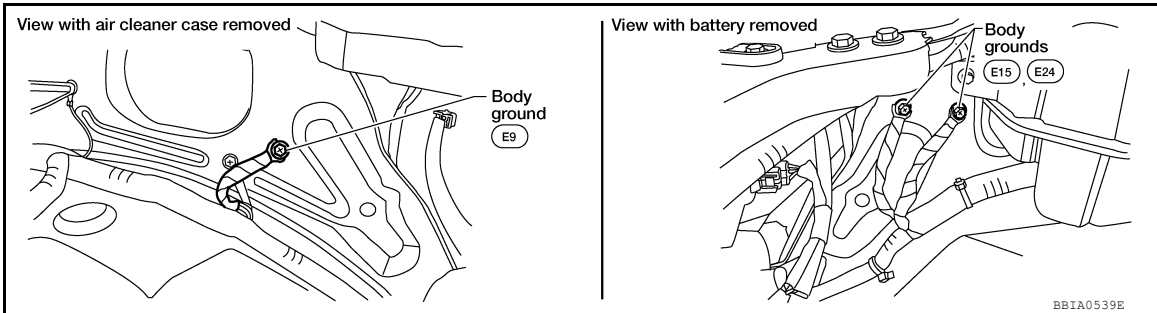
2. Check voltage between ECM terminal 71 (battery current sensor signal) and ground for 10 seconds.
The voltage should be above 2.3V at least once.
3. If NG, go to [EC-341, "Diagnosis Procedure"](#).



Diagnosis Procedure

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body.
Refer to [EC-97, "Ground Inspection"](#).

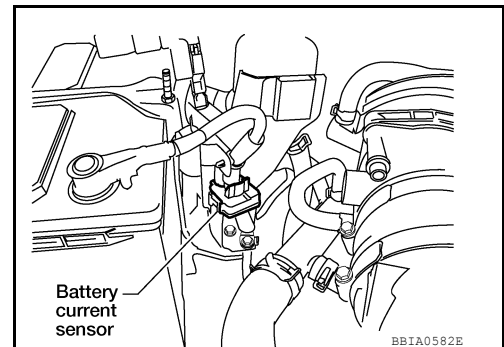


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.

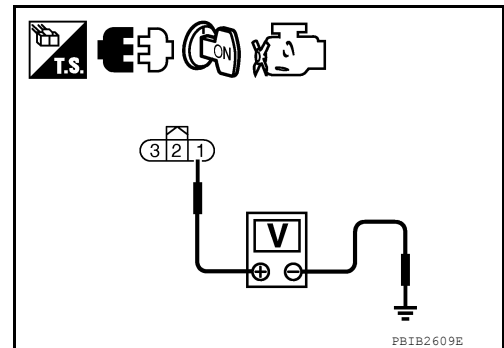


3. Check voltage between battery current sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

P1554 BATTERY CURRENT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between battery current sensor terminal 2 and ECM terminal 67.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 6.
- NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between battery current sensor terminal 3 and ECM terminal 71.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK BATTERY CURRENT SENSOR

Refer to [EC-342. "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358293

BATTERY CURRENT SENSOR

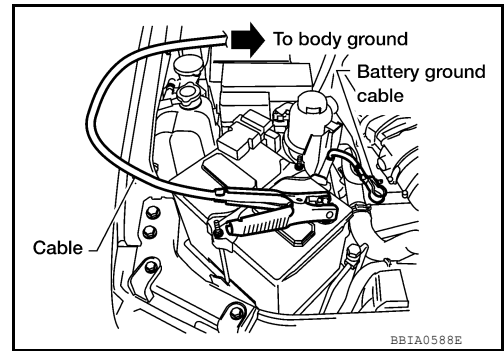
1. Reconnect harness connectors disconnected.
2. Disconnect battery negative cable.

P1554 BATTERY CURRENT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

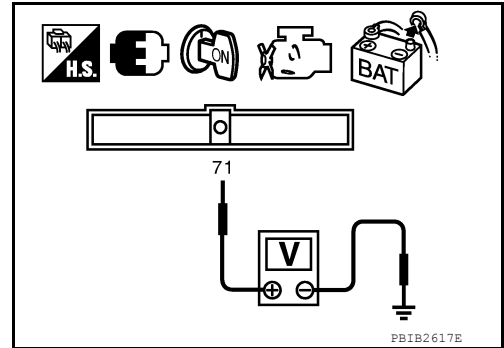
3. Install jumper cable between battery negative terminal and body ground.
4. Turn ignition switch ON.



5. Check voltage between ECM terminal 71 (battery current sensor signal) and ground.

Voltage: Approximately 2.5V

6. If NG, replace battery negative cable assembly.



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P1564 ASCD STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

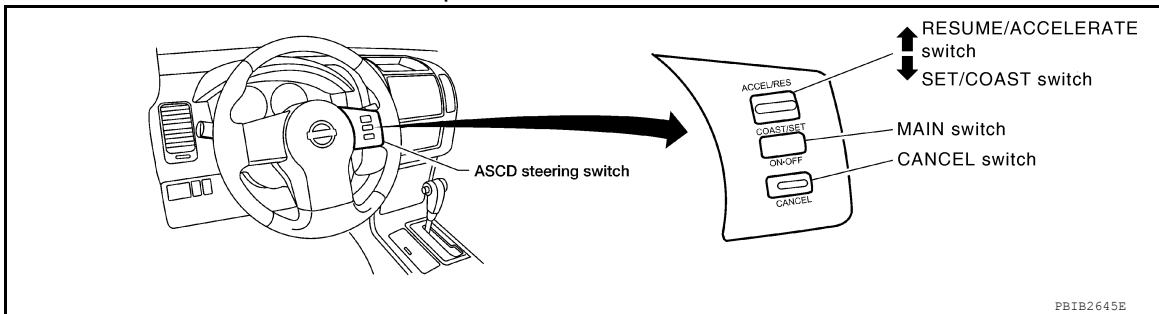
[VQ40DE]

P1564 ASCD STEERING SWITCH

Component Description

INFOID:000000007358294

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.



Refer to [EC-53, "System Description"](#) for the ASCD function.

On Board Diagnosis Logic

INFOID:000000007358295

This self-diagnosis has the one trip detection logic.

The MIL will not illuminate for this diagnosis.

NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-309](#).

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1564 1564	ASCD steering switch	<ul style="list-style-type: none"> An excessively high voltage signal from the ASCD steering switch is sent to ECM. ECM detects that input signal from the ASCD steering switch is out of the specified range. ECM detects that the ASCD steering switch is stuck ON. 	<ul style="list-style-type: none"> Harness or connectors (The switch circuit is open or shorted.) ASCD steering switch ECM

DTC Confirmation Procedure

INFOID:000000007358296

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Ⓟ WITH CONSULT

1. Turn ignition switch ON and wait at least 10 seconds.
2. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
3. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
4. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Check DTC.
7. If DTC is detected, go to [EC-344, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358297

1. CHECK GROUND CONNECTIONS

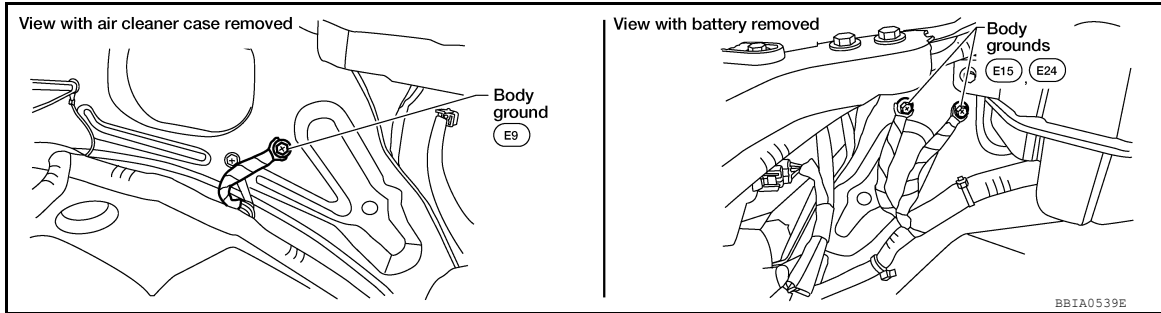
1. Turn ignition switch OFF.

P1564 ASCD STEERING SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT

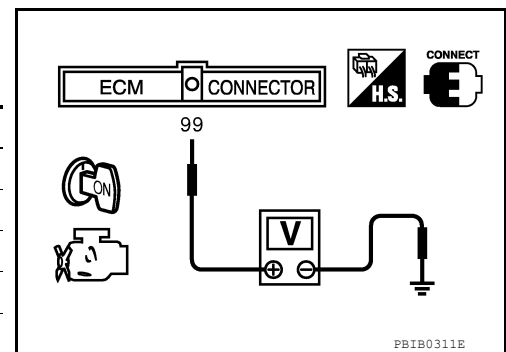
- Turn ignition switch ON.
- Select "MAIN SW", "CANCEL SW", "RESUME/ACC SW" and "SET SW" in "DATA MONITOR" mode with CONSULT.
- Check each item indication under the following conditions.

Switch	Monitor item	Condition	Indication
MAIN switch	MAIN SW	Pressed	ON
		Released	OFF
CANCEL switch	CANCEL SW	Pressed	ON
		Released	OFF
RESUME/ACCELERATE switch	RESUME/ACC SW	Pressed	ON
		Released	OFF
SET/COAST switch	SET SW	Pressed	ON
		Released	OFF

Without CONSULT

- Turn ignition switch ON.
- Check voltage between ECM terminal 99 and ground with pressing each button.

Switch	Condition	Voltage [V]
MAIN switch	Pressed	Approx. 0
	Released	Approx. 4
CANCEL switch	Pressed	Approx. 1
	Released	Approx. 4
RESUME/ACCELERATE switch	Pressed	Approx. 3
	Released	Approx. 4
SET/COAST switch	Pressed	Approx. 2
	Released	Approx. 4



OK or NG

- OK >> GO TO 8.
- NG >> GO TO 3.

3. CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect combination switch harness connector.

P1564 ASCD STEERING SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Disconnect ECM harness connector.
4. Check harness continuity between combination switch terminal 15 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M31, E152
- Harness connectors E5, F14
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 99 and combination switch terminal 14. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M31, E152
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ASCD STEERING SWITCH

Refer to [EC-346, "Component Inspection"](#).

OK or NG

- OK >> GO TO 8.
NG >> Replace steering switch. Refer to [ST-20, "Removal and Installation"](#).

8. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358298

ASCD STEERING SWITCH

1. Disconnect combination switch (spiral cable).

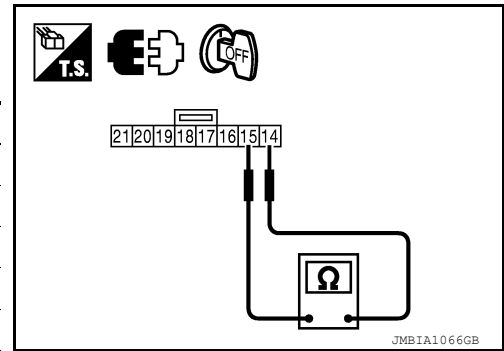
P1564 ASCD STEERING SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check continuity between combination switch (spiral cable) terminals 14 and 15 with pushing each switch.

Switch	Condition	Resistance [Ω]
MAIN switch	Pressed	Approx. 0
	Released	Approx. 4,000
CANCEL switch	Pressed	Approx. 250
	Released	Approx. 4,000
RESUME/ACCELERATE switch	Pressed	Approx. 1,480
	Released	Approx. 4,000
SET/COAST switch	Pressed	Approx. 660
	Released	Approx. 4,000



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P1572 ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

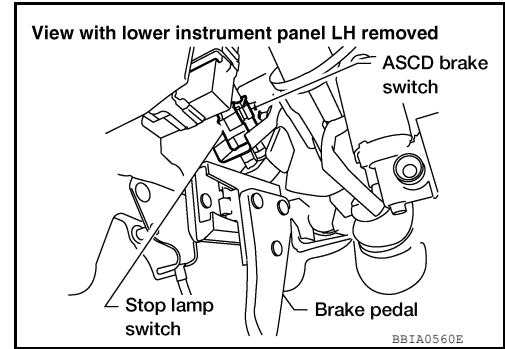
[VQ40DE]

P1572 ASCD BRAKE SWITCH

Component Description

INFOID:000000007358299

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal). Refer to [EC-53. "System Description"](#) for the ASCD function.



On Board Diagnosis Logic

INFOID:000000007358300

**This self-diagnosis has the one trip detection logic.
The MIL will not illuminate for this diagnosis.**

NOTE:

- If DTC P 1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-309](#).
- This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch is turn OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition		Possible Cause
P1572 1572	ASCN brake switch	A)	When the vehicle speed is above 30km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to ECM at the same time.	<ul style="list-style-type: none"> • Harness or connectors (The stop lamp switch circuit is shorted.) • Harness or connectors (The ASCD brake switch circuit is shorted.) • Stop lamp switch • ASCD brake switch • Incorrect stop lamp switch installation • Incorrect ASCD brake switch installation • ECM
		B)	ASCN brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven	

DTC Confirmation Procedure

INFOID:000000007358301

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- The procedure for malfunction B is not described. It takes an extremely long time to complete the procedure for malfunction B. By performing the procedure for malfunction A, the condition that causes malfunction B can be detected.
- If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.
 1. Turn ignition switch OFF and wait at least 10 seconds.
 2. Turn ignition switch ON.
 3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Steps 4 and 5 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT

1. Start engine (VDC switch OFF).
2. Select "DATA MONITOR" mode with CONSULT.
3. Press MAIN switch and make sure that CRUISE indicator illuminates.

P1572 ASCD BRAKE SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Drive the vehicle for at least 5 consecutive seconds under the following condition.

VHCL SPEED SE	More than 30 km/h (19 MPH)
Selector lever	Suitable position

5. Check 1st trip DTC.
 If DTC is detected, go to [EC-349, "Diagnosis Procedure"](#).
 If DTC is not detected, go to the following step.
6. Drive the vehicle for at least 5 consecutive seconds under the following condition.

VHCL SPEED SE	More than 30 km/h (19 MPH)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than five seconds so as not to come off from the above-mentioned vehicle speed.

7. Check 1st trip DTC.
 8. If DTC is detected, go to [EC-349, "Diagnosis Procedure"](#).

WITH GST
 Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358302

1.CHECK OVERALL FUNCTION-I

- With CONSULT**
- Turn ignition switch ON.
 - Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT.
 - Check "BRAKE SW1" indication under the following conditions.

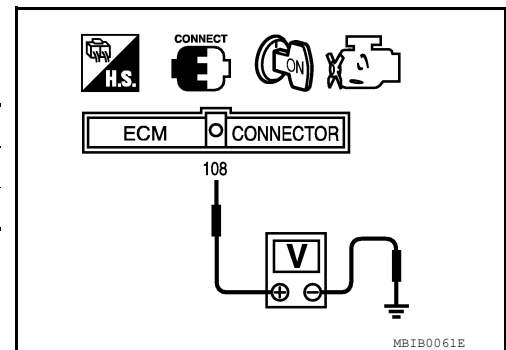
CONDITION	INDICATION
When brake pedal: Slightly depressed	OFF
When brake pedal: Fully released	ON

- Without CONSULT**
- Turn ignition switch ON.
 - Check voltage between ECM terminal 108 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal: Slightly depressed	Approximately 0V
When brake pedal: Fully released	Battery voltage

OK or NG

- OK >> GO TO 2.
 NG >> GO TO 3.



2.CHECK OVERALL FUNCTION-II

- With CONSULT**
 Check "BRAKE SW2" indication in "DATA MONITOR" mode.

CONDITION	INDICATION
When brake pedal: Fully released	OFF
When brake pedal: Slightly depressed	ON

- Without CONSULT**

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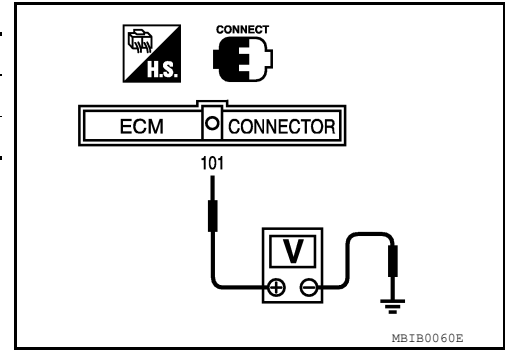
P1572 ASCD BRAKE SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Check voltage between ECM terminal 101 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal: Fully released	Approximately 0V
When brake pedal: Slightly depressed	Battery voltage

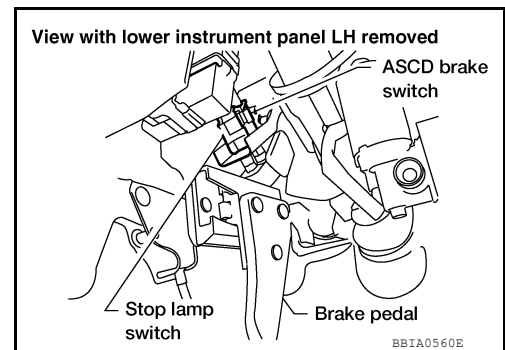


OK or NG

- OK >> GO TO 11.
- NG >> GO TO 7.

3. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.

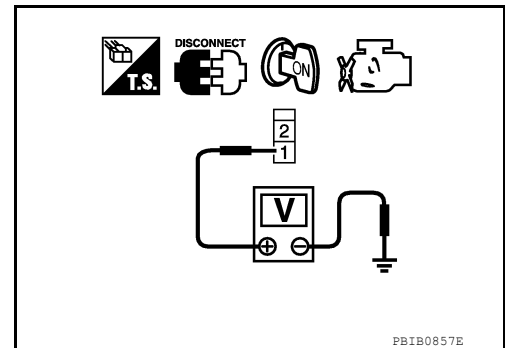


4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E160
- 10 A fuse (No.12)
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground in harness or connectors.

5. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

P1572 ASCD BRAKE SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD BRAKE SWITCH

Refer to [EC-352, "Component Inspection"](#).

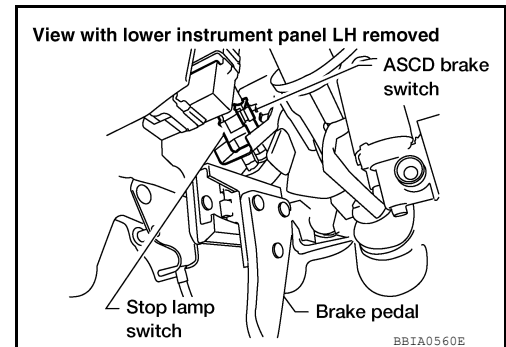
OK or NG

OK >> GO TO 11.

NG >> Replace ASCD brake switch. Refer to [BR-23, "Removal and Installation"](#).

7. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect stop lamp switch harness connector.



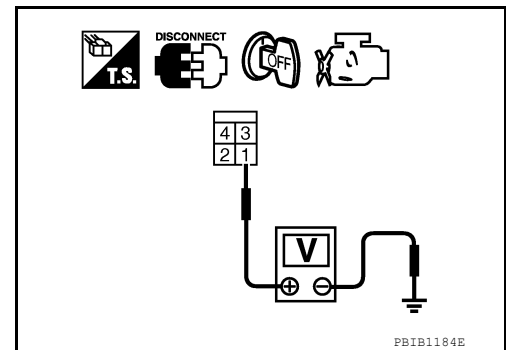
- Check voltage between stop lamp switch terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 9.

NG >> GO TO 8.



8. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E160
- 10 A fuse (No.20)
- Harness for open or short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

- Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK STOP LAMP SWITCH

P1572 ASCD BRAKE SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Refer to [EC-352. "Component Inspection"](#).

OK or NG

OK >> GO TO 11.

NG >> Replace stop lamp switch. Refer to [BR-23. "Removal and Installation"](#).

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

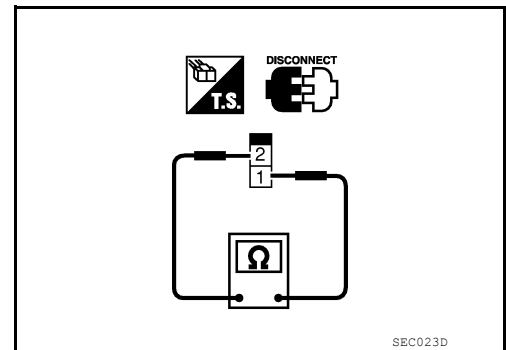
INFOID:000000007358303

ASC D BRAKE SWITCH

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check harness continuity between ASCD brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal: Fully released.	Should exist.
When brake pedal: Slightly depressed.	Should not exist.

If NG, adjust ASCD brake switch installation, refer to [BR-17. "Inspection and Adjustment - Standard Pedal"](#) and perform step 3 again.

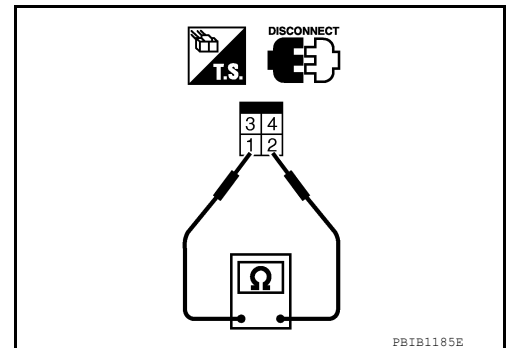


STOP LAMP SWITCH

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check harness continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal: Fully released.	Should not exist.
When brake pedal: Slightly depressed.	Should exist.

If NG, adjust stop lamp switch installation, refer to [BR-17. "Inspection and Adjustment - Standard Pedal"](#), and perform step 3 again.



P1574 ASCD VEHICLE SPEED SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1574 ASCD VEHICLE SPEED SENSOR

Component Description

INFOID:000000007802207

The ECM receives two vehicle speed sensor signals via CAN communication line. One is sent from combination meter, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to [EC-53, "System Description"](#) for ASCD functions.

On Board Diagnosis Logic

INFOID:000000007802208

**This self-diagnosis has the one trip detection logic.
The MIL will not illuminate for this diagnosis.**

NOTE:

- If DTC P1574 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-311, "On Board Diagnosis Logic"](#).
- If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to [EC-296, "On Board Diagnosis Logic"](#).
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-309, "On Board Diagnosis Logic"](#).

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1574 1574	ASCD vehicle speed sensor	The difference between the two vehicle speed signals is out of the specified range.	<ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted.)• Combination meter• ABS actuator and electric unit (control unit)• Wheel sensor• TCM• ECM

DTC Confirmation Procedure

INFOID:000000007802209

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Step 3 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

1. Start engine.
2. Drive the vehicle at more than 40 km/h (25 MPH).
3. Check DTC.
4. If DTC is detected, go to [EC-353, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007802210

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to [TM-35, "OBD-II Diagnostic Trouble Code \(DTC\)"](#).

OK or NG

- OK >> GO TO 2.
- NG >> Perform trouble shooting relevant to DTC indicated.

2. CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"

Refer to [BRC-8, "Work Flow"](#) (TYPE 1) or [BRC-117, "Work Flow"](#) (TYPE 2).

P1574 ASCD VEHICLE SPEED SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

OK >> GO TO 3.

NG >> Repair or replace.

3.CHECK COMBINATION METER FUNCTION

Refer to [MWI-4, "Work Flow"](#).

>> **INSPECTION END**

P1715 INPUT SPEED SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1715 INPUT SPEED SENSOR

Description

INFOID:000000007358304

ECM receives input speed sensor signal from TCM through CAN communication line. ECM uses this signal for engine control.

On Board Diagnosis Logic

INFOID:000000007358305

NOTE:

- If DTC P1715 is displayed with DTC UXXXX first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1715 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-311, "On Board Diagnosis Logic"](#).
- If DTC P1715 is displayed with DTC P0335, first perform the trouble diagnosis for DTC P0335. Refer to [EC-219, "Component Description"](#).
- If DTC P1715 is displayed with DTC P0340, P0345 first perform the trouble diagnosis for DTC P0340, P0345. Refer to [EC-223, "Component Description"](#).
- If DTC P1715 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-309, "Component Description"](#).

The MIL will not illuminate for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1715 1715	Input speed sensor (TCM output)	Input speed sensor signal is different from the theoretical value calculated by ECM from output speed sensor signal and engine rpm signal.	<ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted)• Harness or connectors (Input speed sensor circuit is open or shorted)• TCM

Diagnosis Procedure

INFOID:000000007358306

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to [TM-35, "OBD-II Diagnostic Trouble Code \(DTC\)"](#).

OK or NG

OK >> GO TO 2.

NG >> Perform trouble shooting relevant to DTC indicated.

2. REPLACE TCM

Replace TCM. Refer to [TM-176, "Removal and Installation"](#).

>> INSPECTION END

P1800 VIAS CONTROL SOLENOID VALVE 1

< DTC/CIRCUIT DIAGNOSIS >

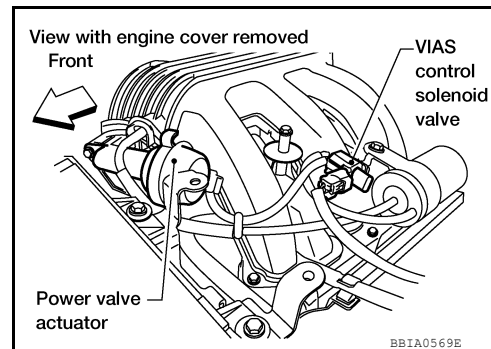
[VQ40DE]

P1800 VIAS CONTROL SOLENOID VALVE 1

Component Description

INFOID:000000007358307

The VIAS control solenoid valve cuts the intake manifold vacuum signal for power valve control. It responds to ON/OFF signals from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal the coil pulls the plunger downward and sends the vacuum signal to the power valve actuator.



On Board Diagnosis Logic

INFOID:000000007358308

The MIL will not illuminate for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1800 1800	VIAS control solenoid valve circuit	An excessively low or high voltage signal is sent to ECM through the valve	<ul style="list-style-type: none">• Harness or connectors (The solenoid valve circuit is open or shorted.)• VIAS control solenoid valve

DTC Confirmation Procedure

INFOID:000000007358309

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 11V at idle.

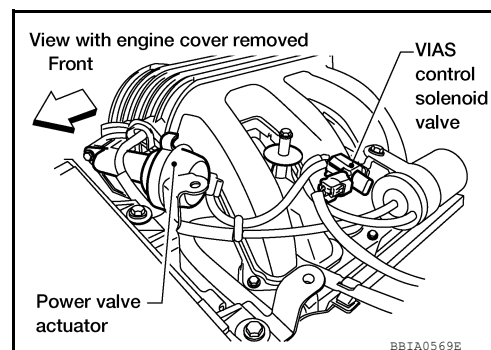
1. Start engine and let it idle for at least 5 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-356, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358310

1. CHECK VIAS CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect VIAS control solenoid valve harness connector.
3. Turn ignition switch ON.



P1800 VIAS CONTROL SOLENOID VALVE 1

[VQ40DE]

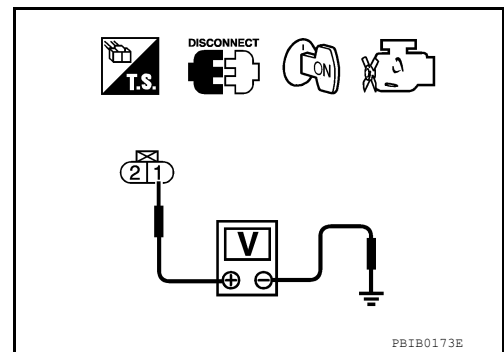
< DTC/CIRCUIT DIAGNOSIS >

4. Check voltage between terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 3.
- NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between VIAS control solenoid valve and IPDM E/R
- Harness for open or short between VIAS control solenoid valve and ECM

>> Repair harness or connectors.

3. CHECK VIAS CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 29 and VIAS control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK VIAS CONTROL SOLENOID VALVE

Refer to [EC-357, "Component Inspection"](#).

OK or NG

- OK >> GO TO 5.
- NG >> Replace VIAS control solenoid valve. Refer to [EM-27, "Removal and Installation"](#).

5. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358311

VIAS CONTROL SOLENOID VALVE

Ⓟ With CONSULT

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform "VIAS S/V-1" in "ACTIVE TEST" mode.

P1800 VIAS CONTROL SOLENOID VALVE 1

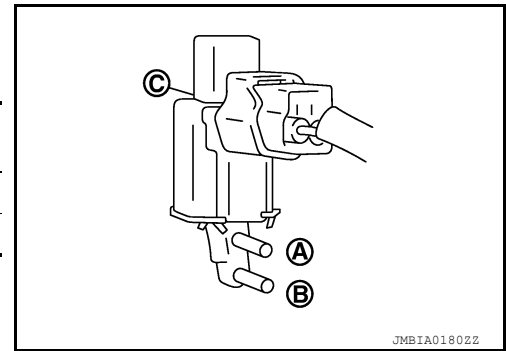
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Check air passage continuity and operation delay time under the following conditions.

Condition VIAS SOL VALVE	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
ON	Yes	No
OFF	No	Yes

Operation takes less than 1 second.

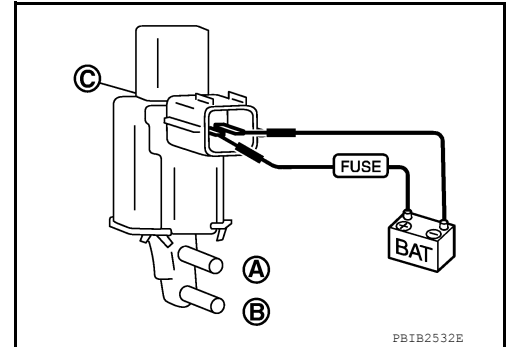


 With GST

- Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals 1 and 2	Yes	No
No supply	No	Yes

Operation takes less than 1 second.



P1805 BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1805 BRAKE SWITCH

Description

INFOID:000000007358312

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is being driven.

On Board Diagnosis Logic

INFOID:000000007358313

The MIL will not illuminate for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805 1805	Brake switch	A brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven.	<ul style="list-style-type: none"> • Harness or connectors (Stop lamp switch circuit is open or shorted.) • Stop lamp switch

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode.

Engine operating condition in fail-safe mode	
ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.	
Vehicle condition	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

DTC Confirmation Procedure

INFOID:000000007358314

NOTE:

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

1. Turn ignition switch ON.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC with CONSULT.
4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to [EC-359, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358315

1.CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Check the stop lamp when depressing and releasing the brake pedal.

Brake pedal	Stop lamp
Fully released	Not illuminated
Slightly depressed	Illuminated

OK or NG

- OK >> GO TO 4.
NG >> GO TO 2.

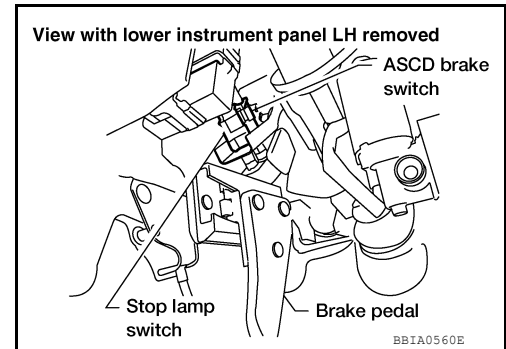
2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

P1805 BRAKE SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Disconnect stop lamp switch harness connector.

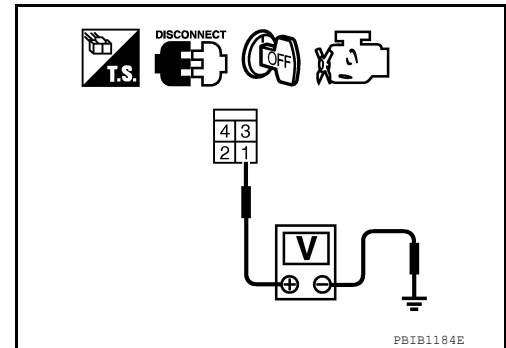


2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- 10A fuse
- Fuse block (J/B) connector E160
- Harness for open and short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Disconnect stop lamp switch harness connector.
3. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK STOP LAMP SWITCH

Refer to [EC-361, "Component Inspection"](#).

OK or NG

- OK >> GO TO 6.
NG >> Replace stop lamp switch. Refer to [BR-23, "Removal and Installation"](#).

6. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

P1805 BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

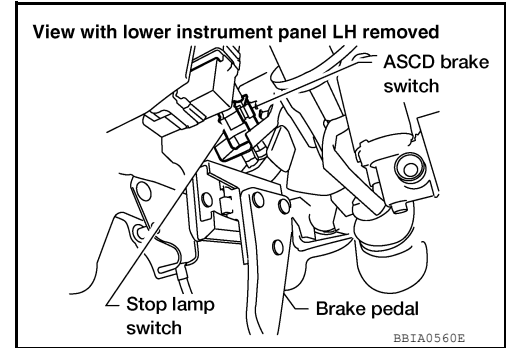
[VQ40DE]

Component Inspection

INFOID:000000007358316

STOP LAMP SWITCH

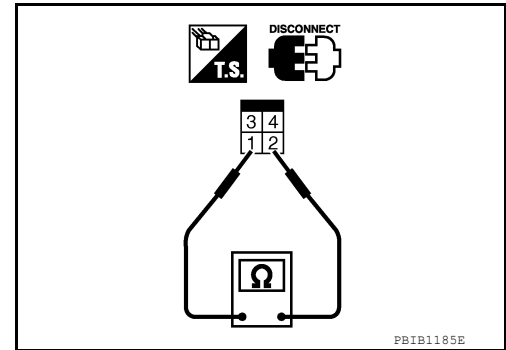
1. Disconnect stop lamp switch harness connector.



2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Conditions	Continuity
Brake pedal: Fully released	Should not exist.
Brake pedal: Slightly depressed	Should exist.

3. If NG, adjust stop lamp switch installation, refer to [BR-17, "Inspection and Adjustment - Standard Pedal"](#) or [BR-18, "Inspection and Adjustment - Adjustable Pedal"](#), and perform step 2 again.



P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

Component Description

INFOID:000000007358317

Power supply for the throttle control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is controlled ON/OFF by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

On Board Diagnosis Logic

INFOID:000000007358318

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2100 2100	Throttle control motor relay circuit open	ECM detects that the voltage of power source for throttle control motor is excessively low.	<ul style="list-style-type: none">• Harness or connectors (Throttle control motor relay circuit is open)• Throttle control motor relay
P2103 2103	Throttle control motor relay circuit short	ECM detects that the throttle control motor relay is stuck ON.	<ul style="list-style-type: none">• Harness or connectors (Throttle control motor relay circuit is shorted)• Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminate.

Engine operating condition in fail-safe mode

ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

INFOID:000000007358319

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

PROCEDURE FOR DTC P2100

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check 1st trip DTC.
4. If DTC is detected, go to [EC-362, "Diagnosis Procedure"](#).

PROCEDURE FOR DTC P2103

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8V.

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.
3. If DTC is detected, go to [EC-362, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358320

1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

[VQ40DE]

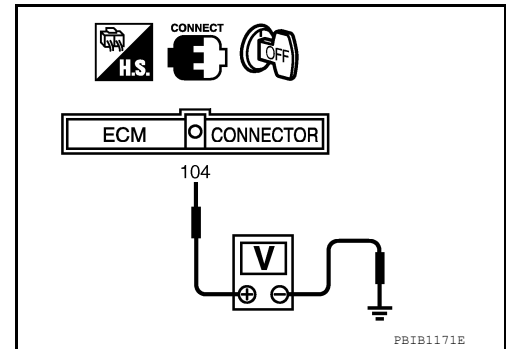
< DTC/CIRCUIT DIAGNOSIS >

- Check voltage between ECM terminal 104 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 2.



2. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

- Disconnect ECM harness connector.
- Disconnect IPDM E/R harness connector E122.
- Check continuity between ECM terminal 104 and IPDM E/R terminal 47. Refer to Wiring Diagram.

Continuity should exist.

- Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 3.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK FUSE

- Disconnect 20 A fuse (No.52). For the fuse arrangement, refer to [PG-75. "IPDM E/R Terminal Arrangement"](#).
- Check if 20A fuse is blown.

OK or NG

- OK >> GO TO 7.
- NG >> Replace 20A fuse.

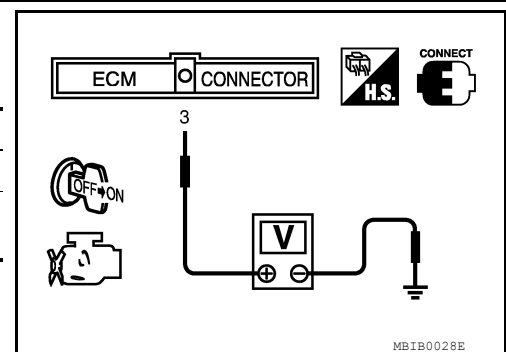
4. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

- Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 5.



5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Disconnect IPDM E/R harness connector E119.
- Check continuity between ECM terminal 3 and IPDM E/R terminal 6. Refer to Wiring Diagram.

Continuity should exist.

- Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 6.

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

OK or NG

- OK >> Replace IPDM E/R. Refer to [PCS-29. "Removal and Installation of IPDM E/R"](#).
- NG >> Repair or replace harness or connectors.

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

Description

INFOID:000000007358321

NOTE:

If DTC P2101 is displayed with DTC P2100 or P2119, first perform the trouble diagnosis for DTC P2100 or P2119. Refer to [EC-362](#) or [EC-371](#).

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The current opening angle of the throttle valve is detected by the throttle position sensor. The throttle position sensor provides feedback to the ECM, when opens/closes the throttle valve in response to driving conditions via the throttle control motor.

On Board Diagnosis Logic

INFOID:000000007358322

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2101 2101	Electric throttle control performance	Electric throttle control function does not operate properly.	<ul style="list-style-type: none">• Harness or connectors (Throttle control motor circuit is open or shorted)• Electric throttle control actuator

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode

ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

INFOID:000000007358323

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V when the engine is running.

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.
4. If DTC is detected, go to [EC-365, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358324

1. CHECK GROUND CONNECTIONS

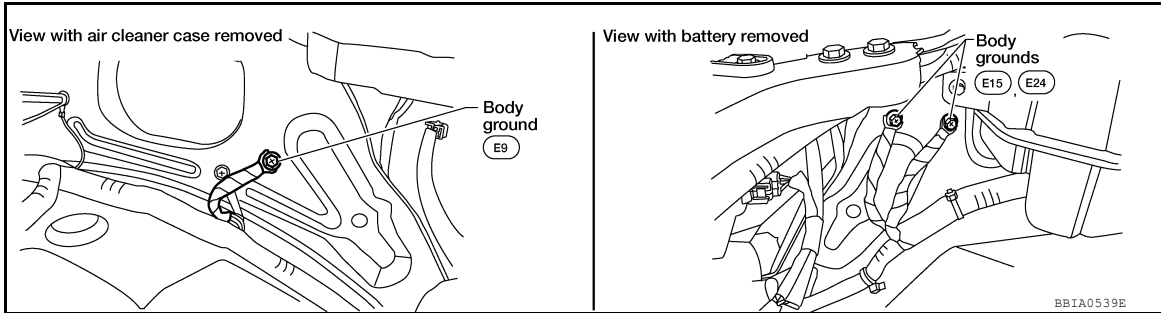
1. Turn ignition switch OFF

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

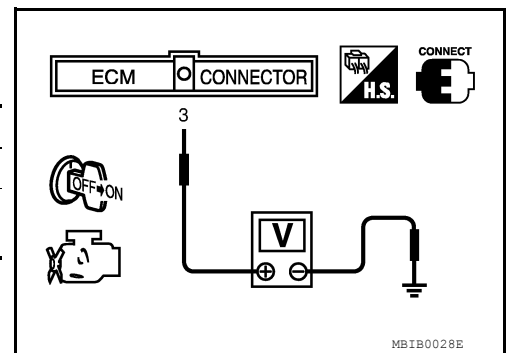
2. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)

OK or NG

- OK >> GO TO 9.
- NG >> GO TO 3.



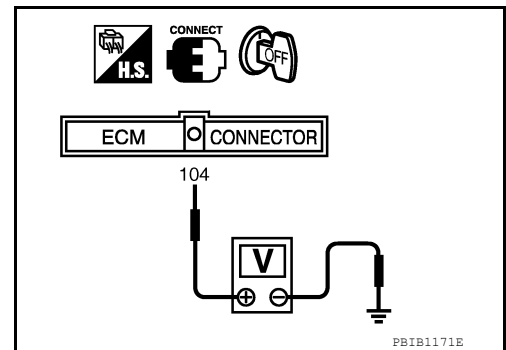
3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

- Turn ignition switch OFF.
- Check voltage between ECM terminal 104 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 6.
- NG >> GO TO 4.



4. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

- Disconnect ECM harness connector.
- Disconnect IPDM E/R harness connector E122.
- Check continuity between ECM terminal 104 and IPDM E/R terminal 47. Refer to Wiring Diagram.

Continuity should exist.

- Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK FUSE

- Disconnect 20 A fuse (No.52). For the fuse arrangement, refer to [PG-75, "IPDM E/R Terminal Arrangement"](#).
- Check 20A fuse for blown.

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> GO TO 8.
- NG >> Replace 20A fuse.

6. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector E119.
4. Check continuity between ECM terminal 3 and IPDM E/R terminal 6.
Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

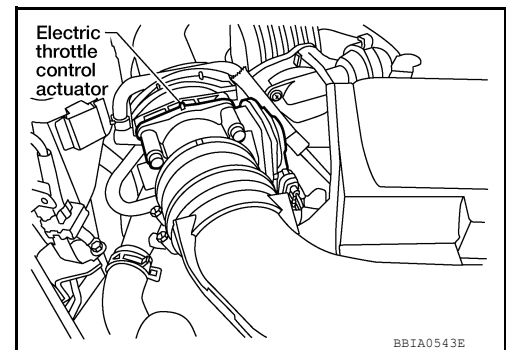
OK or NG

- OK >> Replace IPDM E/R. Refer to [PCS-29. "Removal and Installation of IPDM E/R"](#).
- NG >> Repair or replace harness or connectors.

9. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals.
Refer to Wiring Diagram.

Electric throttle control actuator terminal	ECM terminal	Continuity
5	5	Should not exist
	4	Should exist
6	5	Should exist
	4	Should not exist



5. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 10.
- NG >> Repair or replace.

10. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct. Refer to [EM-26. "Removal and Installation"](#).

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

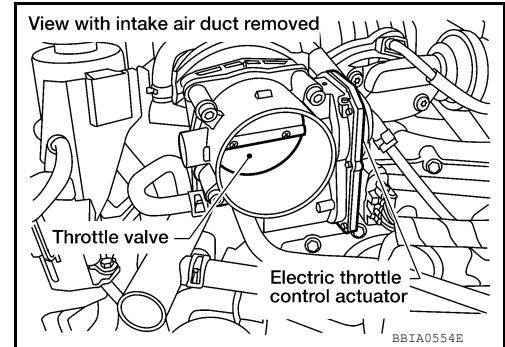
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

- OK >> GO TO 11.
- NG >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to [EC-25, "Throttle Valve Closed Position Learning"](#).



11. CHECK THROTTLE CONTROL MOTOR

Refer to [EC-368, "Component Inspection"](#).

OK or NG

- OK >> GO TO 12.
- NG >> GO TO 13.

12. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

OK or NG

- OK >> GO TO 13.
- NG >> Repair or replace harness or connectors.

13. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace the electric throttle control actuator. Refer to [EM-27, "Removal and Installation"](#).

>> **INSPECTION END**

Component Inspection

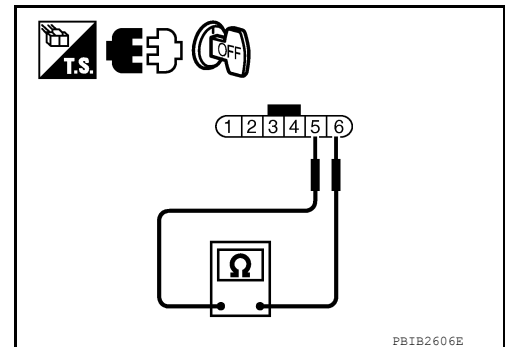
INFOID:000000007358325

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 5 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 $^{\circ}$ C (77 $^{\circ}$ F)]

3. If NG, replace electric throttle control actuator. Refer to [EM-27, "Removal and Installation"](#).



P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P2118 THROTTLE CONTROL MOTOR

Component Description

INFOID:000000007358326

The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The current opening angle of the throttle valve is detected by the throttle position sensor. The throttle position sensor provides feedback to the ECM, when opens/closes the throttle valve in response to driving conditions via the throttle control motor.

On Board Diagnosis Logic

INFOID:000000007358327

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2118 2118	Throttle control motor circuit short	ECM detects short in both circuits between ECM and throttle control motor.	<ul style="list-style-type: none">• Harness or connectors (Throttle control motor circuit is shorted.)• Electric throttle control actuator (Throttle control motor)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode

ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

INFOID:000000007358328

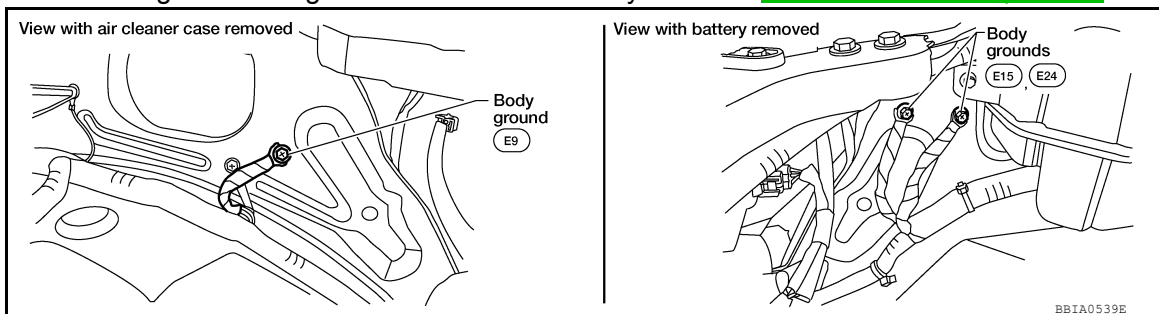
1. If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON and wait at least 2 seconds.
3. Start engine and let it idle for 5 seconds.
4. Check DTC.
5. If DTC is detected, go to [EC-369, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358329

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
NG >> Repair or replace ground connections.

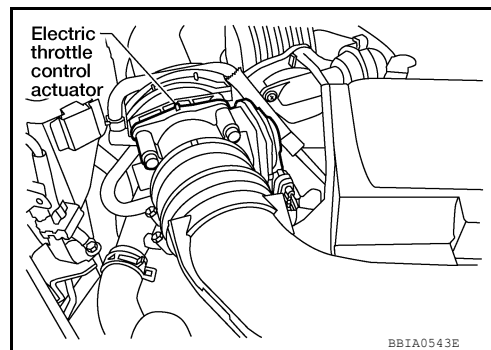
2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

P2118 THROTTLE CONTROL MOTOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Disconnect electric throttle control actuator harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
5	5	Should not exist
	4	Should exist
6	5	Should exist
	4	Should not exist

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 3.
 NG >> Repair or replace.

3. CHECK THROTTLE CONTROL MOTOR

Refer to [EC-370, "Component Inspection"](#).

OK or NG

- OK >> GO TO 4.
 NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

OK or NG

- OK >> GO TO 5.
 NG >> Repair or replace harness or connectors.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace the electric throttle control actuator. Refer to [EM-27, "Removal and Installation"](#).

>> **INSPECTION END**

Component Inspection

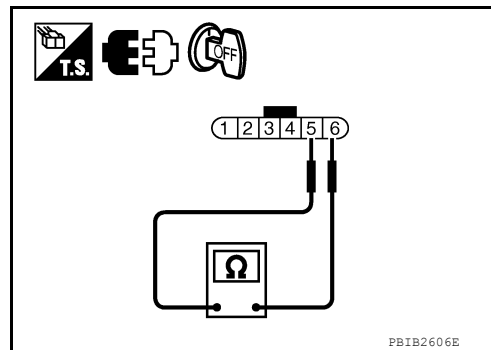
INFOID:000000007358330

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 5 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]

3. If NG, replace electric throttle control actuator. Refer to [EM-27, "Removal and Installation"](#).



P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

Component Description

INFOID:000000007358331

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and sends the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and opens/closes the throttle valve in response to driving conditions via the throttle control motor.

On Board Diagnosis Logic

INFOID:000000007358332

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P2119 2119	Electric throttle control actuator	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	• Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detects that the throttle valve is stuck open.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL illuminates.

Detected items	Engine operating condition in fail-safe mode
Malfunction A	The ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in N or P position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

INFOID:000000007358333

NOTE:

- Perform **PROCEDURE FOR MALFUNCTION A AND B** first. If the DTC cannot be confirmed, perform **PROCEDURE FOR MALFUNCTION C**.
- If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.
 1. Turn ignition switch OFF and wait at least 10 seconds.
 2. Turn ignition switch ON.
 3. Turn ignition switch OFF and wait at least 10 seconds.

PROCEDURE FOR MALFUNCTION A AND B

1. Turn ignition switch ON and wait at least 1 second.
2. Shift selector lever to D position and wait at least 3 seconds.
3. Shift selector lever to P position.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON and wait at least 1 second.
6. Shift selector lever to D position, and wait at least 3 seconds.
7. Shift selector lever to P position.
8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
9. Check DTC.
10. If DTC is detected, go to [EC-372. "Diagnosis Procedure"](#).

P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

PROCEDURE FOR MALFUNCTION C

Ⓟ With CONSULT

1. Turn ignition switch ON and wait at least 1 second.
2. Shift selector lever to D position and wait at least 3 seconds.
3. Shift selector lever to P or N position.
4. Start engine and let it idle for 3 seconds.
5. Check DTC.
6. If DTC is detected, go to [EC-372, "Diagnosis Procedure"](#).

Diagnosis Procedure

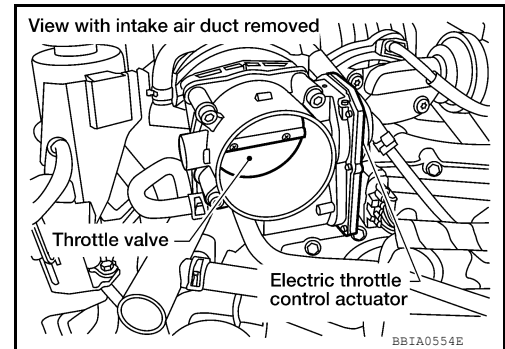
INFOID:000000007358334

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct. Refer to [EM-26, "Removal and Installation"](#).
2. Check if a foreign matter is caught between the throttle valve and the housing.

OK or NG

- OK >> GO TO 2.
- NG >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to [EC-25, "Throttle Valve Closed Position Learning"](#).



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace the electric throttle control actuator. Refer to [EM-27, "Removal and Installation"](#).

>> INSPECTION END

P2122, P2123 APP SENSOR

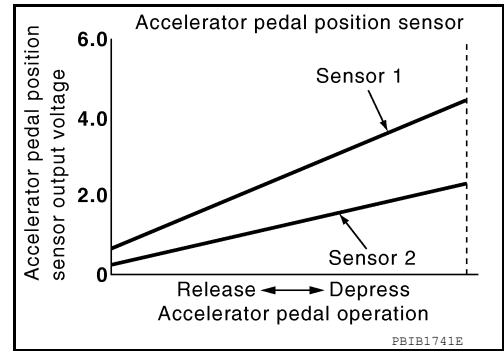
Component Description

INFOID:000000007358335

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



On Board Diagnosis Logic

INFOID:000000007358336

These self-diagnoses have the one trip detection logic.

NOTE:

If DTC P2122 or P2123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-312](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2122 2122	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	<ul style="list-style-type: none"> Harness or connectors (The APP sensor 1 circuit is open or shorted.) Accelerator pedal position sensor (APP sensor 1)
P2123 2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode

The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.

The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:000000007358337

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

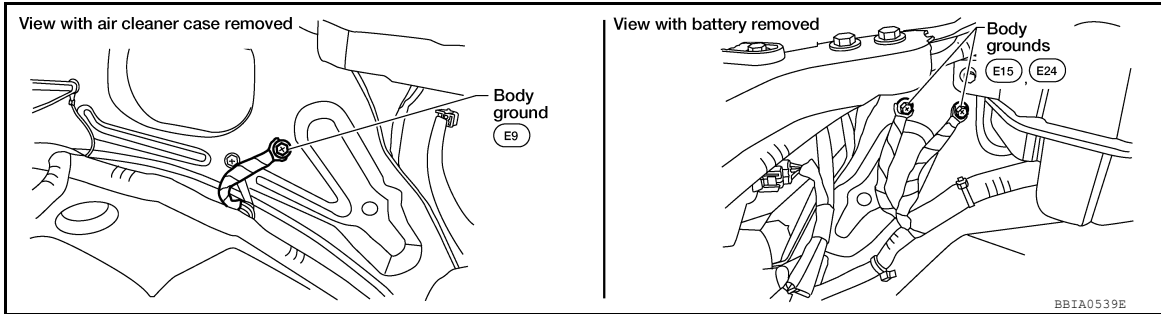
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to [EC-374. "Diagnosis Procedure"](#).

Diagnosis Procedure

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).

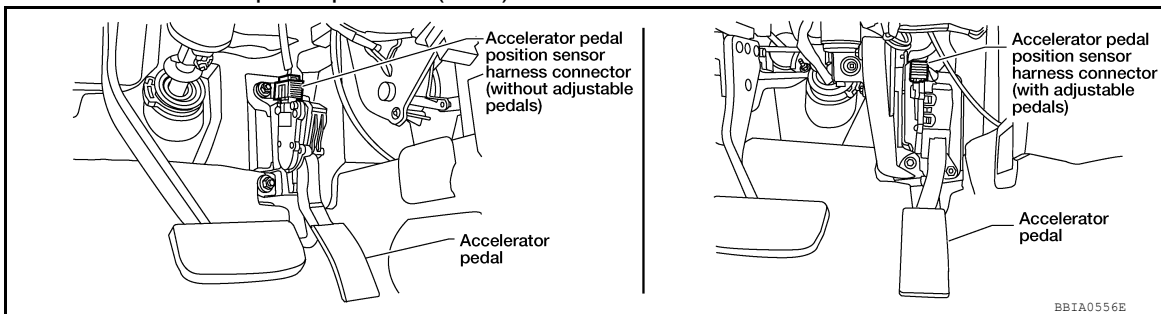


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.

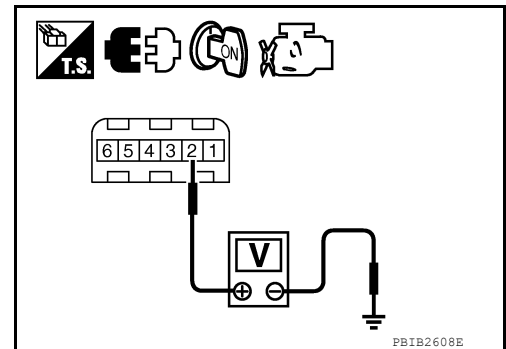


2. Turn ignition switch ON.
3. Check voltage between APP sensor terminal 2 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 3.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 4 and ECM terminal 82. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3.

P2122, P2123 APP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to [EC-375, "Component Inspection"](#).

OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to [ACC-4, "Removal and Installation"](#).

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

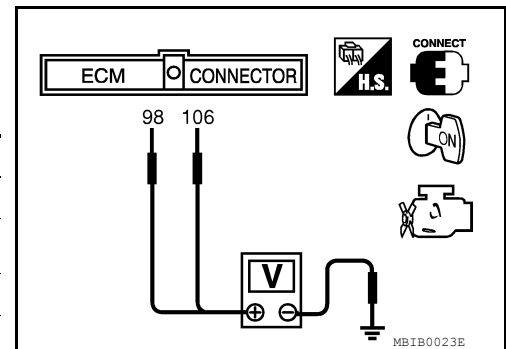
Component Inspection

INFOID:000000007358339

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.65 - 0.87V
	Fully depressed	More than 4.3V
98 (Accelerator pedal position sensor 2)	Fully released	0.28 - 0.48V
	Fully depressed	More than 2.0V



4. If NG, replace accelerator pedal assembly. Refer to [ACC-4, "Removal and Installation"](#).

P2127, P2128 APP SENSOR

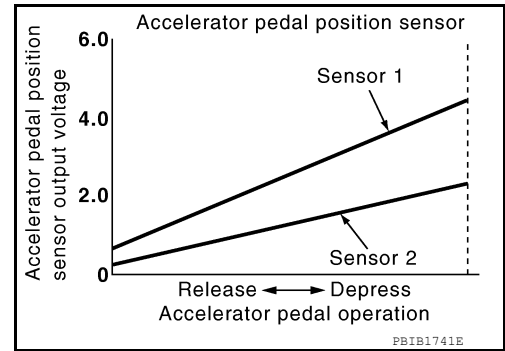
Component Description

INFOID:000000007358340

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



On Board Diagnosis Logic

INFOID:000000007358341

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2127 2127	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The APP sensor 2 circuit is open or shorted.) • Accelerator pedal position sensor (APP sensor 2) • Electric throttle control actuator (TP sensor 1 and 2)
P2128 2128	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode

The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.

The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.

So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:000000007358342

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to [EC-376, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358343

1. CHECK GROUND CONNECTIONS

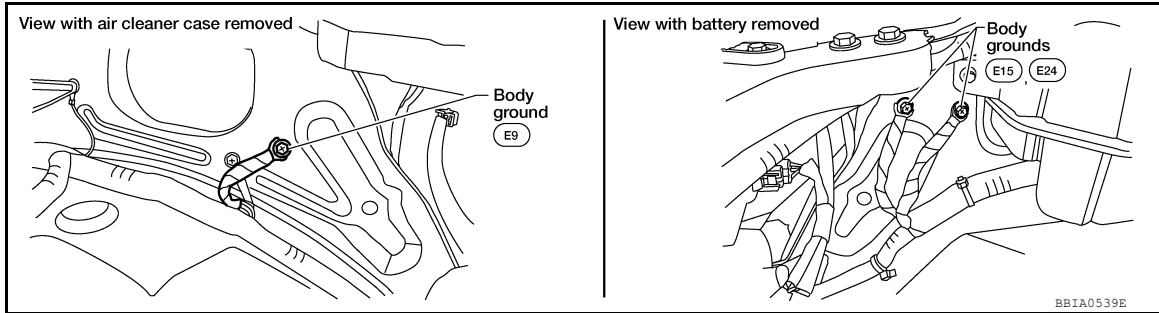
1. Turn ignition switch OFF.

P2127, P2128 APP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Loosen and retighten three ground screws on the body, Refer to [EC-97. "Ground Inspection"](#).

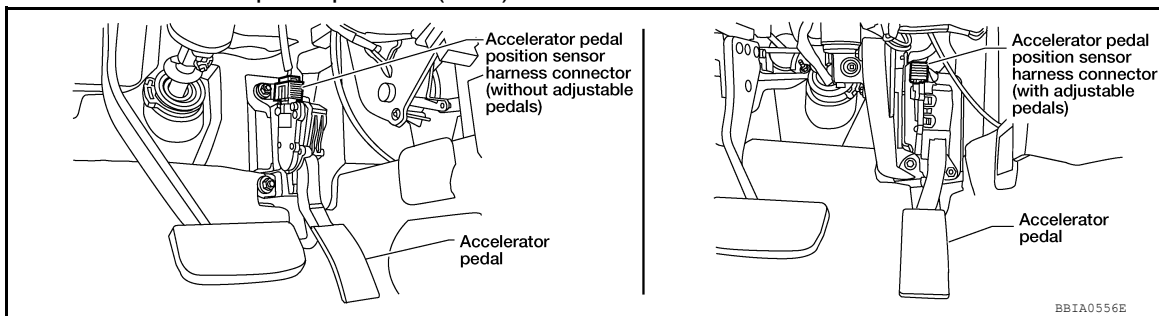


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

- Disconnect accelerator pedal position (APP) sensor harness connector.

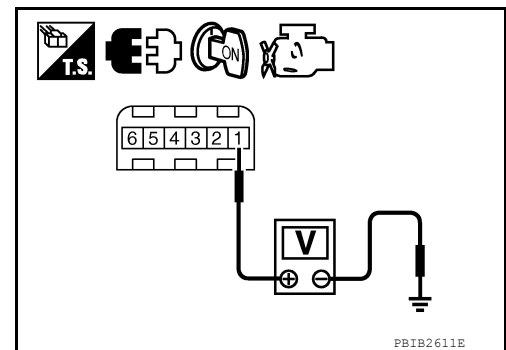


- Turn ignition switch ON.
- Check voltage between APP sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 3.



3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between APP sensor terminal 1 and ECM terminal 91. Refer to wiring diagram.

Continuity should exist.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit.

4. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-III

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal
91	APP sensor terminal 1
47	Electric throttle control actuator terminal 2

P2127, P2128 APP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> GO TO 5.
- NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to [EC-207, "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to [EM-27, "Removal and Installation"](#).

>> **INSPECTION END**

7. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 5 and ECM terminal 83.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 98 and APP sensor terminal 6.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK APP SENSOR

Refer to [EC-378, "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 10.

10. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to [ACC-4, "Removal and Installation"](#).

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358344

ACCELERATOR PEDAL POSITION SENSOR

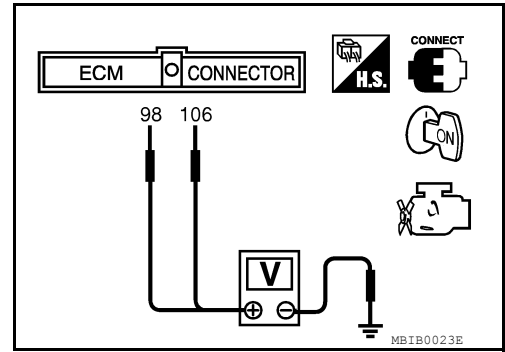
P2127, P2128 APP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.65 - 0.87V
	Fully depressed	More than 4.3V
98 (Accelerator pedal position sensor 2)	Fully released	0.28 - 0.48V
	Fully depressed	More than 2.0V



4. If NG, replace accelerator pedal assembly. Refer to [ACC-4. "Removal and Installation"](#).

A
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P2135 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

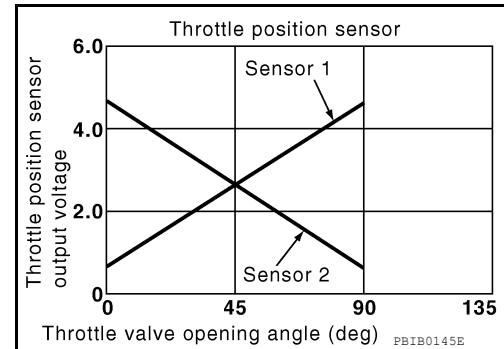
P2135 TP SENSOR

Component Description

INFOID:000000007358345

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

INFOID:000000007358346

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2135 2135	Throttle position sensor circuit range/performance	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	<ul style="list-style-type: none"> • Harness or connector (The TP sensor 1 or 2 circuit is open or shorted.) (The APP sensor 2 circuit is shorted). • Electric throttle control actuator (TP sensor 1 or 2) • Accelerator pedal position sensor (APP sensor 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL illuminates.

Engine operation condition in fail-safe mode

The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:000000007358347

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to [EC-380, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358348

1. CHECK GROUND CONNECTIONS

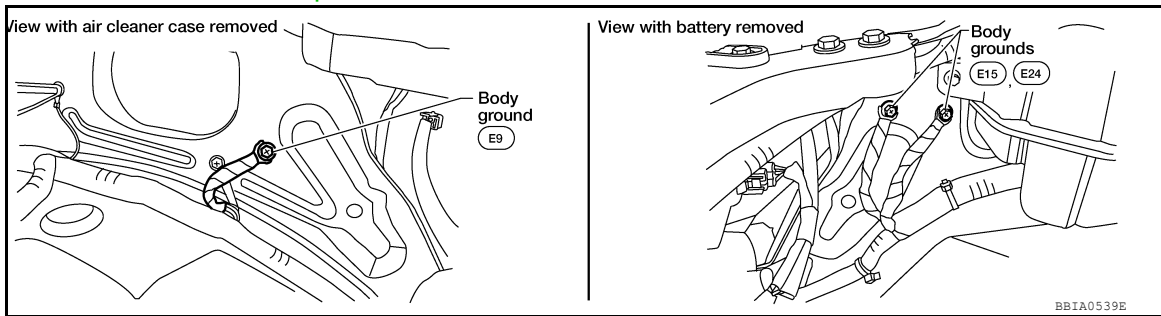
1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body.

P2135 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Refer to [EC-97. "Ground Inspection"](#).



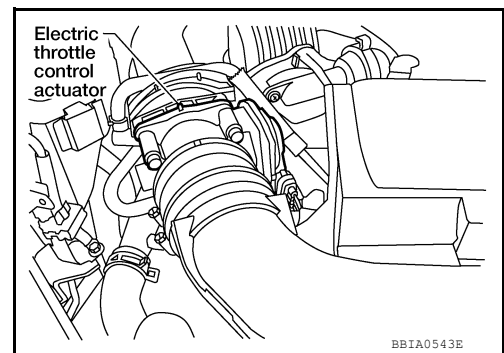
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-1

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch ON.



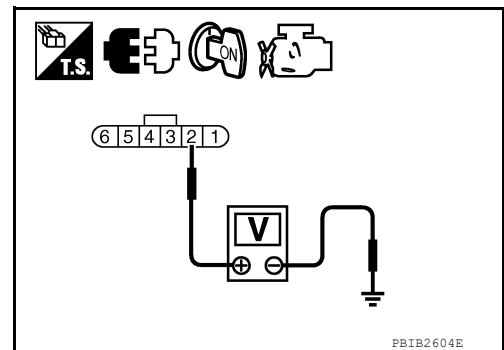
3. Check voltage between electric throttle control actuator terminal 2 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 7.

NG >> GO TO 3.



3. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 2 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit.

4. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-III

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal
47	Electric throttle control actuator terminal 2
91	APP sensor terminal 1

P2135 TP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

OK >> GO TO 5.

NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to [EC-378. "Component Inspection"](#).

OK or NG

OK >> GO TO 11.

NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to [ACC-4. "Removal and Installation"](#).

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 4 and ECM terminal 66.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 50 and electric throttle control actuator terminal 1, ECM terminal 69 and electric throttle control actuator terminal 3.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to [EC-383. "Component Inspection"](#).

OK or NG

OK >> GO TO 11.

NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace the electric throttle control actuator. Refer to [EM-27. "Removal and Installation"](#).

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

P2135 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

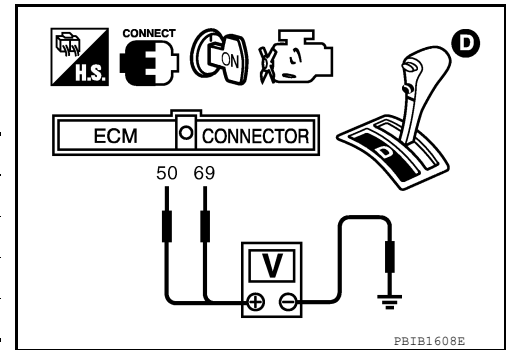
Component Inspection

INFOID:000000007358349

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform [EC-25, "Throttle Valve Closed Position Learning"](#).
3. Turn ignition switch ON.
4. Set selector lever to D.
5. Check voltage between ECM terminals 50 (TP sensor 1 signal), 69 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
69 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator. Refer to [EM-27, "Removal and Installation"](#).

P2138 APP SENSOR

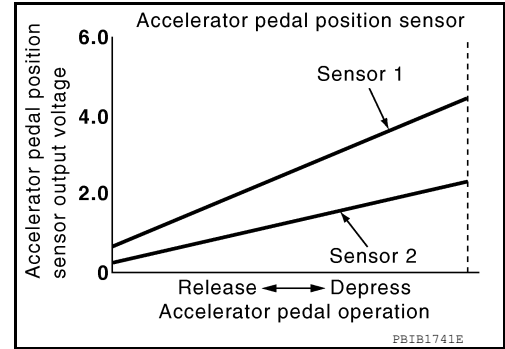
Component Description

INFOID:000000007358350

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



On Board Diagnosis Logic

INFOID:000000007358351

This self-diagnosis has the one trip detection logic.

NOTE:

If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-312](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2138 2138	Accelerator pedal position sensor circuit range/performance	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	<ul style="list-style-type: none"> • Harness or connector (The APP sensor 1 and 2 circuit is open or shorted.) (The TP sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 1 and 2) • Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode

The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.

The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:000000007358352

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

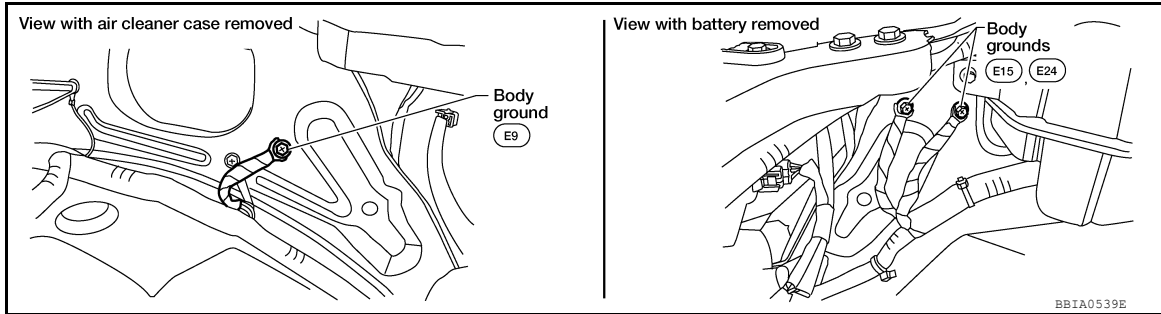
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to [EC-385, "Diagnosis Procedure"](#).

Diagnosis Procedure

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97. "Ground Inspection"](#).

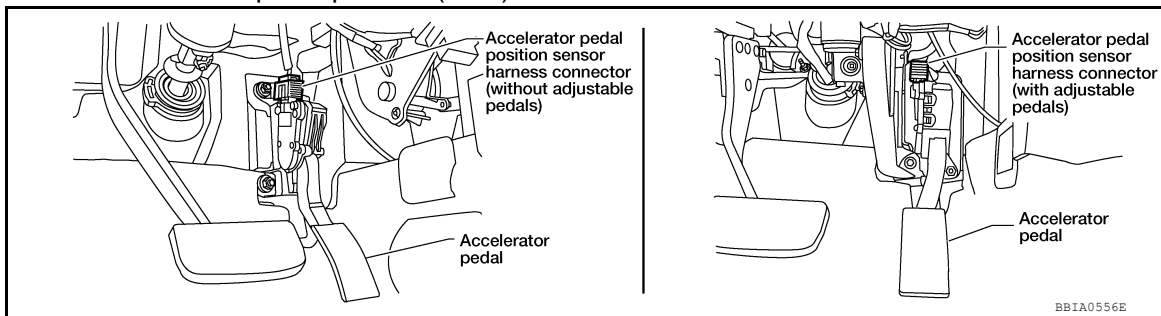


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.

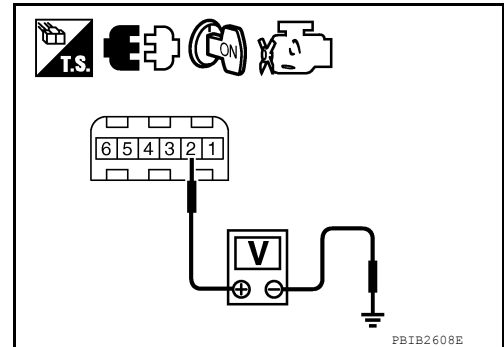


2. Turn ignition switch ON.
3. Check voltage between APP sensor terminals 2 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 3.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.



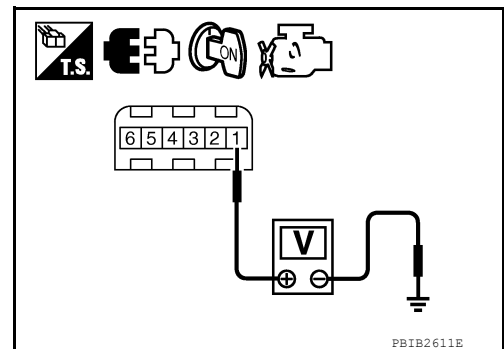
3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

Check voltage between APP sensor terminal 1 and ground with CONSULT or tester.

1. **Voltage: Approximately 5V**

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 4.



4. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.

A
EC
C
D
E
F
G
H
I
J
K
L
M
N
O
P

P2138 APP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 1 and ECM terminal 91.
Refer to wiring diagram.

Continuity should exist.

OK or NG

- OK >> GO TO 5.
NG >> Repair open circuit.

5. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-III

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal
91	APP sensor terminal 1
47	Electric throttle control actuator terminal 2

OK or NG

- OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK THROTTLE POSITION SENSOR

Refer to [EC-207, "Component Inspection"](#).

OK or NG

- OK >> GO TO 12.
NG >> GO TO 7.

7. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to [EM-27, "Removal and Installation"](#).

>> INSPECTION END

8. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminals 4 and ECM terminal 82, APP sensor terminal 5 and ECM terminal 83.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3, ECM terminal 98 and APP sensor terminal 6.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 10.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK APP SENSOR

P2138 APP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Refer to [EC-387, "Component Inspection"](#).

OK or NG

- OK >> GO TO 12.
- NG >> GO TO 11.

11. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to [ACC-4, "Removal and Installation"](#).

>> INSPECTION END

12. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

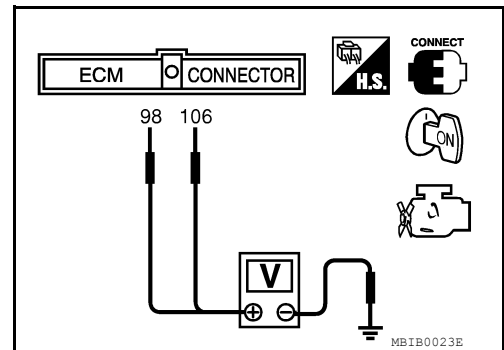
Component Inspection

INFOID:000000007358354

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.65 - 0.87V
	Fully depressed	More than 4.3V
98 (Accelerator pedal position sensor 2)	Fully released	0.28 - 0.48V
	Fully depressed	More than 2.0V



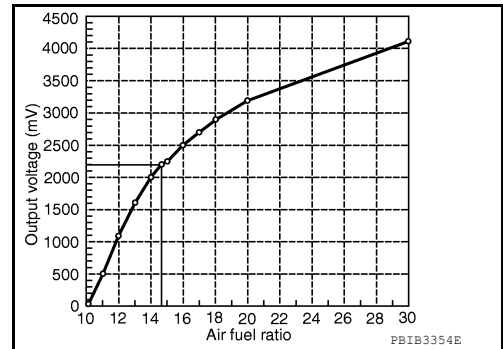
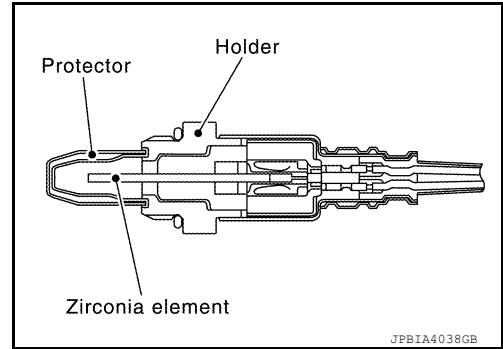
4. If NG, replace accelerator pedal assembly. Refer to [ACC-4, "Removal and Installation"](#).

P2A00, P2A03 A/F SENSOR 1

Component Description

INFOID:000000007358355

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element. The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich. Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).



On Board Diagnosis Logic

INFOID:000000007358356

To judge the malfunction, the A/F signal computed by ECM from the A/F sensor 1 signal is monitored so it will not shift to LEAN side or RICH side.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P2A00 2A00 (Bank 1)	Air fuel ratio (A/F) sensor 1 circuit range/performance	<ul style="list-style-type: none"> The output voltage computed by ECM from the A/F sensor 1 signal shifts to the lean side for a specified period. The A/F signal computed by ECM from the A/F sensor 1 signal shifts to the rich side for a specified period. 	<ul style="list-style-type: none"> A/F sensor 1 A/F sensor 1 heater Heated oxygen sensor 2 Fuel pressure Fuel injector Intake air leaks Exhaust gas leaks
P2A03 2A03 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358357

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

Ⓟ WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
6. Clear the self-learning coefficient by touching "CLEAR".

P2A00, P2A03 A/F SENSOR 1

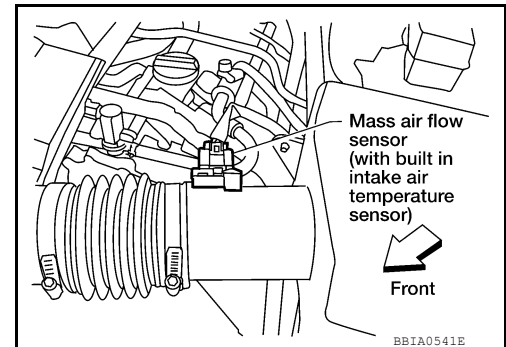
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

7. Turn ignition switch OFF and wait at least 10 seconds.
8. Turn ignition switch ON.
9. Turn ignition switch OFF and wait at least 10 seconds.
10. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
11. Let engine idle for 1 minute.
12. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
13. Check 1st trip DTC.
14. If 1st trip DTC is detected, go to [EC-389, "Diagnosis Procedure"](#).

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Disconnect mass air flow sensor harness connector.
6. Start engine and let it idle for at least 5 seconds.
7. Stop engine and reconnect mass air flow sensor harness connector.
8. Select Service \$03 with GST and make sure that DTC P0102 is detected.
9. Select Service \$04 with GST and erase the DTC P0102.
10. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
11. Let engine idle for 1 minute.
12. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
13. Select Service \$07 with GST.
If 1st trip DTC is detected, go to [EC-389, "Diagnosis Procedure"](#).

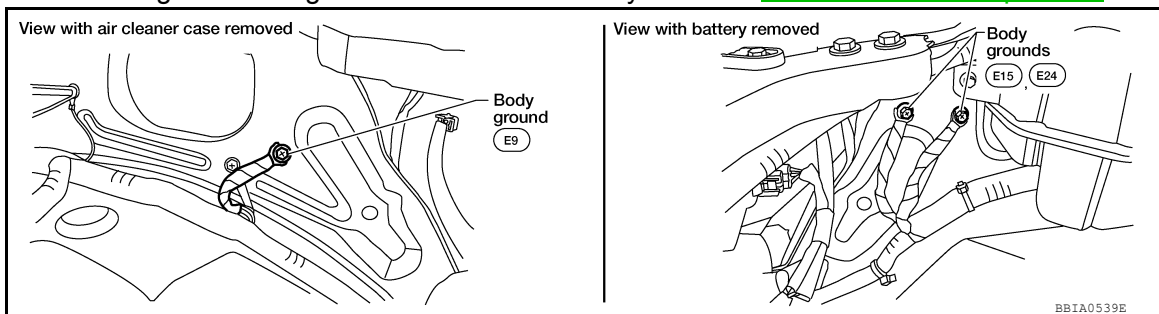


Diagnosis Procedure

INFOID:000000007358358

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
NG >> Repair or replace ground connections.

2. RETIGHTEN AIR FUEL RATIO (A/F) SENSOR 1 AND HEATED OXYGEN SENSOR 2

Loosen and retighten the air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2. Refer to [EC-41, "Engine Control Component Parts Location"](#).

>> GO TO 3.

3. CHECK FOR EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before the three way catalyst 2.

Is exhaust gas detected?

- YES >> Repair or replace.

< DTC/CIRCUIT DIAGNOSIS >

NO >> GO TO 4.

4. CHECK FOR INTAKE AIR LEAK

1. Start engine and run it at idle.
2. Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 5.
 NG >> Repair or replace.

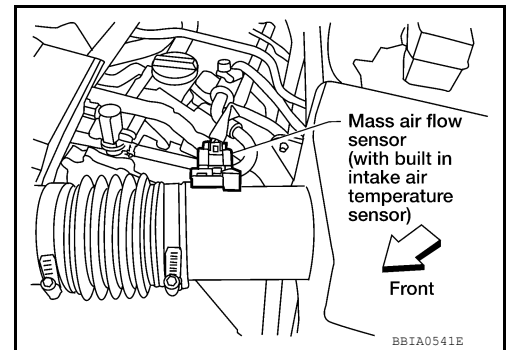
5. CLEAR THE SELF-LEARNING DATA.

Ⓟ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.
**Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
 Is it difficult to start engine?**

ⓧ Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor harness connector.
4. Restart engine and let it idle for at least 3 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Make sure DTC P0102 is displayed.
7. Erase the DTC memory. Refer to [EC-74, "On Board Diagnosis Function"](#).
8. Make sure DTC P0000 is displayed.
9. Run engine for at least 10 minutes at idle speed.
**Is the 1st trip DTC P0171, P0172 or P0174, P0175 detected?
 Is it difficult to start engine?**

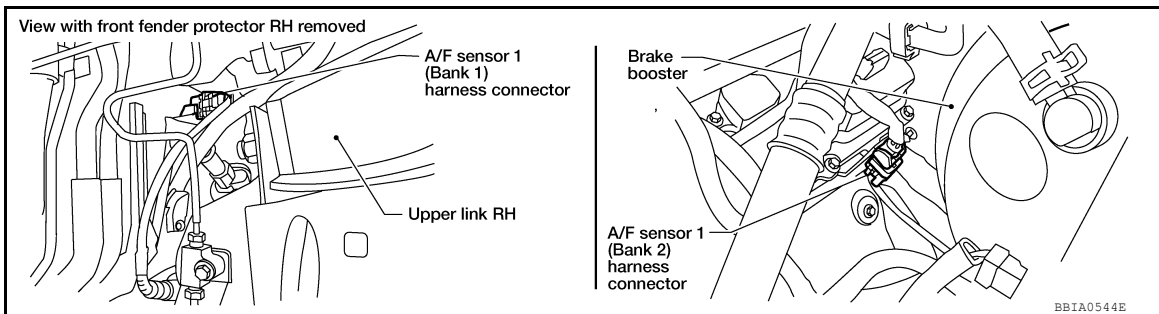


Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to [EC-185](#) or [EC-191](#).
 No >> GO TO 6.

6. CHECK HARNESS CONNECTOR

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.



3. Check harness connector for water.

Water should not exit.

OK or NG

OK >> GO TO 7.
 NG >> Repair or replace harness connector.

7. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.

P2A00, P2A03 A/F SENSOR 1

[VQ40DE]

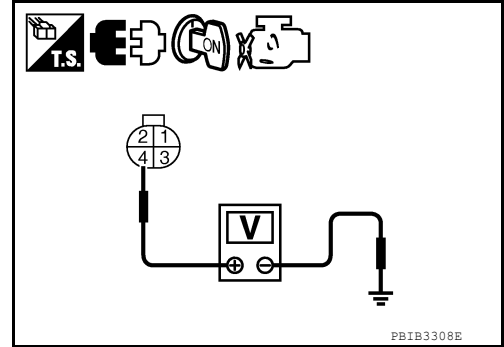
< DTC/CIRCUIT DIAGNOSIS >

- Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 9.
- NG >> GO TO 8.



8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R connector E119
- 15 A fuse (No.51)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

9. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between A/F sensor 1 terminal and ECM terminal as follows. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

- Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

- Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 10.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK A/F SENSOR 1 HEATER

Refer to [EC-105. "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 13.

11. CHECK HEATED OXYGEN SENSOR 2

Refer to [EC-169, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace heated oxygen sensor 2. Refer to [EC-41, "Engine Control Component Parts Location"](#).

12. CHECK INTERMITTENT INCIDENT

Perform [GI-37, "Intermittent Incident"](#).

OK or NG

OK >> GO TO 13.

NG >> Repair or replace.

13. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to [EC-41, "Engine Control Component Parts Location"](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

>> GO TO 14.

14. CONFIRM A/F ADJUSTMENT DATA

1. Turn ignition switch ON.
2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT.
3. Make sure that "0" is displayed on CONSULT screen.

OK or NG

OK >> **INSPECTION END**

NG >> GO TO 15.

15. CLEAR A/F ADJUSTMENT DATA

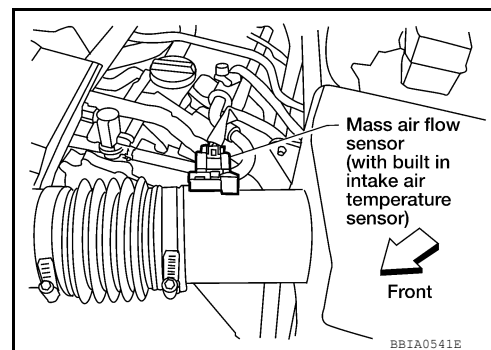
Ⓟ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".

ⓧ Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor harness connector.
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Make sure DTC P0102 is displayed.
7. Erase the DTC memory. Refer to [EC-74, "On Board Diagnosis Function"](#).
8. Make sure DTC P0000 is displayed.

>> GO TO 16.



16. CONFIRM A/F ADJUSTMENT DATA

1. Turn ignition switch OFF and then ON.
2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT.
3. Make sure that "0" is displayed on CONSULT screen.

OK or NG

OK >> **INSPECTION END**

ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

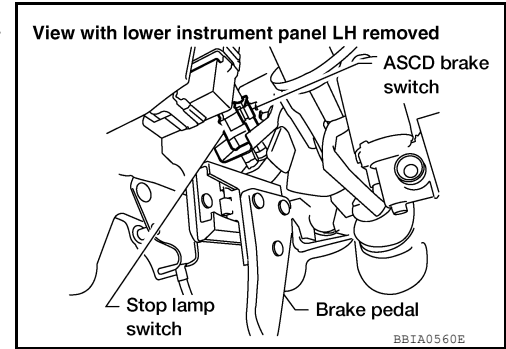
[VQ40DE]

ASCD BRAKE SWITCH

Component Description

INFOID:000000007358359

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by two types of input (ON/OFF signal). Refer to [EC-53. "System Description"](#) for the ASCD function.



Diagnosis Procedure

INFOID:000000007358360

1. CHECK OVERALL FUNCTION-I

With CONSULT

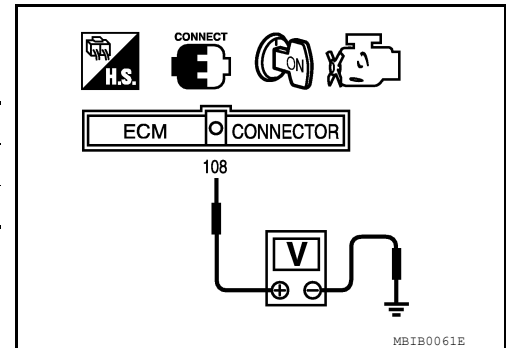
1. Turn ignition switch ON.
2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT.
3. Check "BRAKE SW1" indication under the following conditions.

CONDITION	INDICATION
When brake pedal: Slightly depressed	OFF
When brake pedal: Fully released	ON

Without CONSULT

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 108 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal: Slightly depressed	Approximately 0V
When brake pedal: Fully released	Battery voltage



OK or NG

- OK >> GO TO 2.
 NG >> GO TO 3.

2. CHECK OVERALL FUNCTION-II

With CONSULT

Check "BRAKE SW2" indication in "DATA MONITOR" mode.

CONDITION	INDICATION
When brake pedal: Fully released	OFF
When brake pedal: Slightly depressed	ON

Without CONSULT

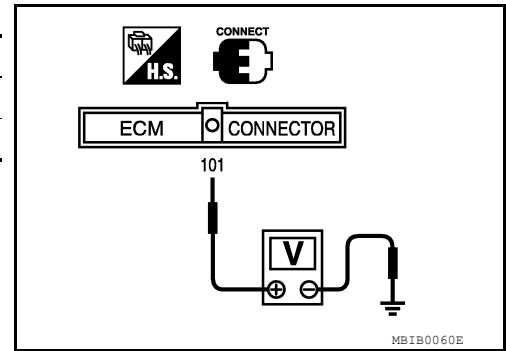
Check voltage between ECM terminal 101 and ground under the following conditions.

ASCD BRAKE SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

CONDITION	VOLTAGE
When brake pedal: Fully released	Approximately 0V
When brake pedal: Slightly depressed	Battery voltage



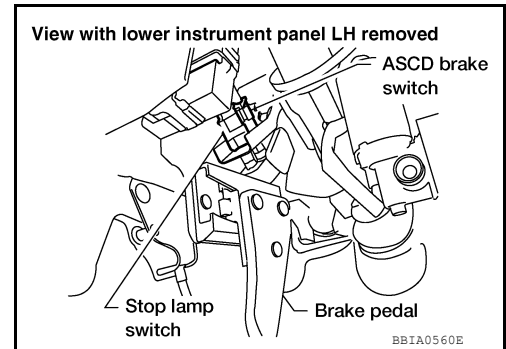
OK or NG

OK >> **INSPECTION END**

NG >> GO TO 7.

3. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.



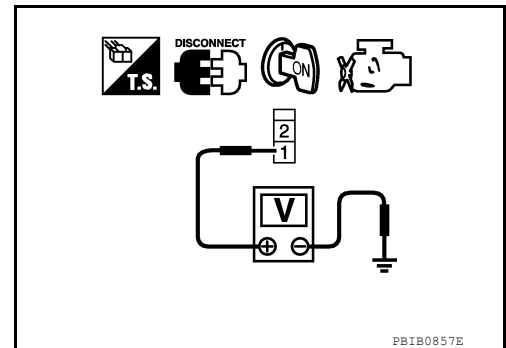
4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E160
- 10A fuse
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground in harness or connectors.

5. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

ASCD BRAKE SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> GO TO 6.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6.CHECK ASCD BRAKE SWITCH

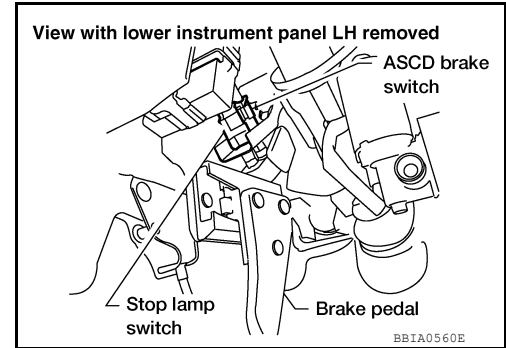
Refer to [EC-396. "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> Replace ASCD brake switch. Refer to [BR-23. "Removal and Installation"](#).

7.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.

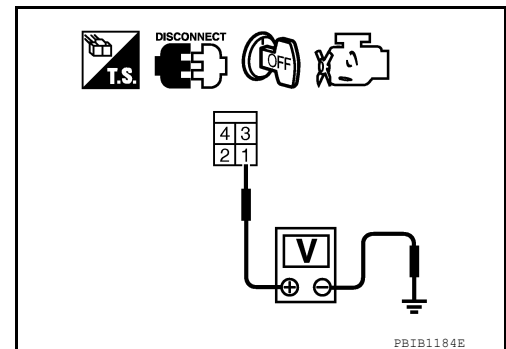


3. Check voltage between stop lamp switch terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 9.
- NG >> GO TO 8.



8.DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E160
- 10A fuse
- Harness for open or short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

9.CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 10.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10.CHECK STOP LAMP SWITCH

Refer to [EC-396. "Component Inspection"](#).

ASCD BRAKE SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

OK >> GO TO 11.

NG >> Replace stop lamp switch. Refer to [BR-23. "Removal and Installation"](#).

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

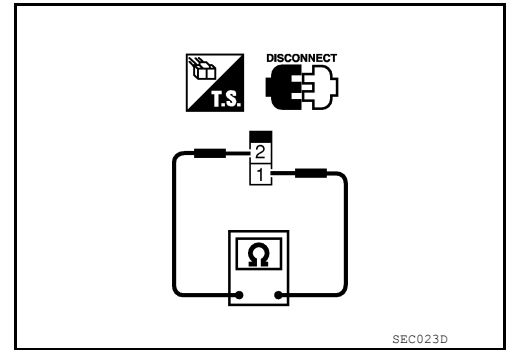
INFOID:000000007358361

ASCD BRAKE SWITCH

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check harness continuity between ASCD brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal: Fully released.	Should exist.
When brake pedal: Slightly depressed.	Should not exist.

If NG, adjust ASCD brake switch installation, refer to [BR-17. "Inspection and Adjustment - Standard Pedal"](#) or [BR-18. "Inspection and Adjustment - Adjustable Pedal"](#) and perform step 3 again.

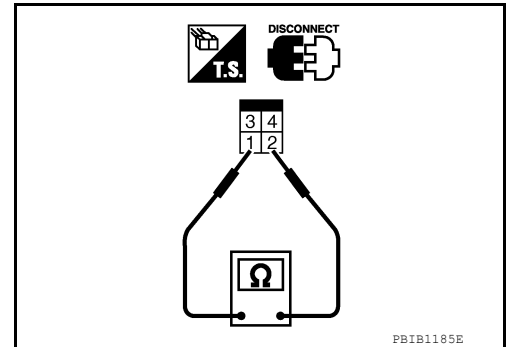


STOP LAMP SWITCH

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check harness continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal: Fully released.	Should not exist.
When brake pedal: Slightly depressed.	Should exist.

If NG, adjust stop lamp switch installation, refer to [BR-17. "Inspection and Adjustment - Standard Pedal"](#) or [BR-18. "Inspection and Adjustment - Adjustable Pedal"](#), and perform step 3 again.



ASCD INDICATOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

ASCD INDICATOR

Component Description

INFOID:000000007358362

ASCD indicator lamp illuminates to indicate ASCD operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.

CRUISE indicator illuminates when MAIN switch on ASCD steering switch is turned ON to indicated that ASCD system is ready for operation.

SET indicator illuminates when the following conditions are met.

- CRUISE indicator is illuminated.
- SET/COAST switch on ASCD steering switch is turned ON while vehicle speed is within the range of the ASCD setting.

SET indicator remains lit during ASCD control.

Refer to [EC-53. "System Description"](#) for the ASCD function.

Diagnosis Procedure

INFOID:000000007358363

1.CHECK OVERALL FUNCTION

Check ASCD indicator under the following conditions.

ASCD INDICATOR	CONDITION		SPECIFICATION
CRUISE LAMP	• Ignition switch: ON	MAIN switch: pressed at the 1st time → at the 2nd time	ON → OFF
SET LAMP	• MAIN switch: ON • When vehicle speed is between 40 km/h (25 MPH) and 144 km/h (89 MPH)	ASCD: Operating	ON
		ASCD: Not operating	OFF

OK or NG

OK >> **INSPECTION END**

NG >> GO TO 2.

2.CHECK DTC

Check that DTC UXXXX is not displayed.

OK or NG

OK >> GO TO 3.

NG >> Perform trouble diagnoses for DTC UXXXX.

3.CHECK COMBINATION METER FUNCTION

Refer to [MWI-4. "Work Flow"](#).

OK or NG

OK >> GO TO 4.

NG >> Go to .

4.CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

COOLING FAN

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

4. CHECK COOLING FAN MOTOR

Refer to [EC-399, "Component Inspection"](#).

OK or NG

OK >> GO TO 5.

NG >> Replace cooling fan motor. Refer to [CO-21, "Removal and Installation \(Motor driven type\)"](#).

5. CHECK INTERMITTENT INCIDENT

Perform [GI-37, "Intermittent Incident"](#).

OK or NG

OK >> INSPECTION END

NG >> Repair or replace harness or connector.

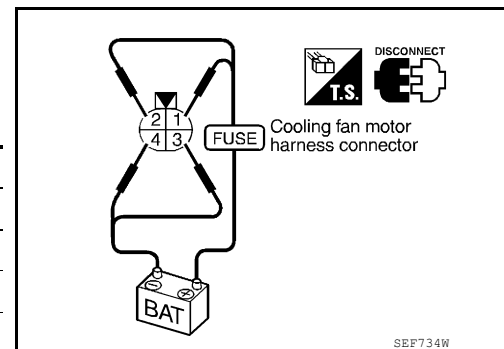
Component Inspection

INFOID:000000007358366

COOLING FAN MOTOR

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

Cooling fan speed	Cooling fan motor terminals	
	(+)	(-)
Low	1	3 and 4
	2	3 and 4
High	1 and 2	3 and 4



Cooling fan motor should operate.

If NG, replace cooling fan motor. Refer to [CO-21, "Removal and Installation \(Motor driven type\)"](#).

ELECTRICAL LOAD SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

ELECTRICAL LOAD SIGNAL

Description

INFOID:000000007358367

The electrical load signal (Headlamp switch signal, etc.) is transferred through the CAN communication line from BCM to ECM via IPDM E/R.

Diagnosis Procedure

INFOID:000000007358368

1. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

1. Turn ignition switch ON.
2. Connect CONSULT and select "DATA MONITOR" mode.
3. Select "LOAD SIGNAL" and check indication under the following conditions.

Condition	Indication
Rear window defogger switch: ON	ON
Rear window defogger switch: OFF	OFF

OK or NG

- OK >> GO TO 2.
NG >> GO TO 4.

2. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Check "LOAD SIGNAL" indication under the following conditions.

Condition	Indication
Lighting switch: ON at 2nd position	ON
Lighting switch: OFF	OFF

OK or NG

- OK >> GO TO 3.
NG >> GO TO 5.

3. CHECK HEATER FAN SIGNAL CIRCUIT OVERALL FUNCTION

Select "HEATER FAN SW" and check indication under the following conditions.

Condition	Indication
Heater fan control switch: ON	ON
Heater fan control switch: OFF	OFF

OK or NG

- OK >> **INSPECTION END**
NG >> GO TO 6.

4. CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to [DEF-3, "Repair Work Flow"](#).

>> **INSPECTION END**

5. CHECK HEADLAMP SYSTEM

Refer to [EXL-4, "Work Flow"](#).

>> **INSPECTION END**

6. CHECK HEATER FAN CONTROL SYSTEM

Refer to [HAC-111, "Symptom Matrix Chart"](#) or [HAC-179, "Symptom Matrix Chart"](#).

ELECTRICAL LOAD SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

>> INSPECTION END

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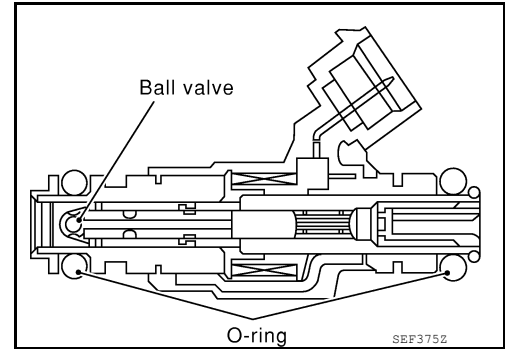
P

FUEL INJECTOR

Component Description

INFOID:000000007358369

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the fuel injector, the coil in the fuel injector is energized. The energized coil pulls the ball valve back and allows fuel to flow through the fuel injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the fuel injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



Diagnosis Procedure

INFOID:000000007358370

1. INSPECTION START

Turn ignition switch to START.

Are any cylinders ignited?

Yes or No

Yes (With CONSULT)>>GO TO 2.

Yes (Without CONSULT)>>GO TO 3.

No >> GO TO 7.

2. CHECK OVERALL FUNCTION

With CONSULT

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

OK or NG

OK >> **INSPECTION END**

NG >> GO TO 7.

3. CHECK FUNCTION OF FUEL INJECTOR-I

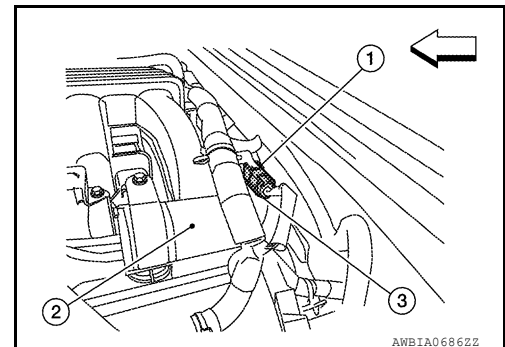
Without CONSULT

1. Stop engine.
2. Disconnect harness connector F44 (3), F201 (1)

2 : Vacuum tank

⇐ : Front

3. Turn ignition switch ON.



FUEL INJECTOR

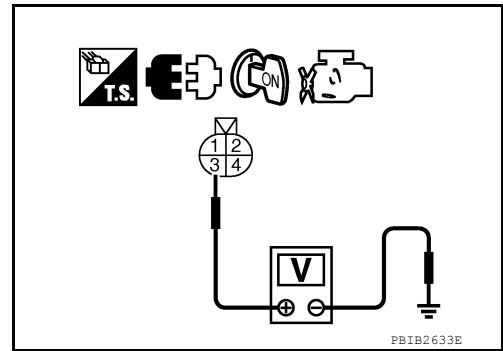
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Check voltage between harness connector F44 terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

5. Turn ignition switch OFF.
6. Disconnect ECM harness connector.
7. Check harness continuity between harness connector F44 and ECM as follows.
Refer to Wiring Diagram.



Cylinder	Harness connector F44 terminal	ECM terminal
1	2	23
3	1	22
5	4	21

Continuity should exist.

8. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

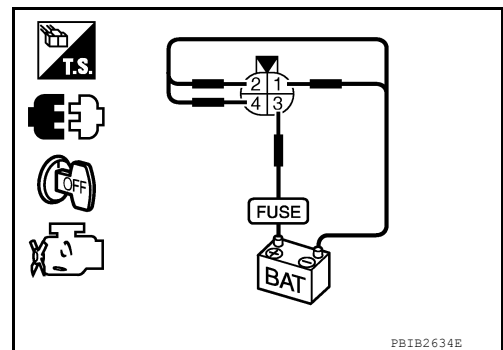
- Harness connectors E2, F32
- IPDM E/R harness connector E119
- 15 A fuse (No.55)
- Harness for open or short between harness connector F44 and fuse
- Harness for open or short between harness connector F201 and fuel injector

>> Repair open circuit or short to ground or short to power in harness or connectors.

5.CHECK FUNCTION OF FUEL INJECTOR-II

Provide battery voltage between harness connector F201 as follows and then interrupt it. Listen to each fuel injector operating sound.

Cylinder	Harness connector F201 terminal	
	(+)	(-)
1	3	2
3	3	1
5	3	4



Operating sound should exist.

OK or NG

- OK >> GO TO 6.
- NG >> GO TO 7.

6.CHECK FUNCTION OF FUEL INJECTOR-III

1. Reconnect all harness connector disconnected.
2. Start engine.

FUEL INJECTOR

[VQ40DE]

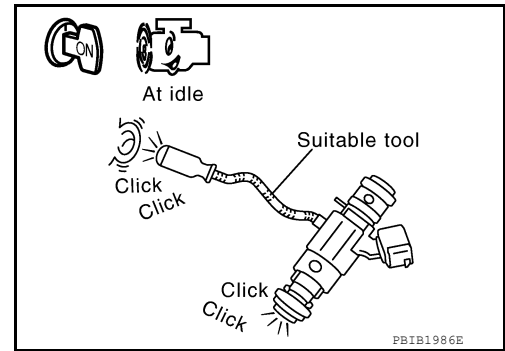
< DTC/CIRCUIT DIAGNOSIS >

- Listen to fuel injectors No. 2, No. 4, No.6 operating sound.

Clicking noise should exist.

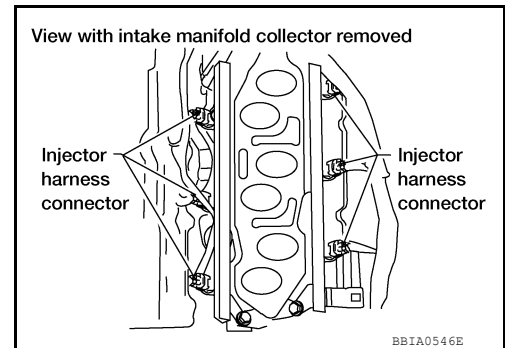
OK or NG

- OK >> **INSPECTION END**
NG >> GO TO 7.



7. CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect fuel injector harness connector.

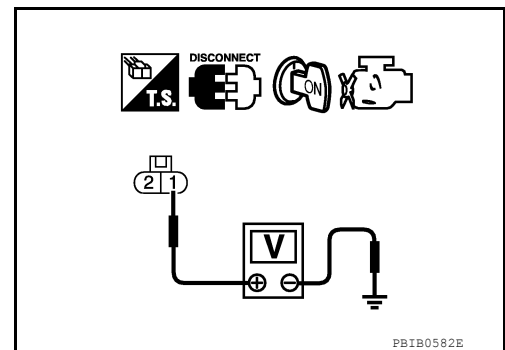


- Turn ignition switch ON.
- Check voltage between fuel injector terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 9.
NG >> GO TO 8.



8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness connectors F44, F201
- IPDM E/R harness connector E119
- 15 A fuse (No.55)
- Harness for open or short between fuel injector and fuse

>> Repair harness or connectors.

9. CHECK FUEL INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between fuel injector terminal 2 and ECM terminals 21, 22, 23, 40, 41, 42. Refer to Wiring Diagram.

Continuity should exist.

- Also check harness for short to ground and short to power.

OK or NG

FUEL INJECTOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- OK >> GO TO 11.
- NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F201, F44
- Harness for open or short between fuel injector and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK FUEL INJECTOR

Refer to [EC-405, "Component Inspection"](#).

OK or NG

- OK >> GO TO 12.
- NG >> Replace fuel injector. Refer to [EM-47, "Removal and Installation"](#).

12. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

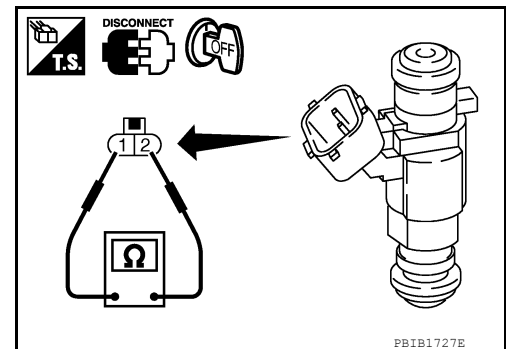
Component Inspection

INFOID:000000007358371

FUEL INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 11.1 - 14.5 Ω [at 10 - 60°C (50 - 140°F)]



FUEL PUMP

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

FUEL PUMP

Description

INFOID:000000007358372

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay
Battery	Battery voltage*		

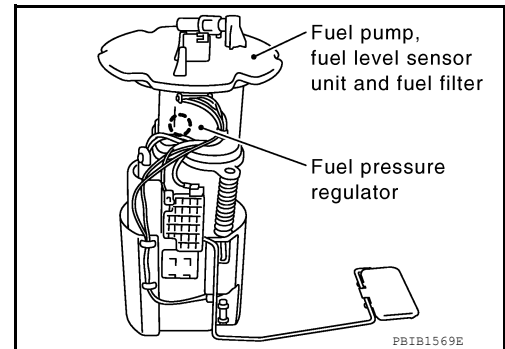
*: ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned ON to improve engine start ability. If the ECM receives a engine speed signal from the camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 1 second.
Engine running and cranking	Operates.
When engine is stopped	Stops in 1.5 seconds.
Except as shown above	Stops.

COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.



INFOID:000000007358373

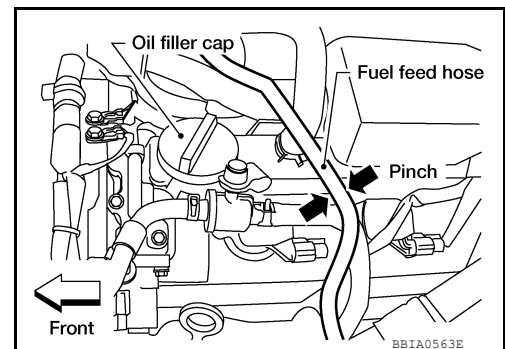
Diagnosis Procedure

1. CHECK OVERALL FUNCTION

1. Turn ignition switch ON.
2. Pinch fuel feed hose with two fingers.
Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.

OK or NG

- OK >> **INSPECTION END**
NG >> GO TO 2.



2. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Turn ignition switch ON.

FUEL PUMP

[VQ40DE]

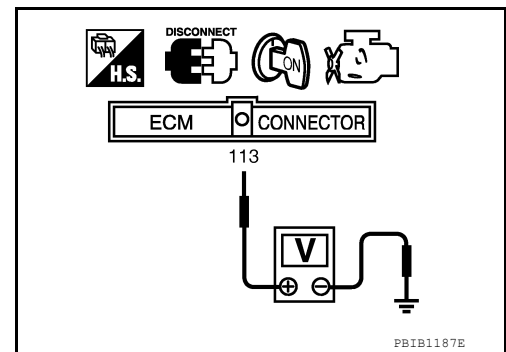
< DTC/CIRCUIT DIAGNOSIS >

4. Check voltage between ECM terminal 113 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 3.



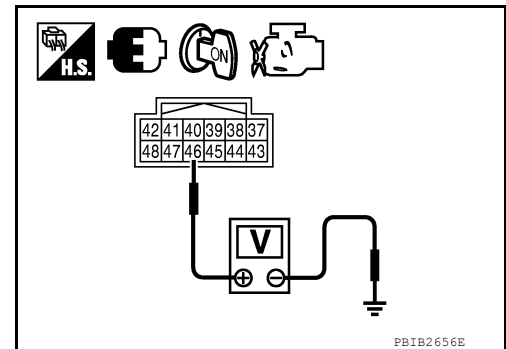
3.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

- Check voltage between IPDM E/R terminal 46 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 12.



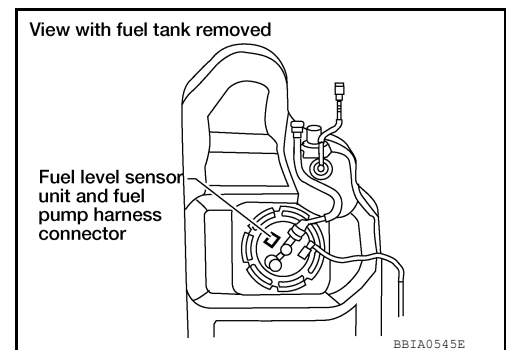
4.DETECT MALFUNCTIONING PART

- Check harness for open or short between IPDM E/R and ECM

>> Repair harness or connectors.

5.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect "fuel level sensor unit and fuel pump" harness connector.
4. Turn ignition switch ON.



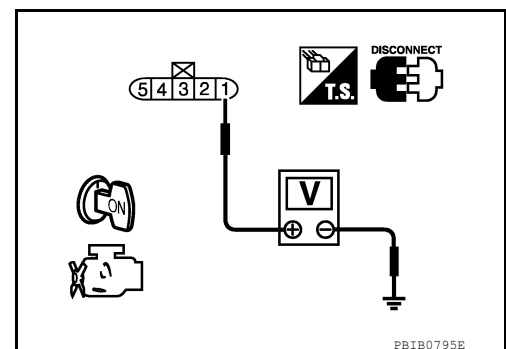
5. Check voltage between "fuel level sensor unit and fuel pump" terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage should exist for 1 second after ignition switch is turned ON.

6. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> GO TO 6.



6.CHECK 15A FUSE

1. Turn ignition switch OFF.

FUEL PUMP

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect 15A fuse. For the fuse arrangement, refer to [PG-75, "IPDM E/R Terminal Arrangement"](#).
3. Check 15 A fuse (No.48).

OK or NG

- OK >> GO TO 7.
- NG >> Replace fuse.

7. CHECK FUEL PUMP POWER SUPPLY CURCUIT-IV

1. Disconnect IPDM E/R harness connector E119.
2. Check harness continuity between "fuel level sensor unit and fuel pump" terminal 1 and IPDM E/R terminal 13.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 12.
- NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness for open or short between "fuel level sensor unit and fuel pump" and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK FUEL PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between "fuel level sensor unit and fuel pump" terminal 3 and ground.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground.

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness for open or short between "fuel level sensor unit and fuel pump" and ground

>> Repair open circuit or short to power in harness or connectors.

11. CHECK FUEL PUMP

Refer to [EC-409, "Component Inspection"](#).

OK or NG

- OK >> GO TO 12.
- NG >> Replace fuel pump. Refer to [FL-11, "Removal and Installation"](#).

12. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

OK or NG

- OK >> Replace IPDM E/R. Refer to [PCS-29, "Removal and Installation of IPDM E/R"](#).
- NG >> Repair or replace harness or connectors.

FUEL PUMP

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

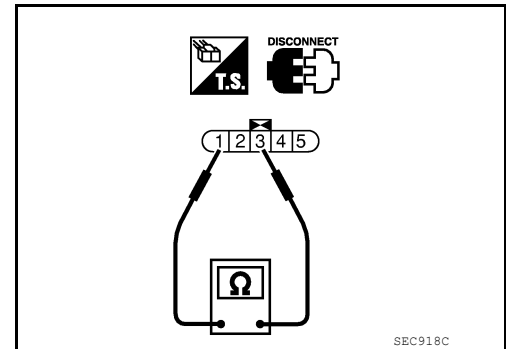
Component Inspection

INFOID:000000007358374

FUEL PUMP

1. Disconnect "fuel level sensor unit and fuel pump" harness connector.
2. Check resistance between "fuel level sensor unit and fuel pump" terminals 1 and 3.

Resistance: Approximately 0.2 - 5.0Ω [at 25°C (77°F)]



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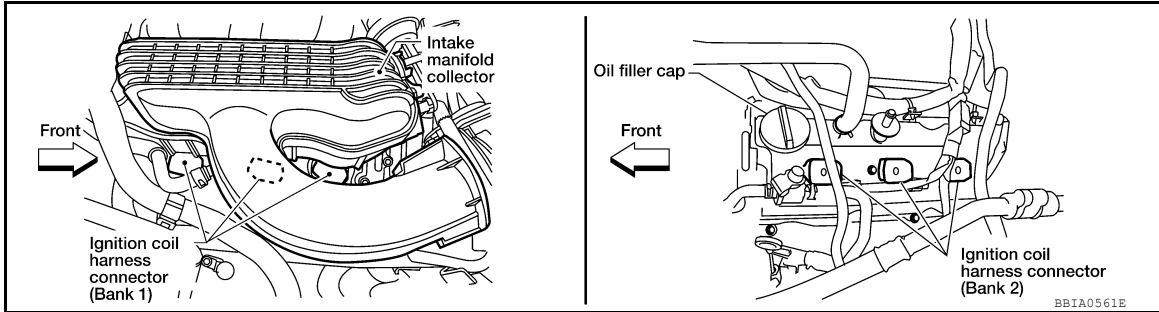
IGNITION SIGNAL

Component Description

INFOID:000000007358375

IGNITION COIL & POWER TRANSISTOR

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns ON and OFF the ignition coil primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.



Diagnosis Procedure

INFOID:000000007358376

1. CHECK ENGINE START

Turn ignition switch OFF, and restart engine.

Is engine running?

Yes or No

- Yes (With CONSULT)>>GO TO 2.
- Yes (Without CONSULT)>>GO TO 3.
- No >> GO TO 4.

2. CHECK OVERALL FUNCTION

With CONSULT

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
2. Make sure that each circuit produces a momentary engine speed drop.

OK or NG

- OK >> **INSPECTION END**
- NG >> GO TO 10.

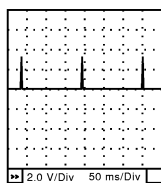
3. CHECK OVERALL FUNCTION

Without CONSULT

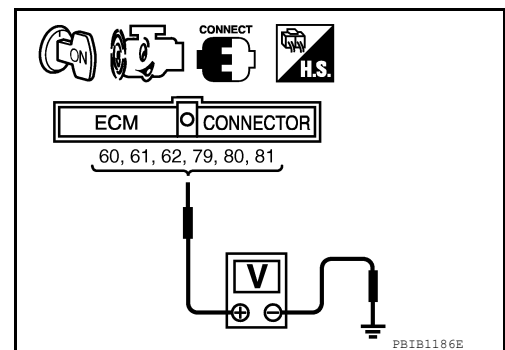
1. Let engine idle.
2. Read the voltage signal between ECM terminals 60, 61, 62, 79, 80, 81 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.

NOTE:

The pulse cycle changes depending on rpm at idle.



SEC986C



PBIB1186E

OK or NG

- OK >> **INSPECTION END**
- NG >> GO TO 10.

4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

IGNITION SIGNAL

[VQ40DE]

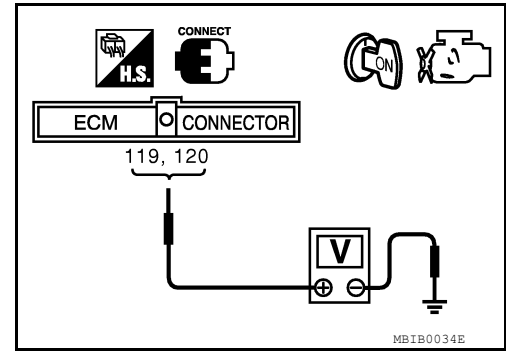
< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.
2. Check voltage between ECM terminals 119, 120 and ground with CONSULT or tester.

Voltage: Battery voltage

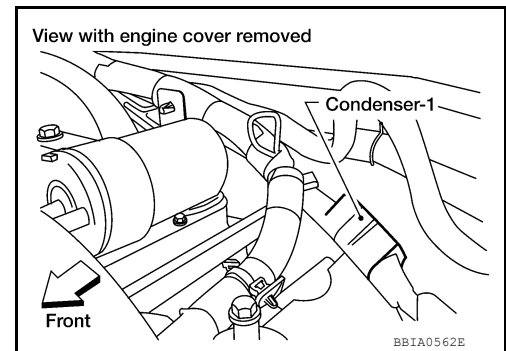
OK or NG

- OK >> GO TO 5.
NG >> Go to [EC-94, "Diagnosis Procedure"](#).



5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect condenser-1 harness connector.
3. Turn ignition switch ON.

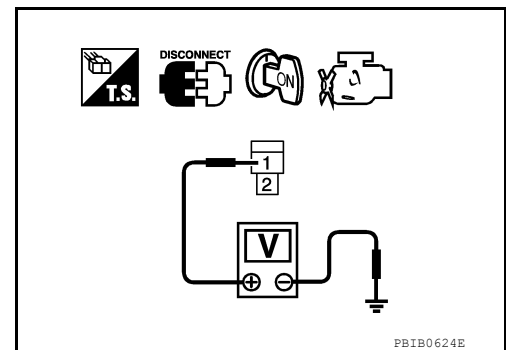


4. Check voltage between condenser-1 terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 8.
NG >> GO TO 6.



6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector E119.
3. Check harness continuity between IPDM E/R terminal 3 and condenser-1 terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 17.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between condenser-1 and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

< DTC/CIRCUIT DIAGNOSIS >

8. CHECK CONDENSER-1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between condenser-1 terminal 2 and ground.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

- OK >> GO TO 9.
- NG >> Repair open circuit or short to power in harness or connectors.

9. CHECK CONDENSER-1

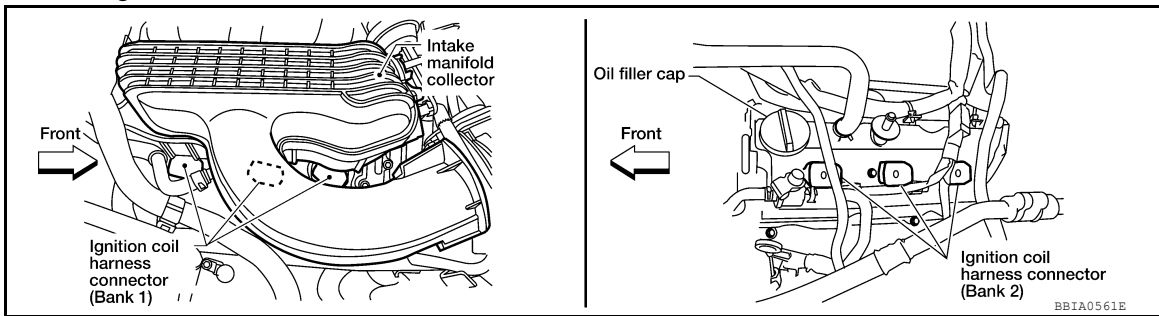
Refer to [EC-413. "Component Inspection"](#).

OK or NG

- OK >> GO TO 10.
- NG >> Replace condenser-1.

10. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.

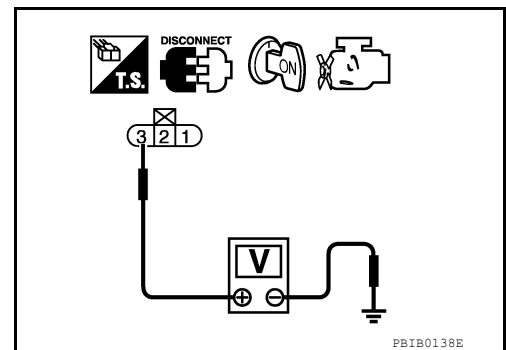


4. Turn ignition switch ON.
5. Check voltage between ignition coil terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 12.
- NG >> GO TO 11.



11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F26, F225
- Harness for open or short between ignition coil and harness connector F32

>> Repair or replace harness or connectors.

12. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between ignition coil terminal 2 and ground.
Refer to Wiring Diagram.

Continuity should exist.

IGNITION SIGNAL

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Also check harness for short to power.

OK or NG

OK >> GO TO 14.

NG >> GO TO 13.

13.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F225, F26
- Harness for open or short between ignition coil and ground

>> Repair open circuit or short to power in harness or connectors.

14.CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 60, 61, 62, 79, 80, 81 and ignition coil terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 16.

NG >> GO TO 15.

15.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F26, F225
- Harness for open or short between ignition coil and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

16.CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to [EC-413. "Component Inspection"](#).

OK or NG

OK >> GO TO 17.

NG >> Replace malfunctioning ignition coil with power transistor. Refer to [EM-42. "Removal and Installation"](#).

17.CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358377

IGNITION COIL WITH POWER TRANSISTOR

CAUTION:

Do the following procedure in the place where ventilation is good without the combustible.

1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector.

IGNITION SIGNAL

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Check resistance between ignition coil terminals as follows.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
1 and 2	Except 0 or ∞
1 and 3	Except 0
2 and 3	

4. If NG, Replace ignition coil with power transistor. Refer to [EM-42, "Removal and Installation"](#).

If OK, go to next step.

5. Turn ignition switch OFF.

6. Reconnect all harness connectors disconnected.

7. Remove fuel pump fuse (No.48) in IPDM E/R to release fuel pressure.

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

8. Start engine.

9. After engine stalls, crank it two or three times to release all fuel pressure.

10. Turn ignition switch OFF.

11. Remove ignition coil harness connectors to avoid the electrical discharge from the ignition coils.

12. Remove ignition coil and spark plug of the cylinder to be checked. Refer to [EM-42, "Removal and Installation"](#).

13. Crank engine for five seconds or more to remove combustion gas in the cylinder.

14. Connect spark plug and harness connector to ignition coil.

15. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.

16. Crank engine for about three seconds, and check whether spark is generated between the spark plug and the grounded part.

Spark should be generated.

CAUTION:

- Never place to the spark plug and the ignition coil within 50cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.

NOTE:

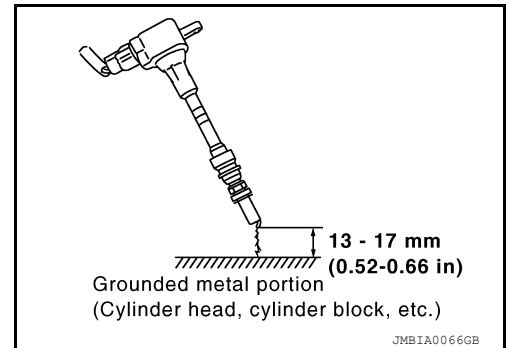
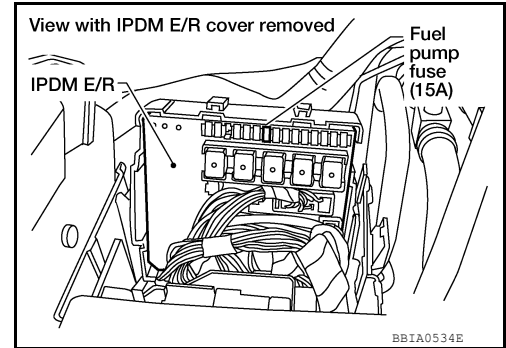
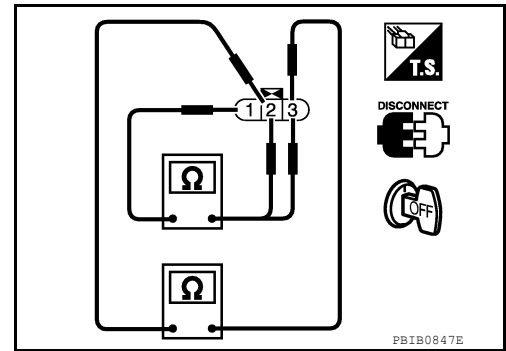
When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

17. If NG, Replace ignition coil with power transistor. Refer to [EM-42, "Removal and Installation"](#).

CONDENSER-1

1. Turn ignition switch OFF.

2. Disconnect condenser-1 harness connector. For the condenser number, refer to [EC-455, "Wiring Diagram"](#). For the condenser layout, refer to [PG-39, "Harness Layout"](#).



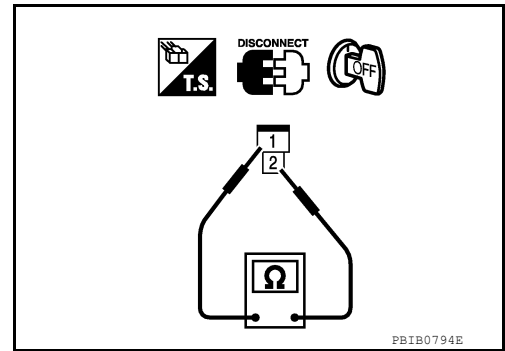
IGNITION SIGNAL

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Check resistance between condenser-1 terminals 1 and 2.

Resistance	Above 1 M Ω at 25°C (77°F)
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ON BOARD REFUELING VAPOR RECOVERY (ORVR)

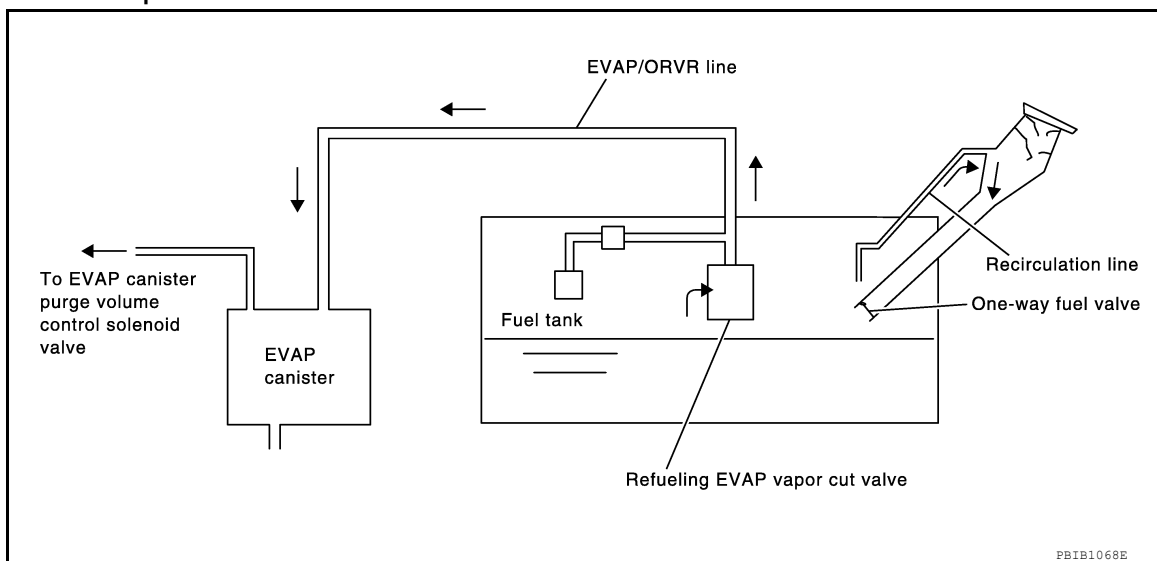
< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

System Description

INFOID:000000007358378



PBIB1068E

From the beginning of refueling, the air and vapor inside the fuel tank go through refueling EVAP vapor cut valve and EVAP/ORVR line to the EVAP canister. The vapor is absorbed by the EVAP canister and the air is released to the atmosphere.

When the refueling has reached the full level of the fuel tank, the refueling EVAP vapor cut valve is closed and refueling is stopped because of auto shut-off. The vapor which was absorbed by the EVAP canister is purged during driving.

WARNING:

When conducting inspections below, Always observe the following:

- Put a "CAUTION: FLAMMABLE" sign in workshop.
- Never smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Always furnish the workshop with a CO₂ fire extinguisher.

CAUTION:

- Before removing fuel line parts, carry out the following procedures:
 - Put drained fuel in an explosion-proof container and put lid on securely.
 - Release fuel pressure from fuel line. Refer to [EC-487, "Fuel Pressure Check"](#).
 - Disconnect battery negative cable.
- Always replace O-ring when the fuel gauge retainer is removed.
- Never kink or twist hose and tube when they are installed.
- Never tighten hose and clamps excessively to avoid damaging hoses.
- After installation, run engine and check for fuel leaks at connections.
- Never attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.

Diagnosis Procedure

INFOID:000000007358379

SYMPTOM: FUEL ODOR FROM EVAP CANISTER IS STRONG.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16, "Removal and Installation"](#).
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

- OK >> GO TO 2.
- NG >> GO TO 3.

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

< DTC/CIRCUIT DIAGNOSIS >

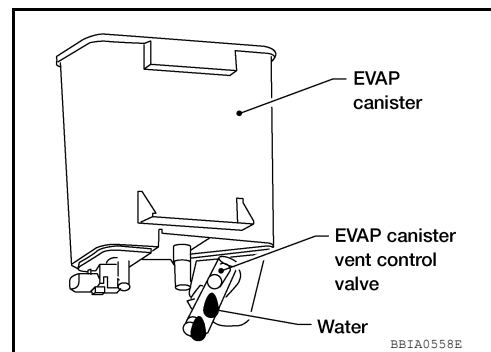
[VQ40DE]

2. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Does water drain from the EVAP canister?

Yes or No

- Yes >> GO TO 3.
- No >> GO TO 6.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to [FL-16, "Removal and Installation"](#).

>> GO TO 4.

4. CHECK DRAIN FILTER

Refer to [EC-419, "Component Inspection"](#).

OK or NG

- OK >> GO TO 5.
- NG >> Replace drain filter. Refer to [EC-57, "Description"](#).

5. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

6. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to [EC-419, "Component Inspection"](#).

OK or NG

- OK >> **INSPECTION END**
- NG >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6, "Removal and Installation"](#).

SYMPTOM: CANNOT REFUEL/FUEL ODOR FROM THE FUEL FILLER OPENING IS STRONG WHILE REFUELING.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16, "Removal and Installation"](#).
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
The weight should be less than 2.0 kg (4.4 lb).

OK or NG

- OK >> GO TO 2.
- NG >> GO TO 3.

2. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

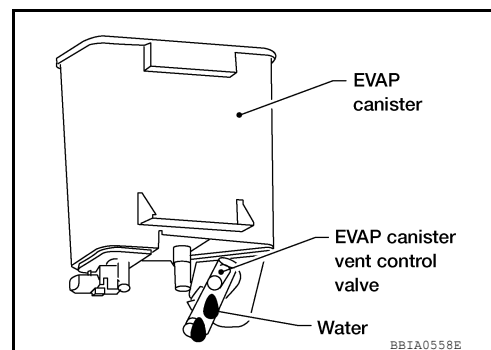
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Does water drain from the EVAP canister?

Yes or No

- Yes >> GO TO 3.
- No >> GO TO 6.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to [FL-16, "Removal and Installation"](#).

>> GO TO 4.

4. CHECK DRAIN FILTER

Refer to [EC-419, "Component Inspection"](#).

OK or NG

- OK >> GO TO 5.
- NG >> Replace drain filter. Refer to [EC-57, "Description"](#).

5. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

6. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kinks, looseness and improper connection.

OK or NG

- OK >> GO TO 7.
- NG >> Repair or replace hoses and tubes.

7. CHECK FILLER NECK TUBE

Check recirculation line for clogging, dents and cracks.

OK or NG

- OK >> GO TO 8.
- NG >> Replace filler neck tube.

8. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to [EC-419, "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6, "Removal and Installation"](#).

9. CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

OK or NG

- OK >> GO TO 10.
- NG >> Replace fuel filler tube.

10. CHECK ONE-WAY FUEL VALVE-I

Check one-way valve for clogging.

OK or NG

- OK >> GO TO 11.

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NG >> Repair or replace one-way fuel valve with fuel tank. Refer to [FL-6, "Removal and Installation"](#).

11. CHECK ONE-WAY FUEL VALVE-II

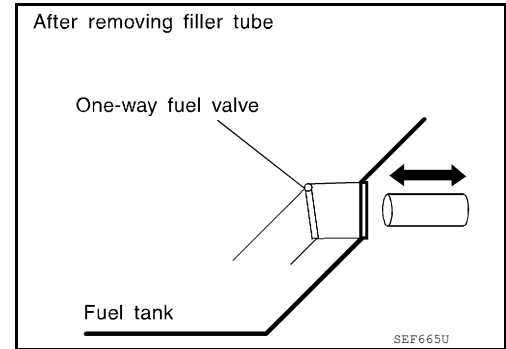
1. Make sure that fuel is drained from the tank.
2. Remove fuel filler tube and hose.
3. Check one-way fuel valve for operation as follows.
When a stick is inserted, the valve should open, when removing stick it should close.

Do not drop any material into the tank.

OK or NG

OK >> **INSPECTION END**

NG >> Replace fuel filler tube or replace one-way fuel valve with fuel tank. Refer to [FL-6, "Removal and Installation"](#).



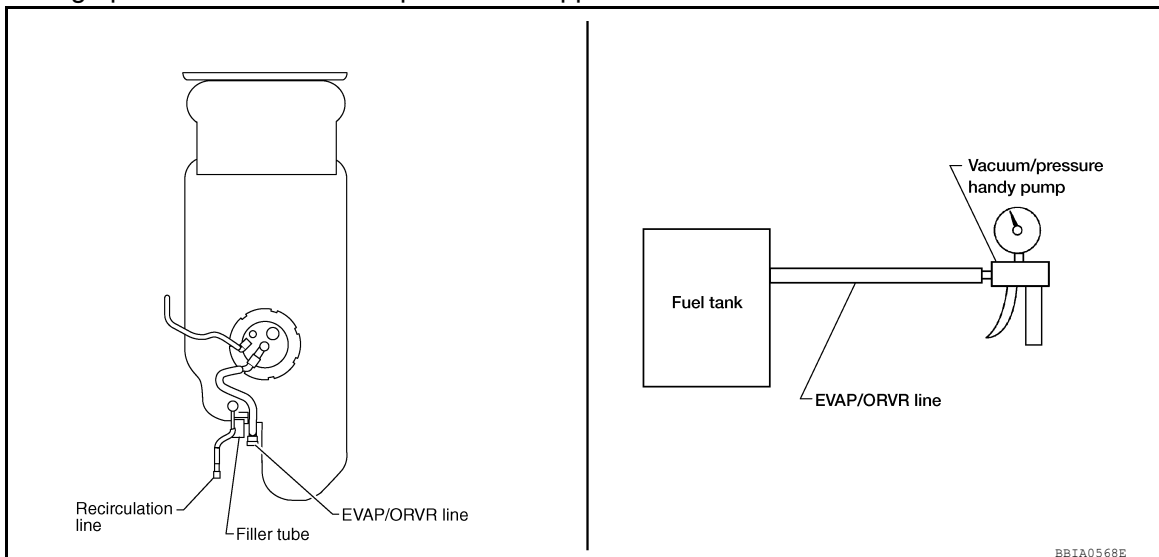
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Component Inspection

REFUELING EVAP VAPOR CUT VALVE

Ⓜ With CONSULT

1. Remove fuel tank. Refer to [FL-6, "Removal and Installation"](#).
2. Drain fuel from the tank as follows:
 - a. Remove fuel feed hose located on the fuel gauge retainer.
 - b. Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
 - c. Drain fuel using "FUEL PUMP RELAY" in "ACTIVE TEST" mode with CONSULT.
3. Check refueling EVAP vapor cut valve for being stuck to close as follows.
Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
4. Check refueling EVAP vapor cut valve for being stuck to open as follows.
 - a. Connect vacuum pump to hose end.
 - b. Remove fuel gauge retainer with fuel gauge unit.
Always replace O-ring with new one.
 - c. Turn fuel tank upside down.
 - d. Apply vacuum pressure to hose end [-13.3 kPa (-100 mmHg, -3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.



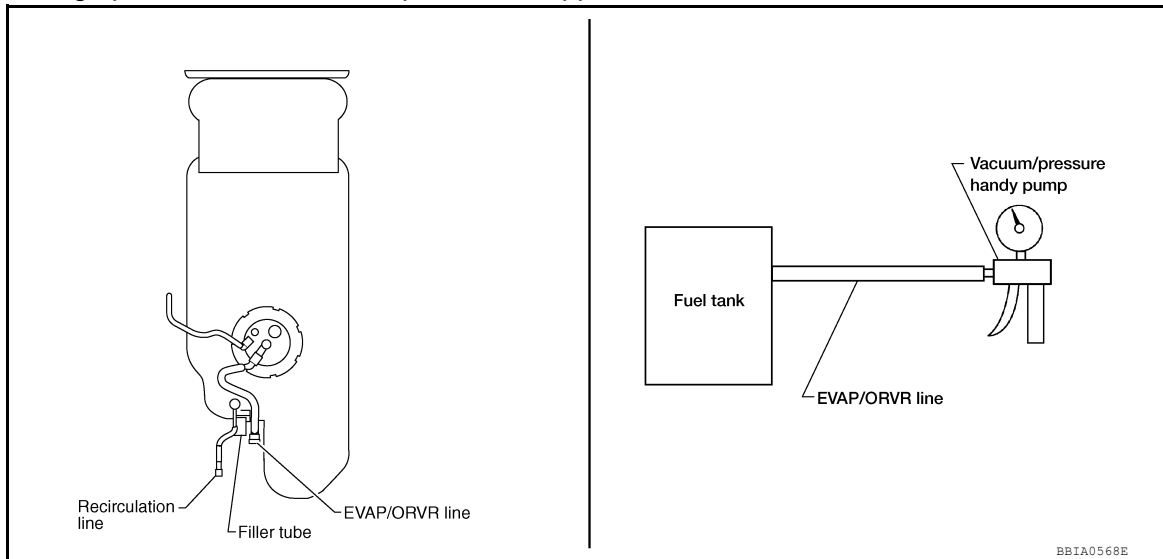
ⓧ Without CONSULT

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

[VQ40DE]

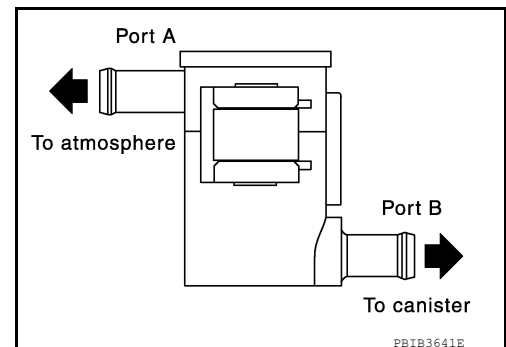
< DTC/CIRCUIT DIAGNOSIS >

1. Remove fuel tank. Refer to [FL-6. "Removal and Installation"](#).
2. Drain fuel from the tank as follows:
 - a. Remove fuel gauge retainer.
 - b. Drain fuel from the tank using a handy pump into a fuel container.
3. Check refueling EVAP vapor cut valve for being stuck to close as follows.
Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
4. Check refueling EVAP vapor cut valve for being stuck to open as follows.
 - a. Connect vacuum pump to hose end.
 - b. Remove fuel gauge retainer with fuel gauge unit.
Always replace O-ring with new one.
 - c. Turn fuel tank upside down.
 - d. Apply vacuum pressure to hose end [-13.3 kPa (-100 mmHg, -3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.



DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter. Refer to [EC-57. "Description"](#).



POSITIVE CRANKCASE VENTILATION

< DTC/CIRCUIT DIAGNOSIS >

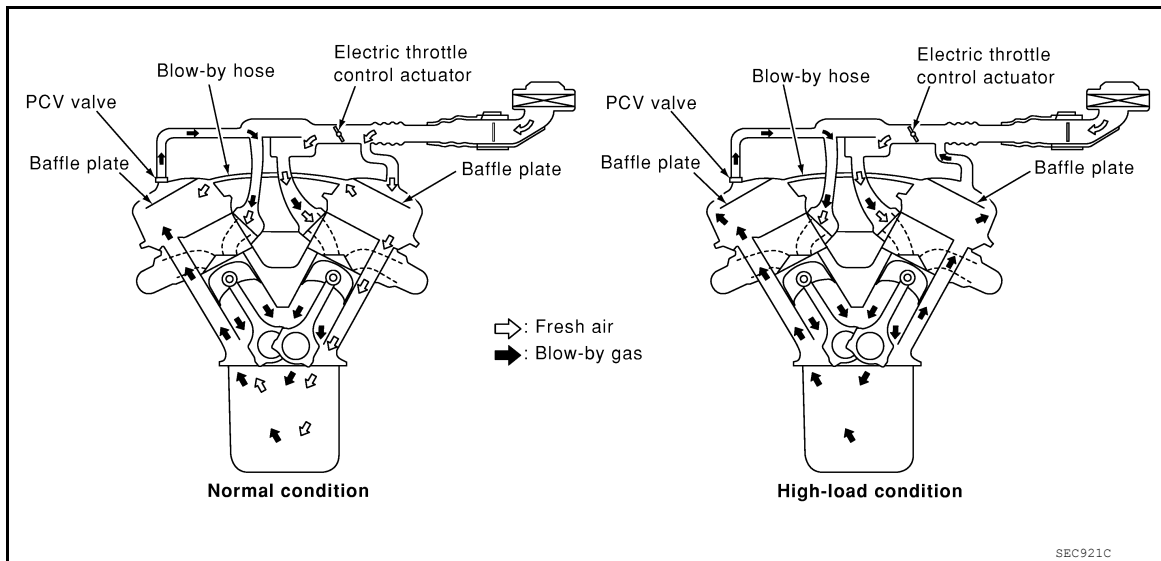
[VQ40DE]

POSITIVE CRANKCASE VENTILATION

Description

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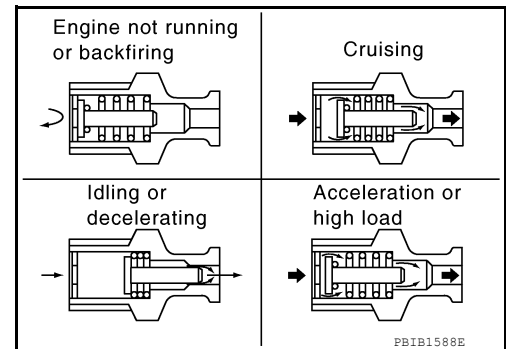
SYSTEM DESCRIPTION



This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover. Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hoseconnection to the air inlet tubes under all conditions.

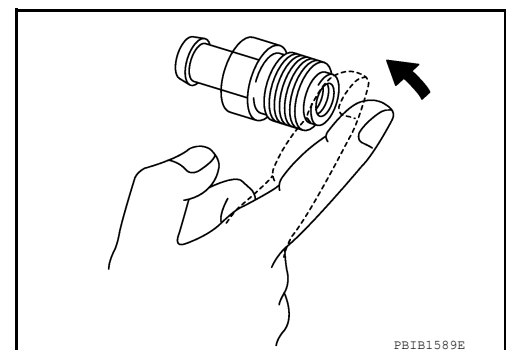


Component Inspection

INFOID:000000007358382

PCV (POSITIVE CRANKCASE VENTILATION) VALVE

With engine running at idle, remove PCV valve from rocker cover. Refer to [EM-43. "Exploded View"](#). A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



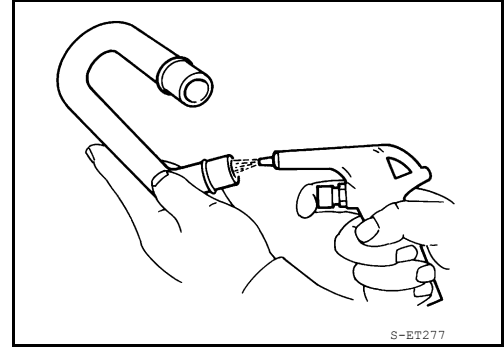
POSITIVE CRANKCASE VENTILATION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

PCV VALVE VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace. Refer to [EM-43](#), "[Exploded View](#)".



REFRIGERANT PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

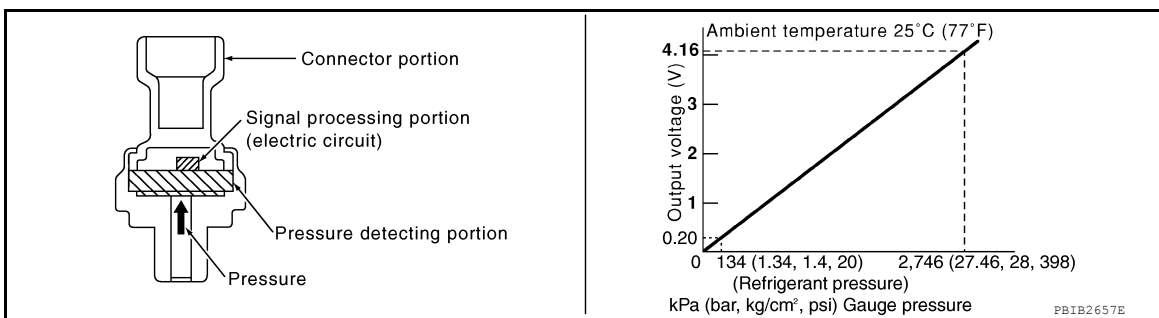
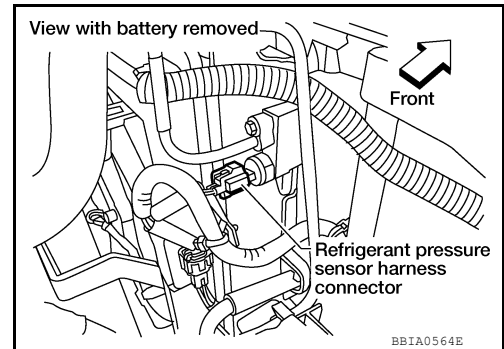
[VQ40DE]

REFRIGERANT PRESSURE SENSOR

Component Description

INFOID:000000007358383

The refrigerant pressure sensor is installed at the condenser of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.



Diagnosis Procedure

INFOID:000000007358384

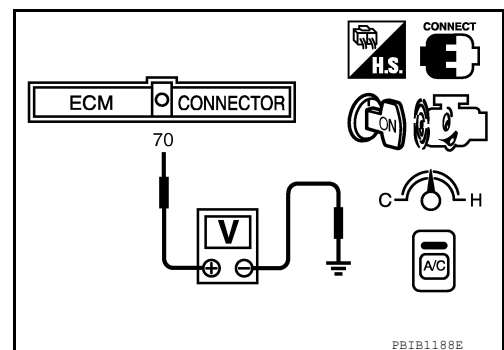
1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower switch ON.
3. Check voltage between ECM terminal 70 and ground with CONSULT or tester.

Voltage: 1.0 - 4.0V

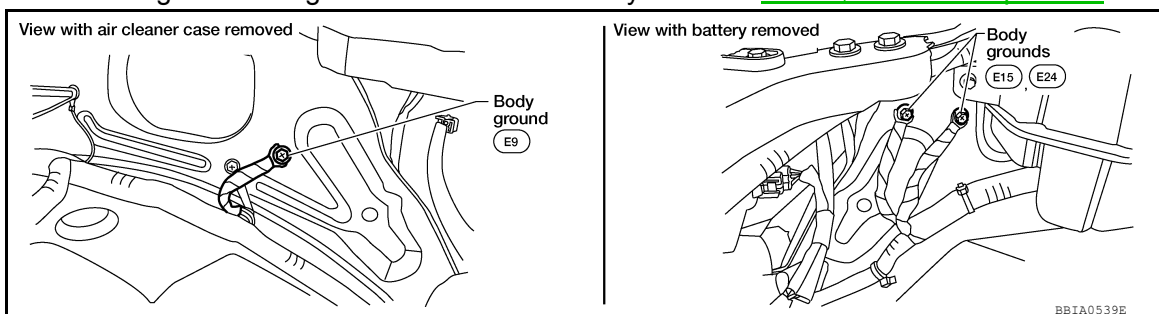
OK or NG

- OK >> **INSPECTION END**
- NG >> GO TO 2.



2. CHECK GROUND CONNECTIONS

1. Turn A/C switch and blower switch OFF.
2. Turn ignition switch OFF.
3. Loosen and retighten three ground screws on the body. Refer to [EC-97, "Ground Inspection"](#).



REFRIGERANT PRESSURE SENSOR

[VQ40DE]

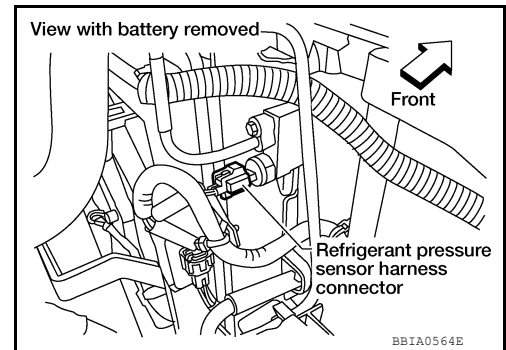
< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> GO TO 3.
- NG >> Repair or replace ground connections.

3. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect refrigerant pressure sensor harness connector.
2. Turn ignition switch ON.

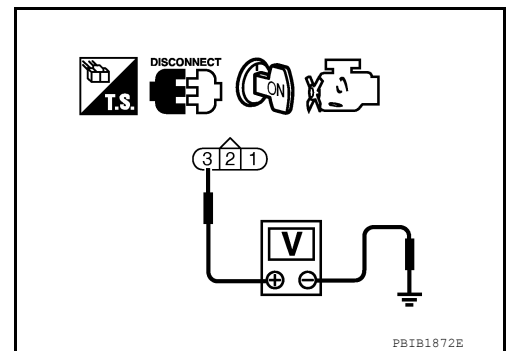


3. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair harness or connectors.

5. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between refrigerant pressure sensor terminal 1 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 70 and refrigerant pressure sensor terminal 2. Refer to Wiring Diagram.

REFRIGERANT PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.

NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

OK or NG

OK >> Replace refrigerant pressure sensor. Refer to [HA-54. "Removal and Installation for Refrigerant Pressure Sensor"](#).

NG >> Repair or replace.

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VIAS

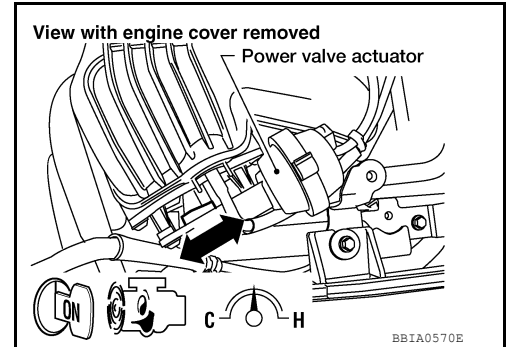
Diagnosis Procedure

INFOID:000000007358385

1. CHECK OVERALL FUNCTION

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Perform "VIAS S/V-1" in "ACTIVE TEST" mode with CONSULT.
3. Turn VIAS control solenoid valve "ON" and "OFF", and make sure that power valve actuator rod moves.

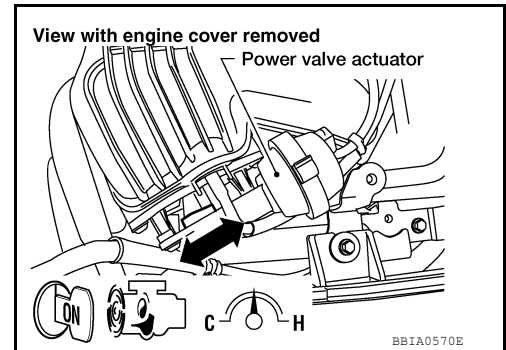


Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Rev engine up to between 2,200 and 3,300 rpm and make sure that power valve actuator rod moves.

OK or NG

- OK >> **INSPECTION END**
- NG (With CONSULT) >> GO TO 2.
- NG (Without CONSULT) >> GO TO 3.



2. CHECK VACUUM EXISTENCE

With CONSULT

1. Stop engine and disconnect vacuum hose connected to power valve actuator.
2. Start engine and let it idle.
3. Perform "VIAS S/V-1" in "ACTIVE TEST" mode with CONSULT.
4. Turn VIAS control solenoid valve "ON" and "OFF", and check vacuum existence under the following conditions.

VIAS SOL VALVE	Vacuum
ON	Should exist.
OFF	Should not exist.

OK or NG

- OK >> Repair or replace power valve actuator. Refer to [EM-27. "Exploded View"](#).
- NG >> GO TO 4.

3. CHECK VACUUM EXISTENCE

Without CONSULT

1. Stop engine and disconnect vacuum hose connected to power valve actuator.
2. Disconnect VIAS control solenoid valve harness connector.
3. Start engine and let it idle.

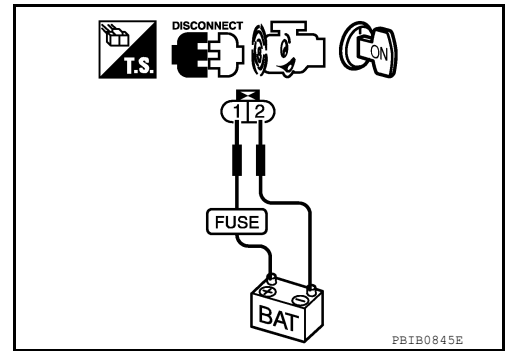
< DTC/CIRCUIT DIAGNOSIS >

4. Apply 12V of direct current between VIAS control solenoid valve terminals 1 and 2.
5. Check vacuum existence under the following conditions.

Condition	Vacuum
12V direct current supply	Should exist.
No supply	Should not exist.

OK or NG

- OK >> Repair or replace power valve actuator. Refer to [EM-27, "Exploded View"](#).
- NG >> GO TO 4.

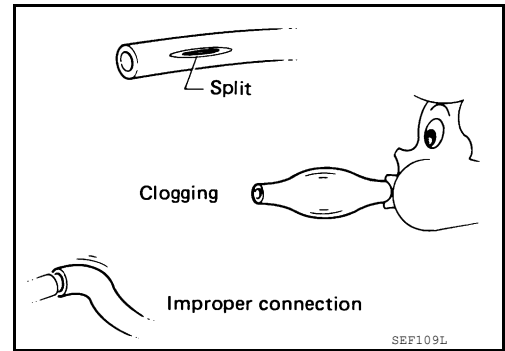


4.CHECK VACUUM HOSE

1. Stop engine.
2. Check hoses and tubes between intake manifold and power valve actuator for cracks, clogging, improper connection or disconnection. Refer to [EC-65, "Vacuum Hose Drawing"](#).

OK or NG

- OK >> GO TO 5.
- NG >> Repair hoses or tubes.



5.CHECK VACUUM TANK

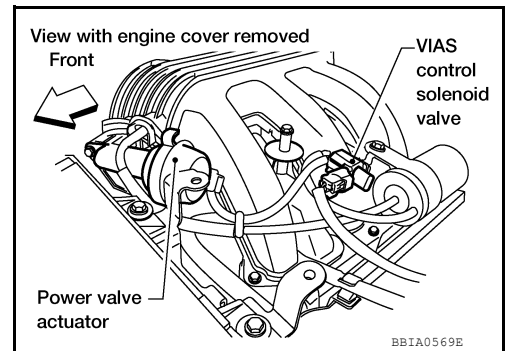
Refer to [EC-428, "Component Inspection"](#).

OK or NG

- OK >> GO TO 6.
- NG >> Replace vacuum tank. Refer to [EM-27, "Removal and Installation"](#).

6.CHECK VIAS CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect VIAS control solenoid valve harness connector.
3. Turn ignition switch ON.

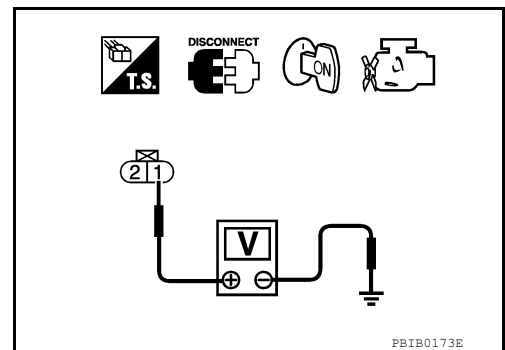


4. Check voltage between terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.



< DTC/CIRCUIT DIAGNOSIS >

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between VIAS control solenoid valve and IPDM E/R
- Harness for open or short between VIAS control solenoid valve and ECM

>> Repair harness or connectors.

8. CHECK VIAS CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 29 and VIAS control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK VIAS CONTROL SOLENOID VALVE

Refer to [EC-428. "Component Inspection"](#).

OK or NG

OK >> GO TO 10.

NG >> Replace VIAS control solenoid valve. Refer to [EM-27. "Removal and Installation"](#).

10. CHECK INTERMITTENT INCIDENT


Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

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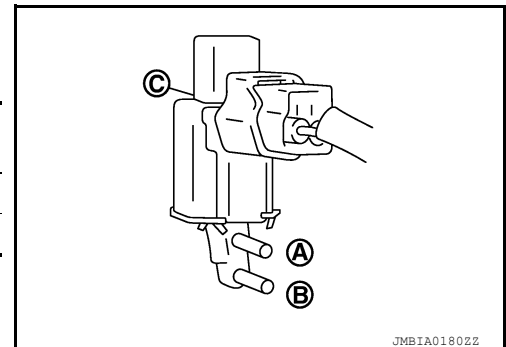
VIAS CONTROL SOLENOID VALVE

 With CONSULT

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform "VIAS S/V-1" in "ACTIVE TEST" mode.
4. Check air passage continuity and operation delay time under the following conditions.

Condition VIAS SOL VALVE	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
ON	Yes	No
OFF	No	Yes

Operation takes less than 1 second.



JMBIA0180ZZ

 Without CONSULT

VIAS

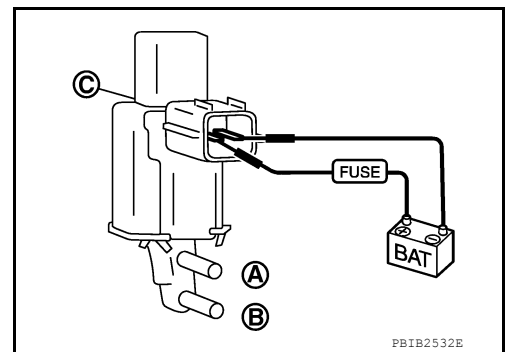
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Check air passage continuity and operation delay time under the following conditions.

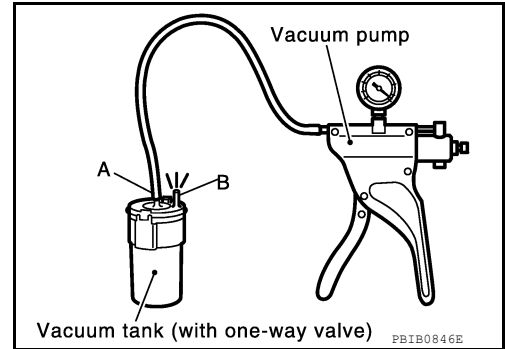
Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals 1 and 2	Yes	No
No supply	No	Yes

Operation takes less than 1 second.



VACUUM TANK

1. Disconnect vacuum hose connected to vacuum tank.
2. Connect a vacuum pump to the port (A) of vacuum tank.
3. Apply vacuum and make sure that vacuum exists at the port (B).



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ECU DIAGNOSIS INFORMATION

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CONSULT Reference Value in Data Monitor Mode

INFOID:000000007358387

Remarks:

- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
- * Specification data may not be directly related to their components signals/values/operations.

i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	• Run engine and compare CONSULT value with the tachometer indication.		Almost the same speed as the tachometer indication.
MAS A/F SE-B1	See EC-86 .		
B/FUEL SCHDL	See EC-86 .		
A/F ALPHA-B1 A/F ALPHA-B2	See EC-86 .		
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158°F)
A/F SEN1 (B1) A/F SEN1 (B2)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2 V
HO2S2 (B1) HO2S2 (B2)	<ul style="list-style-type: none"> • Revving engine from idle to 3,000 rpm quickly after the following conditions are met - Engine: After warming up - Keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load. 		0 - 0.3 V ↔ Approx. 0.6 - 1.0 V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	<ul style="list-style-type: none"> • Revving engine from idle to 3,000 rpm quickly after the following conditions are met - Engine: After warming up - Keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load. 		LEAN ↔ RICH
VHCL SPEED SE	• Turn drive wheels and compare CONSULT value with the speedometer indication.		Almost the same speed as the speedometer indication
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14 V
ACCEL SEN 1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.65 - 0.87 V
		Accelerator pedal: Fully depressed	More than 4.3 V
ACCEL SEN 2*1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.56 - 0.96 V
		Accelerator pedal: Fully depressed	More than 4.0 V
TP SEN 1-B1 TP SEN 2-B1*1	• Ignition switch: ON (Engine stopped) • Shift lever: D	Accelerator pedal: Fully released	More than 0.36 V
		Accelerator pedal: Fully depressed	Less than 4.75 V
EVAP SYS PRES	• Ignition switch: ON		Approx. 1.8 - 4.8 V
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	• Ignition switch: ON	Shift lever: P or N	ON
		Shift lever: Except above	OFF
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel: Not being turned	OFF
		Steering wheel: Being turned.	ON

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

MONITOR ITEM	CONDITION	SPECIFICATION	A
LOAD SIGNAL	• Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd	ON
		Rear window defogger switch is OFF and lighting switch is OFF	OFF
IGNITION SW	• Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	• Engine: After warming up, idle the engine	Heater fan: Operating.	ON
		Heater fan: Not operating	OFF
BRAKE SW	• Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1 INJ PULSE-B2	• Engine: After warming up • Shift lever: P or N • Air conditioner switch: OFF • No load	Idle	2.0 - 3.0 msec
		2,000 rpm	1.9 - 2.9 msec
IGN TIMING	• Engine: After warming up • Shift lever: P or N • Air conditioner switch: OFF • No load	Idle	13° - 18° BTDC
		2,000 rpm	25° - 45° BTDC
CAL/LD VALUE	• Engine: After warming up • Shift lever: P or N • Air conditioner switch: OFF • No load	Idle	5% - 35%
		2,500 rpm	5% - 35%
MASS AIRFLOW	• Engine: After warming up • Shift lever: P or N • Air conditioner switch: OFF • No load	Idle	2.0 - 6.0 g/s
		2,500 rpm	7.0 - 20.0 g/s
PURG VOL C/V	• Engine: After warming up • Shift lever: P or N • Air conditioner switch: OFF • No load	Idle (Accelerator pedal is not depressed even slightly, after engine starting)	0%
		2,000 rpm	—
INT/V TIM (B1) INT/V TIM (B2)	• Engine: After warming up • Shift lever: P or N • Air conditioner switch: OFF • No load	Idle	-5° - 5°CA
		2,000 rpm	Approx. 0° - 30°CA
INT/V SOL (B1) INT/V SOL (B2)	• Engine: After warming up • Shift lever: P or N • Air conditioner switch: OFF • No load	Idle	0% - 2%
		2,000 rpm	Approx. 0% - 50%
VIAS S/V-1	• Engine: After warming up	2,200 - 3,300 rpm	ON
		Except above conditions	OFF
AIR COND RLY	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
FUEL PUMP RLY	• For 1 second after turning ignition switch ON • Engine running or cranking • Except above conditions		ON
			OFF
VENT CONT/V	• Ignition switch: ON		OFF
THRTL RELAY	• Ignition switch: ON		ON
COOLING FAN	• Engine: After warming up, idle the engine • Air conditioner switch: OFF	Engine coolant temperature: 97°C (207°F) or less	OFF
		Engine coolant temperature: Between 98°C (208°F) and 104°C (219°F)	LOW
		Engine coolant temperature: 105°C (221°F) or more	HI

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 HTR (B1) HO2S2 HTR (B2)	<ul style="list-style-type: none"> Engine speed: Below 3,600 rpm after the following conditions are met. <ul style="list-style-type: none"> - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 		ON
	<ul style="list-style-type: none"> Engine speed: Above 3,600 rpm 		OFF
I/P PULLY SPD	<ul style="list-style-type: none"> Vehicle speed: More than 20 km/h (12 MPH) 		Almost the same speed as the speedometer indication
VEHICLE SPEED	<ul style="list-style-type: none"> Turn drive wheels and compare the CONSULT value with speedometer indication. 		Almost the same speed as the speedometer indication
TRVL AFTER MIL	<ul style="list-style-type: none"> Ignition switch: ON 	Vehicle has traveled after MIL has turned ON.	0 - 65,535 km (0 - 40,723 mile)
A/F S1 HTR (B1) A/F S1 HTR (B2)	<ul style="list-style-type: none"> Engine: After warming up, idle the engine 		4 - 100%
AC PRESS SEN	<ul style="list-style-type: none"> Engine: Idle Both A/C switch blower fan switch: ON (Compressor operates) 		1.0 - 4.0 V
VHCL SPEED SE	<ul style="list-style-type: none"> Turn drive wheels and compare speedometer indication with the CONSULT value. 		Almost the same speed as the CONSULT value
SET VHCL SPD	<ul style="list-style-type: none"> Engine: Running 	ASCD: Operating.	The preset vehicle speed is displayed.
MAIN SW	<ul style="list-style-type: none"> Ignition switch: ON 	MAIN switch: Pressed	ON
		MAIN switch: Released	OFF
CANCEL SW	<ul style="list-style-type: none"> Ignition switch: ON 	CANCEL switch: Pressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	<ul style="list-style-type: none"> Ignition switch: ON 	RESUME/ACCELERATE switch: Pressed	ON
		RESUME/ACCELERATE switch: Released	OFF
SET SW	<ul style="list-style-type: none"> Ignition switch: ON 	SET/COAST switch: Pressed	ON
		SET/COAST switch: Released	OFF
BRAKE SW1	<ul style="list-style-type: none"> Ignition switch: ON 	Brake pedal: Fully released	ON
		Brake pedal: Slightly depressed	OFF
BRAKE SW2	<ul style="list-style-type: none"> Ignition switch: ON 	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
CRUISE LAMP	<ul style="list-style-type: none"> Ignition switch: ON 	MAIN switch: pressed at the 1st time → at the 2nd time	ON → OFF
SET LAMP	<ul style="list-style-type: none"> MAIN switch: ON When vehicle speed is between 40km/h (25MPH) and 144km/h (89MPH) 	ASCD: Operating	ON
		ASCD: Not operating	OFF
ALT DUTY	<ul style="list-style-type: none"> Engine: Idle 		0 - 80%
BAT CUR SEN	<ul style="list-style-type: none"> Engine speed: Idle Battery: Fully charged*2 Shift lever: P or N Air conditioner switch: OFF No load 		Approx. 2,600 - 3,500 mV
ALT DUTY SIG	<ul style="list-style-type: none"> Power generation voltage variable control: Operating 		ON
	<ul style="list-style-type: none"> Power generation voltage variable control: Not operating 		OFF
A/F ADJ-B1	<ul style="list-style-type: none"> Engine: Running 		-0.330 - 0.330
A/F ADJ-B2	<ul style="list-style-type: none"> Engine: Running 		-0.330 - 0.330
EVAP LEAK DIAG	<ul style="list-style-type: none"> Ignition switch: ON 		Indicates the condition of EVAP leak diagnosis.

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

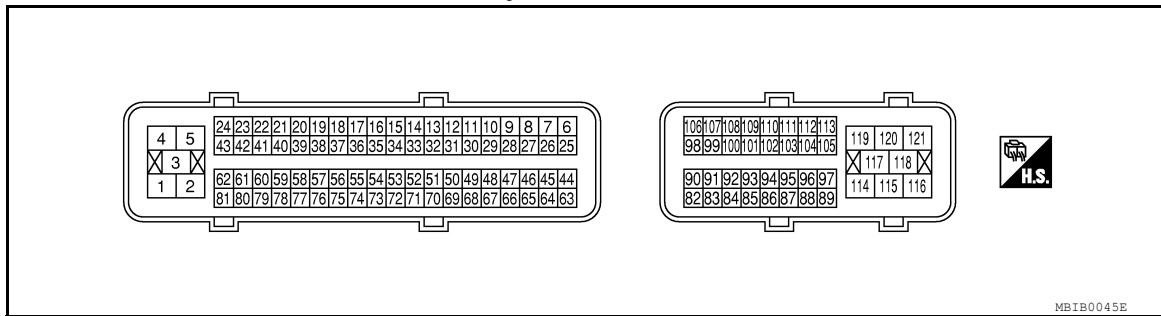
MONITOR ITEM	CONDITION	SPECIFICATION
EVAP DIAG READY	• Ignition switch: ON	Indicates the ready condition of EVAP leak diagnosis.
HO2 S2 DIAG1 (B1)	DTC P0139 self-diagnosis (delayed response) is incomplete.	INCMP
	DTC P0139 self-diagnosis (delayed response) is complete.	CMPLT
HO2 S2 DIAG1 (B2)	DTC P0159 self-diagnosis (delayed response) is incomplete.	INCMP
	DTC P0159 self-diagnosis (delayed response) is complete.	CMPLT
HO2 S2 DIAG2 (B1)	DTC P0139 self-diagnosis (slow response) is incomplete.	INCMP
	DTC P0139 self-diagnosis (slow response) is complete.	CMPLT
HO2 S2 DIAG2 (B2)	DTC P0159 self-diagnosis (slow response) is incomplete.	INCMP
	DTC P0159 self-diagnosis (slow response) is complete.	CMPLT
THRTL STK CNT B1	NOTE: The item is indicated, but not used.	—

*1: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to [PG-5. "How to Handle Battery"](#).

ECM Harness Connector Terminal Layout

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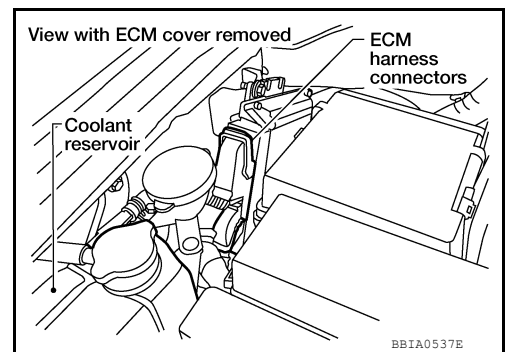


ECM Terminal and Reference Value

INFOID:000000007358389

PREPARATION

ECM located in the engine room passenger side behind reservoir tank.



ECM INSPECTION TABLE

Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT.

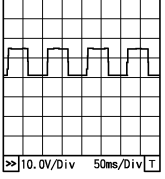
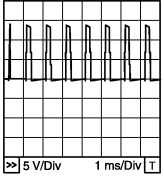
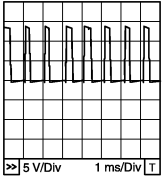
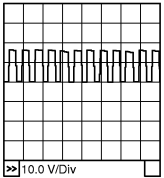
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECMs transistor. Use a ground other than ECM terminals, such as the ground.

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< ECU DIAGNOSIS INFORMATION >

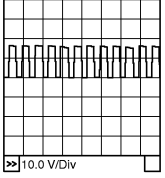
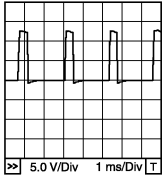
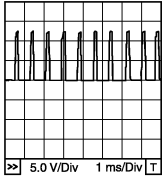
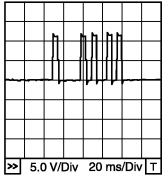
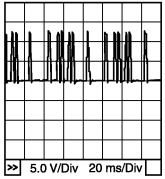
[VQ40DE]

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	BR	ECM ground	[Engine is running] • Idle speed	Body ground
2	G	A/F sensor 1 heater (Bank 1)	[Engine is running] • Warm-up condition • Idle speed (More than 140 seconds after starting engine)	Approximately 2.9 - 8.8V★  <small>10.0V/Div 50ms/Div T</small> PBIA8148J
3	V	Throttle control motor relay power supply	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
4	L/W	Throttle control motor (Close)	[Ignition switch: ON] • Engine: Stopped • Shift lever: D • Accelerator pedal: Fully released	0 - 14V★  <small>5 V/Div 1 ms/Div T</small> PBIB1104E
5	L/B	Throttle control motor (Open)	[Ignition switch: ON] • Engine: Stopped • Shift lever: D • Accelerator pedal: Fully depressed	0 - 14V★  <small>5 V/Div 1 ms/Div T</small> PBIB1105E
6	R	Heated oxygen sensor 2 heater (Bank 2)	[Engine is running] • Engine speed is below 3,600 rpm after the following conditions are met - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	0 - 1.0V
			[Ignition switch: ON] • Engine: Stopped [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
10	W	Intake valve timing control solenoid valve (Bank 2)	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	7 - 12V★  <small>10.0 V/Div</small> PBIB1790E

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

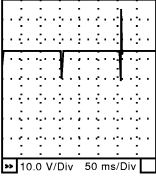
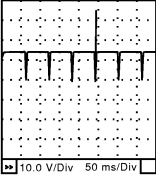
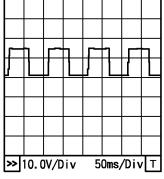
TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11	LG	Intake valve timing control solenoid valve (Bank 1)	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	7 - 12V★ 
12	P	Power steering pressure sensor	[Engine is running] • Steering wheel: Being turned	0.5 - 4.5V
			[Engine is running] • Steering wheel: Not being turned	0.4 - 0.8V
13	G	Crankshaft position sensor (POS)	[Engine is running] • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle	Approximately 10V★ 
			[Engine is running] • Engine speed: 2,000 rpm	Approximately 10V★ 
14	Y	Camshaft position sensor (PHASE) (Bank 2)	[Engine is running] • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle	1.0 - 4.0V★ 
			[Engine is running] • Engine speed: 2,000 rpm	1.0 - 4.0V★ 
15	W	Knock sensor (Bank 1)	[Engine is running] • Idle speed	Approximately 2.5V
16	BR	A/F sensor 1 (Bank 2)	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8V Output voltage varies with air fuel ratio.

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< ECU DIAGNOSIS INFORMATION >

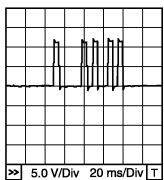
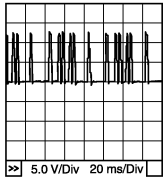
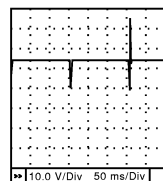
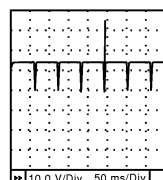
[VQ40DE]

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
21 22 23	W LG SB	Fuel injector No. 5 Fuel injector No. 3 Fuel injector No. 1	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Idle speed <p>NOTE: The pulse cycle changes depending on rpm at idle</p>	<p>BATTERY VOLTAGE (11 - 14V)★</p>  <p style="text-align: right; font-size: small;">SEC984C</p>
			<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000 rpm 	<p>BATTERY VOLTAGE (11 - 14V)★</p>  <p style="text-align: right; font-size: small;">SEC985C</p>
24 43	G G	A/F sensor 1 heater (Bank 2)	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Idle speed (More than 140 seconds after starting engine) 	<p>Approximately 2.9 - 8.8V★</p>  <p style="text-align: right; font-size: small;">PBIA6148J</p>
25	P	Heated oxygen sensor 2 heater (Bank 1)	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Engine speed: Below 3,600 rpm after the following conditions are met - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 	0 - 1.0V
			<p>[Ignition switch: ON]</p> <ul style="list-style-type: none"> • Engine: Stopped <p>[Engine is running]</p> <ul style="list-style-type: none"> • Engine speed: Above 3,600 rpm 	BATTERY VOLTAGE (11 - 14V)
29	G	VIAS control solenoid valve	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Idle speed 	BATTERY VOLTAGE (11 - 14V)
			<p>[Engine is running]</p> <ul style="list-style-type: none"> • Engine speed: Between 2,200 and 3,300 rpm 	0 - 1.0V
32	W	EVAP control system pressure sensor	[Ignition switch: ON]	Approximately 1.8 - 4.8V

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

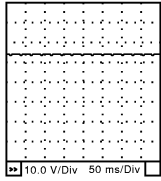
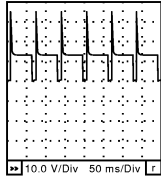
TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	L	Camshaft position sensor (PHASE) (Bank 1)	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Idle speed <p>NOTE: The pulse cycle changes depending on rpm at idle</p>	<p>1.0 - 4.0V★</p>  <p style="text-align: right; font-size: small;">PBIB1039E</p>
			<p>[Engine is running]</p> <ul style="list-style-type: none"> • Engine speed: 2,000 rpm 	<p>1.0 - 4.0V★</p>  <p style="text-align: right; font-size: small;">PBIB1040E</p>
34	BR	Intake air temperature sensor	<p>[Engine is running]</p>	<p>Approximately 0 - 4.8V Output voltage varies with intake air temperature.</p>
35	O/L	A/F sensor 1 (Bank 1)	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000 rpm 	<p>Approximately 1.8V Output voltage varies with air fuel ratio.</p>
36	W	Knock sensor (Bank 2)	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Idle speed 	<p>Approximately 2.5V</p>
40 41 42	V R O	Fuel injector No. 6 Fuel injector No. 4 Fuel injector No. 2	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Idle speed <p>NOTE: The pulse cycle changes depending on rpm at idle</p>	<p>BATTERY VOLTAGE (11 - 14V)★</p>  <p style="text-align: right; font-size: small;">SEC984C</p>
			<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000 rpm 	<p>BATTERY VOLTAGE (11 - 14V)★</p>  <p style="text-align: right; font-size: small;">SEC985C</p>

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< ECU DIAGNOSIS INFORMATION >

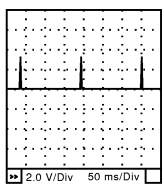
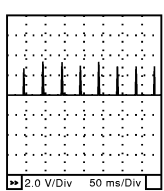
[VQ40DE]

TERMI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	R	EVAP canister purge volume control solenoid valve	[Engine is running] <ul style="list-style-type: none"> Idle speed Accelerator pedal is not depressed even slightly, after engine starting 	BATTERY VOLTAGE (11 - 14V)★  <small>SEC990C</small>
			[Engine is running] <ul style="list-style-type: none"> Engine speed: About 2,000 rpm (More than 100 seconds after starting engine) 	BATTERY VOLTAGE (11 - 14V)★  <small>SEC991C</small>
47	L	Sensor power supply (Throttle position sensor)	[Ignition switch: ON]	Approximately 5V
48	SB	Sensor power supply (EVAP control system pressure sensor)	[Ignition switch: ON]	Approximately 5V
49	P	Sensor power supply (Refrigerant pressure sensor/ Battery current sensor)	[Ignition switch: ON]	Approximately 5V
50	W	Throttle position sensor 1	[Ignition switch: ON] <ul style="list-style-type: none"> Engine: Stopped Shift lever: D Accelerator pedal: Fully released 	More than 0.36V
			[Ignition switch: ON] <ul style="list-style-type: none"> Engine: Stopped Shift lever: D Accelerator pedal: Fully depressed 	Less than 4.75V
51	P	Mass air flow sensor	[Engine is running] <ul style="list-style-type: none"> Warm-up condition Idle speed 	0.9 - 1.2V
			[Engine is running] <ul style="list-style-type: none"> Warm-up condition Engine speed: 2,500 rpm 	1.5 - 1.8V
55	G	Heated oxygen sensor 2 (Bank 2)	[Engine is running] <ul style="list-style-type: none"> Revvng engine from idle to 3,000 rpm quickly after the following conditions are met Engine: After warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 	0 - Approximately 1.0V
56	W/L	A/F sensor 1 (Bank 1)	[Ignition switch: ON]	Approximately 2.2V

ECM

< ECU DIAGNOSIS INFORMATION >

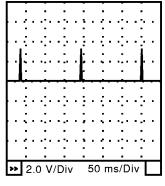
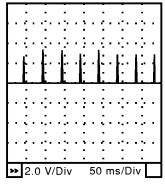
[VQ40DE]

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	
60 61 62	SB L Y	Ignition signal No. 5 Ignition signal No. 3 Ignition signal No. 1	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle	0 - 0.2V★ 	A
			[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,500 rpm 	0.1 - 0.4V★ 	C
66	B	Sensor ground (Throttle position sensor)	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed 	Approximately 0V	D
67	B	Sensor ground	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed 	Approximately 0V	E
68	G	Sensor power supply (Power steering pressure sensor)	[Ignition switch: ON]	Approximately 5V	F
69	R	Throttle position sensor 2	[Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Shift lever: D • Accelerator pedal: Fully released 	Less than 4.75V	G
			[Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Shift lever: D • Accelerator pedal: Fully depressed 	More than 0.36V	H
70	BR	Refrigerant pressure sensor	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Both A/C switch and blower switch: ON (Compressor operates) 	1.0 - 4.0V	I
71	R	Battery current sensor	[Engine is running] <ul style="list-style-type: none"> • Battery: Fully charged* • Idle speed 	Approximately 2.6 - 3.5V	J
73	Y	Engine coolant temperature sensor	[Engine is running]	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.	K
74	W	Heated oxygen sensor 2 (Bank 1)	[Engine is running] <ul style="list-style-type: none"> • Revving engine from idle to 3,000 rpm quickly after the following conditions are met - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 	0 - Approximately 1.0V	L
75	B/R	A/F sensor 1 (Bank 2)	[Ignition switch: ON]	Approximately 2.2V	M
78	GR	Sensor ground (Heated oxygen sensor 2)	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed 	Approximately 0V	N

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
79 80 81	P GR G	Ignition signal No. 6 Ignition signal No. 4 Ignition signal No. 2	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle	0 - 0.2V★ 
			[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,500 rpm 	0.1 - 0.4V★ 
82	B	Sensor ground (APP sensor 1)	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed 	Approximately 0V
83	B	Sensor ground (APP sensor 2)	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed 	Approximately 0V
85	W	Data link connector	[Ignition switch: ON] <ul style="list-style-type: none"> • CONSULT or GST: disconnected 	Approximately 5V - Battery voltage (11 - 14V)
86	P	CAN communication line	—	—
90	L	Sensor power supply (APP sensor 1)	[Ignition switch: ON]	Approximately 5V
91	G	Sensor power supply (APP sensor 2)	[Ignition switch: ON]	Approximately 5V
94	L	CAN communication line	—	—
98	GR	Accelerator pedal position sensor 2	[Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Accelerator pedal: Fully released 	0.28 - 0.48V
			[Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Accelerator pedal: Fully depressed 	More than 2.0
99	SB	ASCD steering switch	[Ignition switch: ON] <ul style="list-style-type: none"> • ASCD steering switch: OFF 	Approximately 4V
			[Ignition switch: ON] <ul style="list-style-type: none"> • MAIN switch: Pressed 	Approximately 0V
			[Ignition switch: ON] <ul style="list-style-type: none"> • CANCEL switch: Pressed 	Approximately 1V
			[Ignition switch: ON] <ul style="list-style-type: none"> • RESUME/ACCELERATE switch: Pressed 	Approximately 3V
			[Ignition switch: ON] <ul style="list-style-type: none"> • SET/COAST switch: Pressed 	Approximately 2V
101	LG	Stop lamp switch	[Ignition switch: OFF] <ul style="list-style-type: none"> • Brake pedal: Fully released 	Approximately 0V
			[Ignition switch: OFF] <ul style="list-style-type: none"> • Brake pedal: Slightly depressed 	BATTERY VOLTAGE (11 - 14V)

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
102	G	PNP signal	[Ignition switch: ON] • Shift lever: P or N	Approximately 0V
			[Ignition switch: ON] • Except above position	BATTERY VOLTAGE (11 - 14V)
104	O	Throttle control motor relay	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch: ON]	0 - 1.0V
106	R	Accelerator pedal position sensor 1	[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully released	0.65 - 0.87V
			[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	More than 4.3V
107	Y	Fuel tank temperature sensor	[Engine is running]	Approximately 0 - 4.8V Output voltage varies with fuel tank temperature.
108	LG	ASCD brake switch	[Ignition switch: ON] • Brake pedal: Slightly depressed	Approximately 0V
			[Ignition switch: ON] • Brake pedal: Fully released	BATTERY VOLTAGE (11 - 14V)
109	W/R	Ignition switch	[Ignition switch: OFF]	0V
			[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
111	BR	ECM relay (Self shut-off)	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.5V
			[Ignition switch: OFF] • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
113	V	Fuel pump relay	[Ignition switch: ON] • For 1 second after turning ignition switch ON [Engine is running]	0 - 1.5V
			[Ignition switch: ON] • More than 1 second after turning ignition switch ON	BATTERY VOLTAGE (11 - 14V)
115 116	B GR	ECM ground	[Engine is running] • Idle speed	Body ground
117	G	EVAP canister vent control valve	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
119 120	R P	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
121	R/B	Power supply for ECM (Back-up)	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

*: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to [PG-5, "How to Handle Battery"](#).

Fail-Safe Chart

INFOID:000000007358390

When the DTC listed below is detected, the ECM enters the fail-safe mode and the MIL illuminates.

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

DTC No.	Detected items	Engine operating condition in fail-safe mode	
P0101 P0102 P0103	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.	
P0117 P0118	Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the following condition. CONSULT displays the engine coolant temperature decided by ECM.	
		Condition	Engine coolant temperature decided (CONSULT display)
		Just as ignition switch is turned ON or START	40°C (104°F)
		Approx. 4 minutes after engine starting	80°C (176°F)
		Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
		When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	
P0122 P0123 P0222 P0223 P2135	Throttle position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor.	
P0643	Sensor power supply	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	
P2100 P2103	Throttle control motor relay	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	
P2101	Electric throttle control function	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	
P2118	Throttle control motor	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	
P2119	Electric throttle control actuator	<p>(When electric throttle control actuator does not function properly due to the return spring malfunction:) ECM controls the electric throttle actuator because of regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.</p> <p>(When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.</p> <p>(When ECM detects the throttle valve is stuck open:) While the vehicle is being driven, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in N or P position, and engine speed will not exceed 1,000 rpm or more.</p>	
P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor.	

- When there is an open circuit on MIL circuit, the ECM cannot warn the driver by lighting up MIL when there is malfunction on engine control system. Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating fail-safe function. The fail-safe function also operates when above diagnoses except MIL circuit are detected and demands the driver to repair the malfunction.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut
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DTC Inspection Priority Chart

INFOID:000000007358391

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

NOTE:

- If DTC UXXXX is displayed with other DTC, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0607 is displayed with other DTC, first perform the trouble diagnosis for DTC P0607. Refer to [EC-311, "Description"](#).

Priority	Detected items (DTC)
1	<ul style="list-style-type: none"> • U0101 U1001 CAN communication line • P0101 P0102 P0103 Mass air flow sensor • P0111 P0112 P0113 P0127 Intake air temperature sensor • P0116 P0117 P0118 P0125 Engine coolant temperature sensor • P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor • P0128 Thermostat function • P0181 P0182 P0183 Fuel tank temperature sensor • P0327 P0328 P0332 P0333 Knock sensor • P0335 Crankshaft position sensor (POS) • P0340 P0345 Camshaft position sensor (PHASE) • P0460 P0461 P0462 P0463 Fuel level sensor • P0500 Vehicle speed sensor • P0605 P607 ECM • P0643 Sensor power supply • P0700 TCM • P0705 Transmission range switch • P0850 Park/Neutral position (PNP) switch • P1550 P1551 P1552 P1553 P1554 Battery current sensor • P1610 - P1615 NATS • P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor
2	<ul style="list-style-type: none"> • P0031 P0032 P0051 P0052 Air fuel ratio (A/F) sensor 1 heater • P0037 P0038 P0057 P0058 Heated oxygen sensor 2 heater • P0075 P0081 Intake valve timing control solenoid valve • P0130 P0131 P0132 P0133 P0150 P0151 P0152 P0153 P2A00 P2A03 Air fuel ratio (A/F) sensor 1 • P0137 P0138 P0139 P0157 P0158 P0159 Heated oxygen sensor 2 • P0441 EVAP control system purge flow monitoring • P0443 P0444 P0445 EVAP canister purge volume control solenoid valve • P0447 P0448 EVAP canister vent control valve • P0451 P0452 P0453 EVAP control system pressure sensor • P0550 Power steering pressure sensor • P0603 ECM power supply • P0710 P0717 P0720 P0731 P0732 P0733 P0734 P0735 P0740 P0744 P0745 P1730 P1752 P1757 P1762 P1767 P1772 P1774 A/T related sensors, solenoid valves and switches • P1217 Engine over temperature (OVERHEAT) • P1800 VIAS control solenoid valve • P1805 Brake switch • P2100 P2103 P2118 Electric throttle control actuator • P2101 Electric throttle control function
3	<ul style="list-style-type: none"> • P0011 P0021 Intake valve timing control • P0171 P0172 P0174 P0175 Fuel injection system function • P0300 - P0306 Misfire • P0420 P0430 Three way catalyst function • P0442 P0455 P0456 EVAP control system • P0506 P0507 Idle speed control system • P050A P050E Cold start control • P1148 P1168 Closed loop control • P1211 TCS control unit • P1212 TCS communication line • P1564 ASCD steering switch • P1572 ASCD brake switch • P1574 ASCD vehicle speed sensor • P2119 Electric throttle control actuator

DTC Index

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

×: Applicable —: Not applicable

Items (CONSULT screen terms)	DTC*1		SRT code	Trip	MIL	Permanent DTC group*4	Reference page
	CONSULT GST*2	ECM*3					
LOST COMM (TCM)	U0101	0101*5	—	1	×	B	EC-98
CAN COMM CIRCUIT	U1001	1001*5	—	2	—	—	EC-99
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	P0000	0000	—	—	Blinking*6	—	—
INT/V TIM CONT-B1	P0011	0011	×	2	×	B	EC-100
INT/V TIM CONT-B2	P0021	0021	×	2	×	B	EC-100
A/F SEN1 HTR (B1)	P0031	0031	—	2	×	B	EC-103
A/F SEN1 HTR (B1)	P0032	0032	—	2	×	B	EC-103
HO2S2 HTR (B1)	P0037	0037	—	2	×	B	EC-106
HO2S2 HTR (B1)	P0038	0038	—	2	×	B	EC-106
A/F SEN1 HTR (B2)	P0051	0051	—	2	×	B	EC-103
A/F SEN1 HTR (B2)	P0052	0052	—	2	×	B	EC-103
HO2S2 HTR (B2)	P0057	0057	—	2	×	B	EC-106
HO2S2 HTR (B2)	P0058	0058	—	2	×	B	EC-106
INT/V TIM V/CIR-B1	P0075	0075	—	2	×	B	EC-110
INT/V TIM V/CIR-B2	P0081	0081	—	2	×	B	EC-110
MAF SEN/CIRCUIT-B1	P0101	0101	—	2	—	B	EC-113
MAF SEN/CIRCUIT-B1	P0102	0102	—	1	×	B	EC-118
MAF SEN/CIRCUIT-B1	P0103	0103	—	1	×	B	EC-118
IAT SENSOR 1 B1	P0111	0111	—	2	×	A	EC-123
IAT SEN/CIRCUIT-B1	P0112	0112	—	2	×	B	EC-126
IAT SEN/CIRCUIT-B1	P0113	0113	—	2	×	B	EC-126
ECT SEN/CIRC	P0116	0116	—	2	×	A	EC-129
ECT SEN/CIRC	P0117	0117	—	1	×	B	EC-132
ECT SEN/CIRC	P0118	0118	—	1	×	B	EC-132
TP SEN 2/CIRC-B1	P0122	0122	—	1	×	B	EC-136
TP SEN 2/CIRC-B1	P0123	0123	—	1	×	B	EC-136
ECT SENSOR	P0125	0125	—	2	×	B	EC-140
IAT SENSOR-B1	P0127	0127	—	2	×	B	EC-143
THERMSTAT FNCTN	P0128	0128	—	2	×	B	EC-146
A/F SENSOR1 (B1)	P0130	0130	—	2	×	A	EC-148
A/F SENSOR1 (B1)	P0131	0131	—	2	×	B	EC-152
A/F SENSOR1 (B1)	P0132	0132	—	2	×	B	EC-156
A/F SENSOR1 (B1)	P0133	0133	×	2	×	A	EC-160
HO2S2 (B1)	P0137	0137	×	2	×	A	EC-165
HO2S2 (B1)	P0138	0138	×	2	×	A	EC-171
HO2S2 (B1)	P0139	0139	×	2	×	A	EC-179
A/F SENSOR1 (B2)	P0150	0150	—	2	×	A	EC-148

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

Items (CONSULT screen terms)	DTC*1		SRT code	Trip	MIL	Permanent DTC group*4	Reference page
	CONSULT GST*2	ECM*3					
A/F SENSOR1 (B2)	P0151	0151	—	2	×	B	EC-152
A/F SENSOR1 (B2)	P0152	0152	—	2	×	B	EC-156
A/F SENSOR1 (B2)	P0153	0153	×	2	×	A	EC-160
HO2S2 (B2)	P0157	0157	×	2	×	A	EC-165
HO2S2 (B2)	P0158	0158	×	2	×	A	EC-171
HO2S2 (B2)	P0159	0159	×	2	×	A	EC-179
FUEL SYS-LEAN-B1	P0171	0171	—	2	×	B	EC-185
FUEL SYS-RICH-B1	P0172	0172	—	2	×	B	EC-191
FUEL SYS-LEAN-B2	P0174	0174	—	2	×	B	EC-185
FUEL SYS-RICH-B2	P0175	0175	—	2	×	B	EC-191
FTT SENSOR	P0181	0181	—	2	×	A and B	EC-197
FTT SEN/CIRCUIT	P0182	0182	—	2	×	B	EC-202
FTT SEN/CIRCUIT	P0183	0183	—	2	×	B	EC-202
TP SEN 1/CIRC-B1	P0222	0222	—	1	×	B	EC-205
TP SEN 1/CIRC-B1	P0223	0223	—	1	×	B	EC-205
MULTI CYL MISFIRE	P0300	0300	—	1 or 2	×	B	EC-209
CYL 1 MISFIRE	P0301	0301	—	1 or 2	×	B	EC-209
CYL 2 MISFIRE	P0302	0302	—	1 or 2	×	B	EC-209
CYL 3 MISFIRE	P0303	0303	—	1 or 2	×	B	EC-209
CYL 4 MISFIRE	P0304	0304	—	1 or 2	×	B	EC-209
CYL 5 MISFIRE	P0305	0305	—	1 or 2	×	B	EC-209
CYL 6 MISFIRE	P0306	0306	—	1 or 2	×	B	EC-209
KNOCK SEN/CIRC-B1	P0327	0327	—	2	—	—	EC-216
KNOCK SEN/CIRC-B1	P0328	0328	—	2	—	—	EC-216
KNOCK SEN/CIRC-B2	P0332	0332	—	2	—	—	EC-216
KNOCK SEN/CIRC-B2	P0333	0333	—	2	—	—	EC-216
CKP SEN/CIRCUIT	P0335	0335	—	2	×	B	EC-219
CMP SEN/CIRC-B1	P0340	0340	—	2	×	B	EC-223
CMP SEN/CIRC-B2	P0345	0345	—	2	×	B	EC-223
TW CATALYST SYS-B1	P0420	0420	×	2	×	A	EC-227
TW CATALYST SYS-B2	P0430	0430	×	2	×	A	EC-227
EVAP PURG FLOW/MON	P0441	0441	×	2	×	A	EC-232
EVAP SMALL LEAK	P0442	0442	×	2	×	A	EC-237
PURG VOLUME CONT/V	P0443	0443	—	2	×	A	EC-244
PURG VOLUME CONT/V	P0444	0444	—	2	×	B	EC-250
PURG VOLUME CONT/V	P0445	0445	—	2	×	B	EC-250
VENT CONTROL VALVE	P0447	0447	—	2	×	B	EC-253
VENT CONTROL VALVE	P0448	0448	—	2	×	B	EC-257
EVAP SYS PRES SEN	P0451	0451	—	2	×	A	EC-262
EVAP SYS PRES SEN	P0452	0452	—	2	×	B	EC-266
EVAP SYS PRES SEN	P0453	0453	—	2	×	B	EC-270
EVAP GROSS LEAK	P0455	0455	—	2	×	A	EC-275

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

Items (CONSULT screen terms)	DTC*1		SRT code	Trip	MIL	Permanent DTC group*4	Reference page
	CONSULT GST*2	ECM*3					
EVAP VERY SML LEAK	P0456	0456	×*7	2	×	A	EC-282
FUEL LEV SEN SLOSH	P0460	0460	—	2	×	A	EC-290
FUEL LEVEL SENSOR	P0461	0461	—	2	×	B	EC-292
FUEL LEVL SEN/CIRC	P0462	0462	—	2	×	B	EC-294
FUEL LEVEL SEN/CIRC	P0463	0463	—	2	×	B	EC-294
VEH SPEED SEN/CIRC	P0500	0500	—	2	×	B	EC-296
ISC SYSTEM	P0506	0506	—	2	×	B	EC-298
ISC SYSTEM	P0507	0507	—	2	×	B	EC-300
COLD START CONTROL	P050A	050A	—	2	×	A	EC-302
COLD START CONTROL	P050E	050E	—	2	×	A	EC-302
PW ST P SEN/CIRC	P0550	0550	—	2	—	—	EC-304
ECM BACK UP/CIRCUIT	P0603	0603	—	2	×	B	EC-307
ECM	P0605	0605	—	1 or 2	× or —	B	EC-309
ECM	P0607	0607	—	1	×	B	EC-311
SENSOR POWER/CIRCUIT	P0643	0643	—	1	×	B	EC-312
TRANSMISSION CONT	P0700	0700	—	1	×	B	TM-50
T/M RANGE SENSOR A	P0705	0705	—	2	×	B	TM-51
ATF TEMP SEN/CIRC*8	P0710	0710	—	2	×	B	TM-78
INPUT SPEED SENSOR A	P0717	0717	—	2	×	B	TM-53
OUTPUT SPEED SENSOR	P0720	0720	—	2	×	B	TM-55
1GR INCORRECT RATIO*8	P0731	0731	—	2	×	B	TM-60
2GR INCORRECT RATIO*8	P0732	0732	—	2	×	B	TM-62
3GR INCORRECT RATIO*8	P0733	0733	—	2	×	B	TM-64
4GR INCORRECT RATIO*8	P0734	0734	—	2	×	B	TM-66
5GR INCORRECT RATIO*8	P0735	0735	—	2	×	B	TM-68
TORQUE CONVERTER	P0740	0740	—	2	×	B	TM-70
TORQUE CONVERTER	P0744	0744	—	2	×	B	TM-72
PC SOLENOID A	P0745	0745	—	2	×	B	TM-74
P-N POS SW/CIRCUIT	P0850	0850	—	2	×	B	EC-315
CLOSED LOOP-B1	P1148	1148	—	1	×	A	EC-317
CLOSED LOOP-B2	P1168	1168	—	1	×	A	EC-317
TCS C/U FUNCTN	P1211	1211	—	2	—	—	EC-318
TCS/CIRC	P1212	1212	—	2	—	—	EC-319
ENG OVER TEMP	P1217	1217	—	1	×	B	EC-320
CTP LEARNING-B1	P1225	1225	—	2	—	—	EC-324
CTP LEARNING-B1	P1226	1226	—	2	—	—	EC-326
BAT CURRENT SENSOR	P1550	1550	—	2	—	—	EC-328
BAT CURRENT SENSOR	P1551	1551	—	2	—	—	EC-332
BAT CURRENT SENSOR	P1552	1552	—	2	—	—	EC-332
BAT CURRENT SENSOR	P1553	1553	—	2	—	—	EC-336
BAT CURRENT SENSOR	P1554	1554	—	2	—	—	EC-340

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

Items (CONSULT screen terms)	DTC*1		SRT code	Trip	MIL	Permanent DTC group*4	Reference page
	CONSULT GST*2	ECM*3					
ASCD SW	P1564	1564	—	1	—	—	EC-344
ASCD BRAKE SW	P1572	1572	—	1	—	—	EC-348
ASCD VHL SPD SEN	P1574	1574	—	1	—	—	EC-353
LOCK MODE	P1610	1610	—	2	—	—	SEC-43 or SEC-139
ID DISCARD IMM-ECM	P1611	1611	—	2	—	—	SEC-37 or SEC-136
CHAIN OF ECM-IMMU	P1612	1612	—	2	—	—	SEC-39 or SEC-138
CHAIN OF IMMU-KEY	P1614	1614	—	2	—	—	SEC-33 or SEC-132
DIFFERENCE OF KEY	P1615	1615	—	2	—	—	SEC-36 or SEC-135
IN PLUY SPEED	P1715	1715	—	2	—	—	EC-355
INTERLOCK	P1730	1730	—	1	×	B	TM-82
INPUT CLUTCH SOL	P1752	1752	—	1	×	B	TM-86
FR BRAKE SOLENOID	P1757	1757	—	1	×	B	TM-88
DRCT CLUTCH SOL	P1762	1762	—	1	×	B	TM-90
HLR CLUTCH SOLENOID	P1767	1767	—	1	×	B	TM-92
L C BRAKE SOLENOID	P1772	1772	—	1	×	B	TM-94
L C BRAKE SOLENOID	P1774	1774	—	1	×	B	TM-96
VIAS S/V-1	P1800	1800	—	2	—	—	EC-356
BRAKE SW/CIRCUIT	P1805	1805	—	2	—	—	EC-359
ETC MOT PWR-B1	P2100	2100	—	1	×	B	EC-362
ETC FUNCTION/CIRC-B1	P2101	2101	—	1	×	B	EC-365
ETC MOT PWR	P2103	2103	—	1	×	B	EC-362
ETC MOT-B1	P2118	2118	—	1	×	B	EC-369
ETC ACTR-B1	P2119	2119	—	1	×	B	EC-371
APP SEN 1/CIRC	P2122	2122	—	1	×	B	EC-373
APP SEN 1/CIRC	P2123	2123	—	1	×	B	EC-373
APP SEN 2/CIRC	P2127	2127	—	1	×	B	EC-376
APP SEN 2/CIRC	P2128	2128	—	1	×	B	EC-376
TP SENSOR-B1	P2135	2135	—	1	×	B	EC-380
APP SENSOR	P2138	2138	—	1	×	B	EC-384
A/F SENSOR1 (B1)	P2A00	2A00	—	2	×	A	EC-388
A/F SENSOR1 (B2)	P2A03	2A03	—	2	×	A	EC-388

*1: 1st trip DTC No. is the same as DTC No.

*2: This number is prescribed by SAE J2012/ISO 15031-6.

*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

*4: Refer to [EC-34](#), "Description", "PERMANENT DIAGNOSTIC TROUBLE CODE (PERMANENT DTC)".

*5: The troubleshooting for this DTC need CONSULT.

*6: When the ECM is in the mode of that displays SRT status, MIL may blink. For the details, refer to "How to Display SRT Status".

*7: SRT code will not be set if the self-diagnostic result is NG.

*8: When erasing this DTC, always use CONSULT or GST.

Test Value and Test Limit

INFOID:000000007619773

The following is the information specified in Service \$06 of SAE J1979/ISO 15031-5.

The test value is a parameter used to determine whether a system/circuit diagnostic test is OK or NG while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.

These data (test value and test limit) are specified by On Board Monitor ID (OBDMID), Test ID (TID), Unit and Scaling ID and can be displayed on the GST screen.

The items of the test value and test limit will be displayed with GST screen which items are provided by the ECM. (e.g., if bank 2 is not applied on this vehicle, only the items of bank 1 are displayed)

ECM

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
HO2S	01H	Air fuel ratio (A/F) sensor 1 (Bank 1)	P0131	83H	0BH	Minimum sensor output voltage for test cycle
			P0131	84H	0BH	Maximum sensor output voltage for test cycle
			P0130	85H	0BH	Minimum sensor output voltage for test cycle
			P0130	86H	0BH	Maximum sensor output voltage for test cycle
			P0133	87H	04H	Response rate: Response ratio (lean to rich)
			P0133	88H	04H	Response rate: Response ratio (rich to lean)
			P2A00	89H	84H	The amount of shift in air fuel ratio
			P2A00	8AH	84H	The amount of shift in air fuel ratio
			P0130	8BH	0BH	Difference in sensor output voltage
			P0133	8CH	83H	Response gain at the limited frequency
			P014C	8DH	04H	O2 sensor slow response - Rich to lean bank 1 sensor 1
			P014C	8EH	04H	O2 sensor slow response - Rich to lean bank 1 sensor 1
			P014D	8FH	84H	O2 sensor slow response - Lean to rich bank 1 sensor 1
			P014D	90H	84H	O2 sensor slow response - Lean to rich bank 1 sensor 1
			P015A	91H	01H	O2 sensor delayed response - Rich to lean bank 1 sensor 1
			P015A	92H	01H	O2 sensor delayed response - Rich to lean bank 1 sensor 1
			P015B	93H	01H	O2 sensor delayed response - Lean to rich bank 1 sensor 1
			P015B	94H	01H	O2 sensor delayed response - Lean to rich bank 1 sensor 1
	02H	Heated oxygen sensor 2 (Bank 1)	P0138	07H	0CH	Minimum sensor output voltage for test cycle
			P0137	08H	0CH	Maximum sensor output voltage for test cycle
			P0138	80H	0CH	Sensor output voltage
			P0139	81H	0CH	Difference in sensor output voltage
			P0139	82H	11H	Rear O2 sensor delay response diagnosis
	03H	Heated oxygen sensor 3 (Bank 1)	P0143	07H	0CH	Minimum sensor output voltage for test cycle
			P0144	08H	0CH	Maximum sensor output voltage for test cycle
			P0146	80H	0CH	Sensor output voltage
			P0145	81H	0CH	Difference in sensor output voltage

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ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
HO2S	05H	Air fuel ratio (A/F) sensor 1 (Bank 2)	P0151	83H	0BH	Minimum sensor output voltage for test cycle
			P0151	84H	0BH	Maximum sensor output voltage for test cycle
			P0150	85H	0BH	Minimum sensor output voltage for test cycle
			P0150	86H	0BH	Maximum sensor output voltage for test cycle
			P0153	87H	04H	Response rate: Response ratio (lean to rich)
			P0153	88H	04H	Response rate: Response ratio (rich to lean)
			P2A03	89H	84H	The amount of shift in air fuel ratio
			P2A03	8AH	84H	The amount of shift in air fuel ratio
			P0150	8BH	0BH	Difference in sensor output voltage
			P0153	8CH	83H	Response gain at the limited frequency
			P014E	8DH	04H	O2 sensor slow response - Rich to lean bank 2 sensor 1
			P014E	8EH	04H	O2 sensor slow response - Rich to lean bank 2 sensor 1
			P014F	8FH	84H	O2 sensor slow response - Lean to rich bank 2 sensor 1
			P014F	90H	84H	O2 sensor slow response - Lean to rich bank 2 sensor 1
			P015C	91H	01H	O2 sensor delayed response - Rich to lean bank 2 sensor 1
			P015C	92H	01H	O2 sensor delayed response - Rich to lean bank 2 sensor 1
	P015D	93H	01H	O2 sensor delayed response - Lean to rich bank 2 sensor 1		
	P015D	94H	01H	O2 sensor delayed response - Lean to rich bank 2 sensor 1		
	06H	Heated oxygen sensor 2 (Bank 2)	P0158	07H	0CH	Minimum sensor output voltage for test cycle
			P0157	08H	0CH	Maximum sensor output voltage for test cycle
			P0158	80H	0CH	Sensor output voltage
			P0159	81H	0CH	Difference in sensor output voltage
			P0159	82H	11H	Rear O2 sensor delay response diagnosis
	07H	Heated oxygen sensor 3 (Bank2)	P0163	07H	0CH	Minimum sensor output voltage for test cycle
			P0164	08H	0CH	Maximum sensor output voltage for test cycle
			P0166	80H	0CH	Sensor output voltage
			P0165	81H	0CH	Difference in sensor output voltage

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
CATA- LYST	21H	Three way catalyst function (Bank1)	P0420	80H	01H	O2 storage index
			P0420	82H	01H	Switching time lag engine exhaust index value
			P2423	83H	0CH	Difference in 3rd O2 sensor output voltage
			P2423	84H	84H	O2 storage index in HC trap catalyst
	22H	Three way catalyst function (Bank2)	P0430	80H	01H	O2 storage index
			P0430	82H	01H	Switching time lag engine exhaust index value
			P2424	83H	0CH	Difference in 3rd O2 sensor output voltage
			P2424	84H	84H	O2 storage index in HC trap catalyst
EGR SYSTEM	31H	EGR function	P0400	80H	96H	Low flow faults: EGR temp change rate (short term)
			P0400	81H	96H	Low flow faults: EGR temp change rate (long term)
			P0400	82H	96H	Low flow faults: Difference between max EGR temp and EGR temp under idling condition
			P0400	83H	96H	Low flow faults: Max EGR temp
			P1402	84H	96H	High Flow Faults: EGR temp increase rate
VVT SYSTEM	35H	VVT Monitor (Bank1)	P0011	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)
			P0014	81H	9DH	VTC exhaust function diagnosis (VTC alignment check diagnosis)
			P0011	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)
			P0014	83H	9DH	VTC exhaust function diagnosis (VTC drive failure diagnosis)
			P100A	84H	10H	VEL slow response diagnosis
			P1090	85H	10H	VEL servo system diagnosis
	36H	VVT Monitor (Bank2)	P0021	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)
			P0024	81H	9DH	VTC exhaust function diagnosis (VTC alignment check diagnosis)
			P0021	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)
			P0024	83H	9DH	VTC exhaust function diagnosis (VTC drive failure diagnosis)
			P100B	84H	10H	VEL slow response diagnosis
			P1093	85H	10H	VEL servo system diagnosis

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ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
EVAP SYSTEM	39H	EVAP control system leak (Cap Off)	P0455	80H	0CH	Difference in pressure sensor output voltage before and after pull down
	3BH	EVAP control system leak (Small leak)	P0442	80H	05H	Leak area index (for more than 0.04 inch)
	3CH	EVAP control system leak (Very small leak)	P0456	80H	05H	Leak area index (for more than 0.02 inch)
			P0456	81H	FDH	Maximum internal pressure of EVAP system during monitoring
			P0456	82H	FDH	Internal pressure of EVAP system at the end of monitoring
	3DH	Purge flow system	P0441	83H	0CH	Difference in pressure sensor output voltage before and after vent control valve close
O2 SENSOR HEATER	41H	A/F sensor 1 heater (Bank 1)	Low Input: P0031 High Input: P0032	81H	0BH	Converted value of heater electric current to voltage
	42H	Heated oxygen sensor 2 heater (Bank 1)	Low Input: P0037 High Input: P0038	80H	0CH	Converted value of heater electric current to voltage
	43H	Heated oxygen sensor 3 heater (Bank 1)	P0043	80H	0CH	Converted value of heater electric current to voltage
	45H	A/F sensor 1 heater (Bank 2)	Low Input: P0051 High Input: P0052	81H	0BH	Converted value of heater electric current to voltage
	46H	Heated oxygen sensor 2 heater (Bank 2)	Low Input: P0057 High Input: P0058	80H	0CH	Converted value of heater electric current to voltage
	47H	Heated oxygen sensor 3 heater (Bank 2)	P0063	80H	0CH	Converted value of heater electric current to voltage
SECONDARY AIR	71H	Secondary air system	P0411	80H	01H	Secondary air injection system incorrect flow detected
			Bank1: P0491 Bank2: P0492	81H	01H	Secondary air injection system insufficient flow
			P2445	82H	01H	Secondary air injection system pump stuck off
			P2448	83H	01H	Secondary air injection system high airflow
			Bank1: P2440 Bank2: P2442	84H	01H	Secondary air injection system switching valve stuck open
			P2440	85H	01H	Secondary air injection system switching valve stuck open
			P2444	86H	01H	Secondary air injection system pump stuck on
FUEL SYSTEM	81H	Fuel injection system function (Bank 1)	P0171 or P0172	80H	2FH	Long term fuel trim
			P0171 or P0172	81H	24H	The number of lambda control clamped
			P117A	82H	03H	Cylinder A/F imbalance monitoring
	82H	Fuel injection system function (Bank 2)	P0174 or P0175	80H	2FH	Long term fuel trim
			P0174 or P0175	81H	24H	The number of lambda control clamped
			P117B	82H	03H	Cylinder A/F imbalance monitoring

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
MISFIRE	A1H	Multiple cylinder misfires	P0301	80H	24H	Misfiring counter at 1000 revolution of the first cylinder
			P0302	81H	24H	Misfiring counter at 1000 revolution of the second cylinder
			P0303	82H	24H	Misfiring counter at 1000 revolution of the third cylinder
			P0304	83H	24H	Misfiring counter at 1000 revolution of the fourth cylinder
			P0305	84H	24H	Misfiring counter at 1000 revolution of the fifth cylinder
			P0306	85H	24H	Misfiring counter at 1000 revolution of the sixth cylinder
			P0307	86H	24H	Misfiring counter at 1000 revolution of the seventh cylinder
			P0308	87H	24H	Misfiring counter at 1000 revolution of the eighth cylinder
			P0300	88H	24H	Misfiring counter at 1000 revolution of the multiple cylinders
			P0301	89H	24H	Misfiring counter at 200 revolution of the first cylinder
			P0302	8AH	24H	Misfiring counter at 200 revolution of the second cylinder
			P0303	8BH	24H	Misfiring counter at 200 revolution of the third cylinder
			P0304	8CH	24H	Misfiring counter at 200 revolution of the fourth cylinder
			P0305	8DH	24H	Misfiring counter at 200 revolution of the fifth cylinder
			P0306	8EH	24H	Misfiring counter at 200 revolution of the sixth cylinder
			P0307	8FH	24H	Misfiring counter at 200 revolution of the seventh cylinder
			P0308	90H	24H	Misfiring counter at 200 revolution of the eighth cylinder
			P0300	91H	24H	Misfiring counter at 1000 revolution of the single cylinder
			P0300	92H	24H	Misfiring counter at 200 revolution of the single cylinder
			P0300	93H	24H	Misfiring counter at 200 revolution of the multiple cylinders

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ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
MISFIRE	A2H	No. 1 cylinder misfire	P0301	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0301	0CH	24H	Misfire counts for last/current driving cycles
	A3H	No. 2 cylinder misfire	P0302	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0302	0CH	24H	Misfire counts for last/current driving cycles
	A4H	No. 3 cylinder misfire	P0303	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0303	0CH	24H	Misfire counts for last/current driving cycles
	A5H	No. 4 cylinder misfire	P0304	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0304	0CH	24H	Misfire counts for last/current driving cycles
	A6H	No. 5 cylinder misfire	P0305	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0305	0CH	24H	Misfire counts for last/current driving cycles
	A7H	No. 6 cylinder misfire	P0306	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0306	0CH	24H	Misfire counts for last/current driving cycles
	A8H	No. 7 cylinder misfire	P0307	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0307	0CH	24H	Misfire counts for last/current driving cycles
	A9H	No. 8 cylinder misfire	P0308	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0308	0CH	24H	Misfire counts for last/current driving cycles

ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

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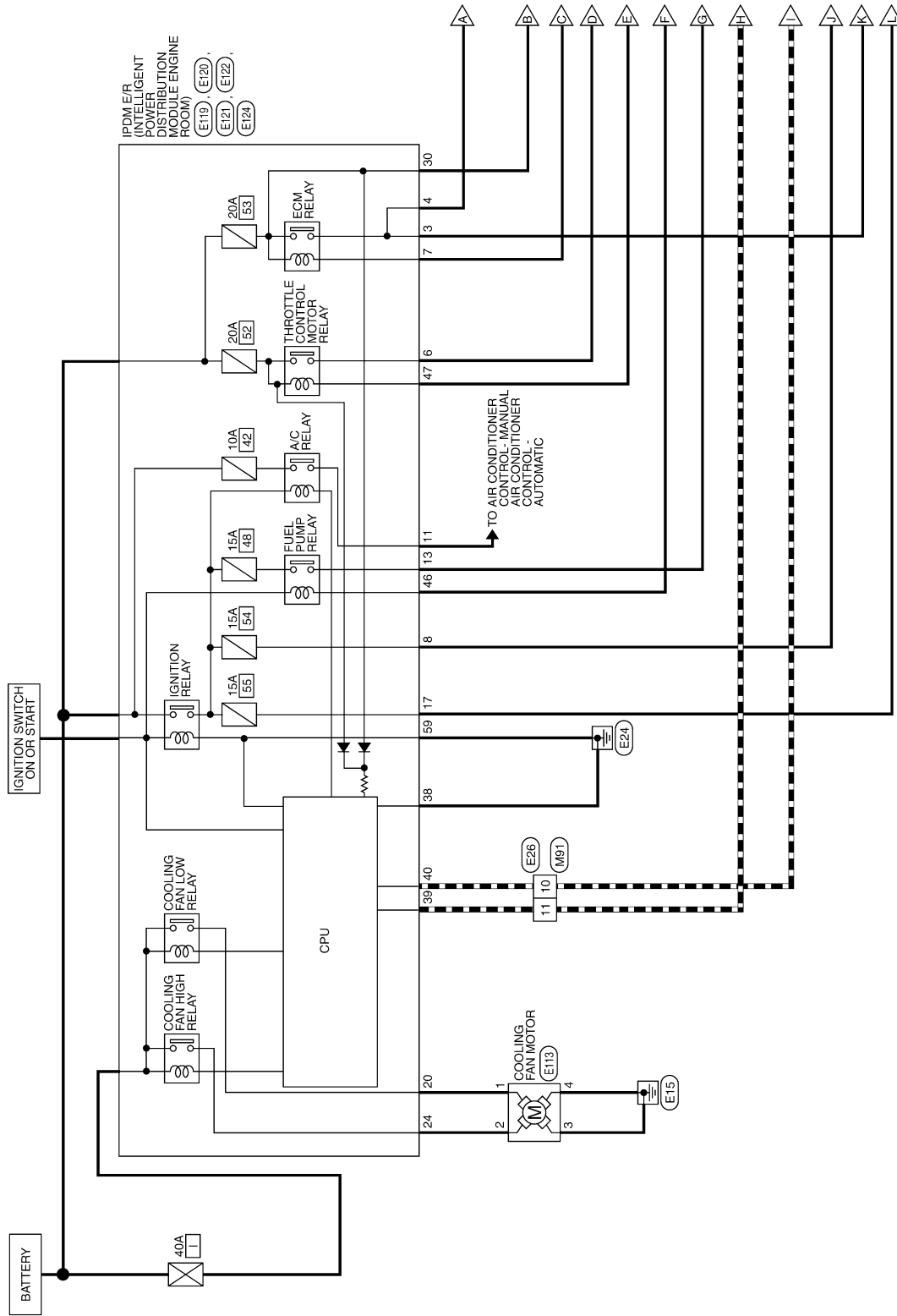
WIRING DIAGRAM

ENGINE CONTROL SYSTEM

Wiring Diagram

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ENGINE CONTROL SYSTEM - VQ40DE



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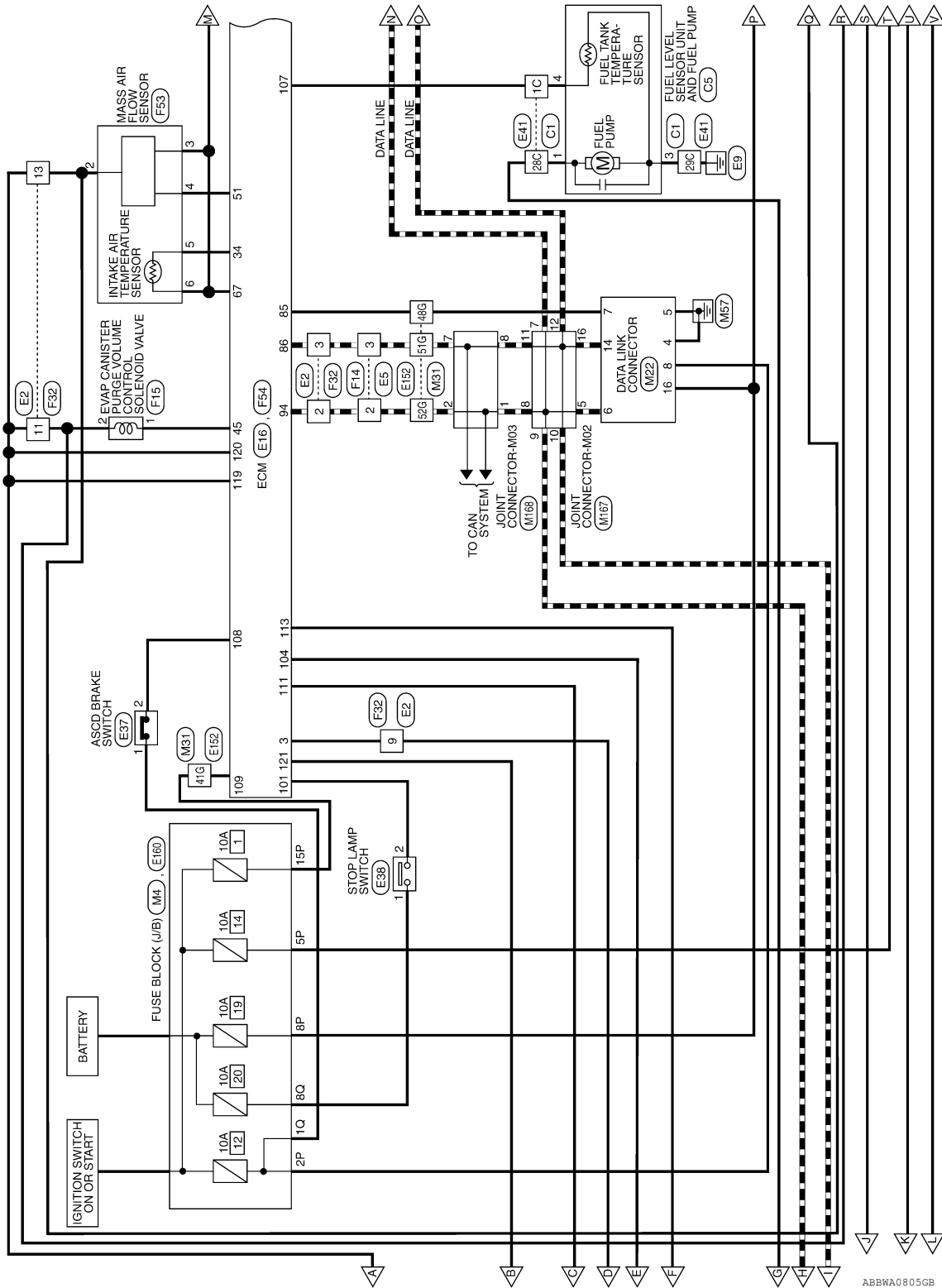
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ENGINE CONTROL SYSTEM

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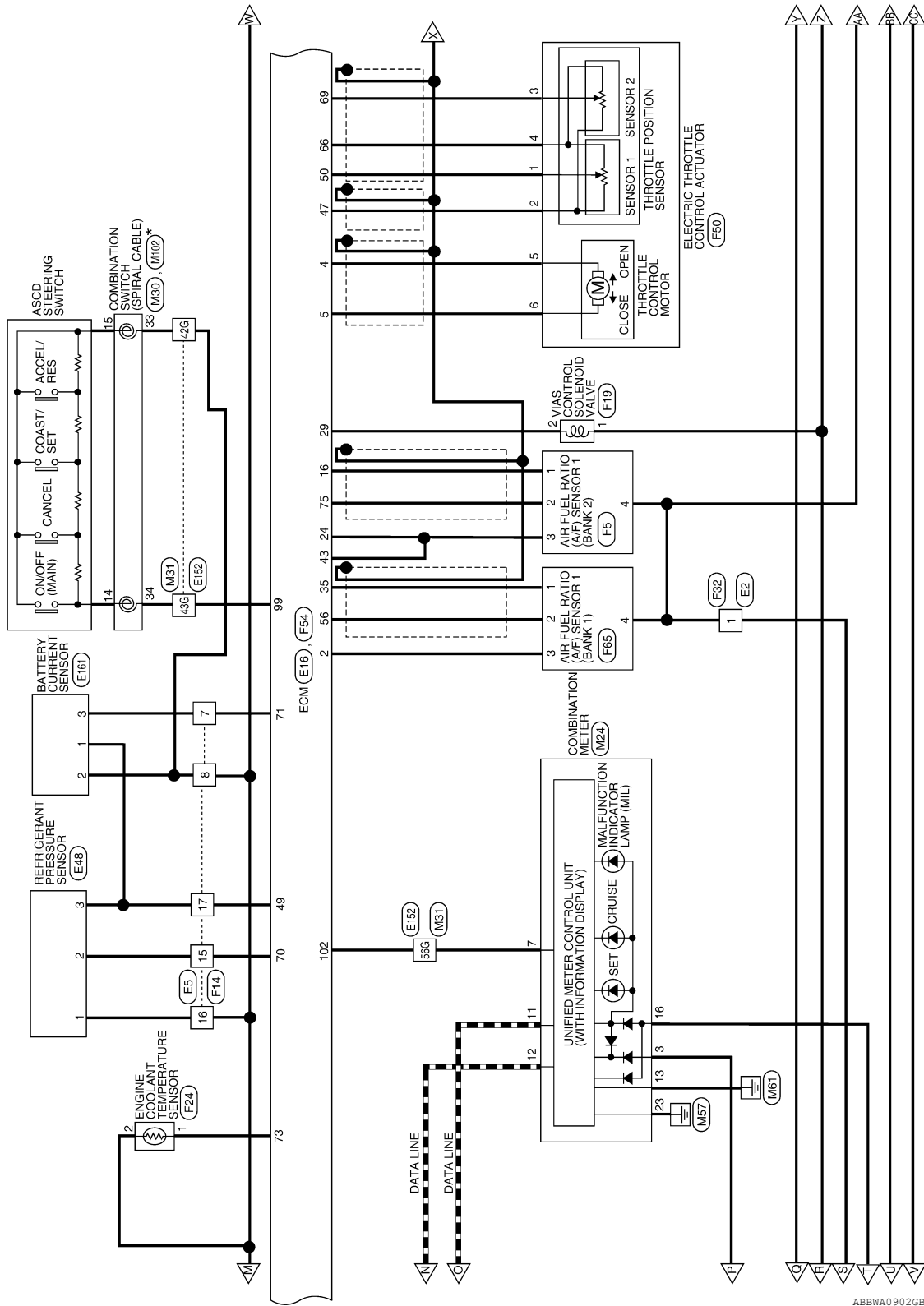


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ENGINE CONTROL SYSTEM

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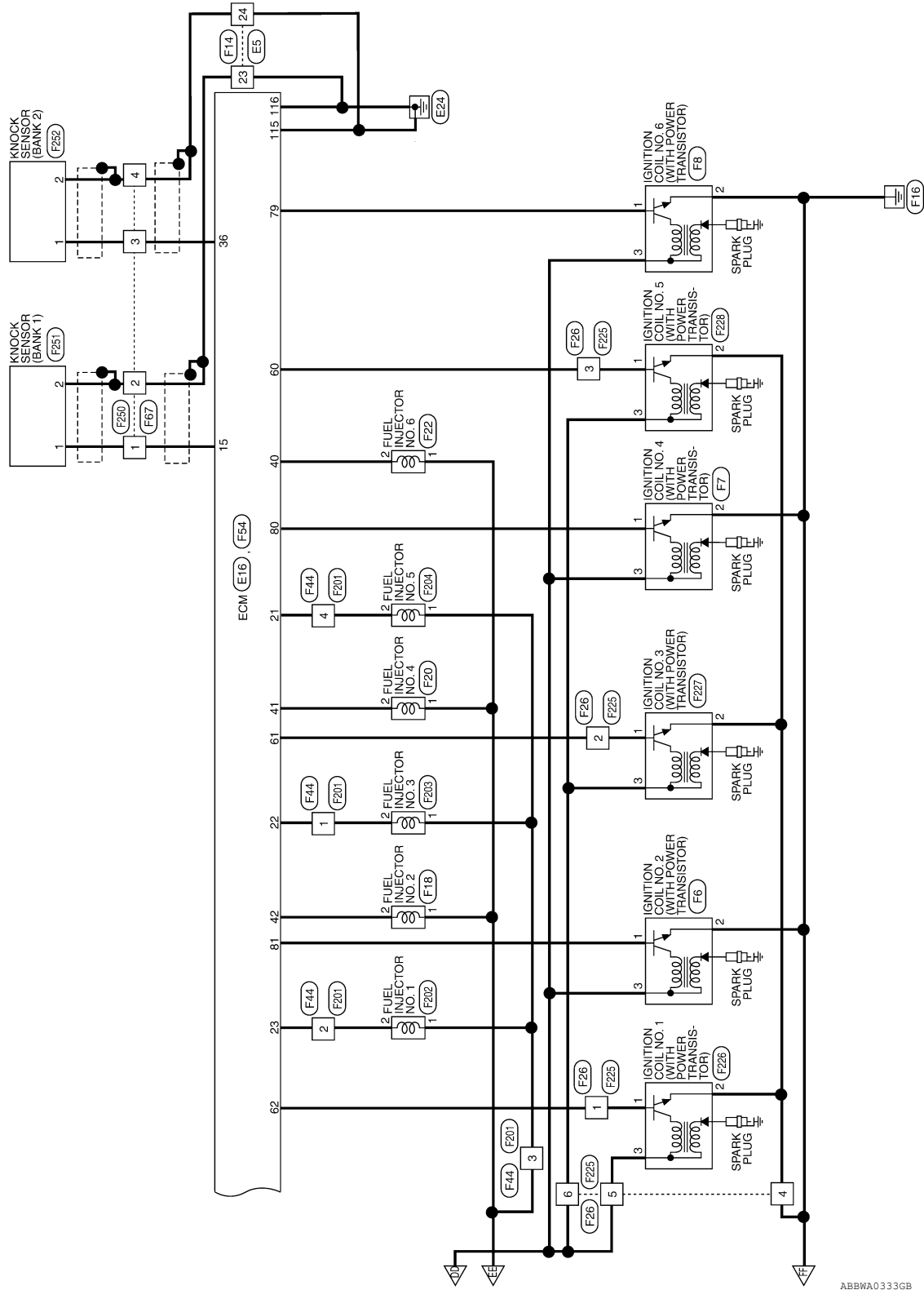
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ENGINE CONTROL SYSTEM

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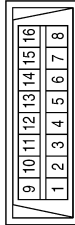


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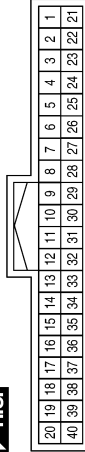
ENGINE CONTROL SYSTEM CONNECTORS - VQ40DE

Connector No.	M4
Connector Name	FUSE BLOCK (J/B)
Connector Color	WHITE



Connector No.	M22
Connector Name	DATA LINK CONNECTOR
Connector Color	WHITE

Connector No.	M24
Connector Name	COMBINATION METER
Connector Color	WHITE

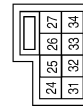


Terminal No.	Color of Wire	Signal Name
2P	W/G	-
5P	W/G	-
8P	R/Y	-
15P	W/R	-

Terminal No.	Color of Wire	Signal Name
4	B	-
5	B	-
6	L	-
7	W	-
8	W/G	-
14	P	-
16	R/Y	-

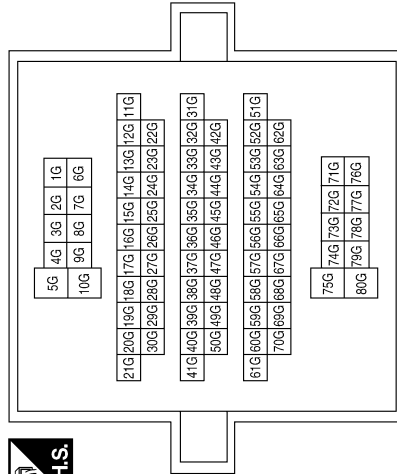
Terminal No.	Color of Wire	Signal Name
3	R/Y	BATTERY
7	G	AT-PN ECM
11	P	CAN-L
12	L	CAN-H
13	GR	GROUND
16	W/G	RUN START
23	B	POWER GND

Connector No.	M30
Connector Name	COMBINATION SWITCH
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
33	B	ASCD RTN
34	SB	ASCD

Connector No.	M31
Connector Name	WIRE TO WIRE
Connector Color	WHITE



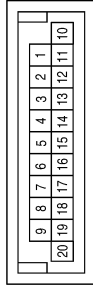
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

Connector No.	M167
Connector Name	JOINT CONNECTOR-M02
Connector Color	BLUE



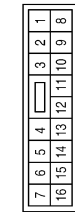
Terminal No.	Color of Wire	Signal Name
5	L	-
7	L	-
8	L	-
9	L	-
10	P	-
11	P	-
12	P	-
16	P	-

Connector No.	M102
Connector Name	COMBINATION SWITCH
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
14	SB	-
15	B	-

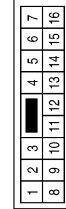
Connector No.	M91
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
10	L	-
11	P	-

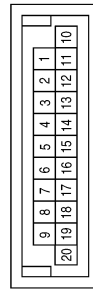
Terminal No.	Color of Wire	Signal Name
3	P	-
9	V	-
10	G	-
11	GR	-
12	BR	-
13	LG	-
16	W/G	-

Connector No.	E2
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	W/R	-
2	L	-

Connector No.	M168
Connector Name	JOINT CONNECTOR-M03
Connector Color	GREEN



Terminal No.	Color of Wire	Signal Name
1	L	-
2	L	-
7	P	-
8	P	-

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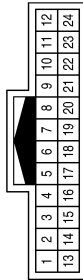
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ENGINE CONTROL SYSTEM

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[VQ40DE]

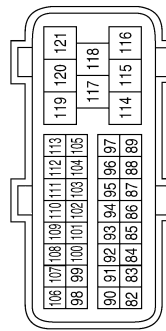
Connector No.	E5
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
2	L	-
3	P	-

Terminal No.	Color of Wire	Signal Name
7	R	-
8	B	-
15	BR	-
16	B	-
17	P	-
18	W	-
19	B	-
20	SB	-
23	GR	-
24	B	-

Connector No.	E16
Connector Name	ECM (WITH VQ40DE)
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
82	B	GND-A
83	B	GND-A2
84	-	-

Terminal No.	Color of Wire	Signal Name
85	W	K-LINE
86	P	CAN-L
87	-	-
88	-	-
89	-	-
90	L	AVCC
91	G	AVCC2
92	-	-
93	-	-
94	L	CAN-H
95	-	-
96	-	-
97	-	-
98	GR	APS2
99	SB	ASCD SW
100	-	-
101	LG	BRAKE
102	G	NEUT
103	-	-

Terminal No.	Color of Wire	Signal Name
104	O	MOTRLY
105	-	-
106	R	APS1
107	Y	TF
108	LG	BNCSW
109	W/R	IGNSW
110	-	-
111	BR	SSOFF
112	-	-
113	V	FPR
114	-	-
115	B	GND
116	GR	GND
117	G	CDCV
118	-	-
119	R	VB
120	P	VB
121	R/B	BATT

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

Connector No.	E37
Connector Name	ASCD BRAKE SWITCH
Connector Color	BROWN



2	1
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Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	LG	-

Connector No.	E26
Connector Name	WIRE TO WIRE
Connector Color	WHITE



1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16

Terminal No.	Color of Wire	Signal Name
10	P	-
11	L	-

Connector No.	E20
Connector Name	ACCELERATOR PEDAL POSITION (APP) SENSOR
Connector Color	BLACK



1	2	3	4	5	6
---	---	---	---	---	---

Terminal No.	Color of Wire	Signal Name
1	G	AVCC2
2	L	AVCC1
3	R	APS1
4	B	GND-A
5	B	GND-A2
6	GR	APS2

Terminal No.	Color of Wire	Signal Name
1C	Y	-
10C	W	-
11C	B	-
12C	SB	-
26C	G	-
27C	W	-
28C	R	-
29C	B	-

Connector No.	E41
Connector Name	WIRE TO WIRE
Connector Color	BLACK



1C	10C	19C	31C	40C
2C	11C	20C	32C	41C
3C	12C	21C	33C	42C
4C	13C	22C	34C	43C
5C	14C	23C	35C	44C
6C	15C	24C	36C	45C
7C	16C	25C	37C	46C
8C	17C	26C	38C	47C
9C	18C	27C	39C	48C

Connector No.	E38
Connector Name	STOP LAMP SWITCH
Connector Color	WHITE



3	4
1	2

Terminal No.	Color of Wire	Signal Name
1	R/B	-
2	Y	-

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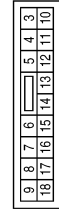
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< WIRING DIAGRAM >

[VQ40DE]

Connector No.	E119
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
3	G	IGN COIL
4	P	ECM
6	V	ETC
7	BR	ECM RLY CONT
8	W/R	O2 SENSOR
11	Y	A/C COMPRESSOR
13	R	FUEL PUMP
17	W/G	INJECTOR

Connector No.	E113
Connector Name	COOLING FAN MOTOR
Connector Color	GRAY



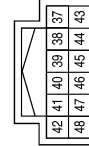
Terminal No.	Color of Wire	Signal Name
1	BR	-
2	P	-
3	B	-
4	B	-

Connector No.	E48
Connector Name	REFRIGERANT PRESSURE SENSOR
Connector Color	BLACK



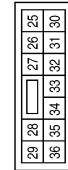
Terminal No.	Color of Wire	Signal Name
1	B	GND
2	BR	SIGNAL
3	P	POWER SUPPLY

Connector No.	E122
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



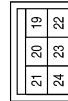
Terminal No.	Color of Wire	Signal Name
38	B	GND (SIGNAL)
39	L	CAN-H
40	P	CAN-L
46	V	FUEL PUMP RLY CONT
47	O	ETC RLY CONT

Connector No.	E121
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	BROWN



Terminal No.	Color of Wire	Signal Name
30	R/B	ECM BAT

Connector No.	E120
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
20	BR	MOTOR FAN 1
24	P	MOTOR FAN 2

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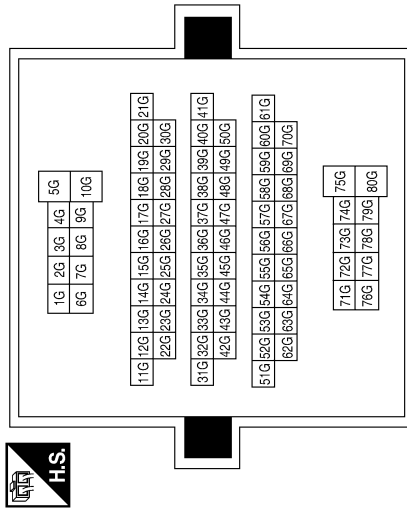
ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

Terminal No.	Color of Wire	Signal Name
41G	W/R	-
42G	B	-
43G	SB	-
48G	W	-
51G	P	-
52G	L	-
56G	G	-

Connector No.	E152
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Connector No.	E124
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
59	B	GND (POWER)

Connector No.	F5
Connector Name	AIR FUEL RATIO (A/F) SENSOR 1 (BANK 2)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	BR	AF+
2	B/R	AF-
3	G	HEATER GND
4	W/R	HEATER PWR

Connector No.	E161
Connector Name	BATTERY CURRENT SENSOR
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	P	POWER SUPPLY
2	B	GND
3	R	SIGNAL

Connector No.	E160
Connector Name	FUSE BLOCK (J/B)
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1Q	W/G	-
8Q	R/B	-

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

Connector No.	F8
Connector Name	IGNITION COIL NO. 6 (WITH POWER TRANSISTOR)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	P	-
2	B	-
3	LG	-

Connector No.	F7
Connector Name	IGNITION COIL NO. 4 (WITH POWER TRANSISTOR)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	GR	-
2	B	-
3	W	-

Connector No.	F6
Connector Name	IGNITION COIL NO. 2 (WITH POWER TRANSISTOR)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	G	-
2	B	-
3	LG	-

Connector No.	F13
Connector Name	HEATED OXYGEN SENSOR 2 (BANK 1)
Connector Color	BLUE



Terminal No.	Color of Wire	Signal Name
1	W	SIGNAL
2	P	HEATED GND
3	W/R	POWER SUPPLY
4	GR	GND O2

Connector No.	F12
Connector Name	HEATED OXYGEN SENSOR 2 (BANK 2)
Connector Color	GREEN



Terminal No.	Color of Wire	Signal Name
1	G	SIGNAL
2	R	HEATED GND
3	W/R	POWER SUPPLY
4	GR	GND O2

Connector No.	F11
Connector Name	CRANKSHAFT POSITION SENSOR (POS)
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	R	POWER SUPPLY
2	G	SIGNAL
3	BR	GND



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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]


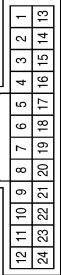
Connector No.	F15
Connector Name	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
Connector Color	GRAY

Terminal No.	Color of Wire	Signal Name
1	R	-
2	GR	-



Terminal No.	Color of Wire	Signal Name
7	R	-
8	B	-
15	BR	-
16	B	-
17	P	-
18	W	-
19	B	-
20	SB	-
23	GR	-
24	B	-

Connector No.	F14
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
2	L	-
3	P	-

Connector No.	F20
Connector Name	FUEL INJECTOR NO. 4
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	R	-

Connector No.	F19
Connector Name	VIAS CONTROL SOLENOID
Connector Color	BLACK

Terminal No.	Color of Wire	Signal Name
1	R	-
2	G	-

Connector No.	F18
Connector Name	FUEL INJECTOR NO. 2
Connector Color	GRAY

Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	O	-

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ENGINE CONTROL SYSTEM

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[VQ40DE]

Connector No.	F21
Connector Name	CONDENSER-1
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	W	-
2	B	-

Connector No.	F22
Connector Name	FUEL INJECTOR NO. 6
Connector Color	GRAY



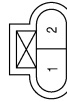
Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	V	-

Connector No.	F23
Connector Name	CAMSHAFT POSITION SENSOR (PHASE) (BANK 2) (WITH VQ40DE)
Connector Color	BLAC



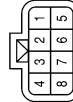
Terminal No.	Color of Wire	Signal Name
1	BR	GND
2	Y	SIGNAL
3	R	POWER SUPPLY

Connector No.	F24
Connector Name	ENGINE COOLANT TEMPERATURE SENSOR (WITH VQ40DE)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	Y	-
2	B	-

Connector No.	F26
Connector Name	WIRE TO WIRE
Connector Color	GREEN



Terminal No.	Color of Wire	Signal Name
1	Y	-
2	L	-
3	SB	-
4	B	-
5	G	-
6	W	-
7	LG	-
8	R	-

Connector No.	F32
Connector Name	WIRE TO WIRE
Connector Color	WHITE



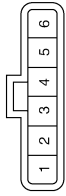
Terminal No.	Color of Wire	Signal Name
1	W/R	-
2	L	-
3	P	-
9	V	-
10	G	- (WITH VQ40DE)
11	GR	-
12	BR	-
13	LG	-
16	W/G	-

ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

Connector No.	F50
Connector Name	ELECTRIC THROTTLE CONTROL ACTUATOR
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	W	TPS1
2	L	AVCC2
3	R	TPS2
4	B	GND-A2
5	L/W	MOTOR 2 (CLOSE)
6	L/B	MOTOR 1 (OPEN)

Connector No.	F46
Connector Name	POWER STEERING PRESSURE SENSOR
Connector Color	BLACK



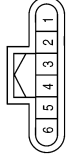
Terminal No.	Color of Wire	Signal Name
1	B	GND
2	P	SIGNAL
3	G	POWER SUPPLY

Connector No.	F44
Connector Name	WIRE TO WIRE
Connector Color	GREEN



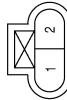
Terminal No.	Color of Wire	Signal Name
1	O/L	-
2	W/L	-
3	W/G	-
4	W	-

Connector No.	F53
Connector Name	MASS AIR FLOW SENSOR
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
2	LG	POWER SUPPLY
3	B	QA-
4	P	QA+
5	BR	AT SEN SIGNAL
6	B	GND

Connector No.	F51
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2)
Connector Color	GREEN



Terminal No.	Color of Wire	Signal Name
1	W	-
2	R	-

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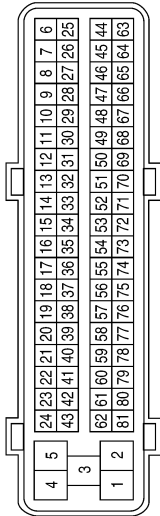
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[VQ40DE]

Terminal No.	Color of Wire	Signal Name
55	G	O2SRL
56	W/L	AF-1
57	-	-
58	-	-
59	-	-
60	SB	IGN #5
61	L	IGN #3
62	Y	IGN #1
63	-	-
64	-	-
65	-	-
66	B	GND-A2
67	B	GND-A
68	G	AVCC(PSPRESS)
69	R	TPS 2
70	BR	PDPRESS
71	R	CURSEN
72	-	-
73	Y	TW
74	W	O2SRR
75	B/R	AF-2
76	-	-
77	-	-
78	GR	GND-O2
79	P	IGN #6
80	GR	IGN #4
81	G	IGN #2

Terminal No.	Color of Wire	Signal Name
21	W	INJ #5
22	LG	INJ #3
23	SB	INJ #1
24	G	AF-H2
25	P	O2HRR
26	-	-
27	-	-
28	-	-
29	G	VIAS
30	-	-
31	-	-
32	W	FTPRS
33	L	PHASE(RH)
34	BR	TA
35	O/L	AF-1
36	W	KNK 2
37	-	-
38	-	-
39	-	-
40	V	INJ #6
41	R	INJ #4
42	O	INJ #2
43	G	AF-H2
44	-	-
45	R	EVAP
46	-	-
47	L	AVCC 2
48	SB	AVCC
49	P	AVCC(PDPRES)
50	W	TPS 1
51	P	QA+
52	-	-
53	-	-
54	-	-

Connector No.	F54
Connector Name	ECM (WITH VQ40DE)
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	BR	GND
2	G	AF-H1
3	V	VMOT
4	L/W	MOTOR 2
5	L/B	MOTOR 1
6	R	O2HRL
7	-	-
8	-	-
9	-	-
10	W	CVTCL
11	LG	CVTCR
12	P	PSPRES
13	G	POS
14	Y	PHASE(LH)
15	W	KNK 1
16	BR	AF+2
17	-	-
18	-	-
19	-	-
20	-	-

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

Connector No.	F67
Connector Name	WIRE TO WIRE
Connector Color	BLUE



Terminal No.	Color of Wire	Signal Name
1	W	-
2	GR	-
3	W	-
4	B	-

Connector No.	F66
Connector Name	CAMSHAFT POSITION SENSOR (PHASE) (BANK 1)
Connector Color	GREEN



Terminal No.	Color of Wire	Signal Name
1	BR	GND
2	L	SIGNAL
3	R	POWER SUPPLY

Connector No.	F65
Connector Name	AIR FUEL RATIO (A/F) SENSOR 1 (BANK 1)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	O/L	AF+
2	W/L	AF-
3	G	HEATER GND
4	W/R	HEATER PWR

Connector No.	F203
Connector Name	FUEL INJECTOR NO. 3
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	V	-

Connector No.	F202
Connector Name	FUEL INJECTOR NO. 1
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	G	-

Connector No.	F201
Connector Name	WIRE TO WIRE
Connector Color	GREEN



Terminal No.	Color of Wire	Signal Name
1	V	-
2	G	-
3	W/G	-
4	L	-

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

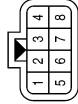
[VQ40DE]

Connector No.	F226
Connector Name	IGNITION COIL NO. 1 (WITH POWER TRANSISTOR)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	Y	-
2	B	-
3	O	-

Connector No.	F225
Connector Name	WIRE TO WIRE
Connector Color	GREEN



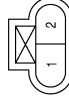
Terminal No.	Color of Wire	Signal Name
1	Y	-
2	L	-
3	V	-
4	B	-
5	O	-
6	W	-
7	LG	-
8	R	-

Connector No.	F204
Connector Name	FUEL INJECTOR NO. 5
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	L	-

Connector No.	F229
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1)
Connector Color	GREEN



Terminal No.	Color of Wire	Signal Name
1	LG	-
2	R	-

Connector No.	F228
Connector Name	IGNITION COIL NO. 5 (WITH POWER TRANSISTOR)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	V	-
2	B	-
3	W	-

Connector No.	F227
Connector Name	IGNITION COIL NO. 3 (WITH POWER TRANSISTOR)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	L	-
2	B	-
3	W	-

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

Connector No.	F252
Connector Name	KNOCK SENSOR (BANK 2)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W	KNK
2	B	GND

Connector No.	F251
Connector Name	KNOCK SENSOR (BANK 1)
Connector Color	GRAY



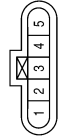
Terminal No.	Color of Wire	Signal Name
1	W	KNK
2	GR	GND

Connector No.	F250
Connector Name	WIRE TO WIRE
Connector Color	BLUE



Terminal No.	Color of Wire	Signal Name
1	W	-
2	GR	-
3	W	-
4	B	-

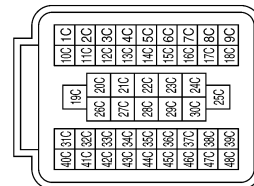
Connector No.	C5
Connector Name	FUEL LEVEL SENSOR UNIT AND FUEL PUMP
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	R	-
3	B	-
4	Y	-

Terminal No.	Color of Wire	Signal Name
1C	Y	-
10C	W	-
11C	B	-
12C	SB	-
26C	G	-
27C	W	-
28C	R	-
29C	B	-

Connector No.	C1
Connector Name	WIRE TO WIRE
Connector Color	BLACK



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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

Connector No.	C7
Connector Name	EVAP CONTROL SYSTEM PRESSURE SENSOR
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	B	-
2	W	-
3	SB	-

Connector No.	C6
Connector Name	EVAP CANISTER VENT CONTROL VALVE
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	W	-
2	G	-

ABBIA0433GB

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VQ40DE]

SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Matrix Chart

INFOID:000000007358395

SYSTEM — BASIC ENGINE CONTROL SYSTEM

		SYMPTOM												Reference page	
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION		BATTERY DEAD (UNDER CHARGE)
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-406
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-487
	Fuel injector circuit	1	1	2	3	2		2	2			2			EC-402
	Evaporative emission system	3	3	4	4	4	4	4	4	4	4	4			EC-57
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4	4	4	1		EC-421
	Incorrect idle speed adjustment						1	1	1	1		1			EC-20
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-365 , EC-371
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-20
	Ignition circuit	1	1	2	2	2		2	2			2			EC-410
Power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-94
Mass air flow sensor circuit		1			2										EC-113 , EC-126
Engine coolant temperature sensor circuit							3			3					EC-132 , EC-140
Air fuel ratio (A/F) sensor 1			1	2	3	2		2	2			2			EC-148 , EC-152 , EC-156 , EC-160 , EC-388
Throttle position sensor circuit							2			2					EC-136 , EC-205 , EC-324 , EC-326 , EC-380
Accelerator pedal position sensor circuit				3	2	1									EC-94 , EC-373 , EC-376 , EC-384

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VQ40DE]

	SYMPTOM												Reference page	
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION		BATTERY DEAD (UNDER CHARGE)
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Knock sensor circuit			2								3			EC-216
Crankshaft position sensor (POS) circuit	2	2												EC-219
Camshaft position sensor (PHASE) circuit	3	2												EC-223
Vehicle speed signal circuit		2	3		3						3			EC-296
Power steering pressure sensor circuit		2					3	3						EC-304
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-307 , EC-309
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-110
PNP signal circuit			3		3		3	3			3			EC-315
VIAS control solenoid valve circuit					1									EC-356
Refrigerant pressure sensor circuit		2				3			3		4			EC-423
Electrical load signal circuit							3							EC-400
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	HAC-111 , HAC-179
ABS actuator and electric unit (control unit)			4											BRC-117

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VQ40DE]

		SYMPTOM												Reference page	
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATSWATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION		BATTERY DEAD (UNDER CHARGE)
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5													FL-6
	Fuel piping		5	5	5		5	5				5			FL-5
	Vapor lock		5												—
	Valve deposit														—
	Poor fuel (Heavy weight gasoline, Low octane)	5		5	5	5		5	5			5			—
Air	Air duct														EM-26
	Air cleaner														EM-26
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)		5	5		5		5	5			5			EM-26
	Electric throttle control actuator	5			5		5			5					EM-27
	Air leakage from intake manifold/Collector/Gasket														EM-27 , EM-30
Cranking	Battery														PG-5
	Generator circuit	1	1	1		1		1	1					1	CHG-5 , CHG-8
	Starter circuit	3										1			STR-5 , STR-9
	Signal plate	6													EM-115
	Park/neutral position (PNP) signal	4													TM-51
Engine	Cylinder head	5	5	5	5	5		5	5			5	3		EM-96
	Cylinder head gasket									4					
	Cylinder block														
	Piston												4		
	Piston ring	6	6	6	6	6		6	6			6			EM-115
	Connecting rod														
	Bearing														
	Crankshaft														

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ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VQ40DE]

		SYMPTOM												Reference page	
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION		BATTERY DEAD (UNDER CHARGE)
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Valve mechanism	Timing chain														EM-61
	Camshaft														EM-78
	Intake valve timing control	5	5	5	5	5		5	5			5			EM-61
	Intake valve												3		EM-90
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5		5	5			5			EM-33,
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			EM-36, LU-12, LU-15
	Oil level (Low)/Filthy oil														
Cooling	Radiator/Hose/Radiator filler cap														LU-8
	Thermostat									5					CO-11
	Water pump														CO-28
	Water gallery	5	5	5	5	5		5	5		4	5			CO-30
	Cooling fan									5					CO-20 or CO-21
	Coolant level (Low)/Contaminated coolant									5					CO-11
NVIS (NISSAN Vehicle Immobilizer System — NATS)		1	1												SEC-5 or SEC-116

1 - 6: The numbers refer to the order of inspection.

NORMAL OPERATING CONDITION

< SYMPTOM DIAGNOSIS >

[VQ40DE]

NORMAL OPERATING CONDITION

Fuel Cut Control (at No Load and High Engine Speed)

INFOID:000000007358396

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
TCM	Neutral position	Fuel cut control	Fuel injector
Accelerator pedal position sensor	Accelerator pedal position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Wheel sensor	Vehicle speed*		

*: This signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

If the engine speed is above 1,800 rpm under no load (for example, the shift position is neutral and engine speed is over 1,800 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

Fuel cut will be operated until the engine speed reaches 1,500 rpm, then fuel cut will be cancelled.

NOTE:

This function is different from deceleration control listed under [EC-48, "System Description"](#).

PRECAUTION**PRECAUTIONS****Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"**

INFOID:000000008832066

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the SR and SB section of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SR section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS**WARNING:**

- When working near the Airbag Diagnosis Sensor Unit or other Airbag System sensors with the Ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the Ignition OFF, disconnect the battery and wait at least 3 minutes before performing any service.

Precaution Necessary for Steering Wheel Rotation After Battery Disconnect

INFOID:000000007833552

NOTE:

- This Procedure is applied only to models with Intelligent Key system and NATS (NISSAN ANTI-THEFT SYSTEM).
- Remove and install all control units after disconnecting both battery cables with the ignition knob in the "LOCK" position.
- Always use CONSULT to perform self-diagnosis as a part of each function inspection after finishing work. If DTC is detected, perform trouble diagnosis according to self-diagnostic results.

For models equipped with the Intelligent Key system and NATS, an electrically controlled steering lock mechanism is adopted on the key cylinder.

For this reason, if the battery is disconnected or if the battery is discharged, the steering wheel will lock and steering wheel rotation will become impossible.

If steering wheel rotation is required when battery power is interrupted, follow the procedure below before starting the repair operation.

OPERATION PROCEDURE

1. Connect both battery cables.

NOTE:

Supply power using jumper cables if battery is discharged.

2. Use the Intelligent Key or mechanical key to turn the ignition switch to the "ACC" position. At this time, the steering lock will be released.
3. Disconnect both battery cables. The steering lock will remain released and the steering wheel can be rotated.
4. Perform the necessary repair operation.

PRECAUTIONS

< PRECAUTION >

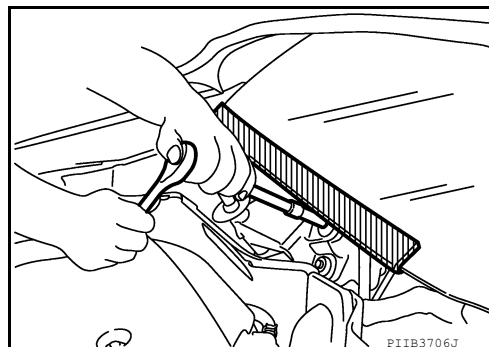
[VQ40DE]

5. When the repair work is completed, return the ignition switch to the "LOCK" position before connecting the battery cables. (At this time, the steering lock mechanism will engage.)
6. Perform a self-diagnosis check of all control units using CONSULT.

Precaution for Procedure without Cowl Top Cover

INFOID:000000007619772

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.



On Board Diagnosis (OBD) System of Engine and A/T

INFOID:000000007358399

The ECM has an on board diagnostic system. It will illuminate the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

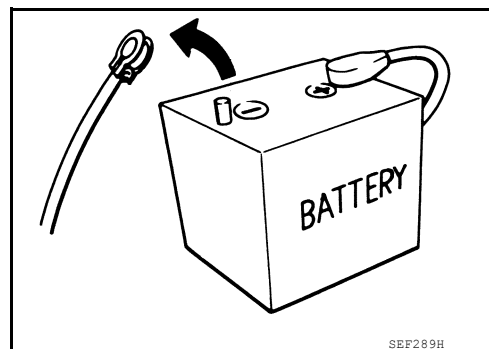
CAUTION:

- Always turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to illuminate.
- Always connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to illuminate due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to [PG-67, "Description"](#).
- Always route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to illuminate due to the short circuit.
- Always connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to illuminate due to the malfunction of the EVAP system or fuel injection system, etc.
- Always erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.

Precaution

INFOID:000000007358400

- Always use a 12 volt battery as power source.
- Never attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned OFF.
- Before removing parts, turn ignition switch OFF and then disconnect negative battery cable.



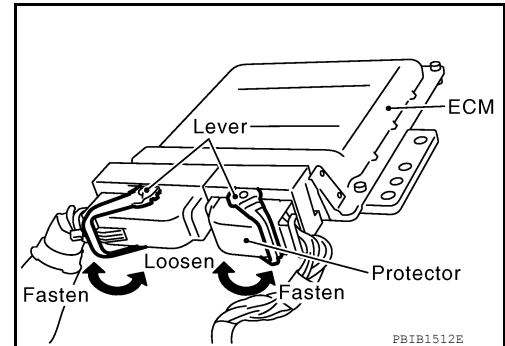
- Never disassemble ECM.
- If a battery cable is disconnected, the memory will return to the ECM value. The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a malfunction. Never replace parts because of a slight variation.
- If the battery is disconnected, the following emission-related diagnostic information will be lost within 24 hours.
 - Diagnostic trouble codes
 - 1st trip diagnostic trouble codes

PRECAUTIONS

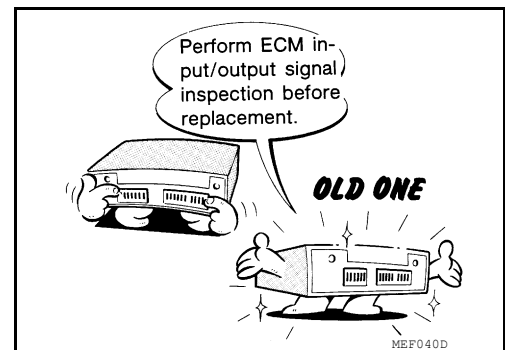
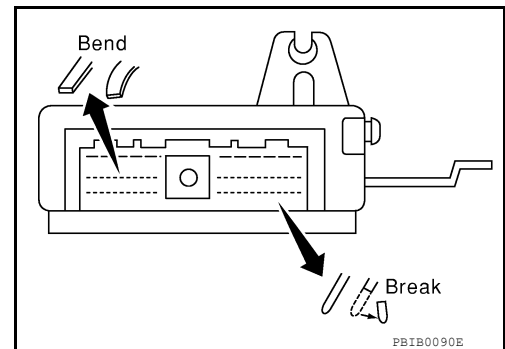
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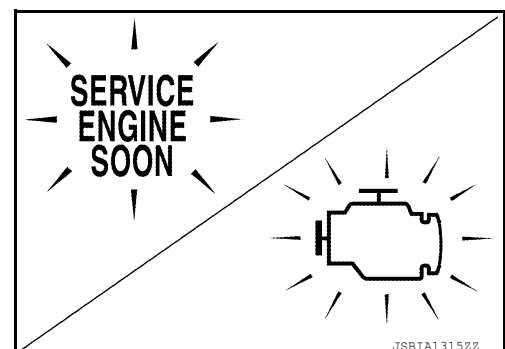
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- <Flexible Fuel Vehicle>
Presumed ethanol mixture ratio
- When connecting ECM harness connector, fasten it securely with levers as far as they will go as shown in the figure.



- When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bends or break).
Check that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- Securely connect ECM harness connectors.
A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.
- Keep engine control system parts and harness dry.
- Before replacing ECM, perform "ECM Terminals and Reference Value" inspection and make sure ECM functions properly. Refer to [EC-433, "ECM Terminal and Reference Value"](#).
- Handle mass air flow sensor carefully to avoid damage.
- Never clean mass air flow sensor with any type of detergent.
- Never disassemble electric throttle control actuator.
- Even a slight leak in the air intake system can cause serious incidents.
- Never shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).



- After performing each TROUBLE DIAGNOSIS, perform DTC Confirmation Procedure or Overall Function Check.
The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Overall Function Check should be a good result if the repair is completed.

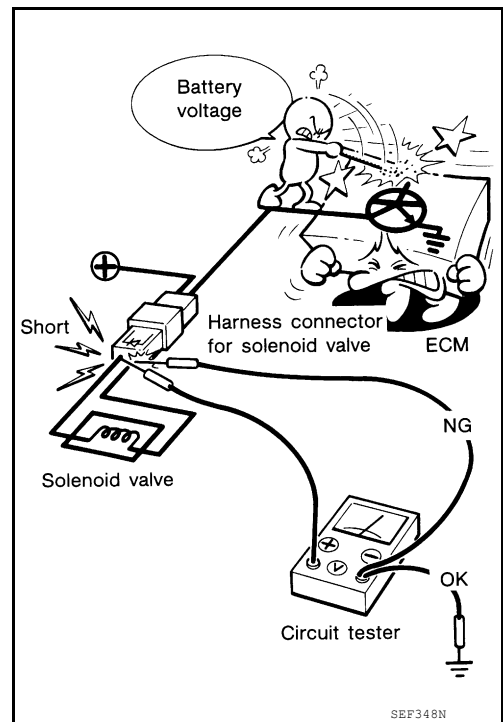


PRECAUTIONS

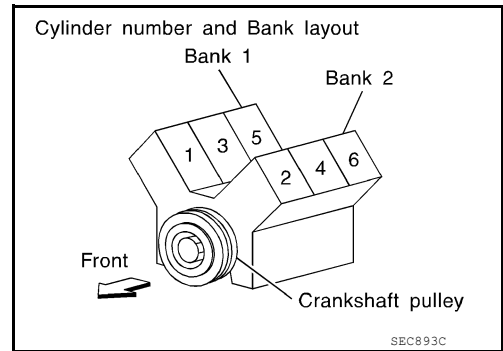
[VQ40DE]

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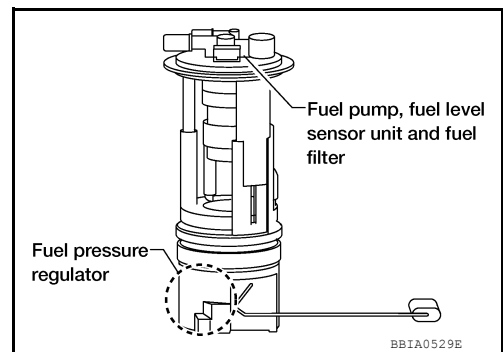
- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact. Accidental contact of probes will cause a short circuit and damage the ECM power transistor.



- B1 indicates bank 1, B2 indicates bank 2 as shown in the figure.



- Never operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.



PRECAUTIONS

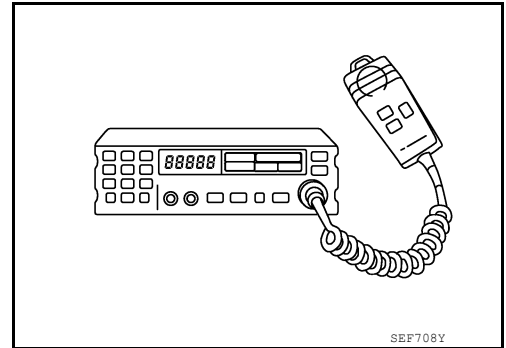
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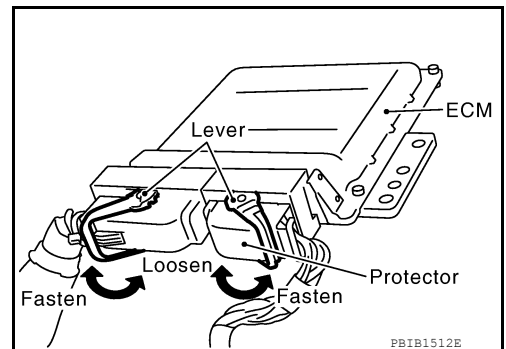
- Never depress accelerator pedal when starting.
- Immediately after starting, Never rev up engine unnecessarily.
- Never rev up engine just prior to shutdown.



- When installing C.B. ham radio or a mobile phone, Always observe the following as it may adversely affect electronic control systems depending on installation location.
 - Keep the antenna as far as possible from the electronic control units.
 - Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls. Never let them run parallel for a long distance.
 - Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.



- Always ground the radio to vehicle body.



PREPARATION

< PREPARATION >

[VQ40DE]

PREPARATION

PREPARATION

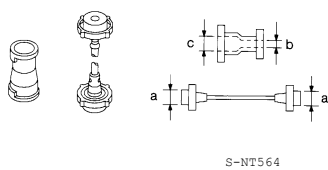
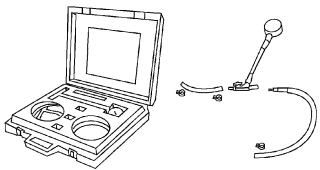
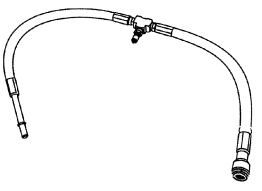

Special Service Tool

INFOID:000000007358401

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The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
EG17650301 (J-33984-A) Radiator cap tester adapter  <p style="text-align: center;">S-NT564</p>	Adapts radiator cap tester to radiator cap and radiator filler neck a: 28 (1.10) dia. b: 31.4 (1.236) dia. c: 41.3 (1.626) dia. Unit: mm (in)
(J-44321) Fuel pressure gauge kit  <p style="text-align: center;">LEC642</p>	Checks fuel pressure
(J-44321-6) Fuel pressure adapter  <p style="text-align: center;">LBIA0376E</p>	Connects fuel pressure gauge to quick connector type fuel lines.
(J-45488) Quick connector re- lease  <p style="text-align: center;">PBIC0198E</p>	Removes fuel tube quick connectors in engine room

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PREPARATION

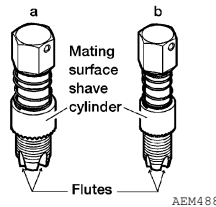
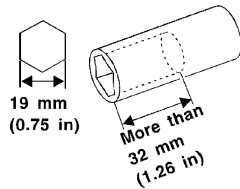
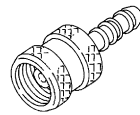
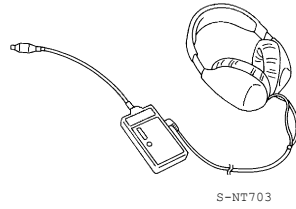
< PREPARATION >

[VQ40DE]

Commercial Service Tool

INFOID:000000007358402

Tool name (Kent-Moore No.)	Description
Leak detector i.e.: (J-41416)	Locates the EVAP leak
EVAP service port adapter i.e.: (J-41413-OBID)	Applies positive pressure through EVAP service port
Fuel filler cap adapter i.e.: (MLR-8382)	Checks fuel tank vacuum relief valve opening pressure
Socket wrench	Removes and installs engine coolant temperature sensor
Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12)	Reconditions the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor b: 12 mm diameter with pitch 1.25 mm for Titanium Oxygen Sensor
Anti-seize lubricant i.e.: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	Lubricates oxygen sensor thread cleaning tool when reconditioning exhaust system threads.



PERIODIC MAINTENANCE

FUEL PRESSURE

Fuel Pressure Check

INFOID:000000007358403

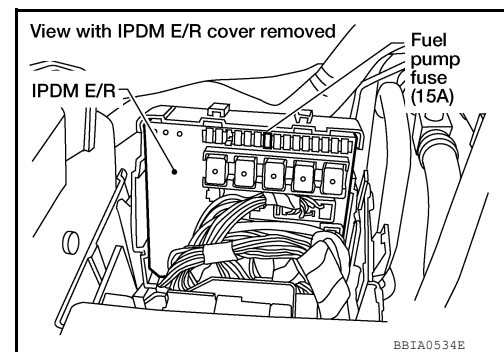
FUEL PRESSURE RELEASE

④ With CONSULT

1. Turn ignition switch ON.
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.

⊗ Without CONSULT

1. Remove fuel pump fuse (No.48) located in IPDM E/R.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch OFF.
5. Reinstall fuel pump fuse after servicing fuel system.



FUEL PRESSURE CHECK

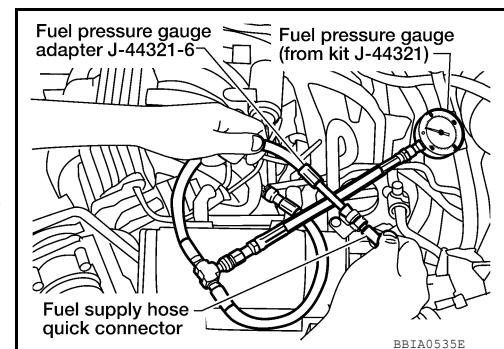
CAUTION:

Be careful not to scratch or get the fuel hose connection area dirty when servicing, so that the quick connector o-ring maintains sealability.

NOTE:

- Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because R51 models do not have fuel return system.
- Use Fuel Pressure Gauge Kit J-44321 and Fuel Pressure Adapter J-44321-6 to check fuel pressure.

1. Release fuel pressure to zero. Refer to "FUEL PRESSURE RELEASE".
2. Remove fuel hose using Quick Connector Release J-45488. Refer to [EM-47. "Removal and Installation"](#).
 - Do not twist or kink fuel hose because it is plastic hose.
 - Do not remove fuel hose from quick connector.
 - Keep fuel hose connections clean.
3. Install Fuel Pressure Adapter J-44321-6 and Fuel Pressure Gauge (from kit J-44321) as shown in figure.
 - Do not distort or bend fuel rail tube when installing fuel pressure gauge adapter.
 - When reconnecting fuel hose, check the original fuel hose for damage and abnormality.
4. Turn ignition switch ON (reactivate fuel pump), and check for fuel leakage.
5. Start engine and check for fuel leakage.
6. Read the indication of fuel pressure gauge.
 - During fuel pressure check, check for fuel leakage from fuel connection every 3 minutes.



At idling: Approximately 350 kPa (3.57 kg/cm², 51 psi)

7. If result is unsatisfactory, go to next step.

FUEL PRESSURE

< PERIODIC MAINTENANCE >

[VQ40DE]

-
8. Check the following.
 - Fuel hoses and fuel tubes for clogging
 - Fuel filter for clogging
 - Fuel pump
 - Fuel pressure regulator for cloggingIf OK, replace fuel pressure regulator. Refer to [EC-481, "Precaution"](#) and [FL-11, "Removal and Installation"](#).
If NG, repair or replace.
 9. Before disconnecting Fuel Pressure Gauge and Fuel Pressure Adapter J-44321-6, release fuel pressure to zero. Refer to "FUEL PRESSURE RELEASE".

EVAP LEAK CHECK

< PERIODIC MAINTENANCE >

[VQ40DE]

EVAP LEAK CHECK

How to Detect Fuel Vapor Leakage

INFOID:000000007358404

CAUTION:

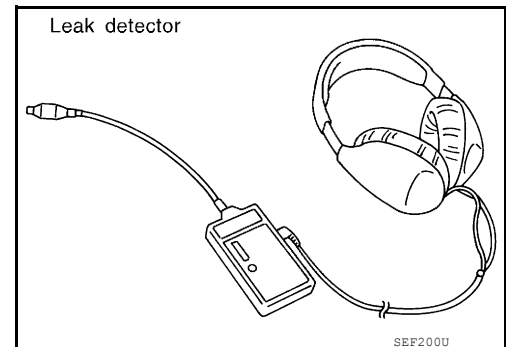
- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in EVAP system.

NOTE:

- Do not start engine.
- Improper installation of EVAP service port adapter to the EVAP service port may cause a leak.

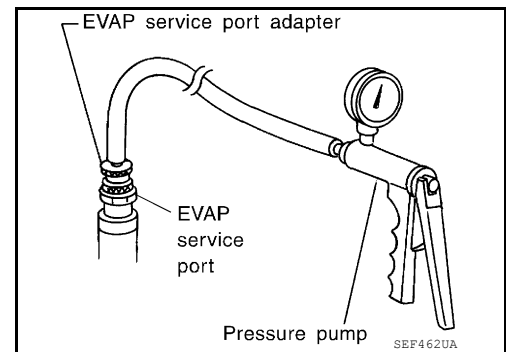
Ⓟ WITH CONSULT

1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Also attach the pressure pump and hose to the EVAP service port adapter.
3. Turn ignition switch ON.
4. Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT MODE" with CONSULT.
5. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
6. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
7. Remove EVAP service port adapter and hose with pressure pump.
8. Locate the leak using a leak detector. Refer to [EC-57. "Description"](#).

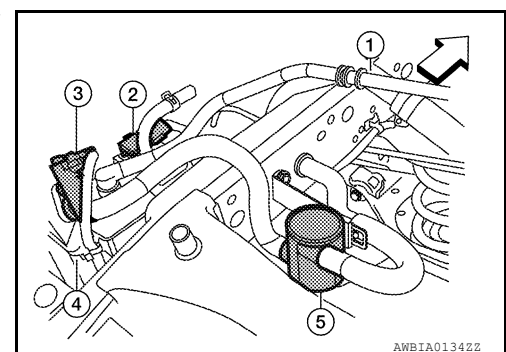


ⓧ WITHOUT CONSULT

1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Also attach the pressure pump with pressure gauge to the EVAP service port adapter.



3. Apply battery voltage between the terminals of EVAP canister vent control valve (3) to make a closed EVAP system.
 - Fuel filler pipe (top of frame view) (1)
 - EVAP control system pressure sensor (2)
 - EVAP canister (4)
 - Drain filter (5)
 - ⇐: Vehicle front
4. To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm², 0.2 to 0.4 psi).
5. Remove EVAP service port adapter and hose with pressure pump.
6. Locate the leak using a leak detector. Refer to [EC-57. "Description"](#).



SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ40DE]

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Fuel Pressure

INFOID:000000007358405

Fuel pressure at idling kPa (kg/cm ² , psi)	Approximately 350 (3.57, 51)
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Idle Speed and Ignition Timing

INFOID:000000007358406

Target idle speed	No load* (in P or N position)	625 ± 50 rpm
Air conditioner: ON	In P or N position	625 rpm or more
Ignition timing	In P or N position	15 ± 5° BTDC

*: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

INFOID:000000007358407

Condition	Calculated load value% (Using CONSULT or GST)
At idle	5 - 35
At 2,500 rpm	5 - 35

Mass Air Flow Sensor

INFOID:000000007358408

Supply voltage	Battery voltage (11 - 14V)
Output voltage at idle	0.9 - 1.2*V
Mass air flow (Using CONSULT or GST)	2.0 - 6.0 g/s at idle* 7.0 - 20.0 g/s at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no load.

Intake Air Temperature Sensor

INFOID:000000007358409

Temperature °C (°F)	Resistance kΩ
25 (77)	1.800 - 2.200

Engine Coolant Temperature Sensor

INFOID:000000007358410

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Air Fuel Ratio (A/F) Sensor 1 Heater

INFOID:000000007358411

Resistance [at 25°C (77°F)]	1.80 - 2.44Ω
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SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ40DE]

Heated Oxygen sensor 2 Heater

INFOID:000000007358412

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Resistance [at 25°C (77°F)]	9.9 - 13.3Ω
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Crankshaft Position Sensor (POS)

INFOID:000000007358413

EC

Refer to [EC-221, "Component Inspection"](#).

Camshaft Position Sensor (PHASE)

INFOID:000000007358414

C

Refer to [EC-226, "Component Inspection"](#).

Throttle Control Motor

INFOID:000000007358415

D

Resistance [at 25°C (77°F)]	Approximately 1 - 15Ω
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E

Fuel Injector

INFOID:000000007358416

F

Resistance [at 10 - 60°C (50 - 140°F)]	11.1 - 14.5Ω
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Fuel Pump

INFOID:000000007358417

G

Resistance [at 25°C (77°F)]	0.2 - 5.0Ω
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PRECAUTION

PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:000000008832069

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the SR and SB section of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SR section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

- When working near the Airbag Diagnosis Sensor Unit or other Airbag System sensors with the Ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the Ignition OFF, disconnect the battery and wait at least 3 minutes before performing any service.

Precaution Necessary for Steering Wheel Rotation After Battery Disconnect

INFOID:000000007833553

NOTE:

- This Procedure is applied only to models with Intelligent Key system and NATS (NISSAN ANTI-THEFT SYSTEM).
- Remove and install all control units after disconnecting both battery cables with the ignition knob in the "LOCK" position.
- Always use CONSULT to perform self-diagnosis as a part of each function inspection after finishing work. If DTC is detected, perform trouble diagnosis according to self-diagnostic results.

For models equipped with the Intelligent Key system and NATS, an electrically controlled steering lock mechanism is adopted on the key cylinder.

For this reason, if the battery is disconnected or if the battery is discharged, the steering wheel will lock and steering wheel rotation will become impossible.

If steering wheel rotation is required when battery power is interrupted, follow the procedure below before starting the repair operation.

OPERATION PROCEDURE

1. Connect both battery cables.

NOTE:

Supply power using jumper cables if battery is discharged.

2. Use the Intelligent Key or mechanical key to turn the ignition switch to the "ACC" position. At this time, the steering lock will be released.
3. Disconnect both battery cables. The steering lock will remain released and the steering wheel can be rotated.
4. Perform the necessary repair operation.

PRECAUTIONS

[VK56DE]

< PRECAUTION >

5. When the repair work is completed, return the ignition switch to the "LOCK" position before connecting the battery cables. (At this time, the steering lock mechanism will engage.)
6. Perform a self-diagnosis check of all control units using CONSULT.

On Board Diagnosis (OBD) System of Engine and A/T

INFOID:000000007358419

The ECM has an on board diagnostic system. It will illuminate the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

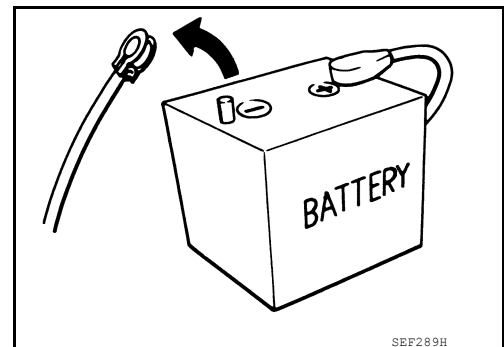
CAUTION:

- Always turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to illuminate.
- Always connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to illuminate due to the open circuit. (Check that the connector is free from water, grease, dirt, bent terminals, etc.)
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to [PG-67, "Description"](#).
- Always route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to illuminate due to the short circuit.
- Always connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to illuminate due to the malfunction of the EVAP system or fuel injection system, etc.
- Always erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.

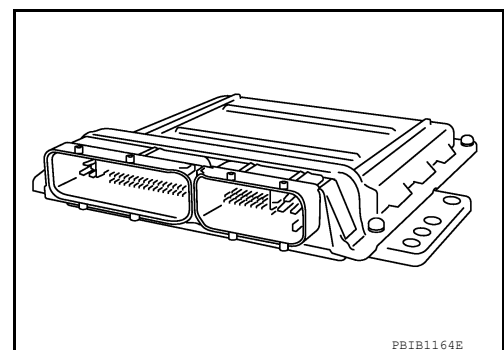
Precaution

INFOID:000000007358420

- Always use a 12 volt battery as power source.
- Never attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned OFF.
- Before removing parts, turn ignition switch OFF and then disconnect negative battery cable.



- Never disassemble ECM.
- If a battery cable is disconnected, the memory will return to the ECM value.
The ECM will now start to self-control at its initial value. Thus, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Never replace parts because of a slight variation.
- If the battery is disconnected, the following emission-related diagnostic information will be cleared within 24 hours.
 - Diagnostic trouble codes
 - 1st trip diagnostic trouble codes
 - Freeze frame data
 - 1st trip freeze frame data
 - System readiness test (SRT) codes
 - Test values



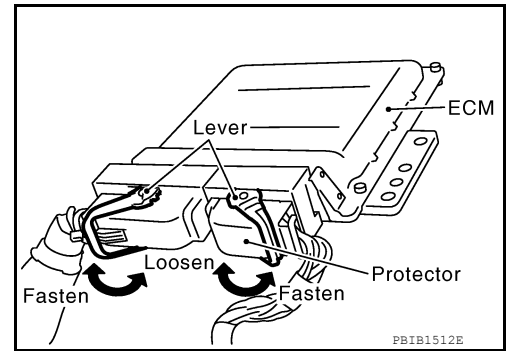
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PRECAUTIONS

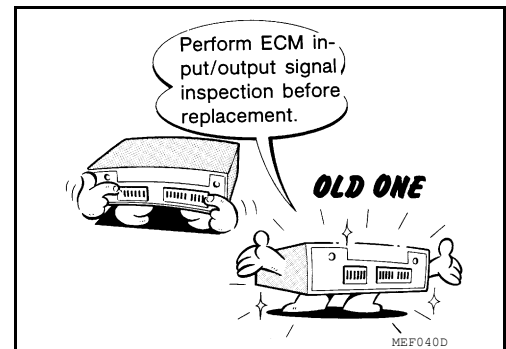
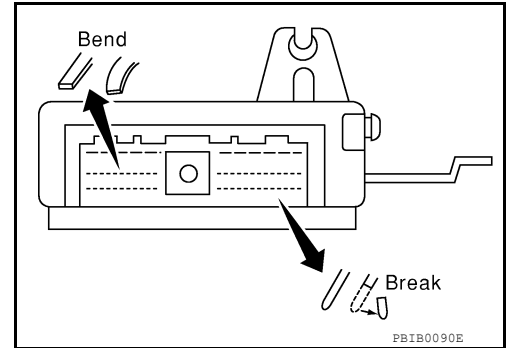
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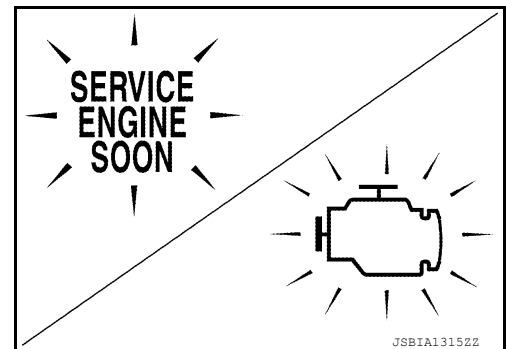
- When connecting ECM harness connector, fasten it securely with a lever as far as it will go as shown in the figure.



- When connecting or disconnecting pin connectors into or from ECM, never damage pin terminals (bends or breaks). Check that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- Securely connect ECM harness connectors. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.
- Keep engine control system parts and harness dry.
- Before replacing ECM, perform ECM Terminals and Reference Value inspection and check that ECM functions properly. Refer to [EC-545, "ECM Terminal and Reference Value"](#).
- Handle mass air flow sensor carefully to avoid damage.
- Never disassemble mass air flow sensor.
- Never clean mass air flow sensor with any type of detergent.
- Never disassemble electric throttle control actuator.
- Even a slight leakage in the air intake system can cause serious incidents.
- Never shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).



- After performing each TROUBLE DIAGNOSIS, perform DTC Confirmation Procedure or Overall Function Check. The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Overall Function Check should be a good result if the repair is completed.

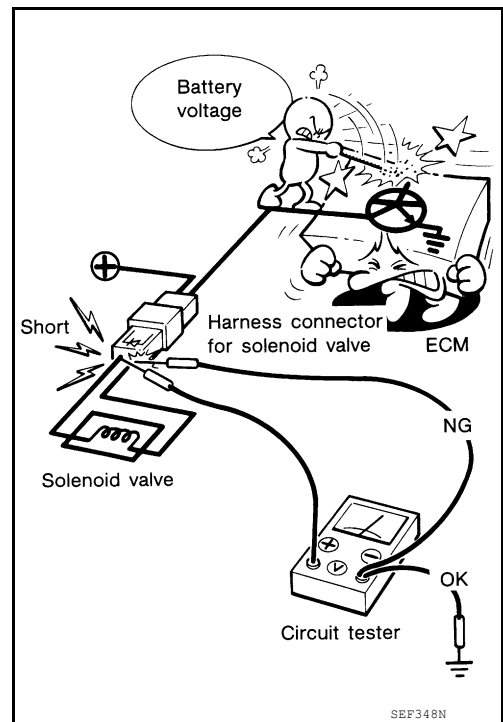


PRECAUTIONS

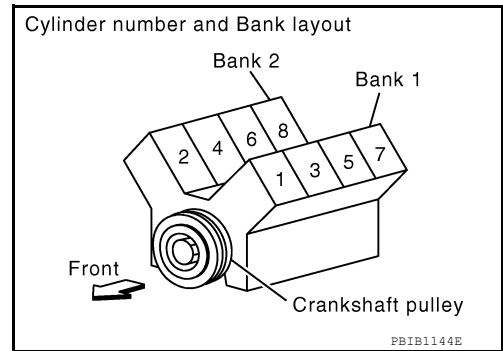
[VK56DE]

< PRECAUTION >

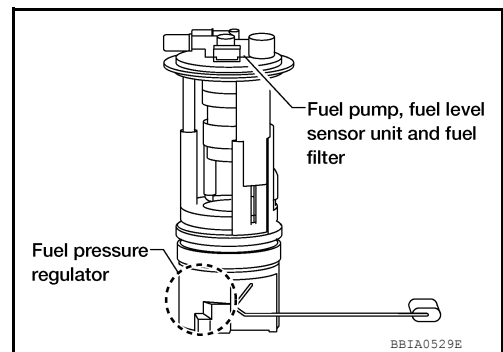
- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact. Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



- B1 indicates bank 1, B2 indicates bank 2 as shown in the figure.



- Never operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.



PRECAUTIONS

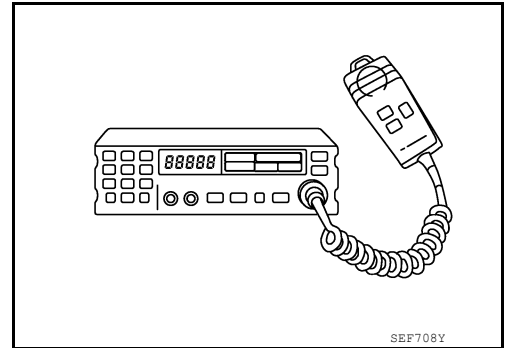
[VK56DE]

< PRECAUTION >

- Never depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Never rev up engine just prior to shutdown.



- When installing C.B. ham radio or a mobile phone, always observe the following as it may adversely affect electronic control systems depending on installation location.
 - Keep the antenna as far as possible from the electronic control units.
 - Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls. Never let them run parallel for a long distance.
 - Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
 - Always ground the radio to vehicle body.



PREPARATION

< PREPARATION >

[VK56DE]

PREPARATION

PREPARATION

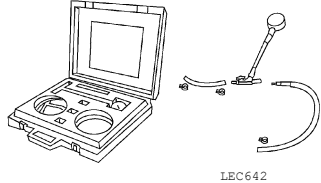
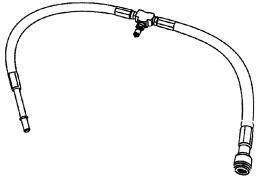
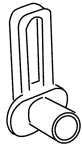
Special Service Tool

INFOID:000000007358421

A

EC

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description	
(J-44321) Fuel pressure gauge kit	 <p style="text-align: center;">L6C642</p>	Checks fuel pressure
(J-44321-6) Fuel pressure adapter	 <p style="text-align: center;">LBIA0376E</p>	Connects fuel pressure gauge to quick connector type fuel lines.
(J-45488) Quick connector re- lease	 <p style="text-align: center;">PBIC0198E</p>	Removes fuel tube quick connectors in engine room.

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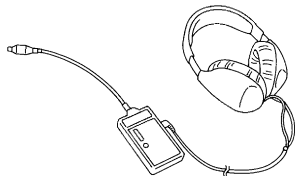
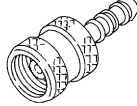
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Commercial Service Tool

INFOID:000000007358422

Tool name (Kent-Moore No.)	Description	
Leak detector i.e.: (J-41416)	 <p style="text-align: center;">S-NT703</p>	Locates the EVAP leak
EVAP service port adapter i.e.: (J-41413-OB)	 <p style="text-align: center;">S-NT704</p>	Applies positive pressure through EVAP service port

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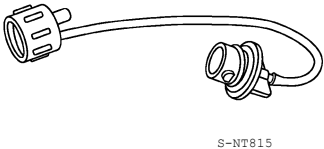
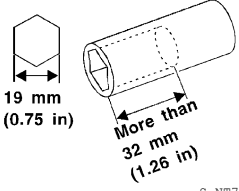
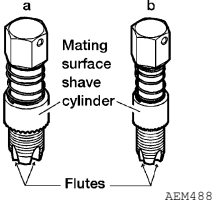
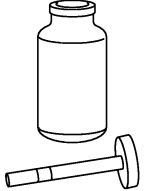
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PREPARATION

[VK56DE]

< PREPARATION >

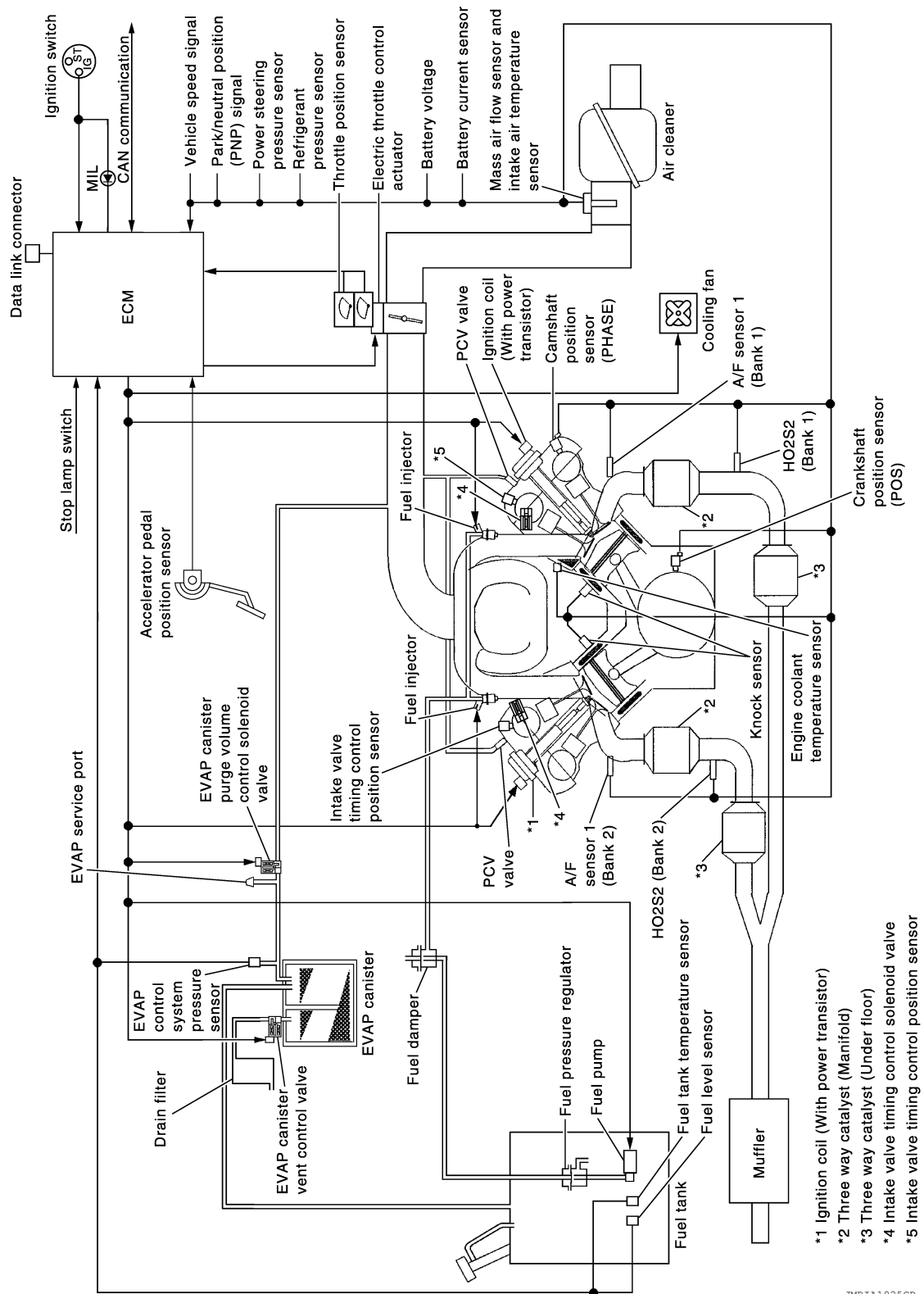
Tool name (Kent-Moore No.)	Description	
Fuel filler cap adapter i.e.: (MLR-8382)	 <p style="text-align: center;">S-NT815</p>	
Socket wrench	 <p style="text-align: center;">S-NT705</p>	
Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12)	 <p style="text-align: center;">AEM488</p>	
Anti-seize lubricant i.e.: (Permatex™ 133AR or equivalent meeting MIL specifica- tion MIL-A-907)	 <p style="text-align: center;">S-NT779</p>	

SYSTEM DESCRIPTION

ENGINE CONTROL SYSTEM

System Diagram

INFOID:000000007358423



JMBIA1925GB

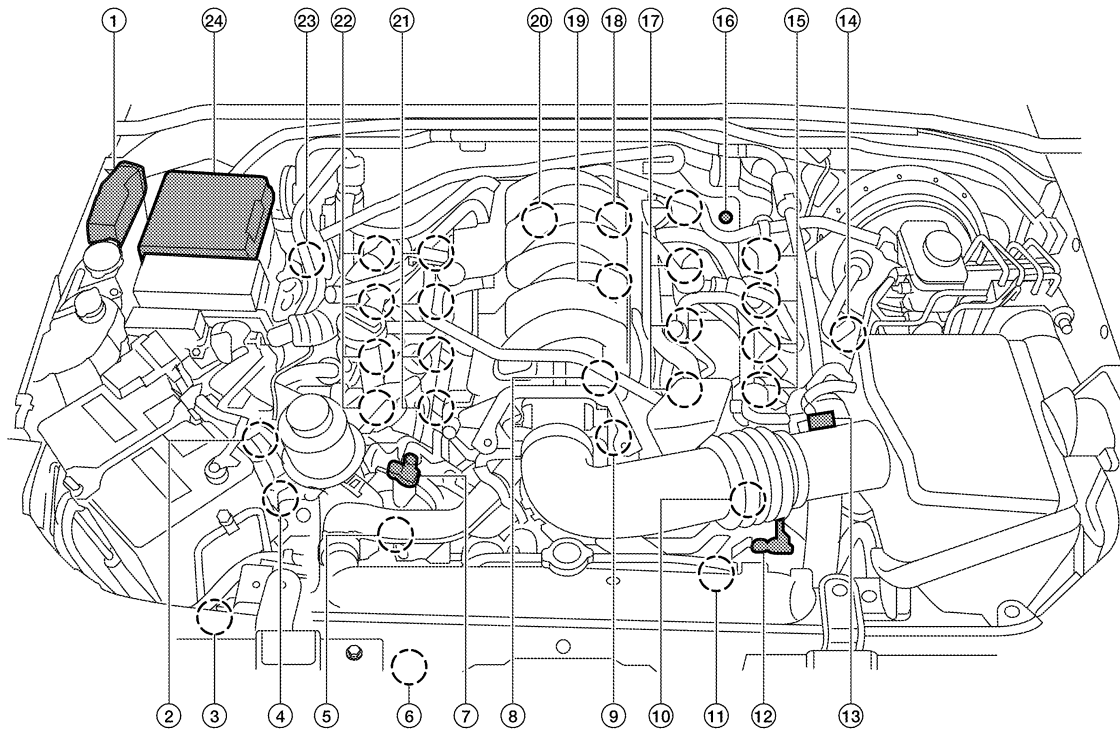
ENGINE CONTROL SYSTEM

< SYSTEM DESCRIPTION >

[VK56DE]

Engine Control Component Parts Location

INFOID:000000007358424



ALBIA03522Z

- | | | |
|---|---|---|
| 1. ECM | 2. Battery current sensor | 3. Refrigerant pressure sensor |
| 4. Power steering pressure sensor | 5. Intake valve timing control solenoid valve (bank 2) | 6. Cooling fan motor |
| 7. Intake valve timing control position sensor (bank 2) | 8. Engine coolant temperature sensor | 9. Electric throttle control actuator |
| 10. Intake valve timing control position sensor (bank 1) | 11. Intake valve timing control solenoid valve (bank 1) | 12. Camshaft position sensor (PHASE) |
| 13. Mass air flow sensor (with intake air temperature sensor) | 14. A/F sensor 1 (bank 1) | 15. Ignition coil (with power transistor) and spark plug (bank 1) |
| 16. EVAP service port | 17. Fuel injector (bank 1) | 18. Knock sensor (bank 1) |
| 19. EVAP canister purge volume control solenoid valve | 20. Knock sensor (bank 2) | 21. Fuel injector (bank 2) |
| 22. Ignition coil (with power transistor) and spark plug (bank 2) | 23. A/F sensor 1 (bank 2) | 24. IPDM E/R |

ENGINE CONTROL SYSTEM

< SYSTEM DESCRIPTION >

[VK56DE]

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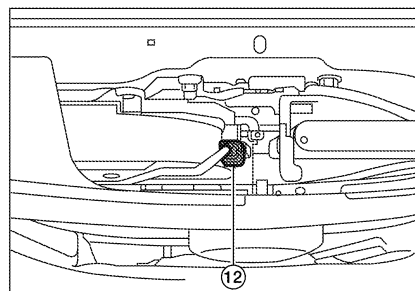
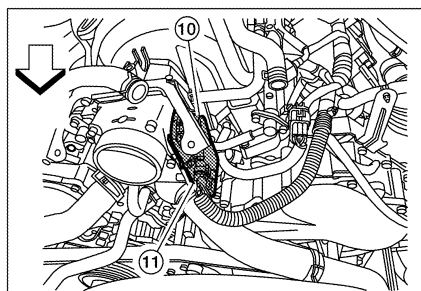
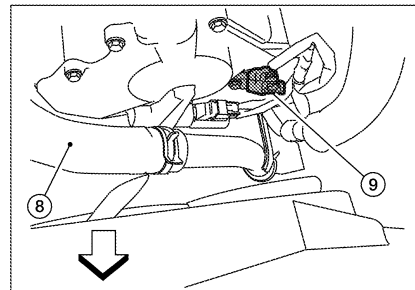
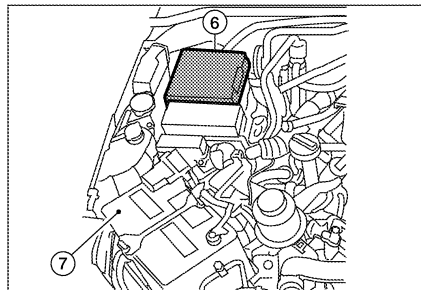
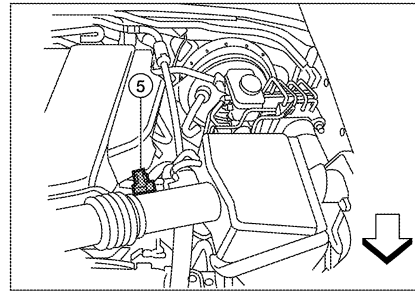
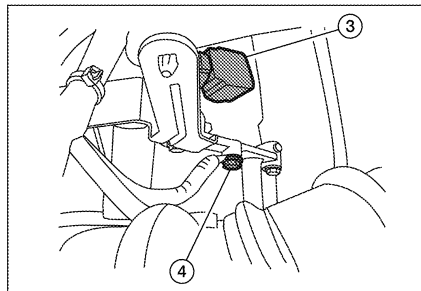
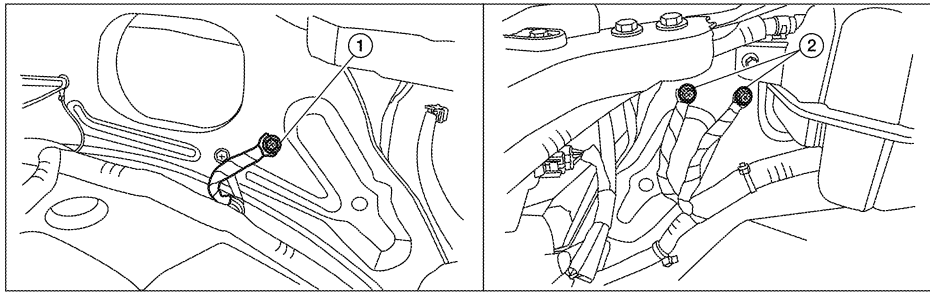
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| 1. Body ground (view with air cleaner case removed) | 2. Body ground (view with battery removed) | 3. No.1 ignition coil |
| 4. Engine ground | 5. Mass air flow sensor (with intake air temperature sensor) | 6. IPDM E/R |
| 7. Battery | 8. Radiator hose | 9. Camshaft position sensor (PHASE) |

ENGINE CONTROL SYSTEM

[VK56DE]

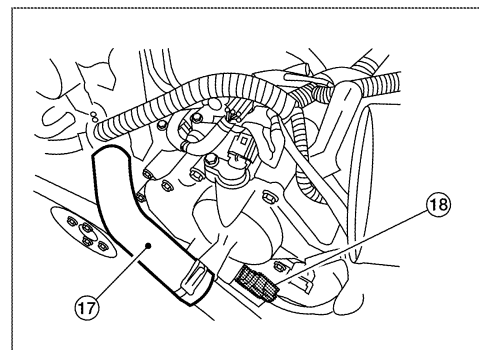
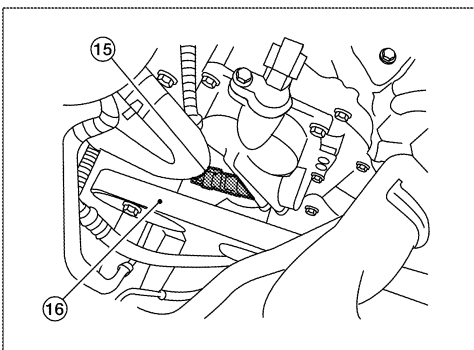
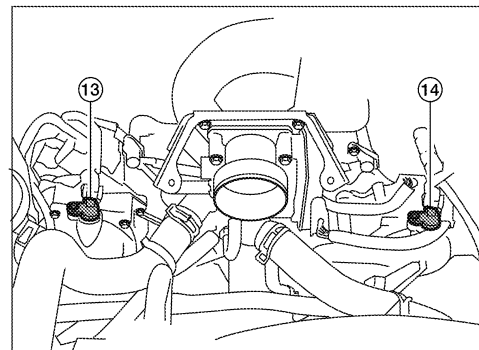
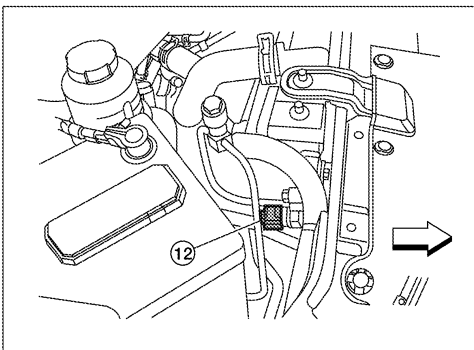
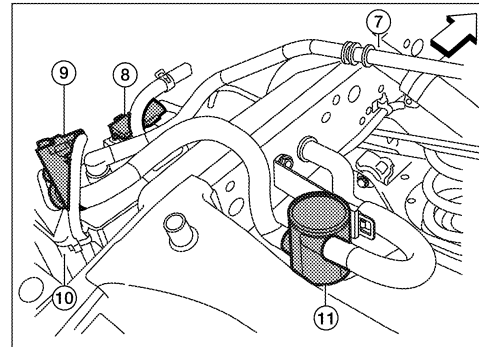
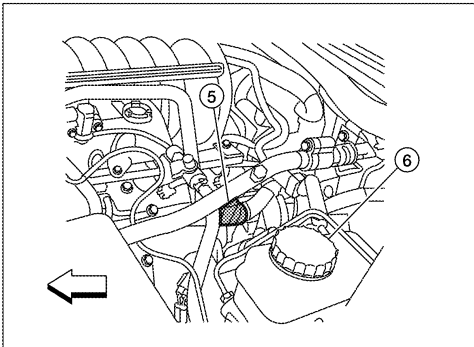
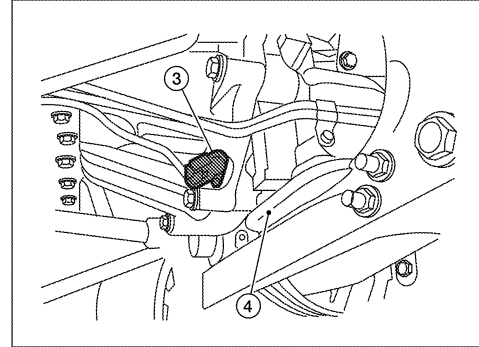
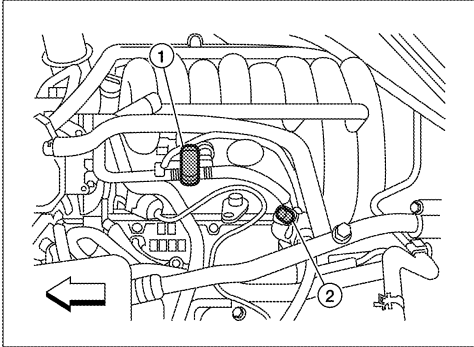
< SYSTEM DESCRIPTION >

10. Electric throttle control actuator
(view with intake air duct removed)

11. Electronic throttle control actuator
harness connector (view with intake
air duct removed)

12. Cooling fan motor harness connec-
tor

← : Vehicle front



AWBIA00822Z

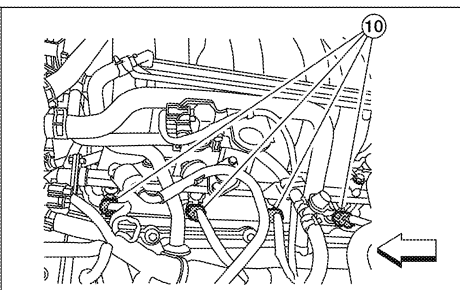
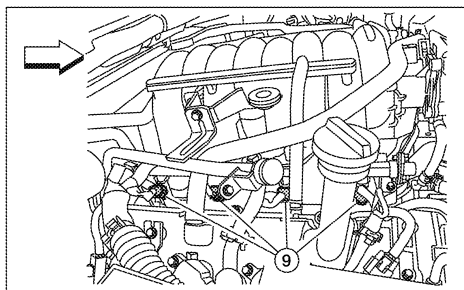
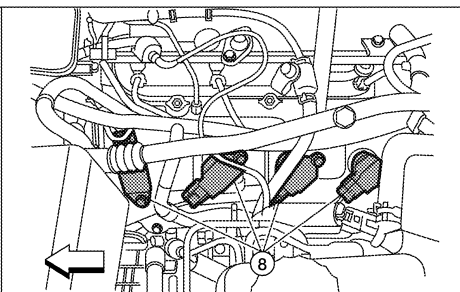
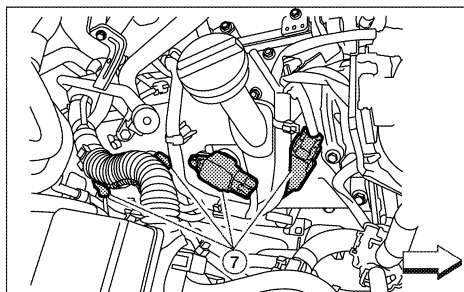
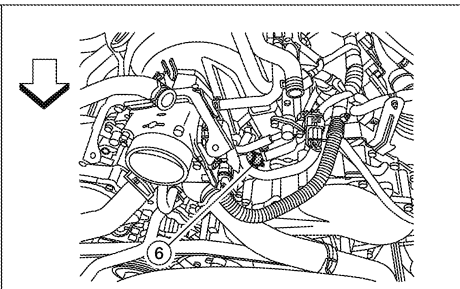
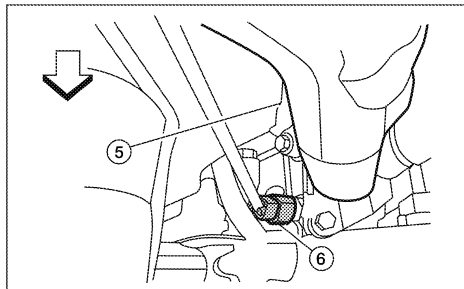
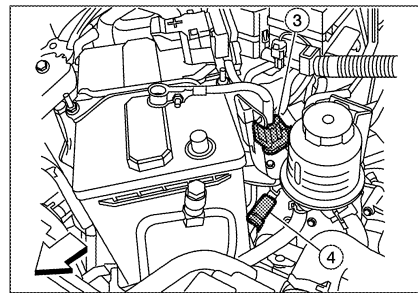
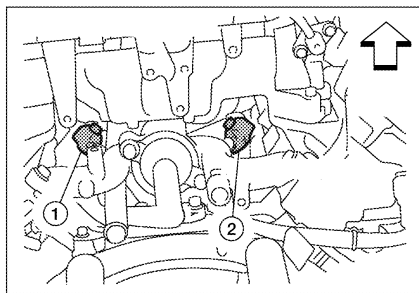
ENGINE CONTROL SYSTEM

[VK56DE]

< SYSTEM DESCRIPTION >

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|---|--|--|
| 1. EVAP canister purge volume control solenoid valve (view with engine cover removed) | 2. EVAP service port | 3. Crankshaft position sensor (POS) (view from under vehicle) |
| 4. Engine oil pan | 5. Condenser-1 | 6. Brake fluid reservoir |
| 7. Fuel filler pipe (top of frame view) | 8. EVAP control system pressure sensor | 9. EVAP canister vent control valve |
| 10. EVAP canister | 11. Drain filter | 12. Refrigerant pressure sensor |
| 13. Intake valve timing control position sensor (bank 2) (view with engine cover and intake air duct removed) | 14. Intake valve timing control position sensor (bank 1) | 15. Intake valve timing control solenoid valve (bank 2) (view with engine cover and intake air duct removed) |
| 16. Drive belt | 17. Radiator hose (view with engine cover and intake air duct removed) | 18. Intake valve timing control solenoid valve (bank 1) |

← : Vehicle front



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|---|---|--------------------------------------|
| 1. Knock sensor (bank 1) (view with engine removed) | 2. Knock sensor (bank 2) (view with engine removed) | 3. Battery current sensor |
| 4. Power steering pressure sensor | 5. Intake manifold | 6. Engine coolant temperature sensor |

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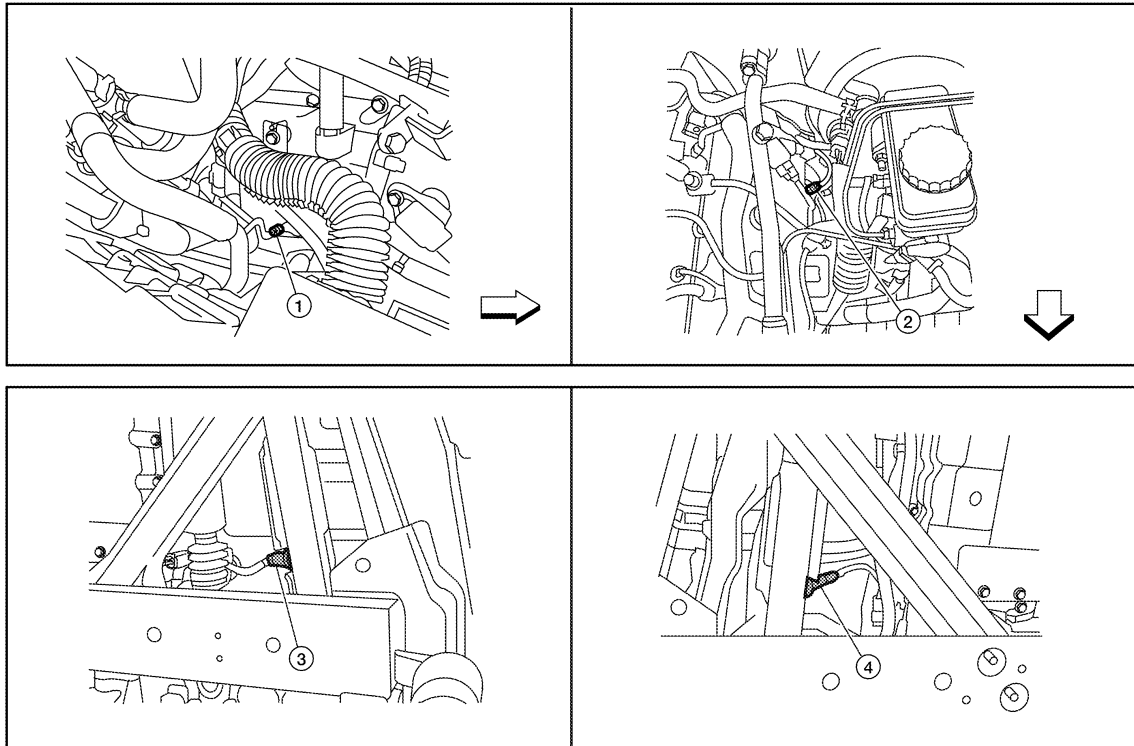
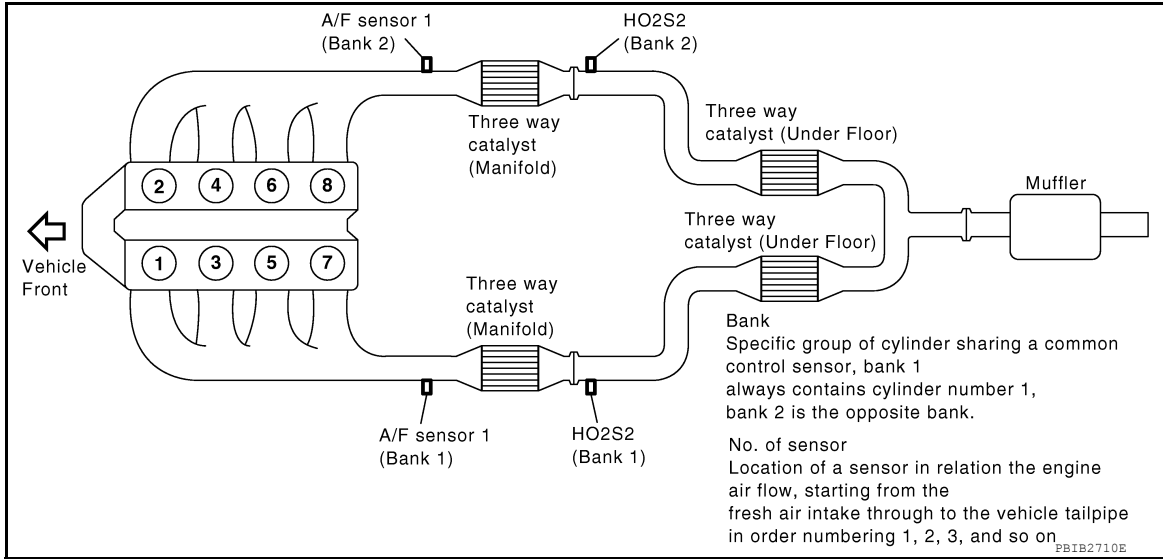
ENGINE CONTROL SYSTEM

[VK56DE]

< SYSTEM DESCRIPTION >

- 7. Ignition coil (with power transistor) (bank2)
- 8. Ignition coil (with power transistor) (bank 1)
- 9. Fuel injector harness connectors (bank 2)
- 10. Fuel injector harness connectors (bank 1)

← : Vehicle front



AWBIA00832Z

- 1. A/F sensor 1 (bank 2)
- 2. A/F sensor 1 (bank 1)
- 3. Heated oxygen sensor 2 (bank 1)
- 4. Heated oxygen sensor 2 (bank 2)

← : Vehicle front

ENGINE CONTROL SYSTEM

< SYSTEM DESCRIPTION >

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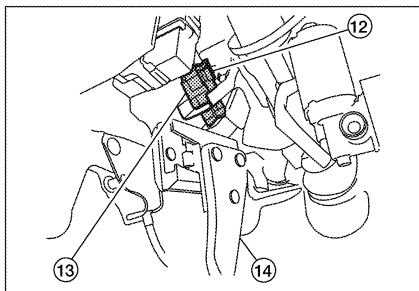
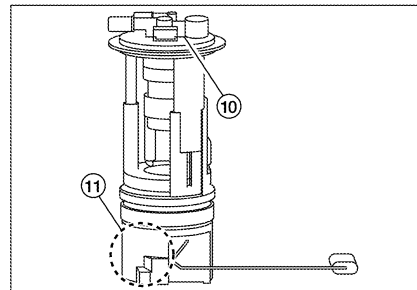
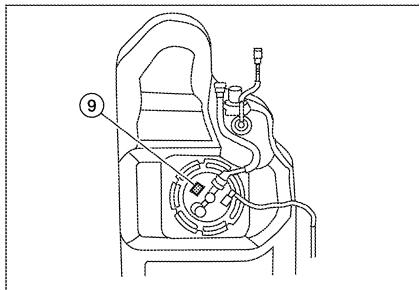
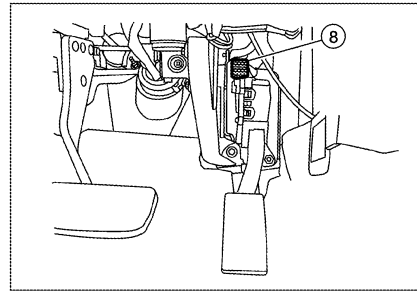
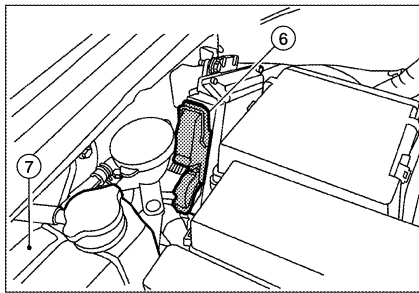
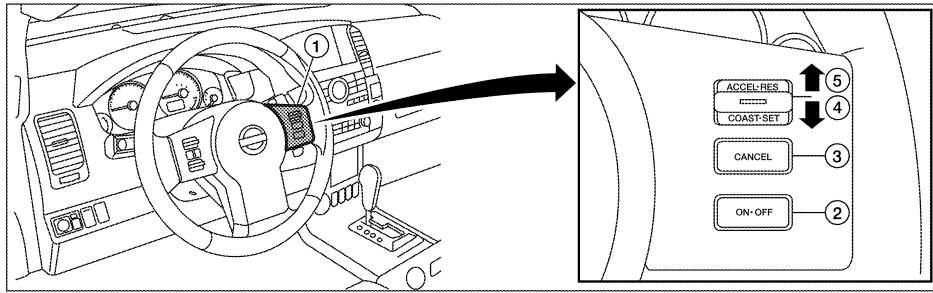
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|-------------------------|--------------------------------------|---|
| 1. ASCD steering switch | 2. MAIN switch | 3. CANCEL switch |
| 4. SET/COAST switch | 5. RESUME/ACCELERATE switch | 6. ECM harness connectors (view with ECM cover removed) |
| 7. Coolant reservoir | 8. Accelerator pedal position sensor | 9. Fuel level sensor unit and fuel pump harness connector (view with fuel tank removed) |

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ENGINE CONTROL SYSTEM

< SYSTEM DESCRIPTION >

[VK56DE]

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|---|-----------------------------|-----------------------|
| 10. Fuel pump, fuel level sensor unit and fuel filter | 11. Fuel pressure regulator | 12. ASCD brake switch |
| 13. Stop lamp switch | 14. Brake pedal | |

MULTIPOINT FUEL INJECTION SYSTEM

< SYSTEM DESCRIPTION >

[VK56DE]

MULTIPOINT FUEL INJECTION SYSTEM

System Description

INFOID:000000007358425

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*3	Fuel injection & mixture ratio control	Fuel injector
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Knock sensor	Engine knocking condition		
Battery	Battery voltage*3		
Power steering pressure sensor	Power steering operation		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		
ABS actuator and electric unit (control unit)	VDC/TCS operation command*2		
Air conditioner switch	Air conditioner operation*2		
Unified meter control unit	Gear position		
	Vehicle speed*2		

*1: This sensor is not used to control the engine system. This is used only for the on board diagnosis.

*2: This signal is sent to the ECM via the CAN communication line.

*3: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from the crankshaft position sensor, the camshaft position sensor and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever position is changed from N to D
- High-load, high-speed operation

<Fuel decrease>

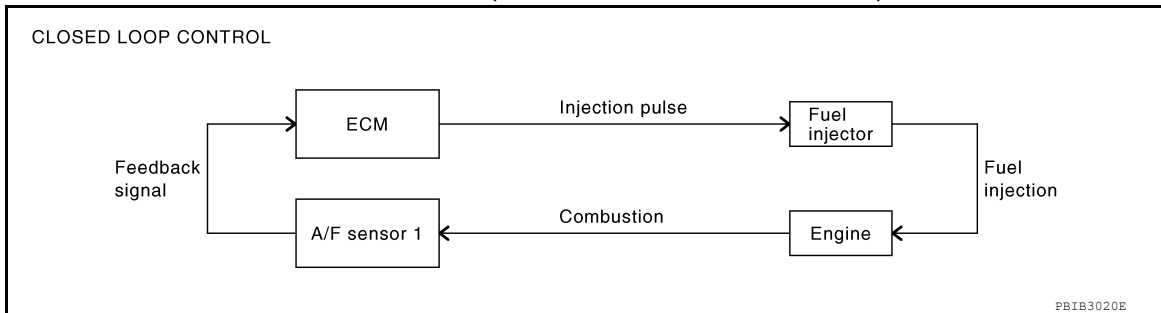
- During deceleration
- During high engine speed operation

MULTIPOINT FUEL INJECTION SYSTEM

[VK56DE]

< SYSTEM DESCRIPTION >

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses air fuel ratio (A/F) sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about A/F sensor 1, refer to [EC-676. "Component Description"](#). This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

This stage is referred to as the closed loop control condition.

Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of A/F sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

Open Loop Control

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of A/F sensor 1 or its circuit
- Insufficient activation of A/F sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from N to D
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from A/F sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.

Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.

"Fuel trim" refers to the feedback compensation value compared against the basic injection duration. "Fuel trim" includes "short-term fuel trim" and "long-term fuel trim".

"Short-term fuel trim" is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from A/F sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.

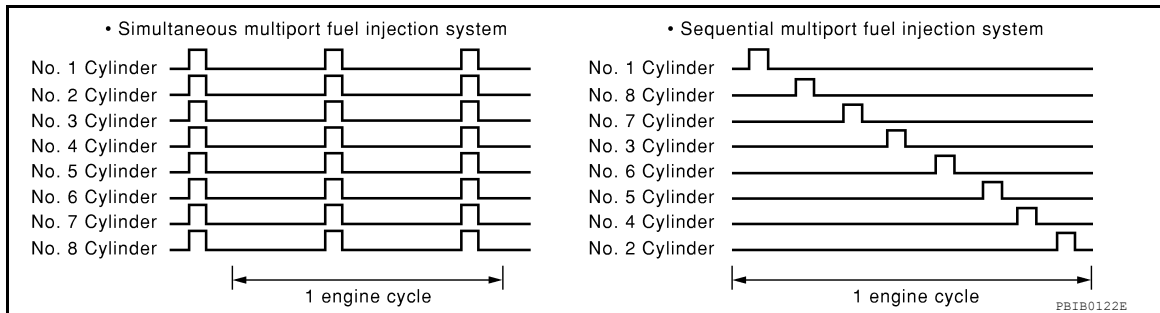
"Long-term fuel trim" is overall fuel compensation carried out overtime to compensate for continual deviation of the "short-term fuel trim" from the central value. Continual deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

MULTIPOINT FUEL INJECTION SYSTEM

[VK56DE]

< SYSTEM DESCRIPTION >

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the ignition order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all 8 cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.

The 8 fuel injectors will then receive the signals 2 times for each engine cycle.

This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration, operation of the engine at excessively high speeds or operation of the vehicle at excessively high speed.

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ELECTRIC IGNITION SYSTEM

[VK56DE]

< SYSTEM DESCRIPTION >

ELECTRIC IGNITION SYSTEM

System Description

INFOID:000000007358426

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*2	Ignition timing control	Power transistor
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Knock sensor	Engine knocking		
Battery	Battery voltage*2		
Unified meter control unit	Gear position		
	Vehicle speed*1		

*1: This signal is sent to the ECM via the CAN communication line.

*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

Ignition order: 1 - 8 - 7 - 3 - 6 - 5 - 4 - 2

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM.

The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.

During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

AIR CONDITIONING CUT CONTROL

< SYSTEM DESCRIPTION >

[VK56DE]

AIR CONDITIONING CUT CONTROL

Input/Output Signal Chart

INFOID:000000007358427

Sensor	Input signal to ECM	ECM function	Actuator
Air conditioner switch	Air conditioner ON signal* ¹	Air conditioner cut control	Air conditioner relay
Accelerator pedal position sensor	Accelerator pedal position		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed* ²		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage* ²		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering pressure sensor	Power steering operation		
Unified meter control unit	Vehicle speed* ¹		

*1: This signal is sent to the ECM via the CAN communication line.

*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

System Description

INFOID:000000007358428

This system improves engine operation when the air conditioner is used. Under the following conditions, the air conditioner is turned OFF.

- When the accelerator pedal is fully depressed
- When cranking the engine
- At high engine speeds
- When the engine coolant temperature becomes excessively high
- When operating power steering during low engine speed or low vehicle speed
- When engine speed is excessively low
- When refrigerant pressure is excessively low or high

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

< SYSTEM DESCRIPTION >

[VK56DE]

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

System Description

INFOID:000000007358429

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
ASCD brake switch	Brake pedal operation	ASCD vehicle speed control	Electric throttle control actuator
Stop lamp switch	Brake pedal operation		
ASCD steering switch	ASCD steering switch operation		
Unified meter control unit	Gear position		
	Vehicle speed*		
TCM	Powertrain revolution*		

*: This signal is sent to the ECM via the CAN communication line

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.

Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH).

ECM controls throttle angle of electric throttle control actuator to regulate engine speed.

Operation status of ASCD is indicated by CRUISE indicator and SET indicator on combination meter. If any malfunction occurs in ASCD system, CRUISE indicator blinks and ASCD control is deactivated.

NOTE:

Always drive vehicle in a safe manner according to traffic conditions and obey all traffic laws.

SET OPERATION

Press MAIN switch. (The CRUISE indicator on combination meter illuminates.)

When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH), press SET/COAST switch. (Then SET indicator on combination meter illuminates.)

ACCELERATE OPERATION

If the RESUME/ACCELERATE switch is pressed during cruise control driving, increase the vehicle speed until the switch is released or vehicle speed reaches maximum speed controlled by the system.

And then ASCD will maintain the new set speed.

CANCEL OPERATION

When any of following conditions exist, cruise operation will be canceled.

- CANCEL switch is pressed
- More than 2 switches at ASCD steering switch are pressed at the same time (Set speed will be cleared)
- Brake pedal is depressed
- Selector lever position is changed to N, P, R position
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed
- VDC system is operated

When the ECM detects any of the following conditions, the ECM will cancel the cruise operation and inform the driver by blinking CRUISE indicator.

- Engine coolant temperature is slightly higher than the normal operating temperature, CRUISE indicator may blink slowly.

When the engine coolant temperature decreases to the normal operating temperature, CRUISE indicator will stop blinking and the cruise operation will be able to work by pressing SET/COAST switch or RESUME/ACCELERATE switch.

- Malfunction for some self-diagnoses regarding ASCD control: SET indicator will blink quickly.

If MAIN switch is turned to OFF while ASCD is activated, all of ASCD operations will be canceled and vehicle speed memory will be erased.

COAST OPERATION

When the SET/COAST switch is pressed during cruise control driving, decrease vehicle set speed until the switch is released. And then ASCD will maintain the new set speed.

RESUME OPERATION

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

[VK56DE]

< SYSTEM DESCRIPTION >

When the RESUME/ACCELERATE switch is pressed after canceling operation other than pressing MAIN switch, vehicle speed will return to last set speed. To resume vehicle set speed, vehicle condition must meet following conditions.

- Brake pedal is released
- A/T selector lever position is other than P and N
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 144 km/h (89 MPH)

Component Description

INFOID:000000007358430

ASCD STEERING SWITCH

Refer to [EC-873, "Component Description"](#).

ASCD BRAKE SWITCH

Refer to [EC-877, "Component Description"](#).

STOP LAMP SWITCH

Refer to [EC-882, "Description"](#).

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to [EC-888, "Description"](#).

ASCD INDICATOR

Refer to [EC-920, "Component Description"](#).

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CAN COMMUNICATION

System Description

INFOID:000000007358431

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

Refer to [LAN-53, "CAN Communication Signal Chart"](#), about CAN communication for detail.

COOLING FAN CONTROL

< SYSTEM DESCRIPTION >

[VK56DE]

COOLING FAN CONTROL

Description

INFOID:000000007358432

SYSTEM DESCRIPTION

Cooling Fan Control

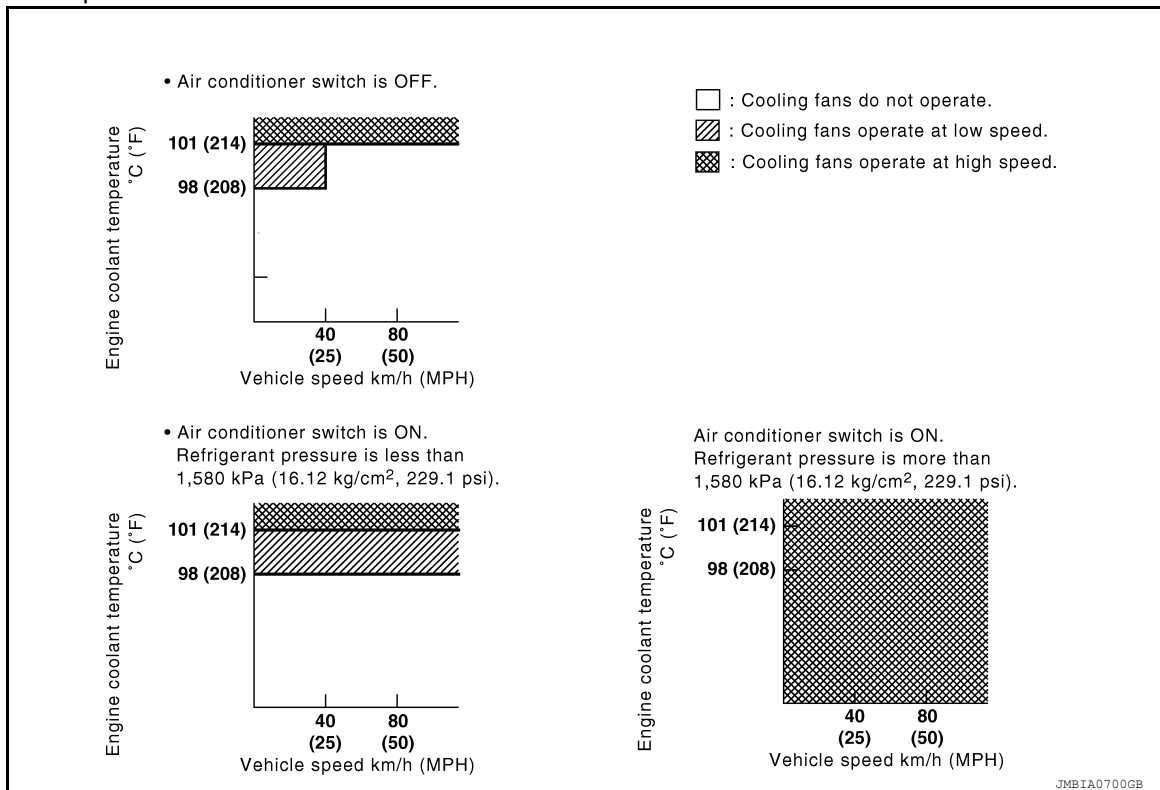
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	Cooling fan control	IPDM E/R (Cooling fan relays)
Battery	Battery voltage*1		
Unified meter control unit	Vehicle speed*2		
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner ON signal*2		
Refrigerant pressure sensor	Refrigerant pressure		

*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to ECM via the CAN communication line.

The ECM controls the cooling fan speed corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure and air conditioner ON signal. The control system has a 3-step control [HIGH/LOW/OFF].

Cooling Fan Operation



Cooling Fan Relay Operation

The ECM controls cooling fan relays in the IPDM E/R via the CAN communication line.

Cooling fan speed	Cooling fan relay	
	LO	HI
Stop (OFF)	OFF	OFF
Low (LOW)	ON	OFF
High (HI)	ON	ON

EVAPORATIVE EMISSION SYSTEM

< SYSTEM DESCRIPTION >

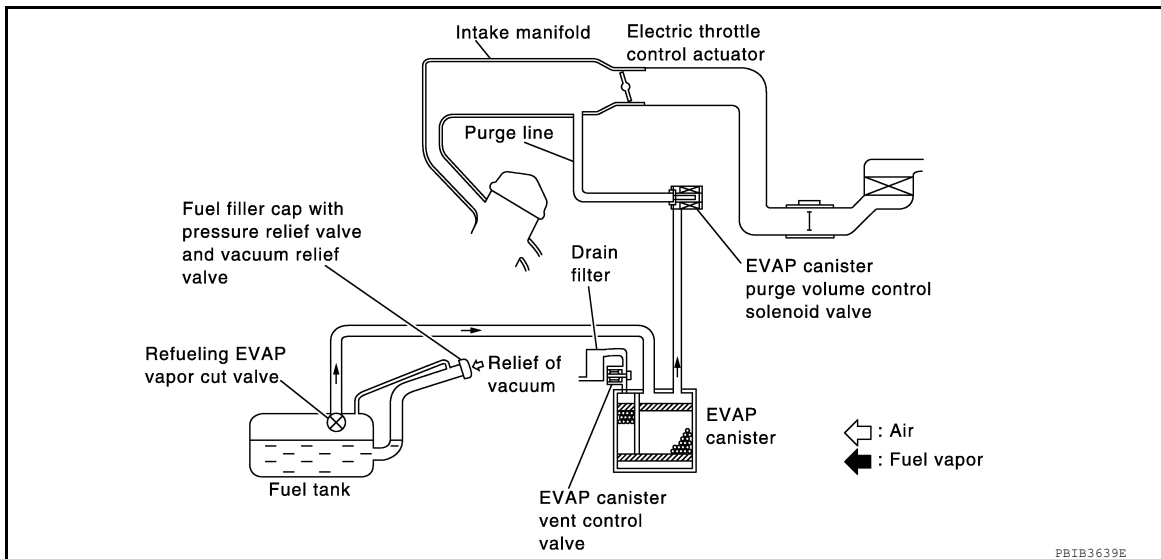
[VK56DE]

EVAPORATIVE EMISSION SYSTEM

Description

INFOID:000000007358433

SYSTEM DESCRIPTION



The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.

The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.

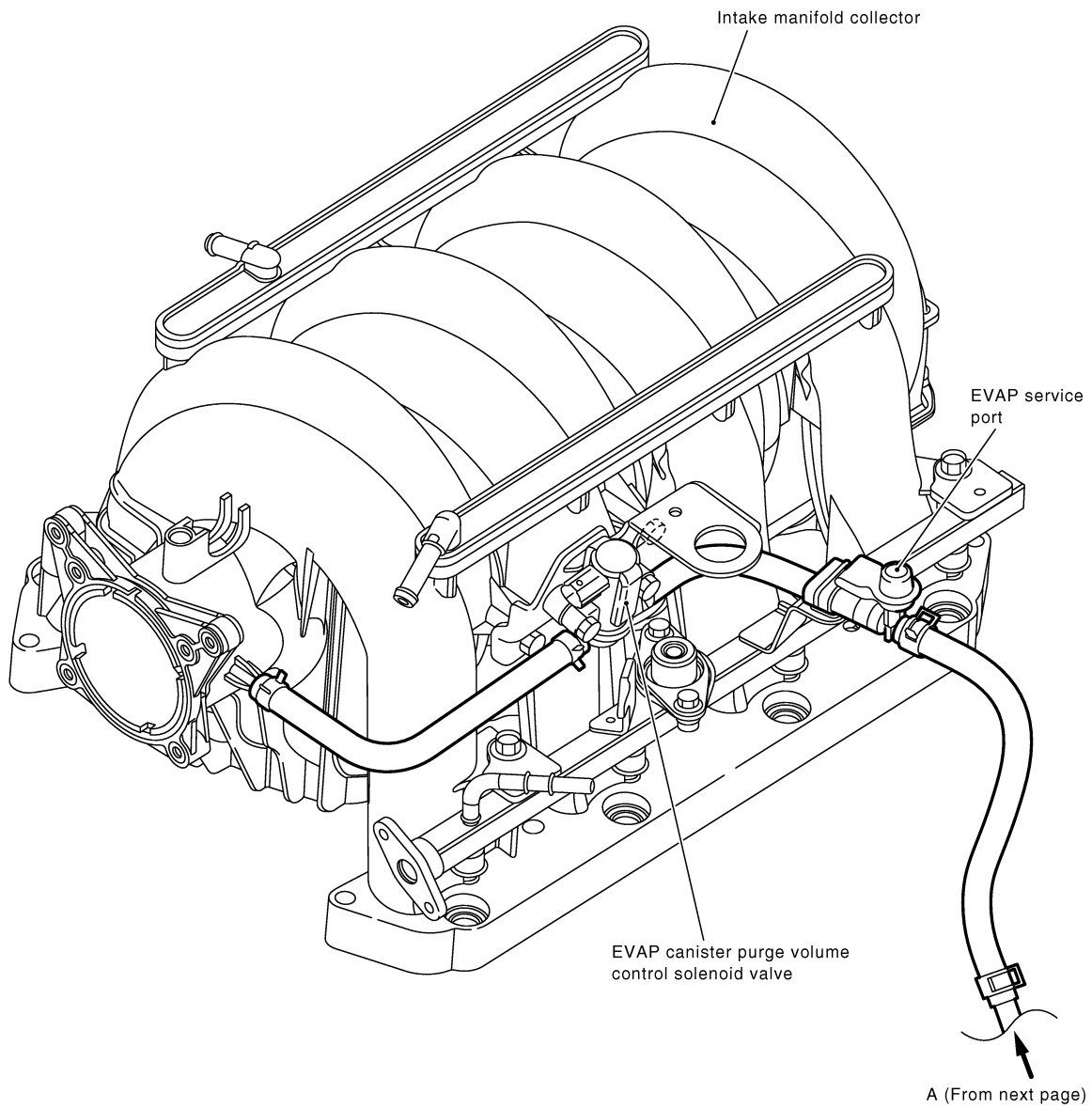
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

EVAPORATIVE EMISSION SYSTEM

< SYSTEM DESCRIPTION >

[VK56DE]

EVAPORATIVE EMISSION LINE DRAWING



NOTE:
Do not use soapy water or any type of solvent while installing vacuum hoses or purge hoses.

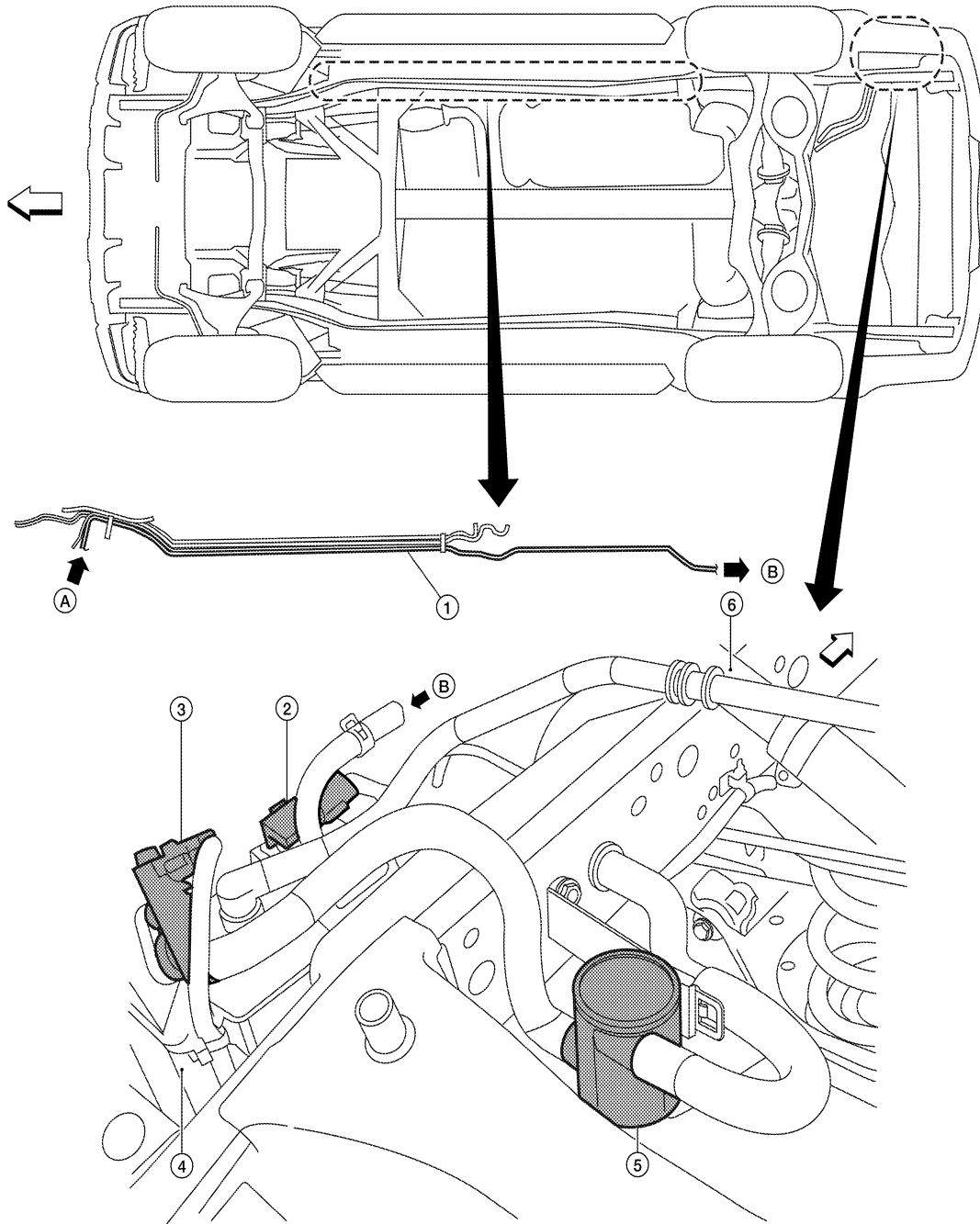
PBIB2053E

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EVAPORATIVE EMISSION SYSTEM

< SYSTEM DESCRIPTION >

[VK56DE]



ALBIA0366ZZ

- | | | |
|--------------------------|--|-------------------------------------|
| 1. EVAP vapor purge line | 2. EVAP control system pressure sensor | 3. EVAP canister vent control valve |
| 4. EVAP canister | 5. Drain filter | 6. Fuel filler pipe |

⇨ : Vehicle front

⇦ : Previous figure

INTAKE VALVE TIMING CONTROL

< SYSTEM DESCRIPTION >

[VK56DE]

INTAKE VALVE TIMING CONTROL

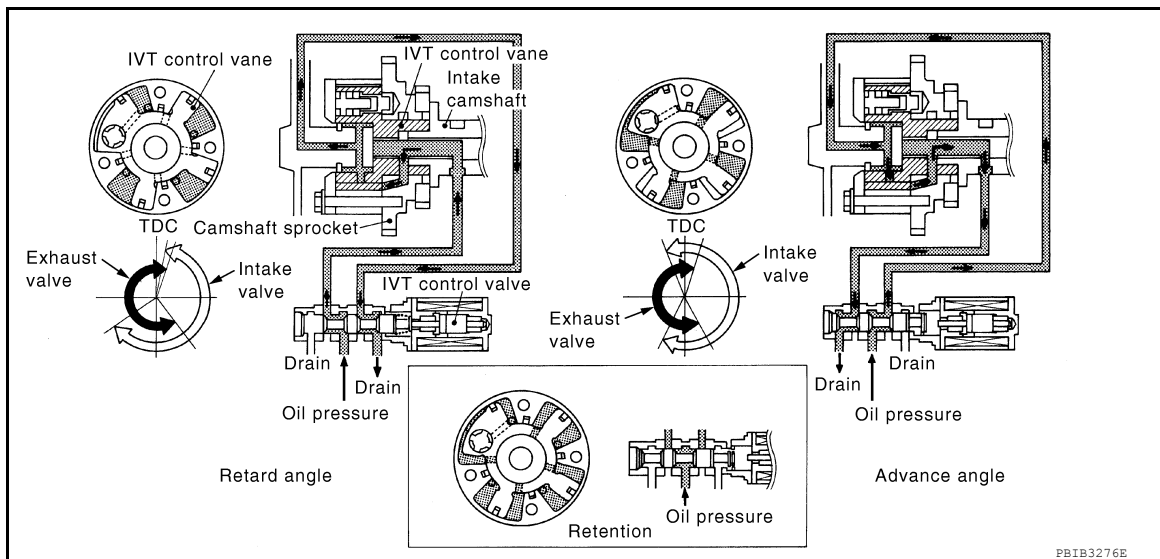
Description

INFOID:000000007358434

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Intake valve timing control position sensor	Intake valve timing signal		
Engine coolant temperature sensor	Engine coolant temperature		
Unified meter control unit	Vehicle speed*		

*: This signal is sent to the ECM via the CAN communication line



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing (IVT) control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

FUEL FILLER CAP WARNING SYSTEM

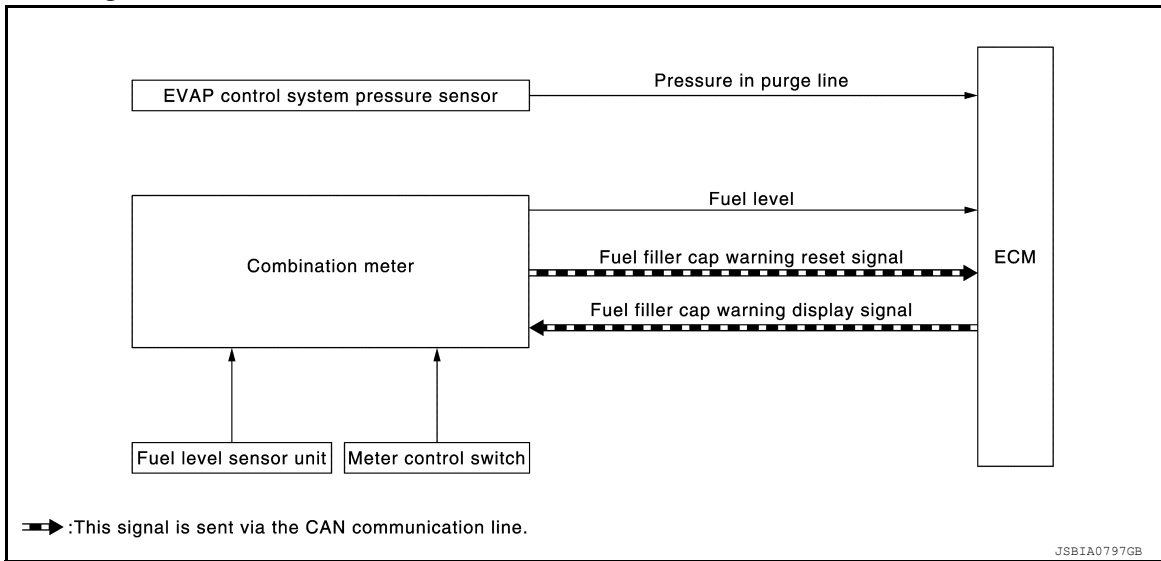
< SYSTEM DESCRIPTION >

[VK56DE]

FUEL FILLER CAP WARNING SYSTEM

System Diagram

INFOID:000000007358435



System Description

INFOID:000000007358436

INPUT/OUTPUT SIGNAL CHART

Input

Unit/Sensor	Input signal to ECM	ECM function
EVAP control system pressure sensor	Pressure in purge line	Fuel filler cap warning control
Combination meter	Fuel level	
	Fuel filler cap warning reset signal*	

*: This signal is sent to the ECM via the CAN communication line.

Output

Unit	Output signal	Actuator
ECM	Fuel filler cap warning display signal*	Combination meter

*: This signal is sent to the combination meter via the CAN communication line.

SYSTEM DESCRIPTION

The fuel filler cap warning system alerts the driver to the prevention of the fuel filler being left uncapped and malfunction occurrences after refueling, by turning ON the fuel filler cap warning display on the combination meter.

ECM judges a refueled state, based on a fuel level signal transmitted from the combination meter.

When a very small leak is detected through the EVAP leak diagnosis performed after judging the refueled state, ECM transmits a fuel filler cap warning display signal (request for display ON) to the combination meter via CAN communication.

When receiving the signal, the combination meter turns ON the fuel filler cap warning display.

CAUTION:

Check fuel filler cap installation condition when the fuel filler cap warning display turns ON.

Reset Operation

The fuel filler cap warning lamp turns OFF, according to any condition listed below:

- Reset operation is performed by operating the meter control switch on the combination meter.
- When the reset operation is performed, the combination meter transmits a fuel filler cap warning reset signal to ECM via CAN communication. ECM transmits a fuel filler cap warning display signal (request for display OFF) to the combination meter via CAN communication. When receiving the signal, the combination meter turns OFF the fuel filler cap warning display.
- EVAP leak diagnosis result is normal.
- Fuel refilled.

FUEL FILLER CAP WARNING SYSTEM

[VK56DE]

< SYSTEM DESCRIPTION >

- DTC erased by using CONSULT.

NOTE:

MIL turns ON if a malfunction is detected in leak diagnosis results again at the trip after the fuel filler cap warning display turns ON/OFF.

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ON BOARD DIAGNOSTIC (OBD) SYSTEM

< SYSTEM DESCRIPTION >

[VK56DE]

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:000000007358437

This system is an on board diagnostic system that records exhaust emission-related diagnostic information and detects a sensors/actuator-related malfunction. A malfunction is indicated by the malfunction indicator lamp (MIL) and stored in ECU memory as a DTC. The diagnostic information can be obtained with the diagnostic tool (GST: Generic Scan Tool).

GST (Generic Scan Tool)

INFOID:000000007358438

When GST is connected with a data link connector equipped on the vehicle side, it will communicate with the control unit equipped in the vehicle and then enable various kinds of diagnostic tests. Refer to [EC-522. "Diagnosis Description"](#).

NOTE:

Service \$0A is not applied for regions where it is not mandated.

DIAGNOSIS SYSTEM (ECM)

DIAGNOSIS DESCRIPTION

DIAGNOSIS DESCRIPTION : 1st Trip Detection Logic and Two Trip Detection Logic

INFOID:000000007799369

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not illuminate at this stage. <1st trip>

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL illuminates. The MIL illuminates at the same time when the DTC is stored. <2nd trip> The "trip" in the "Two Trip Detection Logic" means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to illuminate or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

Items	MIL				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Illuminate	Blinking	Illuminate				
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0308 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0308 is being detected	—	—	×	—	—	×	—	—
One trip detection diagnoses (Refer to EC-555, "DTC Index" .)	—	×	—	—	×	—	—	—
Except above	—	—	—	×	—	×	×	—

DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data

INFOID:000000007799370

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not recur, the 1st trip DTC will not be displayed.

If a malfunction is detected during the 1st trip, the 1st trip DTC is saved in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are saved in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.

For malfunctions in which 1st trip DTCs are displayed, refer to [EC-555, "DTC Index"](#). These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT.

1st trip DTC is specified in Service \$07 of SAE J1979/ISO 15031-5. 1st trip DTC detection occurs without illuminating the MIL and therefore does not warn the driver of a malfunction.

When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in Work Flow procedure Step 2, refer to [EC-587, "Trouble Diagnosis Introduction"](#). Then perform DTC Confirmation Procedure or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, absolute throttle position, base fuel schedule and intake air temperature at the moment a malfunction is detected.

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT or GST. The 1st trip freeze frame data can only be displayed on the CONSULT screen.

DIAGNOSIS SYSTEM (ECM)

[VK56DE]

< SYSTEM DESCRIPTION >

Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0308 Fuel Injection System Function — DTC: P0171, P0172, P0174, P0175
2		Except the above items
3	1st trip freeze frame data	

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was saved in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased.

DIAGNOSIS DESCRIPTION : Counter System

INFOID:000000007799371

RELATIONSHIP BETWEEN MIL, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on.
- The MIL will turn OFF after the vehicle is driven 3 times (driving pattern B) with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The "TIME" in "SELF-DIAGNOSTIC RESULTS" mode of CONSULT will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in OK for the 2nd trip.

COUNTER SYSTEM CHART

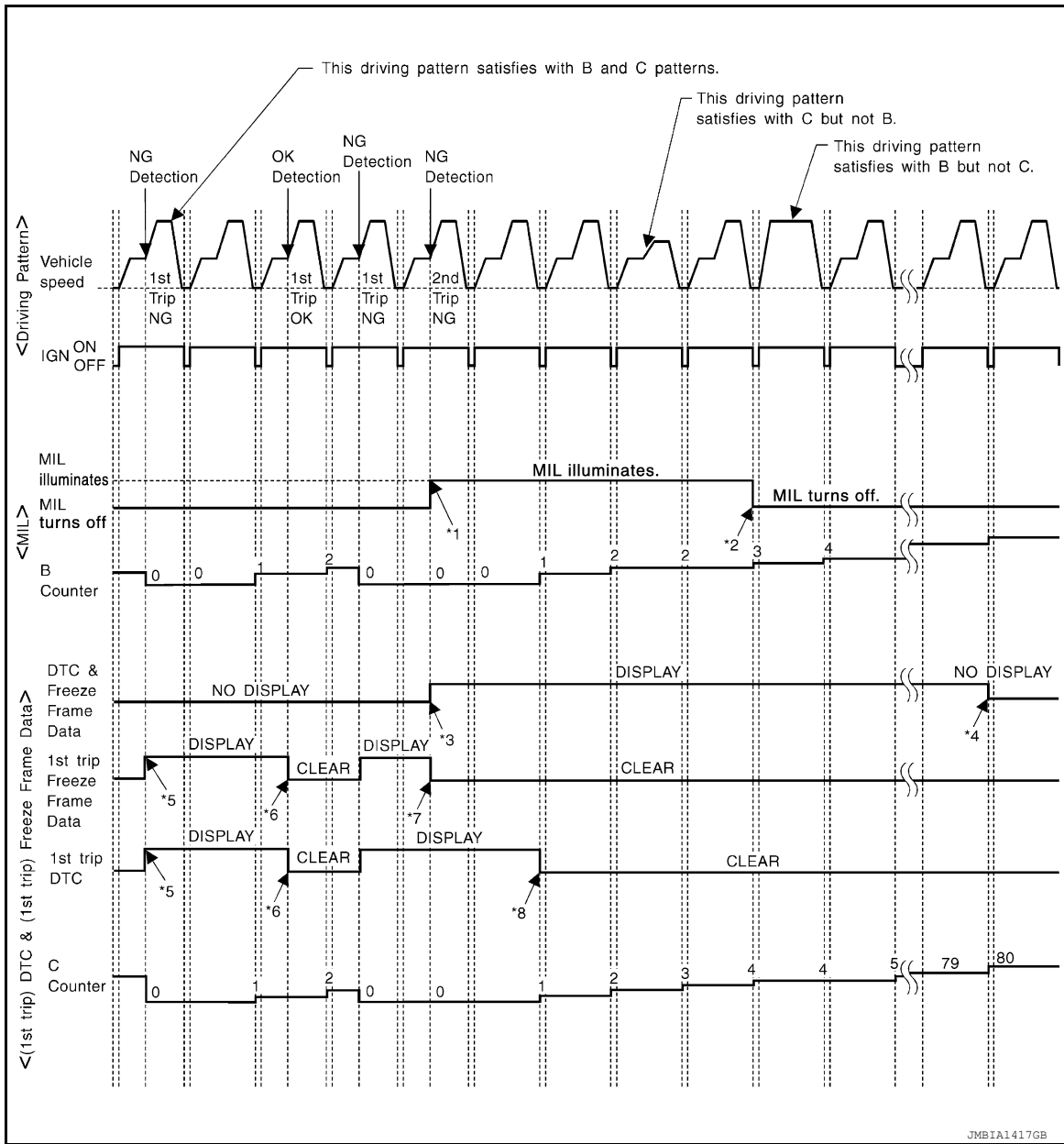
Items	Fuel Injection System	Misfire	Other
MIL (turns OFF)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2	1 (pattern B)

For details about patterns B and C under "Fuel Injection System" and "Misfire", see "EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM".

For details about patterns A and B under Other, see "EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM".

- *1: Clear timing is at the moment OK is detected.
- *2: Clear timing is when the same malfunction is detected in the 2nd trip.

Relationship Between MIL, DTC, 1st Trip DTC and Driving Patterns for "Misfire <Exhaust Quality Deterioration>", "Fuel Injection System"



*1: When the same malfunction is detected in two consecutive trips, MIL will light up.

*2: MIL will turn OFF after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

Explanation for Driving Patterns for "Misfire <Exhaust Quality Deterioration>", "Fuel Injection System"

Driving Pattern B

Refer to [EC-527. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

DIAGNOSIS SYSTEM (ECM)

[VK56DE]

< SYSTEM DESCRIPTION >

Driving Pattern C

Refer to [EC-527. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

Example:

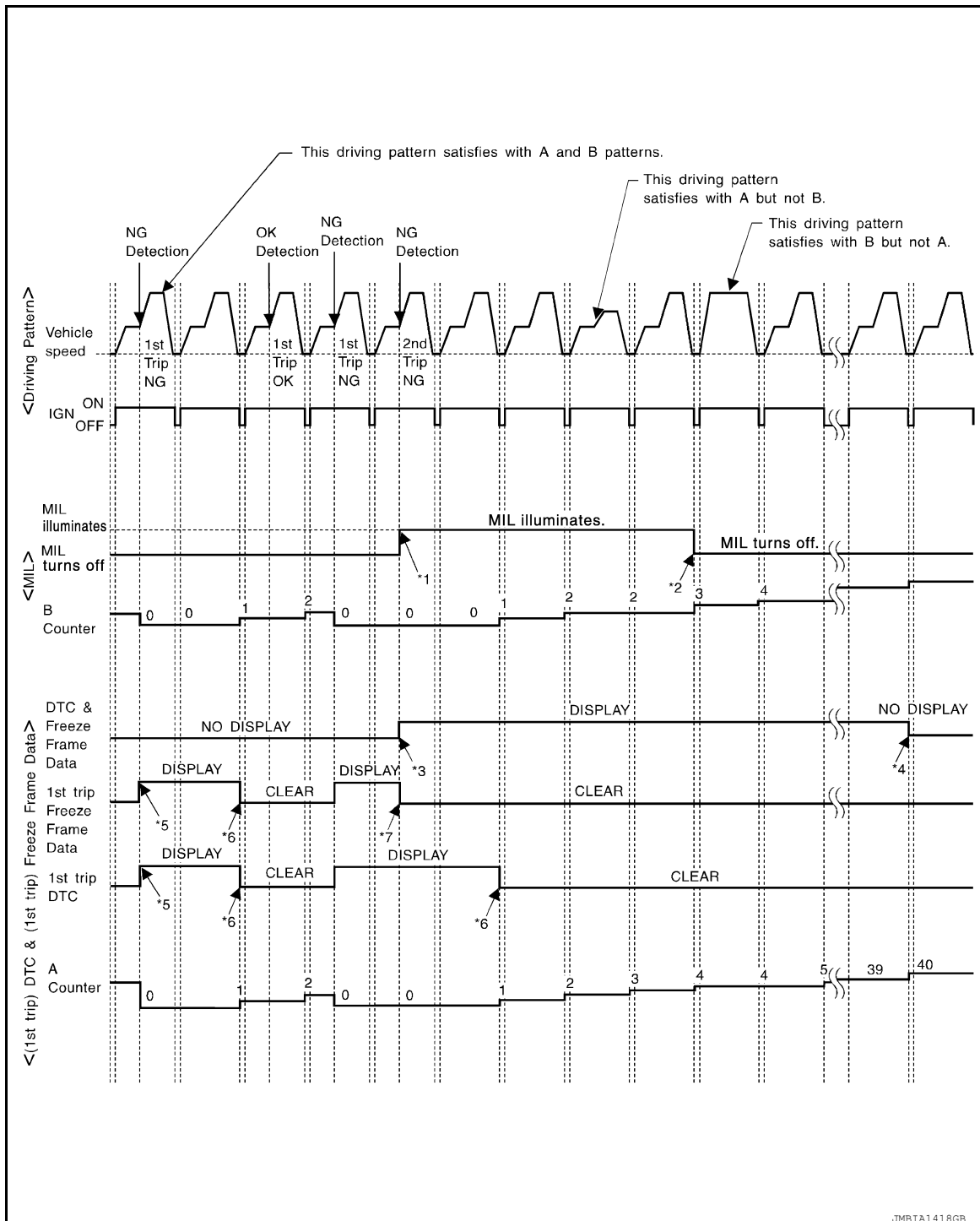
If the stored freeze frame data is as per the following:

Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)

To be satisfied with driving pattern C, the vehicle should run under the following conditions:

Engine speed: 475 – 1,225 rpm, Calculated load value: 27 – 33%, Engine coolant temperature: more than 70°C (158°F)

Relationship Between MIL, DTC, 1st Trip DTC and Driving Patterns Except For “Misfire <Exhaust Quality Deterioration>”, “Fuel Injection System”



- | | | | |
|---|--|---|----|
| <p>*1: When the same malfunction is detected in two consecutive trips, MIL will light up.</p> | <p>*2: MIL will turn OFF after vehicle is driven 3 times (pattern B) without any malfunctions.</p> | <p>*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.</p> | A |
| <p>*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)</p> | <p>*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.</p> | <p>*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.</p> | EC |
| <p>*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.</p> | | | C |

Explanation for Driving Patterns Except for “Misfire <Exhaust Quality Deterioration>”, “Fuel Injection System”

Driving Pattern A

Refer to [EC-527, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

Driving Pattern B

Refer to [EC-527, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

DIAGNOSIS DESCRIPTION : Driving Pattern

INFOID:000000007799372

CAUTION:

Always drive at a safe speed.

DRIVING PATTERN A

Driving pattern A means a trip satisfying the following conditions.

- Engine speed reaches 400 rpm or more.
- Engine coolant temperature rises by 20°C (36°F) or more after starting the engine.
- Engine coolant temperature reaches 70°C (158°F) or more.
- The ignition switch is turned from ON to OFF.

NOTE:

- When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern A.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern A.

DRIVING PATTERN B

Driving pattern B means a trip satisfying the following conditions.

- Engine speed reaches 400 rpm or more.
- Engine coolant temperature reaches 70°C (158°F) or more.
- Vehicle speed of 70 – 120 km/h (44 – 75 MPH) is maintained for 60 seconds or more under the control of closed loop.
- Vehicle speed of 30 – 60 km/h (19 – 37 MPH) is maintained for 10 seconds or more under the control of closed loop.
- Under the closed loop control condition, the following state reaches 12 seconds or more in total: Vehicle speed of 4 km/h (2 MPH) or less with idling condition.
- The state of driving at 10 km/h (7 MPH) or more reaches 10 minutes or more in total.
- A lapse of 22 minutes or more after engine start.

NOTE:

- Drive the vehicle at a constant velocity.
- When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern B.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern B.

DRIVING PATTERN C

Driving pattern C means operating vehicle as per the following:

The following conditions should be satisfied at the same time:
 Engine speed: (Engine speed in the freeze frame data) ±375 rpm

DIAGNOSIS SYSTEM (ECM)

[VK56DE]

< SYSTEM DESCRIPTION >

Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]

Engine coolant temperature condition:

- When the freeze frame data shows lower than 70°C (158°F), engine coolant temperature should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), engine coolant temperature should be higher than or equal to 70°C (158°F).

NOTE:

- When the same malfunction is detected regardless of the above vehicle conditions, reset the counter of driving pattern C.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern C.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

DRIVING PATTERN D

Driving pattern D means a trip satisfying the following conditions.

- The state of driving at 40 km/h (25 MPH) reaches 300 seconds or more in total.
- Idle speed lasts 30 seconds or more.
- A lapse of 600 seconds or more after engine start.

NOTE:

- When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern D.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern D.

DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code

INFOID:000000007799373

System Readiness Test (SRT) code is specified in Service \$01 of SAE J1979/ISO 15031-5.

As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.

If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating "INCMP", use the information in this Service Manual to set the SRT to "CMPLT".

In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate "CMPLT" for each application system. Once set as "CMPLT", the SRT status remains "CMPLT" until the self-diagnosis memory is erased.

Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate "INCMP" for these items.

NOTE:

The SRT will also indicate "INCMP" if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.

If, during the state emissions inspection, the SRT indicates "CMPLT" for all test items, the inspector will continue with the emissions test. However, if the SRT indicates "INCMP" for one or more of the SRT items the vehicle is returned to the customer untested.

NOTE:

If permanent DTC is stored or MIL illuminates during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates "CMPLT" for all test items. Therefore, it is important to check SRT ("CMPLT"), DTC (No DTCs) and permanent DTC (NO permanent DTCs) before the inspection.

SRT SET TIMING

SRT is set as "CMPLT" after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VK56DE]

Self-diagnosis result		Example							
		Diagnosis	Ignition cycle						
			← ON →	OFF	← ON →	OFF	← ON →	OFF	← ON →
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)			
		P0402	OK (1)	— (1)	— (1)	OK (2)			
		P1402	OK (1)	OK (2)	— (2)	— (2)			
		SRT of EGR	“CMPLT”	“CMPLT”	“CMPLT”	“CMPLT”			
	Case 2	P0400	OK (1)	— (1)	— (1)	— (1)			
		P0402	— (0)	— (0)	OK (1)	— (1)			
		P1402	OK (1)	OK (2)	— (2)	— (2)			
		SRT of EGR	“INCMP”	“INCMP”	“CMPLT”	“CMPLT”			
NG exists	Case 3	P0400	OK	OK	—	—			
		P0402	—	—	—	—			
		P1402	NG	—	NG	NG (Consecutive NG)			
		(1st trip) DTC	1st trip DTC	—	1st trip DTC	DTC (= MIL ON)			
		SRT of EGR	“INCMP”	“INCMP”	“INCMP”	“CMPLT”			

OK: Self-diagnosis is carried out and the result is OK.

NG: Self-diagnosis is carried out and the result is NG.

—: Self-diagnosis is not carried out.

When all SRT related self-diagnoses show OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate “CMPLT”. → Case 1 above

When all SRT related self-diagnoses show OK results through several different cycles, the SRT will indicate “CMPLT” at the time the respective self-diagnoses have at least one OK result. → Case 2 above

If one or more SRT related self-diagnoses show NG results in 2 consecutive cycles, the SRT will also indicate “CMPLT”. → Case 3 above

The table above shows that the minimum number of cycles for setting SRT as “INCMP” is the number one (1) for each self-diagnosis (Case 1 & 2) or the number two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate “CMPLT” at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires “CMPLT” of the SRT only with OK self-diagnosis results.
- During SRT driving pattern, the 1st trip DTC (NG) is detected prior to “CMPLT” of SRT and the self-diagnosis memory must be erased from the ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate “INCMP”.

NOTE:

SRT can be set as “CMPLT” together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates “CMPLT”.

DIAGNOSIS DESCRIPTION : Permanent Diagnostic Trouble Code (Permanent DTC)

INFOID:000000007799374

Permanent DTC is defined in SAE J1979/ISO 15031-5 Service \$0A.

ECM stores a DTC issuing a command of turning on MIL as a permanent DTC and keeps storing the DTC as a permanent DTC until ECM judges that there is no presence of malfunction.

Permanent DTCs cannot be erased by using the erase function of CONSULT or Generic Scan Tool (GST) and by disconnecting the battery to shut off power to ECM. This prevents a vehicle from passing the in-use inspection without repairing a malfunctioning part.

When not passing the in-use inspection due to more than one permanent DTC, permanent DTCs should be erased, referring to this manual.

NOTE:

- The important items in in-use inspection are that MIL is not ON, SRT test items are set, and permanent DTCs are not included.
- Permanent DTCs do not apply for regions that permanent DTCs are not regulated by law.

< SYSTEM DESCRIPTION >

PERMANENT DTC SET TIMING

The setting timing of permanent DTC is stored in ECM with the lighting of MIL when a DTC is confirmed.

DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)

INFOID:000000007799375

When emission related ECU detects a malfunction in the emission control systems components and/or the powertrain control components (which affect vehicle emissions), it turns on/blinks MIL to inform the driver that a malfunction has been detected.

1. The MIL illuminates when ignition switch is turned ON (engine is not running).

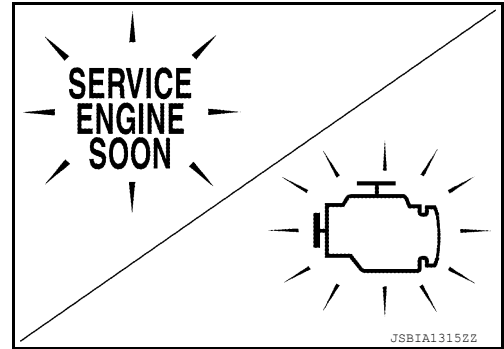
NOTE:

Check the MIL circuit if MIL does not illuminate. Refer to [EC-936, "Component Function Check"](#).

2. When the engine is started, the MIL should go off.

NOTE:

If MIL continues to illuminate/blink, perform self-diagnoses and inspect/repair accordingly because an emission related ECU has detected a malfunction in the emission control systems components and/or the powertrain control components (which affect vehicle emissions).



On Board Diagnosis Function

INFOID:000000007799376

ON BOARD DIAGNOSIS ITEM

The on board diagnostic system has the following functions.

Diagnostic test mode	Function
Bulb check	MIL can be checked.
SRT status	ECM can read if SRT codes are set.
Malfunction warning	If ECM detects a malfunction, it illuminates or blinks MIL to inform the driver that a malfunction has been detected.
Self-diagnostic results	DTCs or 1st trip DTCs stored in ECM can be read.
Accelerator pedal released position learning	ECM can learn the accelerator pedal released position. Refer to EC-597, "Accelerator Pedal Released Position Learning" .
Throttle valve closed position learning	ECM can learn the throttle valve closed position. Refer to EC-597, "Throttle Valve Closed Position Learning" .
Idle air volume learning	ECM can learn the idle air volume. Refer to EC-597, "Idle Air Volume Learning" .

BLUB CHECK MODE

Description

This function allows damage inspection in the MIL bulb (blown, open circuit, etc.).

Operation Procedure

1. Turn ignition switch ON.
2. The MIL on the instrument panel should stay ON.
If it remains OFF, check MIL circuit. Refer to [EC-936, "Diagnosis Procedure"](#).

SRT STATUS MODE

Description

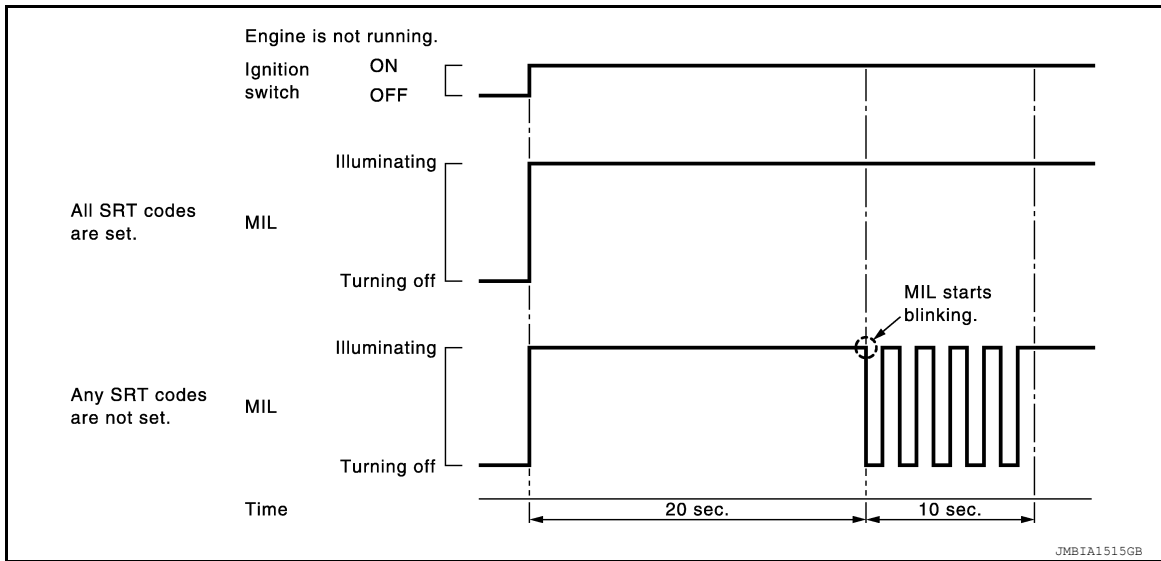
This function allows to read if ECM has completed the self-diagnoses of major emission control systems and components. For SRT, refer to [EC-600, "Description"](#).

Operation Procedure

1. Turn ignition switch ON and wait 20 seconds.
2. SRT status is indicated as shown blow.
 - ECM continues to illuminate MIL if all SRT codes are set.

< SYSTEM DESCRIPTION >

- ECM blinks MIL for about 10 seconds if all SRT codes are not set.



MALFUNCTION WARNING MODE

Description

In this function ECM turns on or blinks MIL when it detects a malfunction in the emission control system components and/or the powertrain control components (which affect vehicle emissions) to inform the driver that a malfunction has been detected.

Operation Procedure

1. Turn ignition switch ON.
2. Check that MIL illuminates.
If it remains OFF, check MIL circuit. Refer to [EC-936, "Diagnosis Procedure"](#).
3. Start engine and let it idle.
 - For two trip detection logic diagnoses, ECM turns on MIL when it detects the same malfunction twice in the two consecutive driving cycles.
 - For 1st trip detection logic diagnoses, ECM turns on MIL when it detects a malfunction in one driving cycle.
 - ECM blinks MIL when it detects a malfunction that may damage the three way catalyst (misfire).

SELF-DIAGNOSTIC RESULTS MODE

Description

This function allows to indicate DTCs or 1st trip DTCs stored in ECM according to the number of times MIL is blinking.

How to Set Self-diagnostic Results Mode

NOTE:

- It is better to count the time accurately with a clock.
 - It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
 - After ignition switch is turned off, ECM is always released from the "Self-diagnostic results" mode.
1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
 2. Repeat the following procedure quickly five times within 5 seconds.
 - Fully depress the accelerator pedal.
 - Fully release the accelerator pedal.
 3. Wait 7 seconds, fully depress the accelerator pedal and keep it depressed for approx. 10 seconds until the MIL starts blinking.

NOTE:

Do not release the accelerator pedal for 10 seconds if MIL starts blinking during this period. This blinking is displaying SRT status and is continued for another 10 seconds.

4. Fully release the accelerator pedal.
ECM has entered to Self-diagnostic results mode.

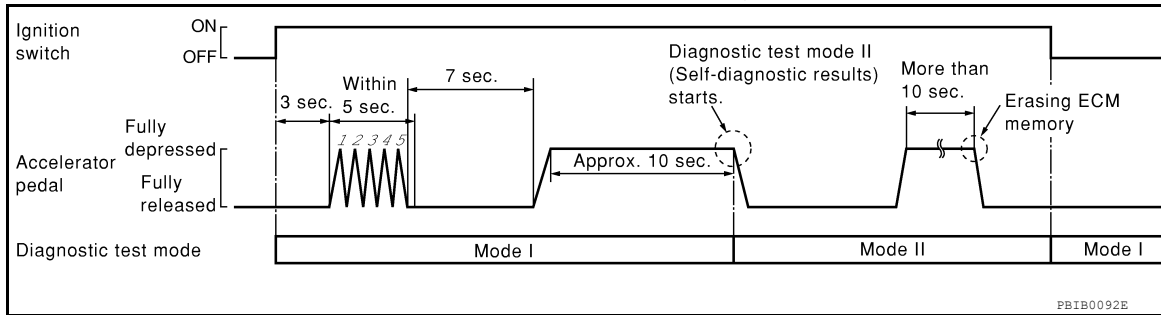
DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VK56DE]

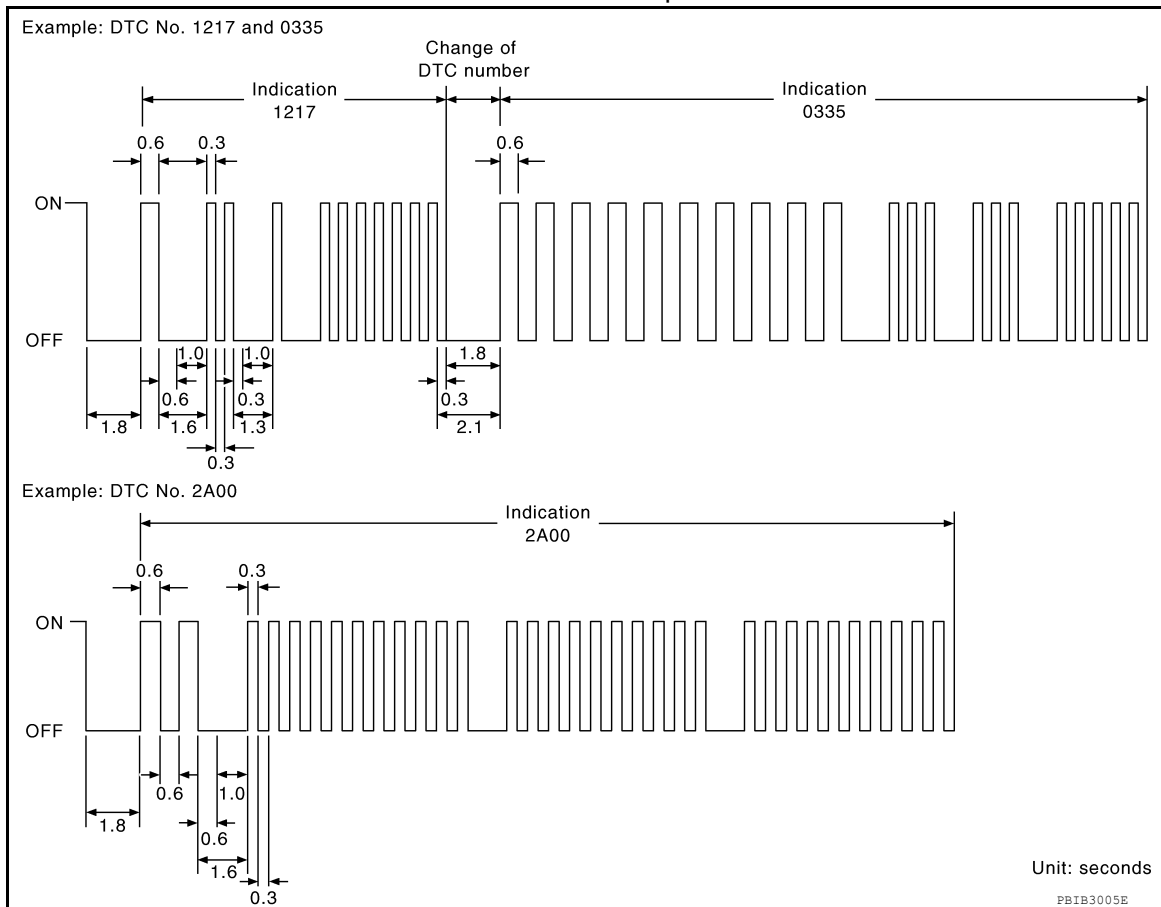
NOTE:

Wait until the same DTC (or 1st trip DTC) appears to completely confirm all DTCs.



How to Read Self-diagnostic Results

The DTC and 1st trip DTC are indicated by the number of blinks of the MIL as shown below. The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MIL illuminates in "malfunction warning" mode, it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes per the following.

Number	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Flashes	10	1	2	3	4	5	6	7	8	9	11	12	13	14	15	16

The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-seconds) - OFF (0.6-seconds) cycle.

The 100th-digit numeral and lower digit numerals consist of a 0.3-seconds ON and 0.3-seconds OFF cycle. A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared. A change from one trouble code to another occurs at an interval of 1.8-seconds OFF.

DIAGNOSIS SYSTEM (ECM)

[VK56DE]

< SYSTEM DESCRIPTION >

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. Refer to [EC-555, "DTC Index"](#).

How to Erase Self-diagnostic Results

By performing this procedure, ECM memory is erased and the following diagnostic information is erased as well.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

NOTE:

Also, if a battery terminal is disconnected, ECM memory is erased and the diagnostic information as listed above is erased. (The amount of time required for erasing may vary from a few seconds to several hours.)

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Set ECM in "Self-diagnostic results".
6. The diagnostic information has been erased from the backup memory in the ECM. Fully depress the accelerator pedal and keep it depressed for more than 10 seconds.
7. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

CONSULT Function

INFOID:000000007358446

FUNCTION

Diagnostic test mode	Function
Work Support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit.
Self Diagnostic Result	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*
Data Monitor	Input/Output data in the ECM can be read.
Active Test	Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
Function Test	This mode is used to inform customers when the vehicle requires periodic maintenance.
DTC & SRT Confirmation	The status of system monitoring tests and the self-diagnosis status/results can be confirmed.
ECU Identification	ECM part number can be read.

*: The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

WORK SUPPORT MODE

Work Item

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VK56DE]

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	<ul style="list-style-type: none"> FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS. 	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	<ul style="list-style-type: none"> THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM. 	When learning the idle air volume
SELF-LEARNING CONT	<ul style="list-style-type: none"> THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT. 	When clearing the coefficient of self-learning control value
EVAP SYSTEM CLOSE	<p>CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS.</p> <ul style="list-style-type: none"> IGN SW ON ENGINE NOT RUNNING AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM FUEL TANK TEMP. IS MORE THAN 0°C (32°F). WITHIN 10 MINUTES AFTER STARTING "EVAP SYSTEM CLOSE" WHEN TRYING TO EXECUTE "EVAP SYSTEM CLOSE" UNDER THE CONDITION EXCEPT ABOVE, CONSULT WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTION. <p>NOTE: WHEN STARTING ENGINE, CONSULT MAY DISPLAY "BATTERY VOLTAGE IS LOW. CHARGE BATTERY", EVEN IN USING CHARGED BATTERY.</p>	When detecting EVAP vapor leak of EVAP system
VIN REGISTRATION	<ul style="list-style-type: none"> IN THIS MODE, VIN IS REGISTERED IN ECM 	When registering VIN in ECM
TARGET IDLE RPM ADJ*1	<ul style="list-style-type: none"> IDLE CONDITION 	When setting target idle speed
TARGET IGN TIM ADJ*1	<ul style="list-style-type: none"> IDLE CONDITION 	When adjusting target ignition timing

*1: This function is not necessary in the usual service procedure.

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to [EC-555, "DTC Index"](#).

How to Read DTC and 1st Trip DTC

DTCs and 1st trip DTCs related to the malfunction are displayed in "Self-diag results".

- When ECM detects a 1st trip DTC, "1t" is displayed for "TIME".
- When ECM has detected a current DTC, "0" is displayed for "TIME".
- If "TIME" is neither "0" nor "1t", the DTC occurred in the past and ECM shows the number of times the vehicle has been driven since the last detection of the DTC.

How to Erase DTC and 1st Trip DTC

NOTE:

- If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.
 - If the DTC is not for A/T related items (see [EC-555, "DTC Index"](#)), skip step 1.
- Erase DTC in TCM. Refer to [TM-35, "Introduction"](#).
 - Select "ENGINE" with CONSULT.
 - Select "SELF-DIAG RESULTS".
 - Touch "ERASE". (DTC in ECM will be erased.)

Freeze Frame Data and 1st Trip Freeze Frame Data

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VK56DE]

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	<ul style="list-style-type: none"> The engine control component part/control system has a trouble code, that is displayed as PXXXX. (Refer to EC-555, "DTC Index".)
FUEL SYS-B1	<ul style="list-style-type: none"> "Fuel injection system status" at the moment a malfunction is detected is displayed.
FUEL SYS-B2	<ul style="list-style-type: none"> One of the following mode is displayed. Mode2: Open loop due to detected system malfunction Mode3: Open loop due to driving conditions (power enrichment, deceleration enrichment) Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control Mode5: Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	<ul style="list-style-type: none"> The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	<ul style="list-style-type: none"> The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRM-B1 [%]	<ul style="list-style-type: none"> "Long-term fuel trim" at the moment a malfunction is detected is displayed.
L-FUEL TRM-B2 [%]	<ul style="list-style-type: none"> The "long-term fuel trim" indicates much more gradual feedback compensation to the base fuel schedule than "short-term fuel trim".
S-FUEL TRM-B1 [%]	<ul style="list-style-type: none"> "Short-term fuel trim" at the moment a malfunction is detected is displayed.
S-FUEL TRM-B2 [%]	<ul style="list-style-type: none"> The "short-term fuel trim" indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
ENGINE SPEED [rpm]	<ul style="list-style-type: none"> The engine speed at the moment a malfunction is detected is displayed.
VEHICL SPEED [km/h] or [mph]	<ul style="list-style-type: none"> The vehicle speed at the moment a malfunction is detected is displayed.
ABSOL TH-P/S [%]	<ul style="list-style-type: none"> The throttle valve opening at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	<ul style="list-style-type: none"> The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	<ul style="list-style-type: none"> The intake air temperature at the moment a malfunction is detected is displayed.
INT MANI PRES [kPa]	<ul style="list-style-type: none"> These items are displayed but are not applicable to this models.
COMBUST CONDITION	

*: The item is the same as that of 1st trip freeze frame data.

DATA MONITOR MODE

Monitored Item

×: Applicable

Monitored item	Unit	Description	Remarks
ENG SPEED	rpm	<ul style="list-style-type: none"> Indicates the engine speed computed from the signal of the crankshaft position sensor (POS) and camshaft position sensor (PHASE). 	<ul style="list-style-type: none"> Accuracy becomes poor if engine speed drops below the idle rpm. If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1	V	<ul style="list-style-type: none"> The signal voltage of the mass air flow sensor is displayed. 	<ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. When engine is running, specification range is indicated in "SPEC".
B/FUEL SCHDL	ms	<ul style="list-style-type: none"> Base fuel schedule indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction. 	<ul style="list-style-type: none"> When engine is running, specification range is indicated in "SPEC".
A/F ALPHA-B1	%	<ul style="list-style-type: none"> The mean value of the air-fuel ratio feedback correction factor per cycle is indicated. 	<ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. When engine is running, specification range is indicated in "SPEC". This data also includes the data for the air-fuel ratio learning control.
A/F ALPHA-B2	%		
COOLAN TEMP/S	°C or °F	<ul style="list-style-type: none"> The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed. 	<ul style="list-style-type: none"> When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.

DIAGNOSIS SYSTEM (ECM)

[VK56DE]

< SYSTEM DESCRIPTION >

Monitored item	Unit	Description	Remarks
A/F SEN1 (B1)	V	• The A/F signal computed from the input signal of the A/F sensor 1 is displayed.	
A/F SEN1 (B2)	V		
HO2S2 (B1)	V	• The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S2 (B2)	V		
HO2S2 MNTR(B1)	RICH/ LEAN	• Display of heated oxygen sensor 2 signal: RICH: means the amount of oxygen after three way catalyst is relatively small. LEAN: means the amount of oxygen after three way catalyst is relatively large.	• When the engine is stopped, a certain value is indicated.
HO2S2 MNTR(B2)	RICH/ LEAN		
VHCL SPEED SE	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from unified meter control unit is displayed.	
BATTERY VOLT	V	• The power supply voltage of ECM is displayed.	
ACCEL SEN 1	V	• The accelerator pedal position sensor signal voltage is displayed.	• ACCEL SEN 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.
ACCEL SEN 2	V		
TP SEN 1-B1	V	• The throttle position sensor signal voltage is displayed.	• TP SEN 2-B1 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.
TP SEN 2-B1	V		
FUEL T/TMP SE	°C or °F	• The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed.	
INT/A TEMP SE	°C or °F	• The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
EVAP SYS PRES	V	• The signal voltage of EVAP control system pressure sensor is displayed.	
FUEL LEVEL SE	V	• The signal voltage of the fuel level sensor is displayed.	
START SIGNAL	ON/OFF	• Indicates start signal status [ON/OFF] computed by ECM according to the signals of engine speed and battery voltage.	• After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS	ON/OFF	• Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG	ON/OFF	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW	ON/OFF	• Indicates [ON/OFF] condition from the park/neutral position (PNP) signal.	
PW/ST SIGNAL	ON/OFF	• [ON/OFF] condition of the power steering system (determined by the signal voltage of the power steering pressure sensor signal) is indicated.	
LOAD SIGNAL	ON/OFF	• Indicates [ON/OFF] condition from the electrical load signal. ON: Lighting switch is in 2nd position. OFF: Lighting switch is OFF.	
IGNITION SW	ON/OFF	• Indicates [ON/OFF] condition from ignition switch signal.	
HEATER FAN SW	ON/OFF	• Indicates [ON/OFF] condition from heater fan switch signal.	
BRAKE SW	ON/OFF	• Indicates [ON/OFF] condition from the stop lamp switch signal.	

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VK56DE]

Monitored item	Unit	Description	Remarks
INJ PULSE-B1	msec	<ul style="list-style-type: none"> Indicates the actual fuel injection pulse width compensated by ECM according to the input signals. 	<ul style="list-style-type: none"> When the engine is stopped, a certain computed value is indicated.
INJ PULSE-B2	msec		
IGN TIMING	BTDC	<ul style="list-style-type: none"> Indicates the ignition timing computed by ECM according to the input signals. 	<ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated.
CAL/LD VALUE	%	<ul style="list-style-type: none"> "Calculated load value" indicates the value of the current air flow divided by peak air flow. 	
MASS AIRFLOW	g/s	<ul style="list-style-type: none"> Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor. 	
PURG VOL C/V	%	<ul style="list-style-type: none"> Indicates the EVAP canister purge volume control solenoid valve control value computed by ECM according to the input signals. The opening becomes larger as the value increases. 	
INT/V TIM(B1)	°CA	<ul style="list-style-type: none"> Indicates [°CA] of intake camshaft advanced angle. 	
INT/V TIM(B2)	°CA		
INT/V SOL(B1)	%	<ul style="list-style-type: none"> The control value of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. The advance angle becomes larger as the value increases. 	
INT/V SOL(B2)	%		
AIR COND RLY	ON/OFF	<ul style="list-style-type: none"> The air conditioner relay control condition (determined by ECM according to the input signals) is indicated. 	
FUEL PUMP RLY	ON/OFF	<ul style="list-style-type: none"> Indicates the fuel pump relay control condition determined by ECM according to the input signals. 	
VENT CONT/V	ON/OFF	<ul style="list-style-type: none"> The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated. ON: Closed OFF: Open 	
THRTL RELAY	ON/OFF	<ul style="list-style-type: none"> Indicates the throttle control motor relay control condition determined by ECM according to the input signals. 	
COOLING FAN	HI/LOW/OFF	<ul style="list-style-type: none"> The control condition of the cooling fan (determined by ECM according to the input signals) is indicated. HI: High speed operation LOW: Low speed operation OFF: Stop 	
HO2S2 HTR (B1)	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals. 	
HO2S2 HTR (B2)	ON/OFF		
I/P PULLY SPD	rpm	<ul style="list-style-type: none"> Indicates the engine speed computed from the input speed sensor signal. 	
VEHICLE SPEED	km/h or mph	<ul style="list-style-type: none"> Indicates the vehicle speed computed from the output speed sensor signal. 	
IDL A/V LEARN	YET/CM-PLT	<ul style="list-style-type: none"> Displays the condition of Idle Air Volume Learning YET: Idle Air Volume Learning has not been performed yet. CMPLT: Idle Air Volume Learning has already been performed successfully. 	
TRVL AFTER MIL	km or mile	<ul style="list-style-type: none"> Distance traveled while MIL is activated. 	

DIAGNOSIS SYSTEM (ECM)

[VK56DE]

< SYSTEM DESCRIPTION >

Monitored item	Unit	Description	Remarks
A/F S1 HTR(B1)	%	<ul style="list-style-type: none"> A/F sensor 1 heater control value computed by ECM according to the input signals. The current flow to the heater becomes larger as the value increases. 	
A/F S1 HTR(B2)	%		
AC PRESS SEN	V	<ul style="list-style-type: none"> The signal voltage from the refrigerant pressure sensor is displayed. 	
VHCL SPEED SE	km/h or mph	<ul style="list-style-type: none"> The vehicle speed computed from the vehicle speed signal sent from unified meter control unit is displayed. 	
SET VHCL SPD	km/h or mph	<ul style="list-style-type: none"> The preset vehicle speed is displayed. 	
MAIN SW	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from MAIN switch signal. 	
CANCEL SW	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from CANCEL switch signal. 	
RESUME/ACC SW	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from RESUME/ACCELERATE switch signal. 	
SET SW	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from SET/COAST switch signal. 	
BRAKE SW1	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from ASCD brake switch signal. 	
BRAKE SW2	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of stop lamp switch signal. 	
VHCL SPD CUT	NON/ CUT	<ul style="list-style-type: none"> Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed increased to excessively high compared with the ASCD set speed, and ASCD operation is cut off. 	
LO SPEED CUT	NON/ CUT	<ul style="list-style-type: none"> Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low compared with the ASCD set speed, and ASCD operation is cut off. 	
AT OD MONITOR	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of A/T O/D according to the input signal from TCM. 	
AT OD CANCEL	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of A/T O/D cancel signal sent from TCM. 	
CRUISE LAMP	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of CRUISE lamp determined by ECM according to the input signals. 	
SET LAMP	ON/OFF	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of SET lamp determined by ECM according to the input signals. 	
ALT DUTY	%	<ul style="list-style-type: none"> Indicates the duty ratio of the power generation command value. The ratio is calculated by ECM based on the battery current sensor signal. 	
BAT CUR SEN	mV	<ul style="list-style-type: none"> The signal voltage of battery current sensor is displayed. 	
ALT DUTY SIG	ON/OFF	<ul style="list-style-type: none"> The control condition of the power generation voltage variable control (determined by ECM according to the input signals) is indicated. ON: Power generation voltage variable control is active. OFF: Power generation voltage variable control is inactive. 	

DIAGNOSIS SYSTEM (ECM)

[VK56DE]

< SYSTEM DESCRIPTION >

Monitored item	Unit	Description	Remarks
A/F ADJ-B1	—	<ul style="list-style-type: none"> Indicates the correction factor stored in ECM. The factor is calculated from the difference between the target air/fuel ratio stored in ECM and the air-fuel ratio calculated from A/F sensor 1 signal. 	
A/F ADJ-B2	—		
HO2 S2 DIAG2 (B1) [INCMP/CMPLT]		<ul style="list-style-type: none"> Indicates DTC P0139 self-diagnosis (slow response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. 	The item is indicated, but not used.
HO2 S2 DIAG2 (B2) [INCMP/CMPLT]		<ul style="list-style-type: none"> Indicates DTC P0159 self-diagnosis (slow response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. 	The item is indicated, but not used.

NOTE:

Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	<ul style="list-style-type: none"> Engine: Return to the original trouble condition Change the amount of fuel injection using CONSULT. 	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Harness and connectors Fuel injector Air fuel ratio (A/F) sensor 1
IGNITION TIMING	<ul style="list-style-type: none"> Engine: Return to the original trouble condition Timing light: Set Retard the ignition timing using CONSULT. 	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Perform Idle Air Volume Learning.
POWER BALANCE	<ul style="list-style-type: none"> Engine: After warming up, idle the engine. A/C switch: OFF Selector lever: P or N Cut off each injector signal one at a time using CONSULT. 	Engine runs rough or dies.	<ul style="list-style-type: none"> Harness and connectors Compression Fuel injector Power transistor Spark plug Ignition coil
COOLING FAN*	<ul style="list-style-type: none"> Ignition switch: ON Turn the cooling fan HI and OFF using CONSULT. 	Cooling fan moves and stops.	<ul style="list-style-type: none"> Harness and connectors Cooling fan motor IPDM E/R
ENG COOLANT TEMP	<ul style="list-style-type: none"> Engine: Return to the original trouble condition Change the engine coolant temperature using CONSULT. 	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Harness and connectors Engine coolant temperature sensor Fuel injector
FUEL PUMP RELAY	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Turn the fuel pump relay ON and OFF using CONSULT and listen to operating sound. 	Fuel pump relay makes the operating sound.	<ul style="list-style-type: none"> Harness and connectors Fuel pump relay
PURG VOL CONT/V	<ul style="list-style-type: none"> Engine: After warming up, run engine at 1,500 rpm. Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT. 	Engine speed changes according to the opening percent.	<ul style="list-style-type: none"> Harness and connectors Solenoid valve
FUEL/T TEMP SEN	<ul style="list-style-type: none"> Change the fuel tank temperature using CONSULT. 		

DIAGNOSIS SYSTEM (ECM)

[VK56DE]

< SYSTEM DESCRIPTION >

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
VENT CONTROL/V	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Turn solenoid valve ON and OFF with the CONSULT and listen to operating sound. 	Solenoid valve makes an operating sound.	<ul style="list-style-type: none"> Harness and connectors Solenoid valve
V/T ASSIGN ANGLE	<ul style="list-style-type: none"> Engine: Return to the original trouble condition Change intake valve timing using CONSULT. 	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Harness and connectors Intake valve timing control solenoid valve
ALTERNATOR DUTY	<ul style="list-style-type: none"> Engine: Idle Change duty ratio using CONSULT. 	Battery voltage changes.	<ul style="list-style-type: none"> Harness and connectors IPDM E/R Alternator

*: Leaving cooling fan OFF with CONSULT while engine is running may cause the engine to overheat.

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

- For items whose SRT codes are set, "CMPLT" is displayed on the CONSULT screen; for items whose SRT codes are not set, "INCMP" is displayed.
- "SRT STATUS" provides the presence or absence of permanent DTCs stored in ECM memory.

PERMANENT DTC STATUS Mode

How to display permanent DTC status


- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Select "PERMANENT DTC STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.

NOTE:

Permanent DTCs stored in ECM memory are displayed on the CONSULT screen to show if a driving pattern required for erasing permanent DTCs is complete (CMPLT) or incomplete (INCMP).

CAUTION:

Since the "PERMANENT DTC STATUS" screen displays the previous trip information, repeat the following twice to update the information: "Ignition switch OFF", "Wait for more than 10 seconds" and "Ignition switch ON".

PERMANENT DTC & SRT CONFIRMATION : PERMANENT DTC STATUS		
<p>CAUTION: Turn ignition switch from ON to OFF twice to update the information on the status screen.</p>		
PERMANENT DTC	DRIVING PATTERN B	DRIVING PATTERN D
XXXX	INCMP	INCMP
XXXX	CMPLT	INCMP
XXXX	INCMP	CMPLT
XXXX	CMPLT	INCMP
XXXX	INCMP	INCMP
XXXX	INCMP	INCMP
<p>The previous trip information is displayed. </p>		

JSBIA0062GB

NOTE:

This mode is not used in regions that permanent DTCs are not regulated by law.

SRT WORK SUPPORT Mode

This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

PERMANENT DTC WORK SUPPORT Mode

DIAGNOSIS SYSTEM (ECM)

[VK56DE]

< SYSTEM DESCRIPTION >

This mode enables a technician to drive a vehicle to complete the driving pattern that is required for erasing permanent DTC.

NOTE:

This mode is not used in regions that permanent DTCs are not regulated by law.

DTC WORK SUPPORT Mode

Test mode	Test item	Corresponding DTC No.	Reference page
EVAPORATIVE SYSTEM	PURG FLOW P0441	P0441	EC-757, "DTC Confirmation Procedure"
	EVP SML LEAK P0442/P1442*	—	—
	EVP V/S LEAK P0456/P1456*	P0442	EC-763, "DTC Confirmation Procedure"
		P0455	EC-799, "DTC Confirmation Procedure"
		P0456	EC-807, "DTC Confirmation Procedure"
PURG VOL CN/V P1444	P0443	EC-770, "DTC Confirmation Procedure"	
A/F SEN1	A/F SEN1 (B1) P1276	P0130	EC-676, "DTC Confirmation Procedure"
	A/F SEN1 (B1) P1278/P1279	P0133	EC-688, "DTC Confirmation Procedure"
	A/F SEN1 (B2) P1286	P0150	EC-676, "DTC Confirmation Procedure"
	A/F SEN1 (B2) P1288/P1289	P0153	EC-688, "DTC Confirmation Procedure"
HO2S2	HO2S2 (B1) P0139	P0139	EC-707, "DTC Confirmation Procedure"
	HO2S2 (B1) P1146	P0138	EC-699, "DTC Confirmation Procedure"
	HO2S2 (B1) P1147	P0137	EC-694, "DTC Confirmation Procedure"
	HO2S2 (B2) P0159	P0159	EC-707, "DTC Confirmation Procedure"
	HO2S2 (B2) P1166	P0158	EC-699, "DTC Confirmation Procedure"
	HO2S2 (B2) P1167	P0157	EC-694, "DTC Confirmation Procedure"

*: DTC P1442 and P1456 does not apply to R51 models but appears in DTC Work Support Mode screens.

ECU DIAGNOSIS INFORMATION

ECM

CONSULT Reference Value in Data Monitor Mode

INFOID:000000007358447

Remarks:

- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
- * Specification data may not be directly related to their components signals/values/operations.

i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	• Run engine and compare CONSULT value with the tachometer indication.		Almost the same speed as the tachometer indication.
MAS A/F SE-B1	See EC-612, "Description" .		
B/FUEL SCHDL	See EC-612, "Description" .		
A/F ALPHA-B1 A/F ALPHA-B2	See EC-612, "Description" .		
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158°F)
A/F SEN1 (B1) A/F SEN1 (B2)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2 V
HO2S2 (B1) HO2S2 (B2)	<ul style="list-style-type: none"> • Revving engine from idle to 3,000 rpm quickly after the following conditions are met. • After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 		0 - 0.3 V ↔ Approx. 0.6 - 1.0 V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	<ul style="list-style-type: none"> • Revving engine from idle to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - Keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 		LEAN ↔ RICH
VHCL SPEED SE	• Turn drive wheels and compare CONSULT value with the speedometer indication.		Almost the same speed as the speedometer indication
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14 V
ACCEL SEN 1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.65 - 1.87 V
		Accelerator pedal: Fully depressed	More than 4.3 V
ACCEL SEN 2* ¹	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.56 - 0.96 V
		Accelerator pedal: Fully depressed	More than 4.0 V
TP SEN 1-B1 TP SEN 2-B1* ¹	<ul style="list-style-type: none"> • Ignition switch: ON (Engine stopped) • Selector lever: D 	Accelerator pedal: Fully released	More than 0.36 V
		Accelerator pedal: Fully depressed	Less than 4.75 V
EVAP SYS PRES	• Ignition switch: ON		Approx. 1.8 - 4.8 V
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor: Operates.)	ON
P/N POSI SW	• Ignition switch: ON	Selector lever: P or N position	ON
		Selector lever: Except above position	OFF

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	<ul style="list-style-type: none"> Engine: After warming up, idle the engine 	Steering wheel: Not being turned (Forward direction)	OFF
		Steering wheel: Being turned	ON
LOAD SIGNAL	<ul style="list-style-type: none"> Ignition switch: ON 	Rear window defogger switch is ON and/or lighting switch is in 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF
IGNITION SW	<ul style="list-style-type: none"> Ignition switch: ON → OFF → ON 		ON → OFF → ON
HEATER FAN SW	<ul style="list-style-type: none"> Engine: After warming up, idle the engine 	Heater fan control switch: OFF	OFF
		Heater fan control switch: ON	ON
BRAKE SW	<ul style="list-style-type: none"> Ignition switch: ON 	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1 INJ PULSE-B2	<ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N position Air conditioner switch: OFF No load 	Idle	2.0 - 2.8 msec
		2,000 rpm	1.9 - 2.9 msec
IGN TIMING	<ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N position Air conditioner switch: OFF No load 	Idle	10° - 20°BTDC
		2,000 rpm	25° - 45°BTDC
CAL/LD VALUE	<ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N position Air conditioner switch: OFF No load 	Idle	14% - 33%
		2,500 rpm	12% - 25%
MASS AIRFLOW	<ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N position Air conditioner switch: OFF No load 	Idle	3.0 - 9.0 g/s
		2,500 rpm	9.0 - 28.0 g/s
PURG VOL C/V	<ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N position Air conditioner switch: OFF No load 	Idle (Accelerator pedal: Not depressed even slightly, after engine starting.)	0%
		2,000 rpm	—
INT/V TIM (B1) INT/V TIM (B2)	<ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N position Air conditioner switch: OFF No load 	Idle	-5° - 5°C
		2,000 rpm	Approx. 0° - 20°C
INT/V SOL (B1) INT/V SOL (B2)	<ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N position Air conditioner switch: OFF No load 	Idle	0% - 2%
		2,000 rpm	Approx. 25% - 50%
AIR COND RLY	<ul style="list-style-type: none"> Engine: After warming up, idle the engine 	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor: Operates)	ON
FUEL PUMP RLY	<ul style="list-style-type: none"> For 1 second after turning ignition switch ON Engine running or cranking 		ON
	<ul style="list-style-type: none"> Except above conditions 		OFF
VENT CONT/V	<ul style="list-style-type: none"> Ignition switch: ON 		OFF
THRTL RELAY	<ul style="list-style-type: none"> Ignition switch: ON 		ON

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

MONITOR ITEM	CONDITION		SPECIFICATION
COOLING FAN	<ul style="list-style-type: none"> Engine: After warming up, idle the engine Air conditioner switch: OFF 	Engine coolant temperature: 97°C (207°F) or less	OFF
		Engine coolant temperature: Between 98°C (208°F) and 100°C (212°F)	LOW
		Engine coolant temperature: 101°C (214°F) or more	HI
HO2S2 HTR (B1) HO2S2 HTR (B2)	<ul style="list-style-type: none"> Engine speed is below 3,600 rpm after the following conditions are met. <ul style="list-style-type: none"> Engine: After warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 		ON
	<ul style="list-style-type: none"> Engine speed: Above 3,600 rpm 		OFF
I/P PULLY SPD	<ul style="list-style-type: none"> Vehicle speed: More than 20 km/h (12 MPH) 		Almost the same speed as the tachometer indication
VEHICLE SPEED	<ul style="list-style-type: none"> Turn drive wheels and compare CONSULT value with the speedometer indication. 		Almost the same speed as the speedometer indication
TRVL AFTER MIL	<ul style="list-style-type: none"> Ignition switch: ON 	Vehicle has traveled after MIL has illuminated.	0 - 65,535 km (0 - 40,723 mile)
A/F S1 HTR (B1) A/F S1 HTR (B2)	<ul style="list-style-type: none"> Engine: After warming up, idle the engine 		4 - 100%
AC PRESS SEN	<ul style="list-style-type: none"> Engine: Idle Both A/C switch and blower fan switch: ON (Compressor operates.) 		1.0 - 4.0 V
VHCL SPEED SE	<ul style="list-style-type: none"> Turn drive wheels and compare CONSULT value with the speedometer indication. 		Almost the same speed as the speedometer indication
SET VHCL SPD	<ul style="list-style-type: none"> Engine: Running 	ASCD: Operating.	The preset vehicle speed is displayed.
MAIN SW	<ul style="list-style-type: none"> Ignition switch: ON 	MAIN switch: Pressed	ON
		MAIN switch: Released	OFF
CANCEL SW	<ul style="list-style-type: none"> Ignition switch: ON 	CANCEL switch: Pressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	<ul style="list-style-type: none"> Ignition switch: ON 	RESUME/ACCELERATE switch: Pressed	ON
		RESUME/ACCELERATE switch: Released	OFF
SET SW	<ul style="list-style-type: none"> Ignition switch: ON 	SET/COAST switch: Pressed	ON
		SET/COAST switch: Released	OFF
BRAKE SW1	<ul style="list-style-type: none"> Ignition switch: ON 	Brake pedal: Fully released	ON
		Brake pedal: Slightly depressed	OFF
BRAKE SW2	<ul style="list-style-type: none"> Ignition switch: ON 	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
CRUISE LAMP	<ul style="list-style-type: none"> Ignition switch: ON 	MAIN switch: Pressed at the 1st time → at the 2nd time	ON → OFF
SET LAMP	<ul style="list-style-type: none"> MAIN switch: ON Vehicle speed: Between 40 km/h (25 MPH) and 144 km/h (89 MPH) 	ASCD: Operating	ON
		ASCD: Not operating	OFF
ALT DUTY	<ul style="list-style-type: none"> Engine: Idle 		0 - 80%
BAT CUR SEN	<ul style="list-style-type: none"> Engine speed: Idle Battery: Fully charged*2 Selector lever: P or N position Air conditioner switch: OFF No load 		Approx. 2,600 - 3,500 mV

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

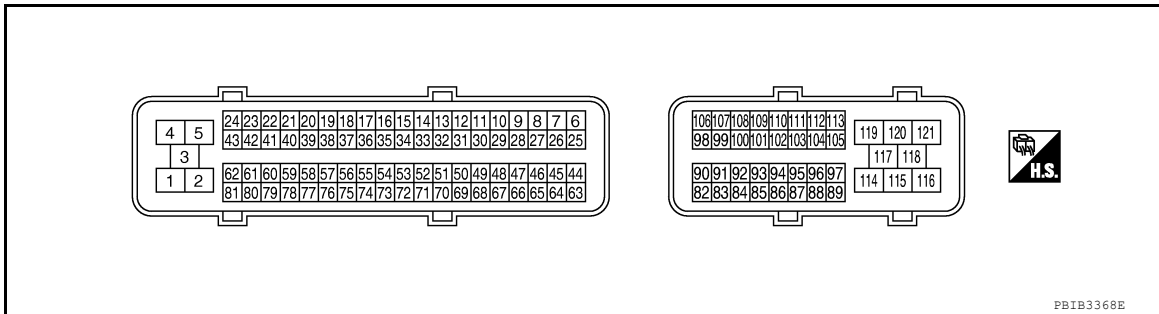
MONITOR ITEM	CONDITION	SPECIFICATION
ALT DUTY SIG	• Power generation voltage variable control: Operating	ON
	• Power generation voltage variable control: Not operating	OFF
HO2 S2 DIAG1 (B1)	DTC P0139 self-diagnosis (delayed response) has not been performed yet.	INCMP
	DTC P0139 self-diagnosis (delayed response) has already been performed successfully.	CMPLT
HO2 S2 DIAG1 (B2)	DTC P0159 self-diagnosis (delayed response) has not been performed yet.	INCMP
	DTC P0159 self-diagnosis (delayed response) has already been performed successfully.	CMPLT
HO2 S2 DIAG2 (B1)	DTC P0139 self-diagnosis (slow response) has not been performed yet.	INCMP
	DTC P0139 self-diagnosis (slow response) has already been performed successfully.	CMPLT
HO2 S2 DIAG2 (B2)	DTC P0159 self-diagnosis (slow response) has not been performed yet.	INCMP
	DTC P0159 self-diagnosis (slow response) has already been performed successfully.	CMPLT

*1: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

*2: Before measuring the terminal voltage, confirm the battery is fully charged. Refer to [PG-5, "How to Handle Battery"](#).

ECM Harness Connector Terminal Layout

INFOID:000000007358448

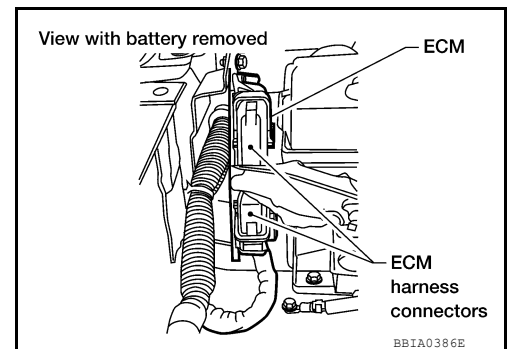


ECM Terminal and Reference Value

INFOID:000000007358449

PREPARATION

ECM is located in the engine room passenger side behind battery.



ECM INSPECTION TABLE

Specification data are reference values and are measured between each terminal and ground. Pulse signal is measured by CONSULT.

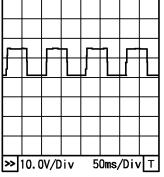
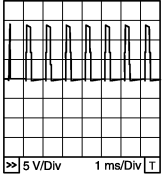
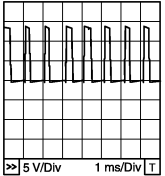
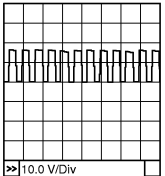
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECMs transistor. Use a ground other than ECM terminals, such as the ground.

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< ECU DIAGNOSIS INFORMATION >

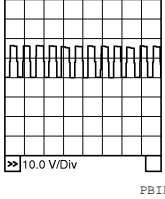
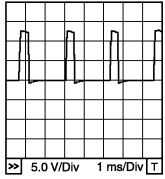
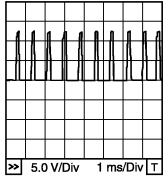
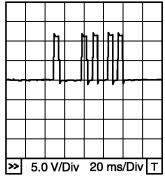
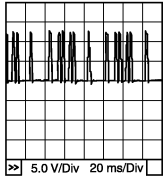
[VK56DE]

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	BR	ECM ground	[Engine is running] • Idle speed	Body ground
2	G	A/F sensor 1 heater (bank 1)	[Engine is running] • Warm-up condition • Idle speed (More than 140 seconds after starting engine)	Approximately 2.9 - 8.8 V★  <small>PBIA8148J</small>
3	V	Throttle control motor power supply	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
4	L/W	Throttle control motor (Close)	[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released	0 - 14 V★  <small>PBIB1104E</small>
5	L/B	Throttle control motor (Open)	[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully depressed	0 - 14 V★  <small>PBIB1105E</small>
6	R	Heated oxygen sensor 2 heater (bank 1)	[Engine is running] • Engine speed: Below 3,600 rpm after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	0 - 1.0 V
			[Ignition switch: ON] • Engine: Stopped [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
10	W	Intake valve timing control solenoid valve (bank 1)	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
			[Engine is running] • Warm-up condition • Engine speed: 2,000rpm	7 - 12 V★  <small>PBIB1790E</small>

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

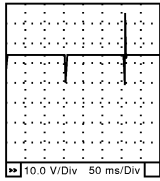
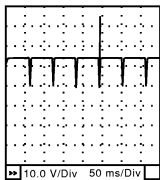
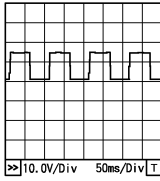
TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11	LG	Intake valve timing control solenoid valve (bank 2)	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
			[Engine is running] • Warm-up condition • Engine speed: 2,000rpm	7 - 12 V★ 
12	P	Power steering pressure sensor	[Engine is running] • Steering wheel: Being turned	0.5 - 4.5 V
			[Engine is running] • Steering wheel: Not being turned	0.4 - 0.8 V
13	G	Crankshaft position sensor (POS)	[Engine is running] • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle	Approximately 10 V★ 
			[Engine is running] • Engine speed: 2,000 rpm	Approximately 10 V★ 
14	SB	Camshaft position sensor (PHASE)	[Engine is running] • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle	1.0 - 4.0 V★ 
			[Engine is running] • Engine speed: 2,000 rpm	1.0 - 4.0 V★ 
15	W	Knock sensor (bank 1)	[Engine is running] • Idle speed	Approximately 2.5 V
16	L	A/F sensor 1 (bank 2)	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	Approximately 1.8 V Output voltage varies with air fuel ratio.

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< ECU DIAGNOSIS INFORMATION >

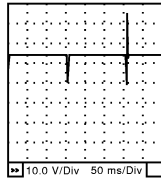
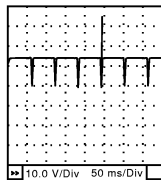
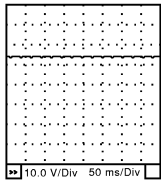
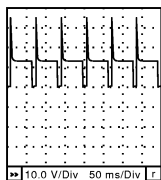
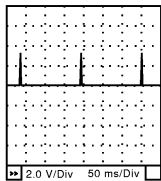
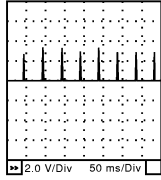
[VK56DE]

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
21 22 23 44	L V G L	Fuel injector No. 5 Fuel injector No. 3 Fuel injector No. 1 Fuel injector No. 7	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Idle speed <p>NOTE: The pulse cycle changes depending on rpm at idle</p>	<p>BATTERY VOLTAGE (11 - 14 V)★</p>  <p style="text-align: right; font-size: small;">SEC984C</p>
			<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000 rpm 	<p>BATTERY VOLTAGE (11 - 14 V)★</p>  <p style="text-align: right; font-size: small;">SEC985C</p>
24 43	G G	A/F sensor 1 heater (bank 2)	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Idle speed (More than 140 seconds after starting engine) 	<p>Approximately 2.9 - 8.8 V★</p>  <p style="text-align: right; font-size: small;">PBIA8148J</p>
25	P	Heated oxygen sensor 2 heater (bank 2)	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Engine speed: Below 3,600 rpm after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 	0 - 1.0 V
			<p>[Ignition switch: ON]</p> <ul style="list-style-type: none"> • Engine: Stopped <p>[Engine is running]</p> <ul style="list-style-type: none"> • Engine speed: Above 3,600 rpm 	BATTERY VOLTAGE (11 - 14 V)
32	W	EVAP control system pressure sensor	[Ignition switch: ON]	Approximately 1.8 - 4.8 V
34	BR	Intake air temperature sensor	[Engine is running]	Approximately 0 - 4.8 V Output voltage varies with intake air temperature.
35	O	A/F sensor 1 (bank 1)	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000 rpm 	Approximately 1.8 V Output voltage varies with air fuel ratio.
36	W	Knock sensor (bank 2)	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Idle speed 	Approximately 2.5 V

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

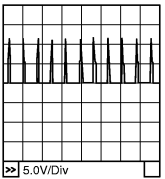
TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
40 41 42 63	V R O W	Fuel injector No. 6 Fuel injector No. 4 Fuel injector No. 2 Fuel injector No. 8	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Idle speed <p>NOTE: The pulse cycle changes depending on rpm at idle</p>	<p>BATTERY VOLTAGE (11 - 14 V)★</p>  <p style="text-align: right; font-size: small;">SEC984C</p>
			<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000 rpm 	<p>BATTERY VOLTAGE (11 - 14 V)★</p>  <p style="text-align: right; font-size: small;">SEC985C</p>
45	R	EVAP canister purge volume control solenoid valve	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Idle speed • Accelerator pedal: Not depressed even slightly, after engine starting 	<p>BATTERY VOLTAGE (11 - 14 V)★</p>  <p style="text-align: right; font-size: small;">SEC990C</p>
			<p>[Engine is running]</p> <ul style="list-style-type: none"> • Engine speed: About 2,000 rpm (More than 100 seconds after starting engine) 	<p>BATTERY VOLTAGE (11 - 14 V)★</p>  <p style="text-align: right; font-size: small;">SEC991C</p>
46 60 61 62	LG V L Y	Ignition signal No. 7 Ignition signal No. 5 Ignition signal No. 3 Ignition signal No. 1	<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Idle speed <p>NOTE: The pulse cycle changes depending on rpm at idle</p>	<p>0 - 0.3 V★</p>  <p style="text-align: right; font-size: small;">SEC986C</p>
			<p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,500 rpm 	<p>0.1 - 0.6 V★</p>  <p style="text-align: right; font-size: small;">SEC987C</p>
47	L	Sensor power supply (Throttle position sensor)	[Ignition switch: ON]	Approximately 5 V

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< ECU DIAGNOSIS INFORMATION >

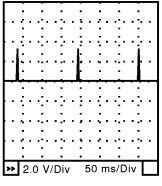
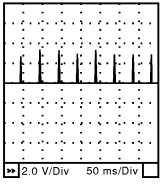
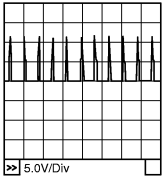
[VK56DE]

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
48	SB	Sensor power supply (EVAP control system pressure sensor)	[Ignition switch: ON]	Approximately 5 V
49	P	Sensor power supply (Refrigerant pressure sensor)	[Ignition switch: ON]	Approximately 5 V
50	W	Throttle position sensor 1	[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released	More than 0.36 V
			[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully depressed	Less than 4.75 V
51	P	Mass air flow sensor	[Engine is running] • Warm-up condition • Idle speed	1.0 - 1.3 V
			[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	1.7 - 2.1 V
53	L	Intake valve timing control position sensor (Bank 2)	[Engine is running] • Warm-up condition • Idle speed	0 - 1.0 V
			[Engine is running] • Engine speed: 2,000 rpm	0 - 1.0 V★  PBIB2046E
55	G	Heated oxygen sensor 2 (bank 1)	[Engine is running] • Revving engine from idle to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	0 - Approximately 1.0 V
56	W	A/F sensor 1 (bank 1)	[Ignition switch: ON]	Approximately 2.2 V

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65 79 80 81	GR P GR G	Ignition signal No. 8 Ignition signal No. 6 Ignition signal No. 4 Ignition signal No. 2	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle	0 - 0.3 V★ 
			[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,500 rpm 	0.1 - 0.6 V★ 
66	B	Sensor ground (Throttle position sensor)	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed 	Approximately 0 V
67	B	Sensor ground	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed 	Approximately 0 V
68	G	Sensor power supply (PSP sensor)	[Ignition switch: ON]	Approximately 5 V
69	R	Throttle position sensor 2	[Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released 	Less than 4.75 V
			[Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully depressed 	More than 0.36 V
70	BR	Refrigerant pressure sensor	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Both A/C switch and blower fan switch: ON (Compressor: Operates.) 	1.0 - 4.0 V
71	R	Battery current sensor	[Engine is running] <ul style="list-style-type: none"> • Battery: Fully charged* • Idle speed 	Approximately 2.6 - 3.5 V
72	Y	Intake valve timing control position sensor (Bank 1)	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed 	0 - 1.0 V
			[Engine is running] <ul style="list-style-type: none"> • Engine speed: 2,000rpm 	0 - 1.0 V★ 
73	Y	Engine coolant temperature sensor	[Engine is running]	Approximately 0 - 4.8 V Output voltage varies with engine coolant temperature.

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	SB	Heated oxygen sensor 2 (bank 2)	[Engine is running] <ul style="list-style-type: none"> • Revving engine from idle to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load 	0 - Approximately 1.0 V
75	P	A/F sensor 1 (bank 2)	[Ignition switch: ON]	Approximately 2.2 V
78	GR	Sensor ground (Heated oxygen sensor 2)	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed 	Approximately 0 V
82	B	Sensor ground (APP sensor 1)	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed 	Approximately 0 V
83	B	Sensor ground (APP sensor 2)	[Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed 	Approximately 0 V
85	W	Data link connector	—	—
86	P	CAN communication line	—	—
90	L	Sensor power supply (APP sensor 1)	[Ignition switch: ON]	Approximately 5 V
91	G	Sensor power supply (APP sensor 2)	[Ignition switch: ON]	Approximately 5 V
94	L	CAN communication line	—	—
98	GR	Accelerator pedal position sensor 2	[Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Accelerator pedal: Fully released 	0.28 - 0.48 V
			[Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Accelerator pedal: Fully depressed 	More than 2.0 V
99	SB	ASCDC steering switch	[Ignition switch: ON] <ul style="list-style-type: none"> • ASCDC steering switch: OFF 	Approximately 4 V
			[Ignition switch: ON] <ul style="list-style-type: none"> • MAIN switch: Pressed 	Approximately 0V
			[Ignition switch: ON] <ul style="list-style-type: none"> • CANCEL switch: Pressed 	Approximately 1 V
			[Ignition switch: ON] <ul style="list-style-type: none"> • RESUME/ACCELERATE switch: Pressed 	Approximately 3 V
			[Ignition switch: ON] <ul style="list-style-type: none"> • SET/COAST switch: Pressed 	Approximately 2 V
101	LG	Stop lamp switch	[Ignition switch: OFF] <ul style="list-style-type: none"> • Brake pedal: Fully released 	Approximately 0 V
			[Ignition switch: OFF] <ul style="list-style-type: none"> • Brake pedal: Slightly depressed 	BATTERY VOLTAGE (11 - 14 V)
102	G	PNP signal	[Ignition switch: ON] <ul style="list-style-type: none"> • Selector lever: P or N position 	Approximately 0 V
			[Ignition switch: ON] <ul style="list-style-type: none"> • Selector lever: Except above position 	BATTERY VOLTAGE (11 - 14 V)

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
104	O	Throttle control motor relay	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)
			[Ignition switch: ON]	0 - 1.0 V
106	R	Accelerator pedal position sensor 1	[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully released	0.65 - 0.87 V
			[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	More than 4.3 V
107	Y	Fuel tank temperature sensor	[Engine is running]	Approximately 0 - 4.8 V Output voltage varies with fuel tank temperature.
108	LG	ASCD brake switch	[Ignition switch: ON] • Brake pedal: Slightly depressed	Approximately 0 V
			[Ignition switch: ON] • Brake pedal: Fully released	BATTERY VOLTAGE (11 - 14 V)
109	W/R	Ignition switch	[Ignition switch: OFF]	0 V
			[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
111	BR	ECM relay (Self shut-off)	[Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF	0 - 1.5 V
			[Ignition switch: OFF] • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14 V)
113	V	Fuel pump relay	[Ignition switch: ON] • For 1 second after turning ignition switch ON	0 - 1.5 V
			[Engine is running] [Ignition switch: ON] • More than 1 second after turning ignition switch ON	BATTERY VOLTAGE (11 - 14 V)
115 116	B GR	ECM ground	[Engine is running] • Idle speed	Body ground
117	G	EVAP canister vent control valve	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
119 120	R P	Power supply for ECM	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
121	R/B	Power supply for ECM (Back up)	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

*: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to [PG-5, "How to Handle Battery"](#).

Fail-Safe Chart

INFOID:000000007358450

When the DTC listed below is detected, the ECM enters fail-safe mode and the MIL illuminates.

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

DTC No.	Detected items	Engine operating condition in fail-safe mode	
P0101 P0102 P0103	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.	
P0117 P0118	Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the following condition. CONSULT displays the engine coolant temperature decided by ECM.	
		Condition	Engine coolant temperature decided (CONSULT display)
		Just as ignition switch is turned ON or START	40°C (104°F)
		Approx. 4 minutes or more after engine starting.	80°C (176°F)
		Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
		When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	
P0122 P0123 P0222 P0223 P2135	Throttle position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.	
P0500	Vehicle speed sensor	The cooling fan operates (Highest) while engine is running.	
P0643	Sensor power supply	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	
P2100 P2103	Throttle control motor relay	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	
P2101	Electric throttle control function	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	
P2118	Throttle control motor	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	
P2119	Electric throttle control actuator	(When electric throttle control actuator does not function properly due to the return spring malfunction:) ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm. (When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less. (When ECM detects the throttle valve is stuck open:) While the vehicle is being driven, it slows down gradually because of fuel cut. After the vehicle stops, the engine stalls. The engine can restart in N or P position, and engine speed will not exceed 1,000 rpm or more.	
P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.	

- When there is an open circuit on MIL circuit, the ECM cannot warn the driver by illuminating MIL when there is malfunction on engine control system. Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating the fail-safe function. The fail-safe function also operates when above diagnoses except MIL circuit are detected and demands the driver to repair the malfunction.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut
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DTC Inspection Priority Chart

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

Priority	Detected items (DTC)	
1	<ul style="list-style-type: none"> • U0101 U1001 CAN communication line • P0101 P0102 P0103 Mass air flow sensor • P0111 P0112 P0113 P0127 Intake air temperature sensor • P0116 P0117 P0118 P0125 Engine coolant temperature sensor • P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor • P0128 Thermostat function • P0181 P0182 P0183 Fuel tank temperature sensor • P0327 P0328 P0332 P0333 Knock sensor • P0335 Crankshaft position sensor (POS) • P0340 Camshaft position sensor (PHASE) • P0460 P0461 P0462 P0463 Fuel level sensor • P0500 Vehicle speed sensor • P0605 P0607 ECM • P0643 Sensor power supply • P0700 TCM • P0705 Transmission range switch • P0850 Park/neutral position (PNP) switch • P1550 P1551 P1552 P1553 P1554 Battery current sensor • P1610 - P1615 NATS • P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor 	<p>A</p> <p>EC</p> <p>C</p> <p>D</p> <p>E</p> <p>F</p> <p>G</p>
2	<ul style="list-style-type: none"> • P0031 P0032 P0051 P0052 A/F sensor 1 heater • P0037 P0038 P0057 P0058 Heated oxygen sensor 2 heater • P0075 P0081 Intake valve timing control solenoid valve • P0130 P0131 P0132 P0133 P0150 P0151 P0152 P0153 P2A00 P2A03 A/F sensor 1 • P0137 P0138 P0139 P0157 P0158 P0159 Heated oxygen sensor 2 • P0441 EVAP control system purge flow monitoring • P0443 P0444 P0445 EVAP canister purge volume control solenoid valve • P0447 P0448 EVAP canister vent control valve • P0451 P0452 P0453 EVAP control system pressure sensor • P0550 Power steering pressure sensor • P0603 ECM power supply • P0710 P0717 P0720 P0731 P0732 P0733 P0734 P0735 P0740 P0744 P0745 P1730 P1752 P1757 P1762 P1764 P1769 P1767 P1772 P1774 A/T related sensors, solenoid valves and switches • P1140 P1145 Intake valve timing control position sensor • P1217 Engine over temperature (OVERHEAT) • P1805 Brake switch • P2100 P2103 P2118 Electric throttle control actuator • P2101 Electric throttle control function 	<p>H</p> <p>I</p> <p>J</p> <p>K</p> <p>L</p>
3	<ul style="list-style-type: none"> • P0011 P0021 Intake valve timing control • P0171 P0172 P0174 P0175 Fuel injection system function • P0300 - P0308 Misfire • P0420 P0430 Three way catalyst function • P0442 EVAP control system (SMALL LEAK) • P0455 EVAP control system (GROSS LEAK) • P0456 EVAP control system (VERY SMALL LEAK) • P0506 P0507 Idle speed control system • P050E Cold start control • P1148 P1168 Closed loop control • P1211 TCS control unit • P1212 TCS communication line • P1564 ASCD steering switch • P1572 ASCD brake switch • P2119 Electric throttle control actuator 	<p>M</p> <p>N</p> <p>O</p> <p>P</p>

DTC Index

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

x:Applicable —: Not applicable

Items (CONSULT screen terms)	DTC*1		SRT code	Trip	MIL	Perma- nent DTC group*8	Reference page
	CONSULT GST*2	ECM*3					
LOST COMM (TCM)	U0101	0101*5	—	1	x	B	EC-624
CAN COMM CIRCUIT	U1001	1001*5	—	2	—	—	EC-625
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	P0000	0000	—	—	Blinking*7	—	—
INT/V TIM CONT-B1	P0011	0011	—	2	x	B	EC-626
INT/V TIM CONT-B2	P0021	0021	—	2	x	B	EC-626
A/F SEN1 HTR (B1)	P0031	0031	—	2	x	B	EC-633
A/F SEN1 HTR (B1)	P0032	0032	—	2	x	B	EC-633
HO2S2 HTR (B1)	P0037	0037	—	2	x	B	EC-636
HO2S2 HTR (B1)	P0038	0038	—	2	x	B	EC-636
A/F SEN1 HTR (B2)	P0051	0051	—	2	x	B	EC-633
A/F SEN1 HTR (B2)	P0052	0052	—	2	x	B	EC-633
HO2S2 HTR (B2)	P0057	0057	—	2	x	B	EC-636
HO2S2 HTR (B2)	P0058	0058	—	2	x	B	EC-636
INT/V TIM V/CIR-B1	P0075	0075	—	2	x	B	EC-640
INT/V TIM V/CIR-B2	P0081	0081	—	2	x	B	EC-640
MAF SEN/CIRCUIT-B1	P0101	0101	—	2	x	B	EC-643
MAF SEN/CIRCUIT-B1	P0102	0102	—	1	x	B	EC-647
MAF SEN/CIRCUIT-B1	P0103	0103	—	1	x	B	EC-647
IAT SENSOR 1 B1	P0111	0111	—	2	x	A	EC-652
IAT SEN/CIRCUIT-B1	P0112	0112	—	2	x	B	EC-654
IAT SEN/CIRCUIT-B1	P0113	0113	—	2	x	B	EC-654
ECT SEN/CIRC	P0116	0116	—	2	x	A	EC-657
ECT SEN/CIRC	P0117	0117	—	1	x	B	EC-660
ECT SEN/CIRC	P0118	0118	—	1	x	B	EC-660
TP SEN 2/CIRC-B1	P0122	0122	—	1	x	B	EC-664
TP SEN 2/CIRC-B1	P0123	0123	—	1	x	B	EC-664
ECT SENSOR	P0125	0125	—	2	x	B	EC-668
IAT SENSOR-B1	P0127	0127	—	2	x	B	EC-671
THERMSTAT FNCTN	P0128	0128	—	2	x	B	EC-674
A/F SENSOR1 (B1)	P0130	0130	—	2	x	A	EC-676
A/F SENSOR1 (B1)	P0131	0131	—	2	x	B	EC-680
A/F SENSOR1 (B1)	P0132	0132	—	2	x	B	EC-684
A/F SENSOR1 (B1)	P0133	0133	x	2	x	A	EC-688
HO2S2 (B1)	P0137	0137	x	2	x	A	EC-694
HO2S2 (B1)	P0138	0138	x	2	x	A	EC-699
HO2S2 (B1)	P0139	0139	x	2	x	A	EC-707
A/F SENSOR1 (B2)	P0150	0150	—	2	x	A	EC-676
A/F SENSOR1 (B2)	P0151	0151	—	2	x	B	EC-680
A/F SENSOR1 (B2)	P0152	0152	—	2	x	B	EC-684
A/F SENSOR1 (B2)	P0153	0153	x	2	x	A	EC-688

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

Items (CONSULT screen terms)	DTC*1		SRT code	Trip	MIL	Perma- nent DTC group*8	Reference page
	CONSULT GST*2	ECM*3					
HO2S2 (B2)	P0157	0157	×	2	×	A	EC-694
HO2S2 (B2)	P0158	0158	×	2	×	A	EC-699
HO2S2 (B2)	P0159	0159	×	2	×	A	EC-707
FUEL SYS-LEAN-B1	P0171	0171	—	2	×	B	EC-714
FUEL SYS-RICH-B1	P0172	0172	—	2	×	B	EC-719
FUEL SYS-LEAN-B2	P0174	0174	—	2	×	B	EC-714
FUEL SYS-RICH-B2	P0175	0175	—	2	×	B	EC-719
FTT SENSOR	P0181	0181	—	2	×	A and B	EC-724
FTT SEN/CIRCUIT	P0182	0182	—	2	×	B	EC-728
FTT SEN/CIRCUIT	P0183	0183	—	2	×	B	EC-728
TP SEN 1/CIRC-B1	P0222	0222	—	1	×	B	EC-731
TP SEN 1/CIRC-B1	P0223	0223	—	1	×	B	EC-731
MULTI CYL MISFIRE	P0300	0300	—	1 or 2	×	B	EC-735
CYL 1 MISFIRE	P0301	0301	—	1 or 2	×	B	EC-735
CYL 2 MISFIRE	P0302	0302	—	1 or 2	×	B	EC-735
CYL 3 MISFIRE	P0303	0303	—	1 or 2	×	B	EC-735
CYL 4 MISFIRE	P0304	0304	—	1 or 2	×	B	EC-735
CYL 5 MISFIRE	P0305	0305	—	1 or 2	×	B	EC-735
CYL 6 MISFIRE	P0306	0306	—	1 or 2	×	B	EC-735
CYL 7 MISFIRE	P0307	0307	—	1 or 2	×	B	EC-735
CYL 8 MISFIRE	P0308	0308	—	1 or 2	×	B	EC-735
KNOCK SEN/CIRC-B1	P0327	0327	—	2	—	—	EC-742
KNOCK SEN/CIRC-B1	P0328	0328	—	2	—	—	EC-742
KNOCK SEN/CIRC-B2	P0332	0332	—	2	—	—	EC-742
KNOCK SEN/CIRC-B2	P0333	0333	—	2	—	—	EC-742
CKP SEN/CIRCUIT	P0335	0335	—	2	×	B	EC-745
CMP SEN/CIRC-B1	P0340	0340	—	2	×	B	EC-749
TW CATALYST SYS-B1	P0420	0420	×	2	×	A	EC-753
TW CATALYST SYS-B2	P0430	0430	×	2	×	A	EC-753
EVAP PURG FLOW/MON	P0441	0441	×	2	×	A	EC-757
EVAP SMALL LEAK	P0442	0442	×	2	×	A	EC-762
PURG VOLUME CONT/V	P0443	0443	—	2	×	B	EC-769
PURG VOLUME CONT/V	P0444	0444	—	2	×	B	EC-774
PURG VOLUME CONT/V	P0445	0445	—	2	×	B	EC-774
VENT CONTROL VALVE	P0447	0447	—	2	×	B	EC-777
VENT CONTROL VALVE	P0448	0448	—	2	×	A	EC-781
EVAP SYS PRES SEN	P0451	0451	—	2	×	B	EC-786
EVAP SYS PRES SEN	P0452	0452	—	2	×	B	EC-790
EVAP SYS PRES SEN	P0453	0453	—	2	×	B	EC-794
EVAP GROSS LEAK	P0455	0455	—	2	×	A	EC-799
EVAP VERY SML LEAK	P0456	0456	×*4	2	×	A	EC-806
FUEL LEV SEN SLOSH	P0460	0460	—	2	×	A	EC-814

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ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

Items (CONSULT screen terms)	DTC*1		SRT code	Trip	MIL	Perma- nent DTC group*8	Reference page
	CONSULT GST*2	ECM*3					
FUEL LEVEL SENSOR	P0461	0461	—	2	×	B	EC-816
FUEL LEVL SEN/CIRC	P0462	0462	—	2	×	B	EC-818
FUEL LEVL SEN/CIRC	P0463	0463	—	2	×	B	EC-818
VEH SPEED SEN/CIRC*6	P0500	0500	—	2	×	B	EC-820
ISC SYSTEM	P0506	0506	—	2	×	B	EC-822
ISC SYSTEM	P0507	0507	—	2	×	B	EC-824
COLD START CONTROL	P050E	050E	—	2	×	A	EC-824
PW ST P SEN/CIRC	P0550	0550	—	2	—	—	EC-828
ECM BACK UP/CIRC	P0603	0603	—	2	×	B	EC-831
ECM	P0605	0605	—	1 or 2	× or —	B	EC-833
ECM	P0607	0607	—	1	×	B	EC-835
SENSOR POWER/CIRC	P0643	0643	—	1	×	B	EC-836
TRANSMISSION CONT	P0700	0700	—	1	×	B	TM-50
T/M RANGE SENSOR A	P0705	0705	—	2	×	B	TM-51
ATF TEMP SEN/CIRC*9	P0710	0710	—	2	×	B	TM-78
INPUT SPEED SENSOR A	P0717	0717	—	2	×	B	TM-53
OUTPUT SPEED SENSOR*6	P0720	0720	—	2	×	B	TM-55
1GR INCORRECT RATIO*8	P0731	0731	—	2	×	B	TM-60
2GR INCORRECT RATIO*8	P0732	0732	—	2	×	B	TM-62
3GR INCORRECT RATIO*8	P0733	0733	—	2	×	B	TM-64
4GR INCORRECT RATIO*8	P0734	0734	—	2	×	B	TM-66
5GR INCORRECT RATIO*8	P0735	0735	—	2	×	B	TM-68
TORQUE CONVERTER	P0740	0740	—	2	×	B	TM-70
TORQUE CONVERTER	P0744	0744	—	2	×	B	TM-72
PC SOLENOID A	P0745	0745	—	2	×	B	TM-74
P-N POS SW/CIRCUIT	P0850	0850	—	2	×	B	EC-839
INTK TIM S/CIRC-B1	P1140	1140	—	2	×	B	EC-842
INTK TIM S/CIRC-B2	P1145	1145	—	2	×	B	EC-842
CLOSED LOOP-B1	P1148	1148	—	1	×	A	EC-846
CLOSED LOOP-B2	P1168	1168	—	1	×	A	EC-846
TCS C/U FUNCTN	P1211	1211	—	2	—	—	EC-847
TCS/CIRC	P1212	1212	—	2	—	—	EC-848
ENG OVER TEMP	P1217	1217	—	1	×	B	EC-849
CTP LEARNING-B1	P1225	1225	—	2	—	—	EC-853
CTP LEARNING-B1	P1226	1226	—	2	—	—	EC-855
BAT CURRENT SENSOR	P1550	1550	—	2	—	—	EC-857
BAT CURRENT SENSOR	P1551	1551	—	2	—	—	EC-861
BAT CURRENT SENSOR	P1552	1552	—	2	—	—	EC-861
BAT CURRENT SENSOR	P1553	1553	—	2	—	—	EC-865
BAT CURRENT SENSOR	P1554	1554	—	2	—	—	EC-869
ASCD SW	P1564	1564	—	1	—	—	EC-873

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

Items (CONSULT screen terms)	DTC*1		SRT code	Trip	MIL	Perma- nent DTC group*8	Reference page
	CONSULT GST*2	ECM*3					
ASCD BRAKE SW	P1572	1572	—	1	—	—	EC-877
LOCK MODE	P1610	1610	—	2	—	—	SEC-43 or SEC-139
ID DISCORD, IMMU-ECM	P1611	1611	—	2	—	—	SEC-37 or SEC-136
CHAIN OF ECM-IMMU	P1612	1612	—	2	—	—	SEC-39 or SEC-138
CHAIN OF IMMU-KEY	P1614	1614	—	2	—	—	SEC-33 or SEC-132
DIFFERENCE OF KEY	P1615	1615	—	2	—	—	SEC-36 or SEC-135
INTERLOCK	P1730	1730	—	1	×	B	TM-82
INPUT CLUTCH SOL	P1752	1752	—	1	×	B	TM-86
FR BRAKE SOLENOID	P1757	1757	—	1	×	B	TM-88
DRCT CLUTCH SOL	P1762	1762	—	1	×	B	TM-90
HLR CLUTCH SOLENOID	P1767	1767	—	1	×	B	TM-92
L C BRAKE SOLENOID	P1772	1772	—	1	×	B	TM-94
L C BRAKE SOLENOID	P1774	1774	—	1	×	B	TM-96
BRAKE SW/CIRCUIT	P1805	1805	—	2	—	—	EC-882
ETC MOT PWR-B1	P2100	2100	—	1	×	B	EC-885
ETC FNCTN/CIRC-B1	P2101	2101	—	1	×	B	EC-888
ETC MOT PWR	P2103	2103	—	1	×	B	EC-885
ETC MOT-B1	P2118	2118	—	1	×	B	EC-892
ETC ACTR-B1	P2119	2119	—	1	×	B	EC-894
APP SEN 1/CIRC	P2122	2122	—	1	×	B	EC-896
APP SEN 1/CIRC	P2123	2123	—	1	×	B	EC-896
APP SEN 2/CIRC	P2127	2127	—	1	×	B	EC-899
APP SEN 2/CIRC	P2128	2128	—	1	×	B	EC-899
TP SENSOR-B1	P2135	2135	—	1	×	B	EC-903
APP SENSOR	P2138	2138	—	1	×	B	EC-907
A/F SENSOR1 (B1)	P2A00	2A00	—	2	×	A	EC-911
A/F SENSOR1 (B2)	P2A03	2A03	—	2	×	A	EC-911

*1: 1st trip DTC No. is the same as DTC No.

*2: This number is prescribed by SAE J2012/ISO 15031-6.

*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

*4: SRT code will not be set if the self-diagnostic result is NG.

*5: The troubleshooting for this DTC needs CONSULT.

*6: When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

*7: When the ECM is in the mode that displays SRT status, MIL may blink. For the details, refer to "How to Display SRT Status".

*8: When erasing this DTC, always use CONSULT or GST.

Test Value and Test Limit

INFOID:000000007800450

The following is the information specified in Service \$06 of SAE J1979/ISO 15031-5.

The test value is a parameter used to determine whether a system/circuit diagnostic test is OK or NG while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

These data (test value and test limit) are specified by On Board Monitor ID (OBDMID), Test ID (TID), Unit and Scaling ID and can be displayed on the GST screen.

The items of the test value and test limit will be displayed with GST screen which items are provided by the ECM. (e.g., if bank 2 is not applied on this vehicle, only the items of bank 1 are displayed)

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description	
				TID	Unit and Scaling ID		
HO2S	01H	Air fuel ratio (A/F) sensor 1 (Bank 1)	P0131	83H	0BH	Minimum sensor output voltage for test cycle	
			P0131	84H	0BH	Maximum sensor output voltage for test cycle	
			P0130	85H	0BH	Minimum sensor output voltage for test cycle	
			P0130	86H	0BH	Maximum sensor output voltage for test cycle	
			P0133	87H	04H	Response rate: Response ratio (lean to rich)	
			P0133	88H	04H	Response rate: Response ratio (rich to lean)	
			P2A00	89H	84H	The amount of shift in air fuel ratio	
			P2A00	8AH	84H	The amount of shift in air fuel ratio	
			P0130	8BH	0BH	Difference in sensor output voltage	
			P0133	8CH	83H	Response gain at the limited frequency	
			P014C	8DH	04H	O2 sensor slow response - Rich to lean bank 1 sensor 1	
			P014C	8EH	04H	O2 sensor slow response - Rich to lean bank 1 sensor 1	
			P014D	8FH	84H	O2 sensor slow response - Lean to rich bank 1 sensor 1	
			P014D	90H	84H	O2 sensor slow response - Lean to rich bank 1 sensor 1	
			P015A	91H	01H	O2 sensor delayed response - Rich to lean bank 1 sensor 1	
			P015A	92H	01H	O2 sensor delayed response - Rich to lean bank 1 sensor 1	
	P015B	93H	01H	O2 sensor delayed response - Lean to rich bank 1 sensor 1			
	P015B	94H	01H	O2 sensor delayed response - Lean to rich bank 1 sensor 1			
	02H	Heated oxygen sensor 2 (Bank 1)	P0138	07H	0CH	Minimum sensor output voltage for test cycle	
			P0137	08H	0CH	Maximum sensor output voltage for test cycle	
			P0138	80H	0CH	Sensor output voltage	
			P0139	81H	0CH	Difference in sensor output voltage	
	03H	Heated oxygen sensor 3 (Bank 1)	P0139	82H	11H	Rear O2 sensor delay response diagnosis	
			P0143	07H	0CH	Minimum sensor output voltage for test cycle	
			P0144	08H	0CH	Maximum sensor output voltage for test cycle	
			P0146	80H	0CH	Sensor output voltage	
				P0145	81H	0CH	Difference in sensor output voltage

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EC
C
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ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
HO2S	05H	Air fuel ratio (A/F) sensor 1 (Bank 2)	P0151	83H	0BH	Minimum sensor output voltage for test cycle
			P0151	84H	0BH	Maximum sensor output voltage for test cycle
			P0150	85H	0BH	Minimum sensor output voltage for test cycle
			P0150	86H	0BH	Maximum sensor output voltage for test cycle
			P0153	87H	04H	Response rate: Response ratio (lean to rich)
			P0153	88H	04H	Response rate: Response ratio (rich to lean)
			P2A03	89H	84H	The amount of shift in air fuel ratio
			P2A03	8AH	84H	The amount of shift in air fuel ratio
			P0150	8BH	0BH	Difference in sensor output voltage
			P0153	8CH	83H	Response gain at the limited frequency
			P014E	8DH	04H	O2 sensor slow response - Rich to lean bank 2 sensor 1
			P014E	8EH	04H	O2 sensor slow response - Rich to lean bank 2 sensor 1
			P014F	8FH	84H	O2 sensor slow response - Lean to rich bank 2 sensor 1
			P014F	90H	84H	O2 sensor slow response - Lean to rich bank 2 sensor 1
			P015C	91H	01H	O2 sensor delayed response - Rich to lean bank 2 sensor 1
			P015C	92H	01H	O2 sensor delayed response - Rich to lean bank 2 sensor 1
	P015D	93H	01H	O2 sensor delayed response - Lean to rich bank 2 sensor 1		
	P015D	94H	01H	O2 sensor delayed response - Lean to rich bank 2 sensor 1		
	06H	Heated oxygen sensor 2 (Bank 2)	P0158	07H	0CH	Minimum sensor output voltage for test cycle
			P0157	08H	0CH	Maximum sensor output voltage for test cycle
			P0158	80H	0CH	Sensor output voltage
			P0159	81H	0CH	Difference in sensor output voltage
			P0159	82H	11H	Rear O2 sensor delay response diagnosis
	07H	Heated oxygen sensor 3 (Bank2)	P0163	07H	0CH	Minimum sensor output voltage for test cycle
			P0164	08H	0CH	Maximum sensor output voltage for test cycle
			P0166	80H	0CH	Sensor output voltage
			P0165	81H	0CH	Difference in sensor output voltage

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
CATA- LYST	21H	Three way catalyst function (Bank1)	P0420	80H	01H	O2 storage index
			P0420	82H	01H	Switching time lag engine exhaust index value
			P2423	83H	0CH	Difference in 3rd O2 sensor output voltage
			P2423	84H	84H	O2 storage index in HC trap catalyst
	22H	Three way catalyst function (Bank2)	P0430	80H	01H	O2 storage index
			P0430	82H	01H	Switching time lag engine exhaust index value
			P2424	83H	0CH	Difference in 3rd O2 sensor output voltage
			P2424	84H	84H	O2 storage index in HC trap catalyst
EGR SYSTEM	31H	EGR function	P0400	80H	96H	Low flow faults: EGR temp change rate (short term)
			P0400	81H	96H	Low flow faults: EGR temp change rate (long term)
			P0400	82H	96H	Low flow faults: Difference between max EGR temp and EGR temp under idling condition
			P0400	83H	96H	Low flow faults: Max EGR temp
			P1402	84H	96H	High Flow Faults: EGR temp increase rate
VVT SYSTEM	35H	VVT Monitor (Bank1)	P0011	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)
			P0014	81H	9DH	VTC exhaust function diagnosis (VTC alignment check diagnosis)
			P0011	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)
			P0014	83H	9DH	VTC exhaust function diagnosis (VTC drive failure diagnosis)
			P100A	84H	10H	VEL slow response diagnosis
			P1090	85H	10H	VEL servo system diagnosis
	36H	VVT Monitor (Bank2)	P0021	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)
			P0024	81H	9DH	VTC exhaust function diagnosis (VTC alignment check diagnosis)
			P0021	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)
			P0024	83H	9DH	VTC exhaust function diagnosis (VTC drive failure diagnosis)
			P100B	84H	10H	VEL slow response diagnosis
			P1093	85H	10H	VEL servo system diagnosis

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
EVAP SYSTEM	39H	EVAP control system leak (Cap Off)	P0455	80H	0CH	Difference in pressure sensor output voltage before and after pull down
	3BH	EVAP control system leak (Small leak)	P0442	80H	05H	Leak area index (for more than 0.04 inch)
	3CH	EVAP control system leak (Very small leak)	P0456	80H	05H	Leak area index (for more than 0.02 inch)
			P0456	81H	FDH	Maximum internal pressure of EVAP system during monitoring
			P0456	82H	FDH	Internal pressure of EVAP system at the end of monitoring
	3DH	Purge flow system	P0441	83H	0CH	Difference in pressure sensor output voltage before and after vent control valve close
O2 SENSOR HEATER	41H	A/F sensor 1 heater (Bank 1)	Low Input: P0031 High Input: P0032	81H	0BH	Converted value of heater electric current to voltage
	42H	Heated oxygen sensor 2 heater (Bank 1)	Low Input: P0037 High Input: P0038	80H	0CH	Converted value of heater electric current to voltage
	43H	Heated oxygen sensor 3 heater (Bank 1)	P0043	80H	0CH	Converted value of heater electric current to voltage
	45H	A/F sensor 1 heater (Bank 2)	Low Input: P0051 High Input: P0052	81H	0BH	Converted value of heater electric current to voltage
	46H	Heated oxygen sensor 2 heater (Bank 2)	Low Input: P0057 High Input: P0058	80H	0CH	Converted value of heater electric current to voltage
	47H	Heated oxygen sensor 3 heater (Bank 2)	P0063	80H	0CH	Converted value of heater electric current to voltage
SECONDARY AIR	71H	Secondary air system	P0411	80H	01H	Secondary air injection system incorrect flow detected
			Bank1: P0491 Bank2: P0492	81H	01H	Secondary air injection system insufficient flow
			P2445	82H	01H	Secondary air injection system pump stuck off
			P2448	83H	01H	Secondary air injection system high airflow
			Bank1: P2440 Bank2: P2442	84H	01H	Secondary air injection system switching valve stuck open
			P2440	85H	01H	Secondary air injection system switching valve stuck open
			P2444	86H	01H	Secondary air injection system pump stuck on
FUEL SYSTEM	81H	Fuel injection system function (Bank 1)	P0171 or P0172	80H	2FH	Long term fuel trim
			P0171 or P0172	81H	24H	The number of lambda control clamped
			P117A	82H	03H	Cylinder A/F imbalance monitoring
	82H	Fuel injection system function (Bank 2)	P0174 or P0175	80H	2FH	Long term fuel trim
			P0174 or P0175	81H	24H	The number of lambda control clamped
			P117B	82H	03H	Cylinder A/F imbalance monitoring

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
MISFIRE	A1H	Multiple cylinder misfires	P0301	80H	24H	Misfiring counter at 1000 revolution of the first cylinder
			P0302	81H	24H	Misfiring counter at 1000 revolution of the second cylinder
			P0303	82H	24H	Misfiring counter at 1000 revolution of the third cylinder
			P0304	83H	24H	Misfiring counter at 1000 revolution of the fourth cylinder
			P0305	84H	24H	Misfiring counter at 1000 revolution of the fifth cylinder
			P0306	85H	24H	Misfiring counter at 1000 revolution of the sixth cylinder
			P0307	86H	24H	Misfiring counter at 1000 revolution of the seventh cylinder
			P0308	87H	24H	Misfiring counter at 1000 revolution of the eighth cylinder
			P0300	88H	24H	Misfiring counter at 1000 revolution of the multiple cylinders
			P0301	89H	24H	Misfiring counter at 200 revolution of the first cylinder
			P0302	8AH	24H	Misfiring counter at 200 revolution of the second cylinder
			P0303	8BH	24H	Misfiring counter at 200 revolution of the third cylinder
			P0304	8CH	24H	Misfiring counter at 200 revolution of the fourth cylinder
			P0305	8DH	24H	Misfiring counter at 200 revolution of the fifth cylinder
			P0306	8EH	24H	Misfiring counter at 200 revolution of the sixth cylinder
			P0307	8FH	24H	Misfiring counter at 200 revolution of the seventh cylinder
			P0308	90H	24H	Misfiring counter at 200 revolution of the eighth cylinder
			P0300	91H	24H	Misfiring counter at 1000 revolution of the single cylinder
			P0300	92H	24H	Misfiring counter at 200 revolution of the single cylinder
			P0300	93H	24H	Misfiring counter at 200 revolution of the multiple cylinders

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ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
MISFIRE	A2H	No. 1 cylinder misfire	P0301	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0301	0CH	24H	Misfire counts for last/current driving cycles
	A3H	No. 2 cylinder misfire	P0302	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0302	0CH	24H	Misfire counts for last/current driving cycles
	A4H	No. 3 cylinder misfire	P0303	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0303	0CH	24H	Misfire counts for last/current driving cycles
	A5H	No. 4 cylinder misfire	P0304	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0304	0CH	24H	Misfire counts for last/current driving cycles
	A6H	No. 5 cylinder misfire	P0305	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0305	0CH	24H	Misfire counts for last/current driving cycles
	A7H	No. 6 cylinder misfire	P0306	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0306	0CH	24H	Misfire counts for last/current driving cycles
	A8H	No. 7 cylinder misfire	P0307	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0307	0CH	24H	Misfire counts for last/current driving cycles
	A9H	No. 8 cylinder misfire	P0308	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0308	0CH	24H	Misfire counts for last/current driving cycles

ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

WIRING DIAGRAM

ENGINE CONTROL SYSTEM

Wiring Diagram

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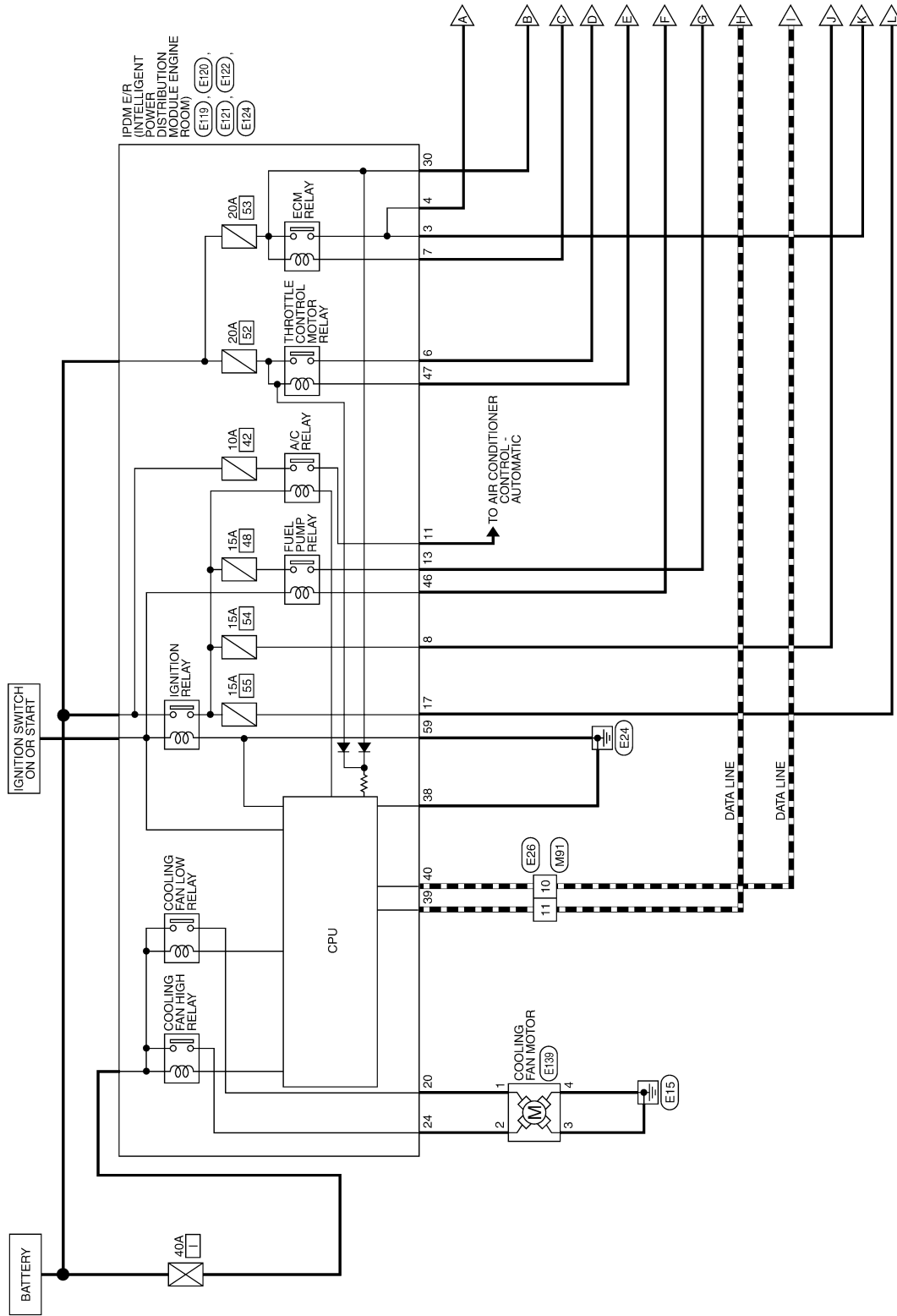
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ENGINE CONTROL SYSTEM - VK56DE

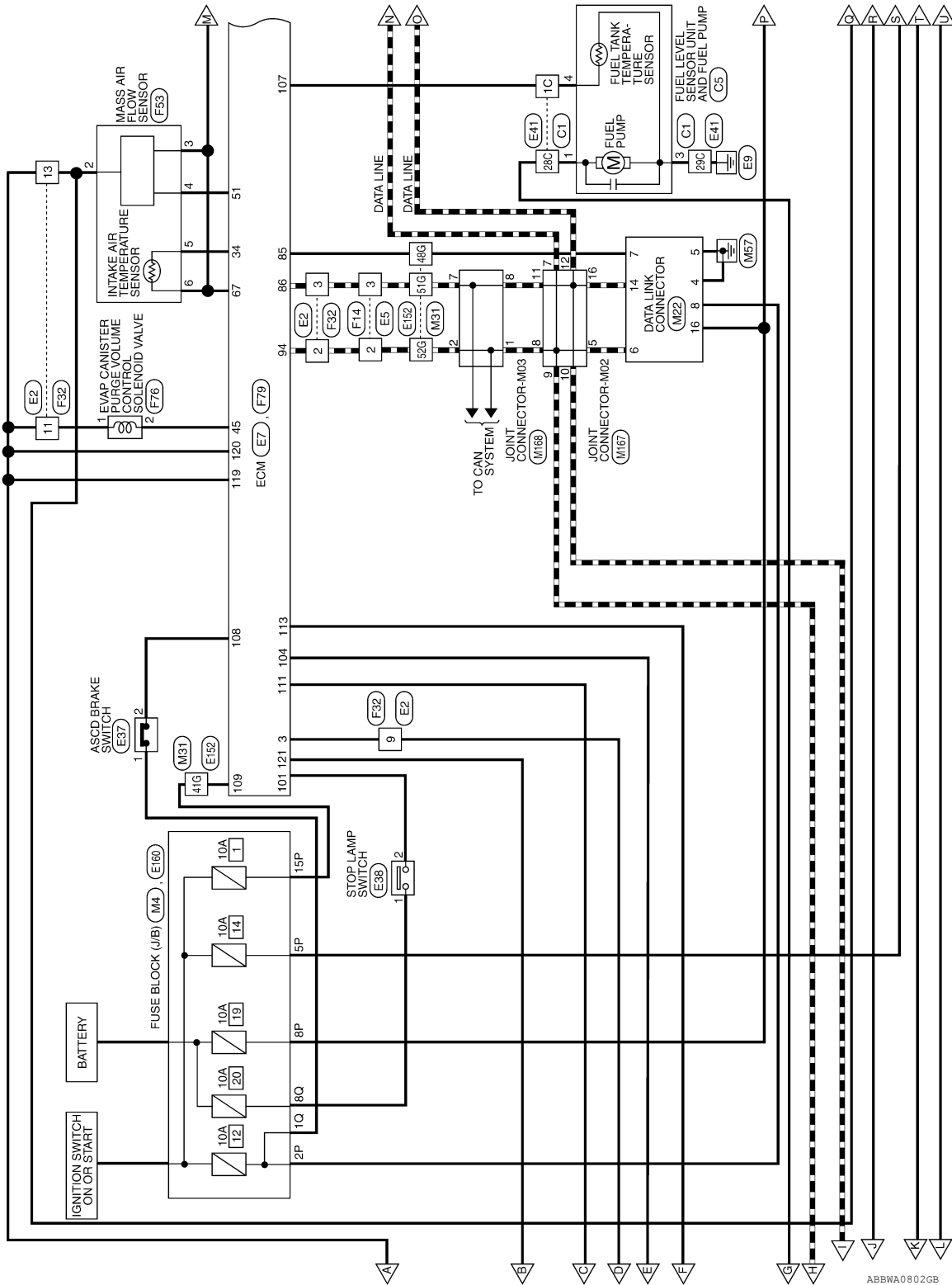


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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

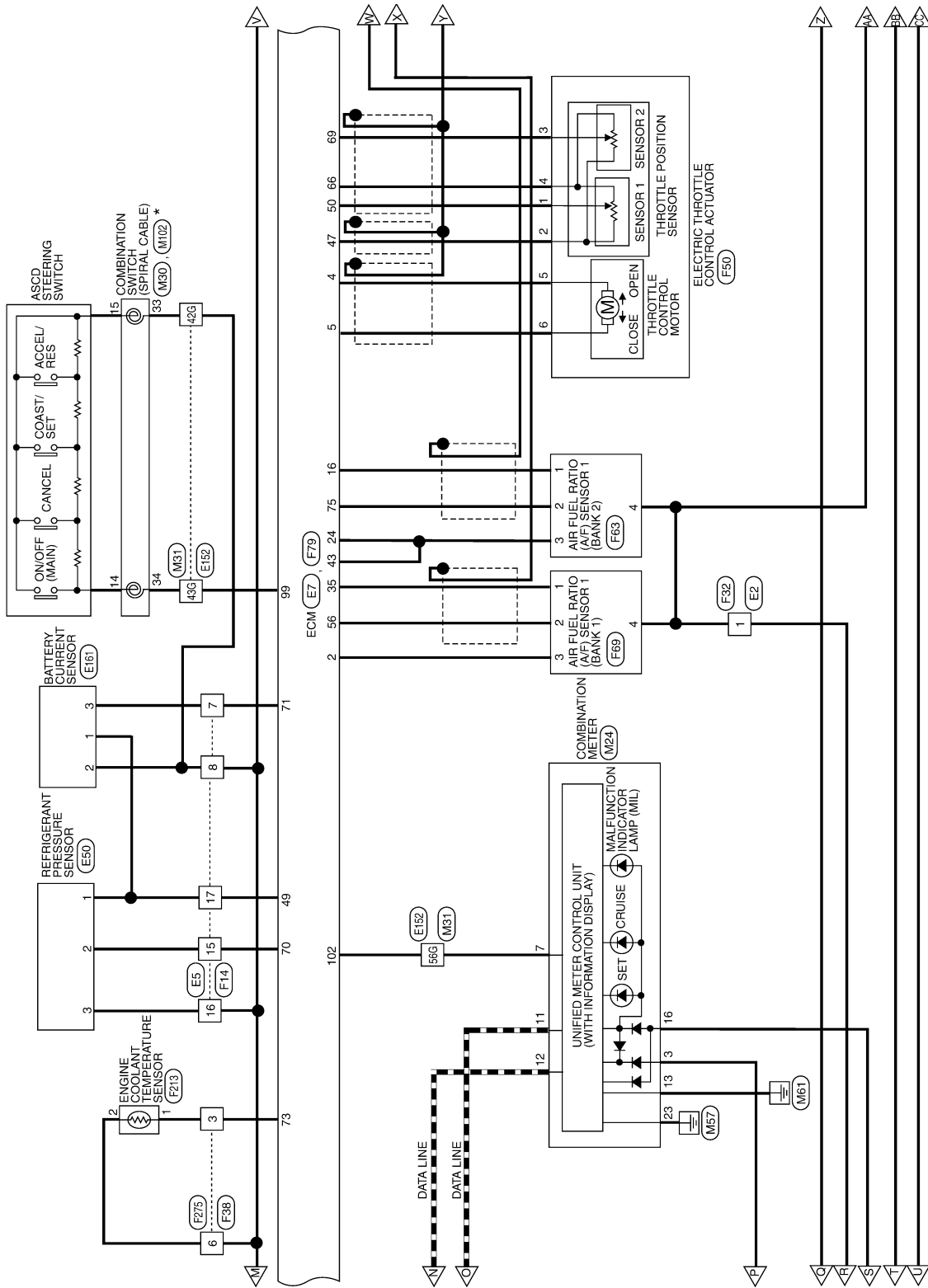


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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]



* : THIS CONNECTOR IS NOT SHOWN IN "HARNES LAYOUT" OF PG SECTION.

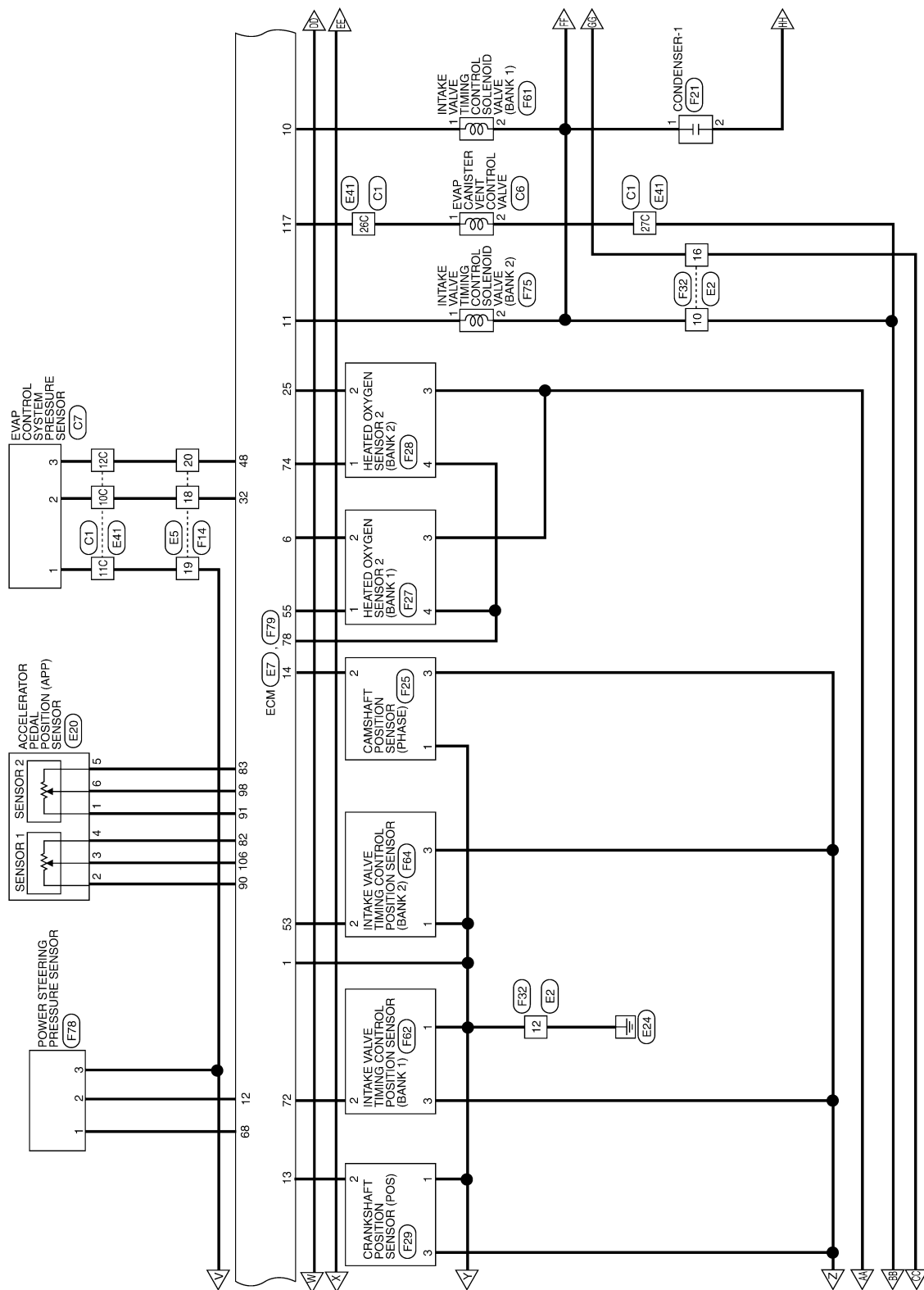
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

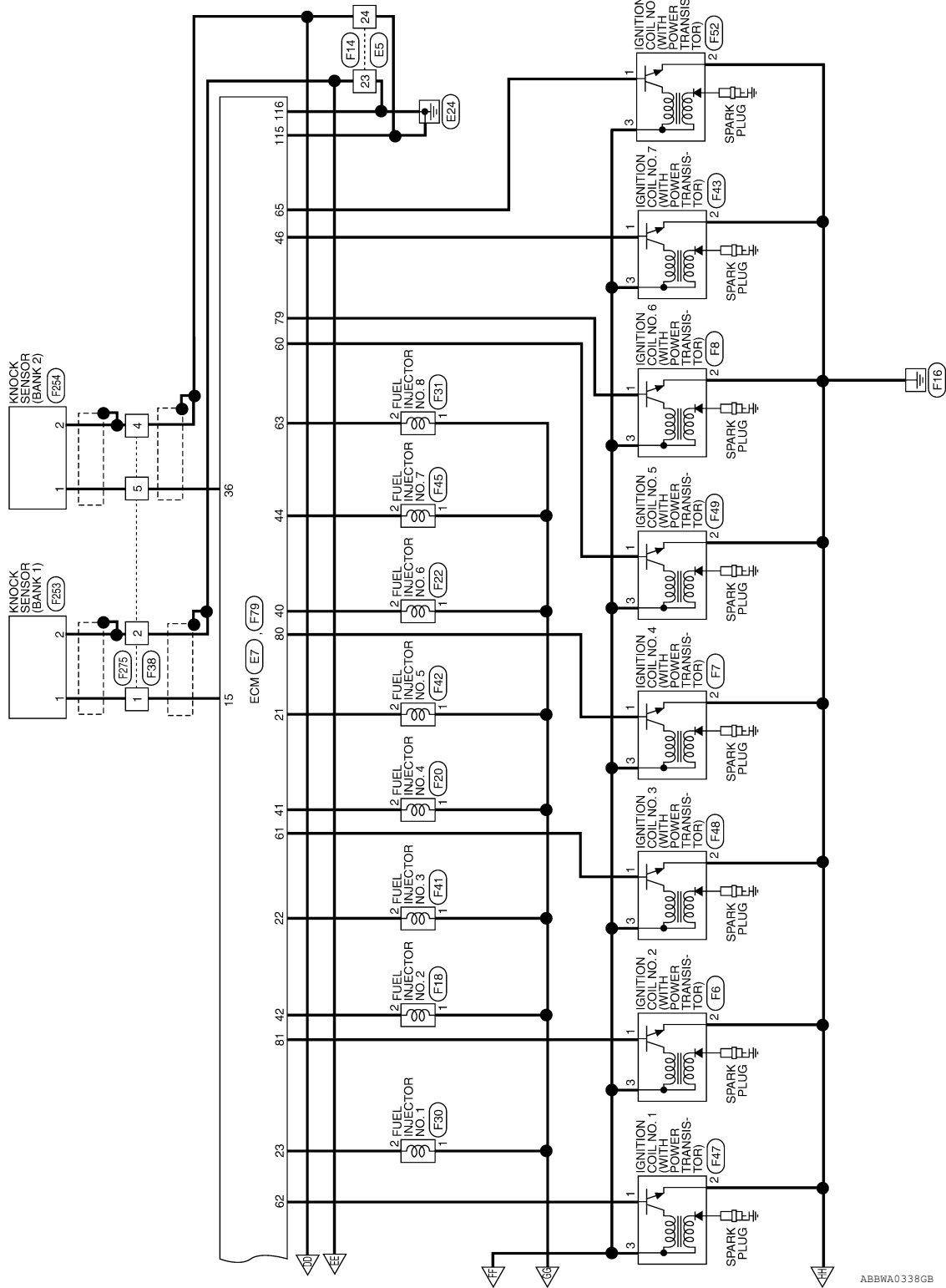


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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

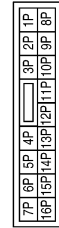


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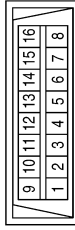
ENGINE CONTROL SYSTEM CONNECTORS - VK56DE

Connector No.	M4
Connector Name	FUSE BLOCK (J/B)
Connector Color	WHITE



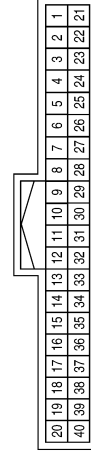
Terminal No.	Color of Wire	Signal Name
2P	W/G	-
5P	W/G	-
8P	R/Y	-
15P	W/R	-

Connector No.	M22
Connector Name	DATA LINK CONNECTOR
Connector Color	WHITE



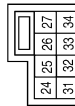
Terminal No.	Color of Wire	Signal Name
4	B	-
5	B	-
6	L	-
7	W	-
8	W/G	-
14	P	-
16	R/Y	-

Connector No.	M24
Connector Name	COMBINATION METER
Connector Color	WHITE



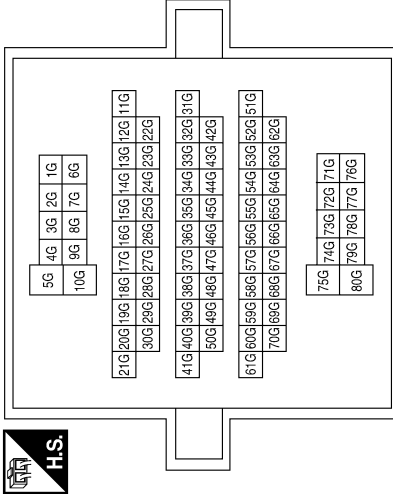
Terminal No.	Color of Wire	Signal Name
3	R/Y	BATTERY
7	G	AT-PN ECM
11	P	CAN-L
12	L	CAN-H
13	GR	GROUND
16	W/G	RUN START
23	B	POWER GND

Connector No.	M30
Connector Name	COMBINATION SWITCH
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
33	B	ASCD_RTN
34	SB	ASCD

Connector No.	M31
Connector Name	WIRE TO WIRE
Connector Color	WHITE



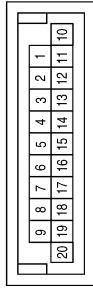
Terminal No.	Color of Wire	Signal Name
41G	W/R	-
42G	B	-
43G	SB	-
48G	W	-
51G	P	-
52G	L	-
56G	G	-

ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

Connector No.	M167
Connector Name	JOINT CONNECTOR-M02
Connector Color	BLUE



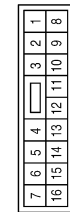
Terminal No.	Color of Wire	Signal Name
5	L	-
7	L	-
8	L	-
9	L	-
10	P	-
11	P	-
12	P	-
16	P	-

Connector No.	M102
Connector Name	COMBINATION SWITCH
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
14	SB	-
15	B	-

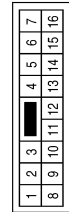
Connector No.	M91
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
10	P	-
11	L	-

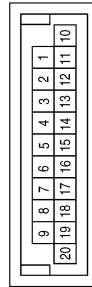
Terminal No.	Color of Wire	Signal Name
3	P	-
9	V	-
10	G	-
11	GR	-
12	BR	-
13	LG	-
16	W/G	-

Connector No.	E2
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	W/R	-
2	L	-

Connector No.	M168
Connector Name	JOINT CONNECTOR-M03
Connector Color	GREEN



Terminal No.	Color of Wire	Signal Name
1	L	-
2	L	-
7	P	-
8	P	-

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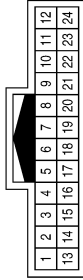
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

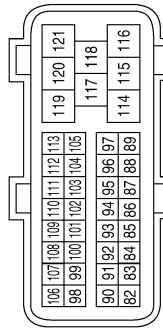
Connector No.	E5
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
2	L	-
3	P	-

Terminal No.	Color of Wire	Signal Name
7	R	-
8	B	-
15	BR	-
16	B	-
17	P	-
18	W	-
19	B	-
20	SB	-
23	GR	-
24	B	-

Connector No.	E7
Connector Name	ECM (WITH VK56DE)
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
85	W	K-LINE
86	P	CAN-L
87	-	-
88	-	-
89	-	-
90	L	AVCC
91	G	AVCC2
92	-	-
93	-	-
94	L	CAN-H
95	-	-
96	-	-
97	-	-
98	GR	APS2
99	SB	ASCD SW
100	-	-
101	LG	BRAKE
102	G	NEUT
103	-	-

Terminal No.	Color of Wire	Signal Name
104	O	MOTRLY
105	-	-
106	R	APS1
107	Y	TF
108	LG	BNCSW
109	W/R	IGNSW
110	-	-
111	BR	SSOFF
112	-	-
113	V	FPR
114	-	-
115	B	GND
116	GR	GND
117	G	CDCV
118	-	-
119	R	VB
120	P	VB
121	R/B	BATT

Terminal No.	Color of Wire	Signal Name
82	B	GND-A
83	B	GND-A2
84	-	-

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

Connector No.	E37
Connector Name	ASCD BRAKE SWITCH
Connector Color	BROWN



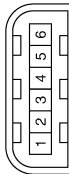
Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	LG	-

Connector No.	E26
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
10	P	-
11	L	-

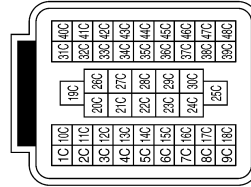
Connector No.	E20
Connector Name	ACCELERATOR PEDAL POSITION (APP) SENSOR
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	G	AVCC2
2	L	AVCC1
3	R	APS1
4	B	GND-A
5	B	GND-A2
6	GR	APS2

Terminal No.	Color of Wire	Signal Name
1C	Y	-
10C	W	-
11C	B	-
12C	SB	-
26C	G	-
27C	W	-
28C	R	-
29C	B	-

Connector No.	E41
Connector Name	WIRE TO WIRE
Connector Color	BLACK



Connector No.	E38
Connector Name	STOP LAMP SWITCH
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	R/B	-
2	Y	-

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

Terminal No.	Color of Wire	Signal Name
4	P	ECM
6	V	ETC
7	BR	ECM RLY CONT
8	W/R	O2 SENSOR
11	Y	A/C COMPRESSOR
13	R	FUEL PUMP
17	W/G	INJECTOR

Connector No.	E119
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



9	8	7	6	5	4	3		
18	17	16	15	14	13	12	11	10

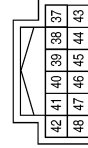
Terminal No.	Color of Wire	Signal Name
3	G	IGN_COIL

Connector No.	E50
Connector Name	REFRIGERANT PRESSURE SENSOR (WITH VK56DE)
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	P	POWER_SUPPLY
2	BR	SIGNAL
3	B	GND

Connector No.	E122
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
38	B	GND (SIGNAL)
39	L	CAN-H
40	P	CAN-L
46	V	FUEL PUMP RLY CONT
47	O	ETC RLY CONT

Connector No.	E121
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	BROWN



Terminal No.	Color of Wire	Signal Name
30	F/B	ECM BAT

Connector No.	E120
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
20	BR	MOTOR FAN 1
24	P	MOTOR FAN 2

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

Connector No.	E124
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	BLACK



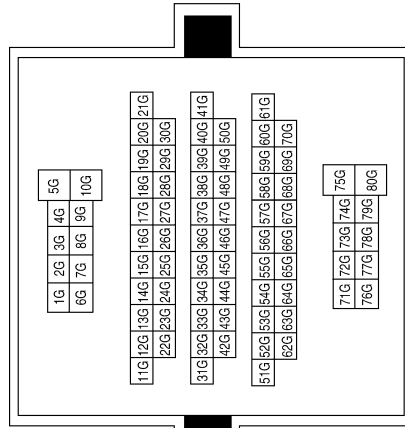
Terminal No.	Color of Wire	Signal Name
59	B	GND (POWER)

Connector No.	E139
Connector Name	COOLING FAN MOTOR
Connector Color	BLACK



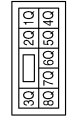
Terminal No.	Color of Wire	Signal Name
1	BR	-
2	P	-
3	B	-
4	B	-

Connector No.	E152
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
41G	W/R	-
42G	B	-
43G	SB	-
48G	W	-
51G	P	-
52G	L	-
56G	G	-

Connector No.	E160
Connector Name	FUSE BLOCK (J/B)
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1Q	W/G	-
8Q	R/B	-

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

Connector No.	F7
Connector Name	IGNITION COIL NO. 4 (WITH POWER TRANSISTOR)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	GR	-
2	B	-
3	W	-

Connector No.	F6
Connector Name	IGNITION COIL NO. 2 (WITH POWER TRANSISTOR)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	G	-
2	B	-
3	LG	-

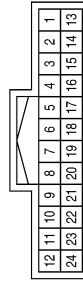
Connector No.	E161
Connector Name	BATTERY CURRENT SENSOR
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	P	POWER SUPPLY
2	B	GND
3	R	SIGNAL

Terminal No.	Color of Wire	Signal Name
7	R	-
8	B	-
15	BR	-
16	B	-
17	P	-
18	W	-
19	B	-
20	SB	-
23	GR	-
24	B	-

Connector No.	F14
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
2	L	-
3	P	-

Connector No.	F8
Connector Name	IGNITION COIL NO. 6 (WITH POWER TRANSISTOR)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	P	-
2	B	-
3	LG	-

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

Connector No.	F21
Connector Name	CONDENSER-1
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	W	-
2	B	-

Connector No.	F20
Connector Name	FUEL INJECTOR NO. 4
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	R	-

Connector No.	F18
Connector Name	FUEL INJECTOR NO. 2
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	O	-

Connector No.	F27
Connector Name	HEATED OXYGEN SENSOR 2 (BANK 1)
Connector Color	GREEN



Terminal No.	Color of Wire	Signal Name
1	G	SIGNAL
2	R	HEATED GND
3	W/R	POWER SUPPLY
4	GR	GND O2

Connector No.	F25
Connector Name	CAMSHAFT POSITION SENSOR (PHASE)
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	BR	GND
2	SB	SIGNAL
3	R	POWER SUPPLY

Connector No.	F22
Connector Name	FUEL INJECTOR NO. 6
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	V	-

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

Connector No.	F30
Connector Name	FUEL INJECTOR NO. 1
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	G	-

Connector No.	F29
Connector Name	CRANKSHAFT POSITION SENSOR (POS)
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	BR	GND
2	G	SIGNAL
3	R	POWER SUPPLY

Connector No.	F28
Connector Name	HEATED OXYGEN SENSOR 2 (BANK 2)
Connector Color	GREEN



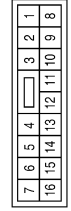
Terminal No.	Color of Wire	Signal Name
1	SB	SIGNAL
2	P	HEATED GND
3	W/R	POWER SUPPLY
4	GR	GND O2

Connector No.	F38
Connector Name	WIRE TO WIRE
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	W	-
2	GR	-
3	Y	-
4	B	-
5	W	-
6	B	-

Connector No.	F32
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	W/R	-
2	L	-
3	P	-
9	V	-
10	O	-(WITH VK56DE)
11	GR	-
12	BR	-
13	LG	-
16	W/G	-

Connector No.	F31
Connector Name	FUEL INJECTOR NO. 8
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	W	-

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

Connector No.	F43
Connector Name	IGNITION COIL NO. 7 (WITH POWER TRANSISTOR)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	LG	-
2	B	-
3	W	-

Connector No.	F42
Connector Name	FUEL INJECTOR NO. 5
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	L	-

Connector No.	F41
Connector Name	FUEL INJECTOR NO. 3
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	V	-

Connector No.	F48
Connector Name	IGNITION COIL NO. 3 (WITH POWER TRANSISTOR)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	L	-
2	B	-
3	W	-

Connector No.	F47
Connector Name	IGNITION COIL NO. 1 (WITH POWER TRANSISTOR)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	Y	-
2	B	-
3	O	-

Connector No.	F45
Connector Name	FUEL INJECTOR NO. 7
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W/G	-
2	L	-

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ENGINE CONTROL SYSTEM

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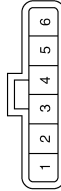
[VK56DE]

Connector No.	F52
Connector Name	IGNITION COIL NO. 8 (WITH POWER TRANSISTOR)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	GR	-
2	B	-
3	G	-

Connector No.	F50
Connector Name	ELECTRIC THROTTLE CONTROL ACTUATOR
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	W	TPS1
2	L	AVCC2
3	R	TPS2
4	B	GND-A2
5	L/W	MOTOR 2 (CLOSE)
6	L/B	MOTOR 1 (OPEN)

Connector No.	F49
Connector Name	IGNITION COIL NO. 5 (WITH POWER TRANSISTOR)
Connector Color	GRAY



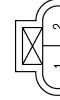
Terminal No.	Color of Wire	Signal Name
1	V	-
2	B	-
3	W	-

Connector No.	F62
Connector Name	INTAKE VALVE TIMING CONTROL POSITION SENSOR (BANK 1)
Connector Color	BLACK



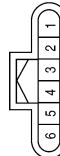
Terminal No.	Color of Wire	Signal Name
1	BR	GND
2	Y	SIGNAL
3	R	POWER SUPPLY

Connector No.	F61
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1)
Connector Color	GREEN



Terminal No.	Color of Wire	Signal Name
1	W	-
2	R	-

Connector No.	F53
Connector Name	MASS AIR FLOW SENSOR
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
2	LG	POWER SUPPLY
3	B	QA-
4	P	QA+
5	BR	AT SEN SIGNAL
6	B	GND

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

Connector No.	F69
Connector Name	AIR FUEL RATIO (A/F) SENSOR 1 (BANK 1)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	O	AF+
2	W	AF-
3	G	HEATER GND
4	W/R	HEATER PWR

Connector No.	F64
Connector Name	INTAKE VALVE TIMING CONTROL POSITION SENSOR (BANK 2)
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	BR	GND
2	L	SIGNAL
3	R	POWER SUPPLY

Connector No.	F63
Connector Name	AIR FUEL RATIO (A/F) SENSOR 1 (BANK 2)
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	L	AF+
2	P	AF-
3	G	HEATER GND
4	W/R	HEATER PWR

Connector No.	F78
Connector Name	POWER STEERING PRESSURE SENSOR
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	G	POWER SUPPLY
2	P	SIGNAL
3	B	GND

Connector No.	F76
Connector Name	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	GR	-
2	R	-

Connector No.	F75
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2)
Connector Color	GREEN



Terminal No.	Color of Wire	Signal Name
1	LG	-
2	R	-

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ENGINE CONTROL SYSTEM

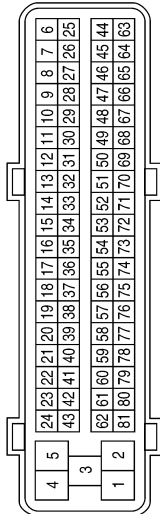
< WIRING DIAGRAM >

[VK56DE]

Terminal No.	Color of Wire	Signal Name
55	G	O2SRL
56	W	AF-1
57	-	-
58	-	-
59	-	-
60	V	IGN #5
61	L	IGN #3
62	Y	IGN #1
63	W	INU #8
64	-	-
65	GR	IGN #8
66	B	GND-A2
67	B	GND-A
68	G	AVCC(PSPRESS)
69	R	TPS 2
70	BR	PDPRESS
71	R	CURSEN
72	Y	VTCPUISL
73	Y	TW
74	SB	O2SRR
75	P	AF-2
76	-	-
77	-	-
78	GR	GND-O2
79	P	IGN #6
80	GR	IGN #4
81	G	IGN #2

Terminal No.	Color of Wire	Signal Name
21	L	INU #5
22	V	INU #3
23	G	INU #1
24	G	AF-H2
25	P	O2HRR
26	-	-
27	-	-
28	-	-
29	-	-
30	-	-
31	-	-
32	W	FTPRS
33	-	-
34	BR	TA
35	O	AF+1
36	W	KNK 2
37	-	-
38	-	-
39	-	-
40	V	INU #6
41	R	INU #4
42	O	INU #2
43	G	AF-H2
44	L	INU #7
45	R	EVAP
46	LG	IGN #7
47	L	AVCC 2
48	SB	AVCC
49	P	AVCC(PDPRES)
50	W	TPS 1
51	P	QA+
52	-	-
53	L	VTCPUISL
54	-	-

Connector No.	F79
Connector Name	ECM (WITH VK56DE)
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	BR	GND
2	G	AF-H1
3	V	VMOT
4	LW	MOTOR 2
5	L/B	MOTOR 1
6	R	O2HRL
7	-	-
8	-	-
9	-	-
10	W	CVTCL
11	LG	CVTCR
12	P	PSPRES
13	G	POS
14	SB	PHASE(LH)
15	W	KNK 1
16	L	AF+2
17	-	-
18	-	-
19	-	-
20	-	-

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

Connector No.	F254
Connector Name	KNOCK SENSOR (BANK 2)
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	W	KNK
2	B	GND

Connector No.	F253
Connector Name	KNOCK SENSOR (BANK 1)
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	W	KNK
2	GR	GND

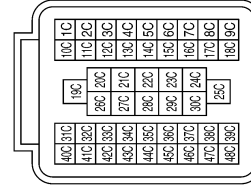
Connector No.	F213
Connector Name	ENGINE COOLANT TEMPERATURE SENSOR
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	Y	-
2	B	-

Terminal No.	Color of Wire	Signal Name
1C	Y	-
10C	W	-
11C	B	-
12C	SB	-
26C	G	-
27C	W	-
28C	R	-
29C	B	-

Connector No.	C1
Connector Name	WIRE TO WIRE
Connector Color	BLACK



Connector No.	F275
Connector Name	WIRE TO WIRE
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	W	-
2	GR	-
3	Y	-
4	B	-
5	W	-
6	B	-

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

Connector No.	C7
Connector Name	EVAP CONTROL SYSTEM PRESSURE SENSOR
Connector Color	GRAY



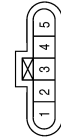
Terminal No.	Color of Wire	Signal Name
1	B	-
2	W	-
3	SB	-

Connector No.	C6
Connector Name	EVAP CANISTER VENT CONTROL VALVE
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	W	-
2	G	-

Connector No.	C5
Connector Name	FUEL LEVEL SENSOR UNIT AND FUEL PUMP
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	R	-
3	B	-
4	Y	-

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BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Trouble Diagnosis Introduction

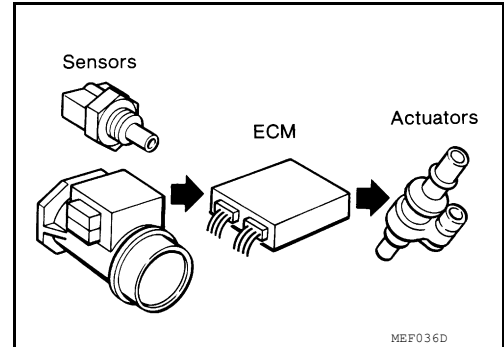
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A

EC

INTRODUCTION

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no malfunctions such as vacuum leaks, fouled spark plugs, or other malfunctions with the engine.



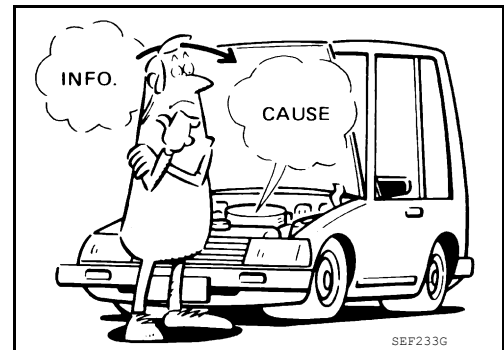
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It is much more difficult to diagnose an incident that occurs intermittently rather than continuously. Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.



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H

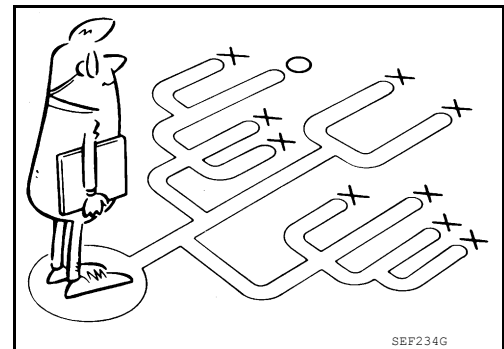
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J

A visual check only may not find the cause of the incidents. A road test with CONSULT (or GST) or a circuit tester connected should be performed. Follow the Work Flow on "WORK FLOW".

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such incidents, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A Diagnostic Worksheet like the example on "Worksheet Sample" should be used.

Start your diagnosis by looking for conventional malfunctions first. This will help troubleshoot driveability malfunctions on an electronically controlled engine vehicle.



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WORK FLOW

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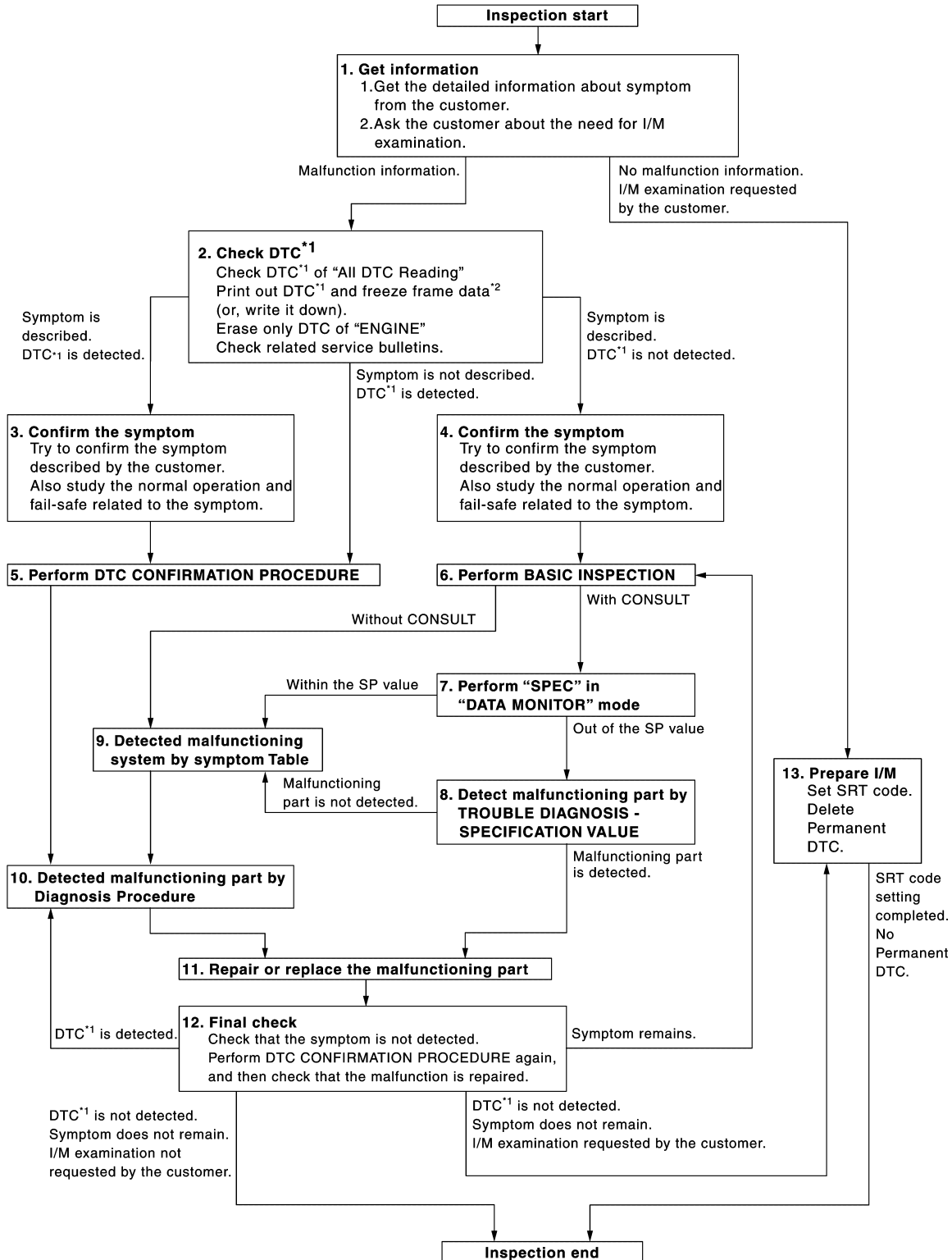
P

DIAGNOSIS AND REPAIR WORK FLOW

[VK56DE]

< BASIC INSPECTION >

Overall Sequence



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Detailed Flow

1. GET INFORMATION FOR SYMPTOM

1. Get the detailed information from the customer about the symptom (the condition and the environment when the incident/malfunction occurred) using the "Diagnostic Work Sheet".
2. Ask if the customer requests I/M examination.

Malfunction information, obtained>>GO TO 2.

DIAGNOSIS AND REPAIR WORK FLOW

[VK56DE]

< BASIC INSPECTION >

No malfunction information, but a request for I/M examination>>GO TO 13.

2.CHECK DTC

1. Check DTC.
2. Perform the following procedure if DTC is displayed.
 - Record DTC and freeze frame data. (Print them out with CONSULT or GST.)
 - Erase DTC.
 - Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Matrix Chart is useful. Refer to [EC-947, "Symptom Matrix Chart"](#).)
3. Check related service bulletins for information.

Are any symptoms described and any DTCs detected?

- Symptom is described, DTC is detected>>GO TO 3.
- Symptom is described, DTC is not detected>>GO TO 4.
- Symptom is not described, DTC is detected>>GO TO 5.

3.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer (except MIL ON).
Also study the normal operation and fail-safe related to the symptom. Refer to [EC-951, "Fuel Cut Control \(at No Load and High Engine Speed\)"](#) and [EC-553, "Fail-Safe Chart"](#).

Diagnosis Work Sheet is useful to verify the incident.

Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

4.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.
Also study the normal operation and fail-safe related to the symptom. Refer to [EC-951, "Fuel Cut Control \(at No Load and High Engine Speed\)"](#) and [EC-553, "Fail-Safe Chart"](#).

Diagnosis Work Sheet is useful to verify the incident.

Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 6.

5.PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE for the displayed DTC, and then check that DTC is detected again.

If two or more DTCs are detected, refer to [EC-555, "DTC Inspection Priority Chart"](#) and determine trouble diagnosis order.

NOTE:

- Freeze frame data is useful if the DTC is not detected.
- Perform Component Function Check if DTC CONFIRMATION PROCEDURE is not included on Service Manual. This simplified check procedure is an effective alternative though DTC cannot be detected during this check.

If the result of Component Function Check is NG, it is the same as the detection of DTC by DTC CONFIRMATION PROCEDURE.

Is DTC detected?

- YES >> GO TO 10.
- NO >> Check according to [GI-37, "Intermittent Incident"](#).

6.PERFORM BASIC INSPECTION

Perform [EC-592, "Basic Inspection"](#).

Will CONSULT be used?

- YES >> GO TO 7.
- NO >> GO TO 9.

7.PERFORM SPEC IN DATA MONITOR MODE

Ⓜ With CONSULT

DIAGNOSIS AND REPAIR WORK FLOW

[VK56DE]

< BASIC INSPECTION >

Check that "MAS A/F SE-B1", "MAS A/F SE-B2", "B/FUEL SCHDL", "A/F ALPHA-B1" and "A/F ALPHA-B2" are within the SP value using "SPEC" in "DATA MONITOR" mode with CONSULT. Refer to [EC-612, "Testing Condition"](#), [EC-612, "Inspection Procedure"](#).

Is the measurement value within the SP value?

YES >> GO TO 9.

NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Detect malfunctioning part according to [EC-613, "Diagnosis Procedure"](#).

Is a malfunctioning part detected?

YES >> GO TO 11.

NO >> GO TO 9.

9. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE

Detect malfunctioning system according to [EC-947, "Symptom Matrix Chart"](#) based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptoms.

>> GO TO 10.

10. DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE

Inspect according to Diagnosis Procedure of the system.

NOTE:

The Diagnosis Procedure in EC section described based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnosis Procedure. For details, refer to [GI-40, "Circuit Inspection"](#).

Is a malfunctioning part detected?

YES >> GO TO 11.

NO >> Monitor input data from related sensors or check voltage of related ECM terminals using CONSULT. Refer to [EC-542, "CONSULT Reference Value in Data Monitor Mode"](#), [EC-545, "ECM Terminal and Reference Value"](#).

11. REPAIR OR REPLACE THE MALFUNCTIONING PART

1. Repair or replace the malfunctioning part.
2. Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replacement.
3. Check DTC. If DTC is displayed, erase it.

>> GO TO 12.

12. FINAL CHECK

When DTC was detected in step 2, perform DTC CONFIRMATION PROCEDURE or Component Function Check again, and then check that the malfunction have been completely repaired.

When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and check that the symptom is not detected.

Is DTC detected and does symptom remain?

YES-1 >> DTC is detected: GO TO 10.

YES-2 >> Symptom remains: GO TO 6.

NO-1 >> Before returning the vehicle to the customer, always erase unnecessary DTC in ECM and TCM (Transmission Control Module). If the completion of SRT is needed, drive vehicle under the specific driving pattern. Refer to [EC-600, "Description"](#).

NO-2 >> I/M examination, requested from the customer: GO TO 13.

13. PREPARE FOR I/M EXAMINATION

1. Set SRT codes. Refer to [EC-600, "Description"](#).
2. Erase permanent DTCs. Refer to [EC-606, "Description"](#).

>> INSPECTION END

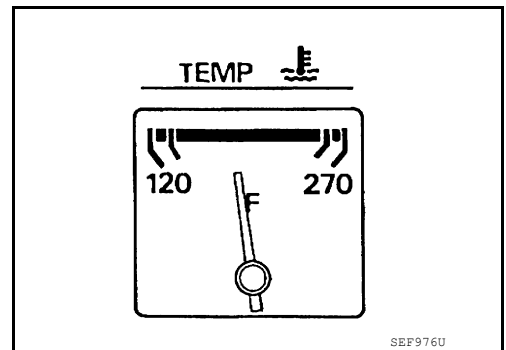
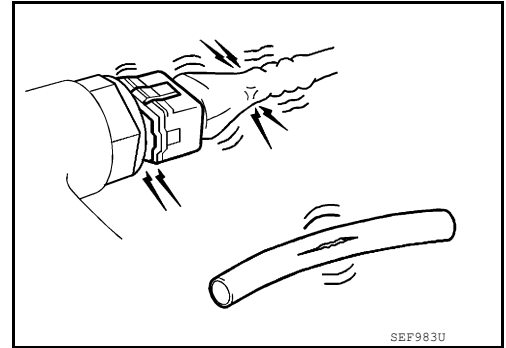
INSPECTION AND ADJUSTMENT

Basic Inspection

INFOID:000000007358456

1. INSPECTION START

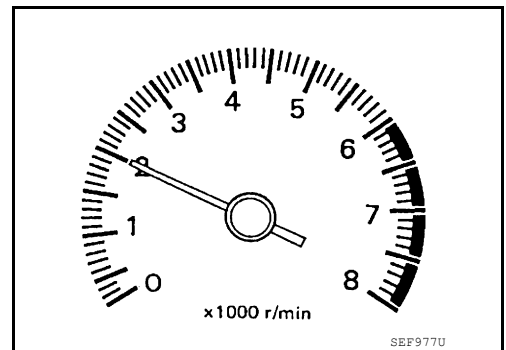
1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
 - Harness connectors for improper connections
 - Wiring harness for improper connections, pinches and cut
 - Vacuum hoses for splits, kinks and improper connections
 - Hoses and ducts for leakage
 - Air cleaner clogging
 - Gasket
3. Check that electrical or mechanical loads are not applied.
 - Headlamp switch is OFF.
 - Air conditioner switch is OFF.
 - Rear window defogger switch is OFF.
 - Steering wheel is in the straight-ahead position, etc.
4. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge. Check that engine stays below 1,000 rpm.



5. Run engine at approximately 2,000 rpm for approximately 2 minutes under no load.
6. Check that no DTC is displayed with CONSULT or GST.

OK or NG

- OK >> GO TO 3.
 NG >> GO TO 2.



2. REPAIR OR REPLACE

Repair or replace components as necessary according to corresponding Diagnostic Procedure.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

Ⓟ With CONSULT

1. Run engine at approximately 2,000 rpm for approximately 2 minutes under no load.

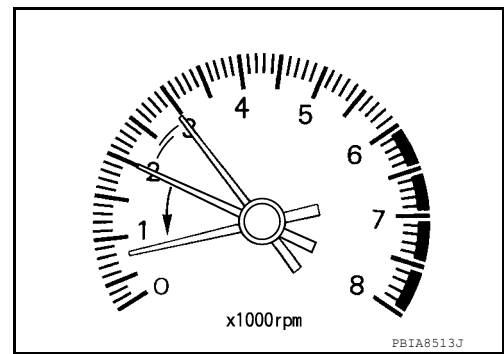
INSPECTION AND ADJUSTMENT

[VK56DE]

< BASIC INSPECTION >

- Rev engine between 2,000 and 3,000 rpm 2 or 3 times under no load, then run engine at idle speed for approximately 1 minute.
- Read idle speed in "DATA MONITOR" mode with CONSULT. Refer to [EC-596. "Idle Speed and Ignition Timing Check"](#).

650 ± 50 rpm (in P or N position)



Without CONSULT

- Run engine at approximately 2,000 rpm for approximately 2 minutes under no load.
- Rev engine between 2,000 and 3,000 rpm 2 or 3 times under no load, then run engine at idle speed for approximately 1 minute.
- Check idle speed. Refer to [EC-596. "Idle Speed and Ignition Timing Check"](#).

650 ± 50 rpm (in P or N position)

OK or NG

- OK >> GO TO 10.
- NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- Stop engine.
- Perform [EC-597. "Accelerator Pedal Released Position Learning"](#).

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform [EC-597. "Throttle Valve Closed Position Learning"](#).

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to [EC-597. "Idle Air Volume Learning"](#).

Is Idle Air Volume Learning carried out successfully?

Yes or No

- Yes >> GO TO 7.
- No >> 1. Follow the instructions of Idle Air Volume Learning.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT

- Start engine and warm it up to normal operating temperature.
- Read idle speed in "DATA MONITOR" mode with CONSULT. Refer to [EC-596. "Idle Speed and Ignition Timing Check"](#).

650 ± 50 rpm (in P or N position)

Without CONSULT

- Start engine and warm it up to normal operating temperature.
- Check idle speed. Refer to [EC-596. "Idle Speed and Ignition Timing Check"](#).

650 ± 50 rpm (in P or N position)

OK or NG

INSPECTION AND ADJUSTMENT

[VK56DE]

< BASIC INSPECTION >

- OK >> GO TO 10.
- NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to [EC-749, "DTC Confirmation Procedure"](#).
- Check crankshaft position sensor (POS) and circuit. Refer to [EC-745, "DTC Confirmation Procedure"](#).

OK or NG

- OK >> GO TO 9.
- NG >> 1. Repair or replace malfunctioning part.
- 2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, but this is rare.)
2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to [SEC-10, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (with intelligent key system), [SEC-120, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (without intelligent key system).

>> GO TO 4.

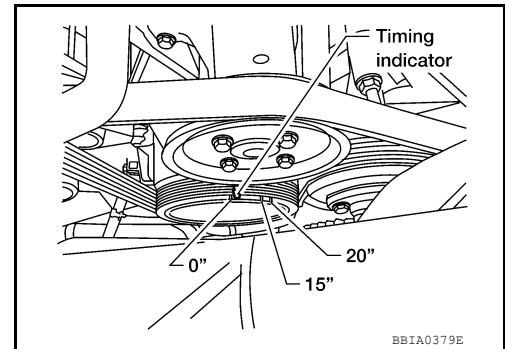
10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.
Refer to [EC-596, "Idle Speed and Ignition Timing Check"](#).

15 ± 5° BTDC (in P or N position)

OK or NG

- OK >> GO TO 19.
- NG >> GO TO 11.



11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform [EC-597, "Throttle Valve Closed Position Learning"](#).

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to [EC-597, "Idle Air Volume Learning"](#).

Is Idle Air Volume Learning carried out successfully?

Yes or No

- Yes >> GO TO 14.
- No >> 1. Follow the instructions of Idle Air Volume Learning.
- 2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

Ⓟ **With CONSULT**

1. Start engine and warm it up to normal operating temperature.

INSPECTION AND ADJUSTMENT

[VK56DE]

< BASIC INSPECTION >

2. Read idle speed in "DATA MONITOR" mode with CONSULT.
Refer to [EC-596, "Idle Speed and Ignition Timing Check"](#).

650 ± 50 rpm (in P or N position)

⊗ Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
Refer to [EC-596, "Idle Speed and Ignition Timing Check"](#).

650 ± 50 rpm (in P or N position)

OK or NG

- OK >> GO TO 15.
NG >> GO TO 17.

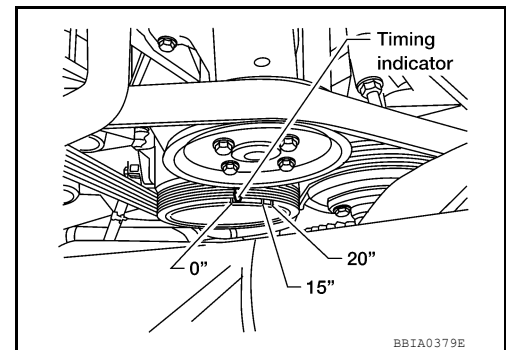
15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.
Refer to [EC-596, "Idle Speed and Ignition Timing Check"](#).

15 ± 5° BTDC (in P or N position)

OK or NG

- OK >> GO TO 19.
NG >> GO TO 16.



16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to [EM-194, "Removal and Installation"](#).

OK or NG

- OK >> GO TO 17.
NG >> 1. Repair the timing chain installation. Refer to [EM-193](#).
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to [EC-749, "DTC Confirmation Procedure"](#).
- Check crankshaft position sensor (POS) and circuit. Refer to [EC-745, "DTC Confirmation Procedure"](#).

OK or NG

- OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to [SEC-10, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (with intelligent key system), [SEC-120, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (without intelligent key system).

>> GO TO 4.

19. INSPECTION END

If ECM is replaced during this Basic Inspection procedure, perform [EC-596, "Procedure After Replacing ECM"](#).

>> INSPECTION END

Idle Speed and Ignition Timing Check

INFOID:000000007358457

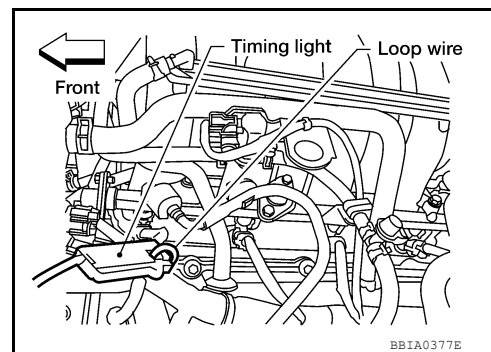
IDLE SPEED

Ⓟ With CONSULT
Check idle speed in "DATA MONITOR" mode with CONSULT.

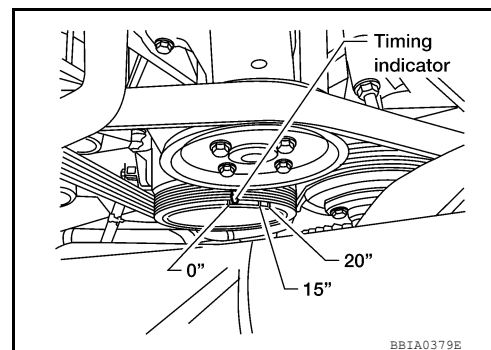
Ⓢ With GST
Check idle speed with GST.

IGNITION TIMING

1. Attach timing light to loop wire as shown.



2. Check ignition timing.



Procedure After Replacing ECM

INFOID:000000007358458

When replacing ECM, the following procedure must be performed.

1. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to [SEC-10. "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (with intelligent key system), [SEC-120. "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (without intelligent key system).
2. Perform [EC-596. "VIN Registration"](#).
3. Perform [EC-597. "Accelerator Pedal Released Position Learning"](#).
4. Perform [EC-597. "Throttle Valve Closed Position Learning"](#).
5. Perform [EC-597. "Idle Air Volume Learning"](#).

VIN Registration

INFOID:000000007358459

DESCRIPTION

VIN Registration is a function of ECM to register VIN in ECM. It must be performed each time ECM is replaced.

NOTE:

Accurate VIN which is registered in ECM may be required for Inspection & Maintenance (I/M).

OPERATION PROCEDURE

Ⓟ With CONSULT

1. Check the VIN of the vehicle and note it. Refer to [GI-21, "Identification Number"](#).
2. Turn ignition switch ON with engine stopped.
3. Select "VIN REGISTRATION" in "WORK SUPPORT" mode.
4. Follow the instructions on the CONSULT display.

A

EC

Accelerator Pedal Released Position Learning

INFOID:000000007358460

C

DESCRIPTION

Accelerator Pedal Released Position Learning is a function of ECM to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time the harness connector of the accelerator pedal position sensor or ECM is disconnected.

D

OPERATION PROCEDURE

1. Check that accelerator pedal is fully released.
2. Turn ignition switch ON and wait at least 2 seconds.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON and wait at least 2 seconds.
5. Turn ignition switch OFF and wait at least 10 seconds.

E

F

Throttle Valve Closed Position Learning

INFOID:000000007358461

G

DESCRIPTION

Throttle Valve Closed Position Learning is a function of ECM to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time the harness connector of the electric throttle control actuator or ECM is disconnected.

H

OPERATION PROCEDURE

1. Check that accelerator pedal is fully released.
2. Turn ignition switch ON.
3. Turn ignition switch OFF wait at least 10 seconds.
Check that throttle valve moves during above 10 seconds by confirming the operating sound.

I

J

Idle Air Volume Learning

INFOID:000000007358462

K

DESCRIPTION

Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps engine idle speed within the specific range. It must be performed under the following conditions:

- Each time the electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of the specification.

L

M

PREPARATION

Before performing Idle Air Volume Learning, check that all of the following conditions are satisfied. Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 100°C (158 - 212°F)
- Selector lever position: P or N
- Electric load switch: OFF

N

O

P

(Air conditioner, headlamp, rear window defogger)

On vehicles equipped with daytime light systems, if the parking brake is applied before the engine is started the headlamp will not be illuminated.

- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
- With CONSULT: Drive vehicle until "ATF TEMP SE 1" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9 V.
- Without CONSULT: Drive vehicle for 10 minutes.

OPERATION PROCEDURE

INSPECTION AND ADJUSTMENT

[VK56DE]

< BASIC INSPECTION >

Ⓟ With CONSULT

1. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
2. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic PREPARATION (previously mentioned) are in good order.
5. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
6. Touch "START" and wait 20 seconds.
7. Check that "CMPLT" is displayed on CONSULT screen. If "CMPLT" is not displayed, Idle Air Volume Learning will not be carried out successfully. In this case, find the cause of the incident by referring to the DIAGNOSTIC PROCEDURE below.
8. Rev up engine 2 or 3 times and check that idle speed and ignition timing are within the specifications.

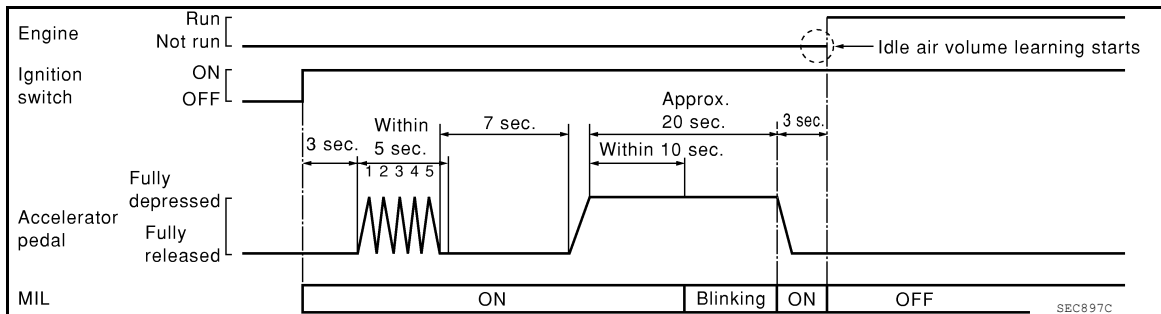
ITEM	SPECIFICATION
Idle speed	650 ± 50 rpm (in P or N position)
Ignition timing	15 ± 5°BTDC (in P or N position)

ⓧ Without CONSULT

NOTE:

- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.

1. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
2. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic PREPARATION (previously mentioned) are in good order.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Check that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
7. Repeat the following procedure quickly 5 times within 5 seconds.
 - a. Fully depress the accelerator pedal.
 - b. Fully release the accelerator pedal.
8. Wait 7 seconds, fully depress the accelerator pedal for approximately 20 seconds until the MIL stops blinking and turns ON.
9. Fully release the accelerator pedal within 3 seconds after the MIL turns ON.
10. Start engine and let it idle.
11. Wait 20 seconds.



12. Rev up engine 2 or 3 times and check that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	650 ± 50 rpm (in P or N position)
Ignition timing	15 ± 5°BTDC (in P or N position)

INSPECTION AND ADJUSTMENT

[VK56DE]

< BASIC INSPECTION >

13. If idle speed and ignition timing are not within the specifications, Idle Air Volume Learning will not be carried out successfully. In this case, find the cause of the incident by referring to the DIAGNOSTIC PROCEDURE below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as per the following:

1. Check that throttle valve is fully closed.
2. Check PCV valve operation.
3. Check that downstream of throttle valve is free from air leakage.
4. When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.
It is useful to perform [EC-612, "Inspection Procedure"](#).
5. If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning again:
 - Engine stalls.
 - Erroneous idle.

Mixture Ratio Self-Learning Value Clear

INFOID:000000007824621

DESCRIPTION

This describes how to erase the mixture ratio self-learning value. For the actual procedure, follow the instructions in "Diagnosis Procedure".

OPERATION PROCEDURE

1. START

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
3. Clear mixture ratio self-learning value by touching "CLEAR".

With GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor harness connector.
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Select Service \$03 with GST. Check DTC P0102 is detected.
7. Select Service \$04 with GST to erase the DTC P0102.

>> END

HOW TO SET SRT CODE

< BASIC INSPECTION >

[VK56DE]

HOW TO SET SRT CODE

Description

INFOID:000000007799380

OUTLINE

In order to set all SRTs, the self-diagnoses as in the "SRT ITEM" table must have been performed at least once. Each diagnosis may require actual driving for a long period of time under various conditions.

SRT ITEM

The table below shows required self-diagnostic items to set the SRT to "CMPLT".

SRT item (CONSULT indication)	Performance Priority*	Required self-diagnostic items to set the SRT to "CMPLT"	Corresponding DTC No.
CATALYST	2	Three way catalyst function	P0420, P0430
EVAP SYSTEM	2	EVAP control system purge flow monitoring	P0441
	1	EVAP control system	P0442
	2	EVAP control system	P0456
HO2S	2	Air fuel ratio (A/F) sensor 1	P0133, P0153
		Heated oxygen sensor 2	P0137, P0157
		Heated oxygen sensor 2	P0138, P0158
		Heated oxygen sensor 2	P0139, P0159

*: If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT.

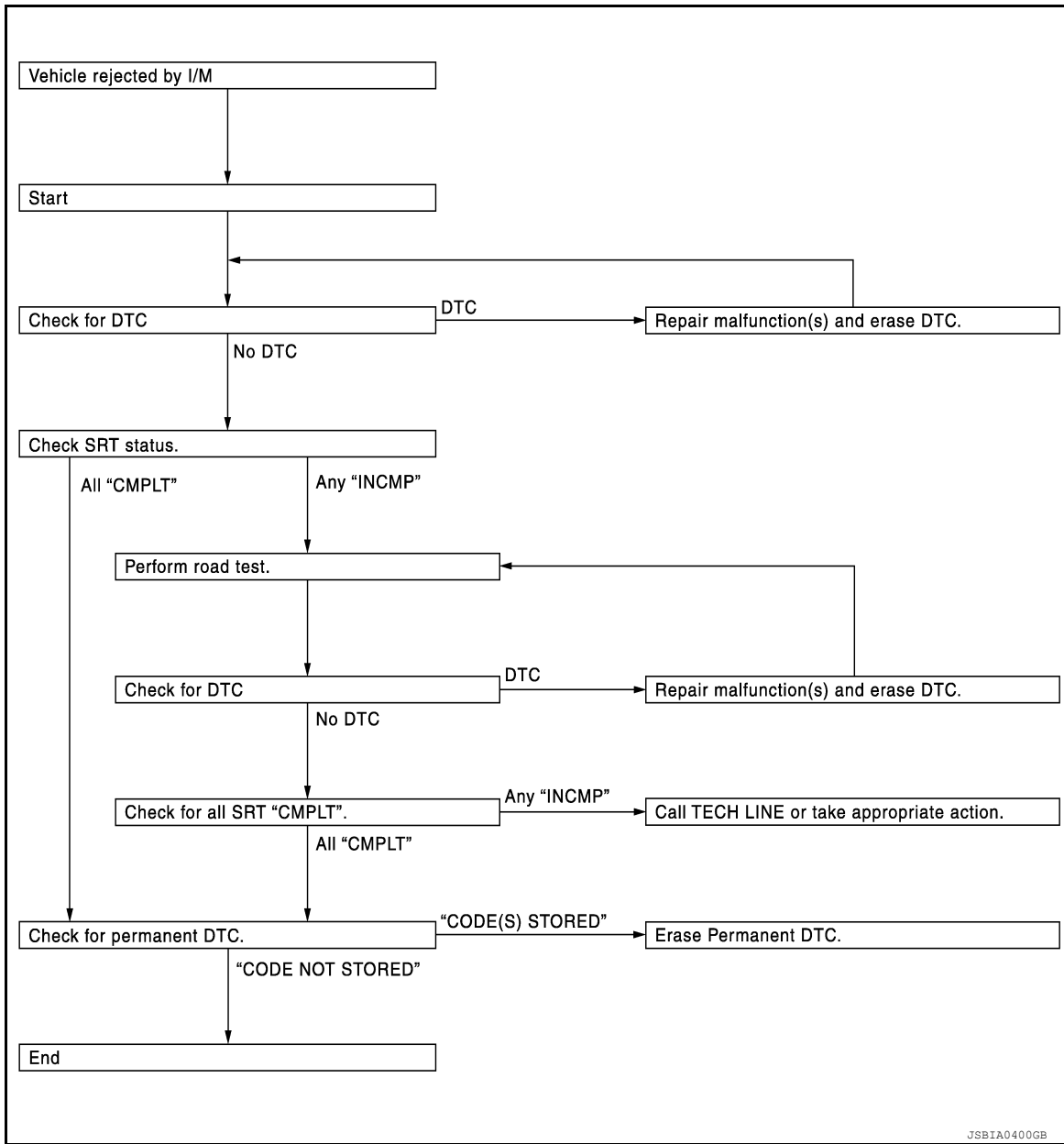
SRT SERVICE PROCEDURE

If a vehicle has failed the state emissions inspection due to one or more SRT items indicating "INCMP", review the flowchart diagnostic sequence, referring to the following flowchart.

HOW TO SET SRT CODE

< BASIC INSPECTION >

[VK56DE]



SRT Set Driving Pattern

INFOID:000000007799381

CAUTION:

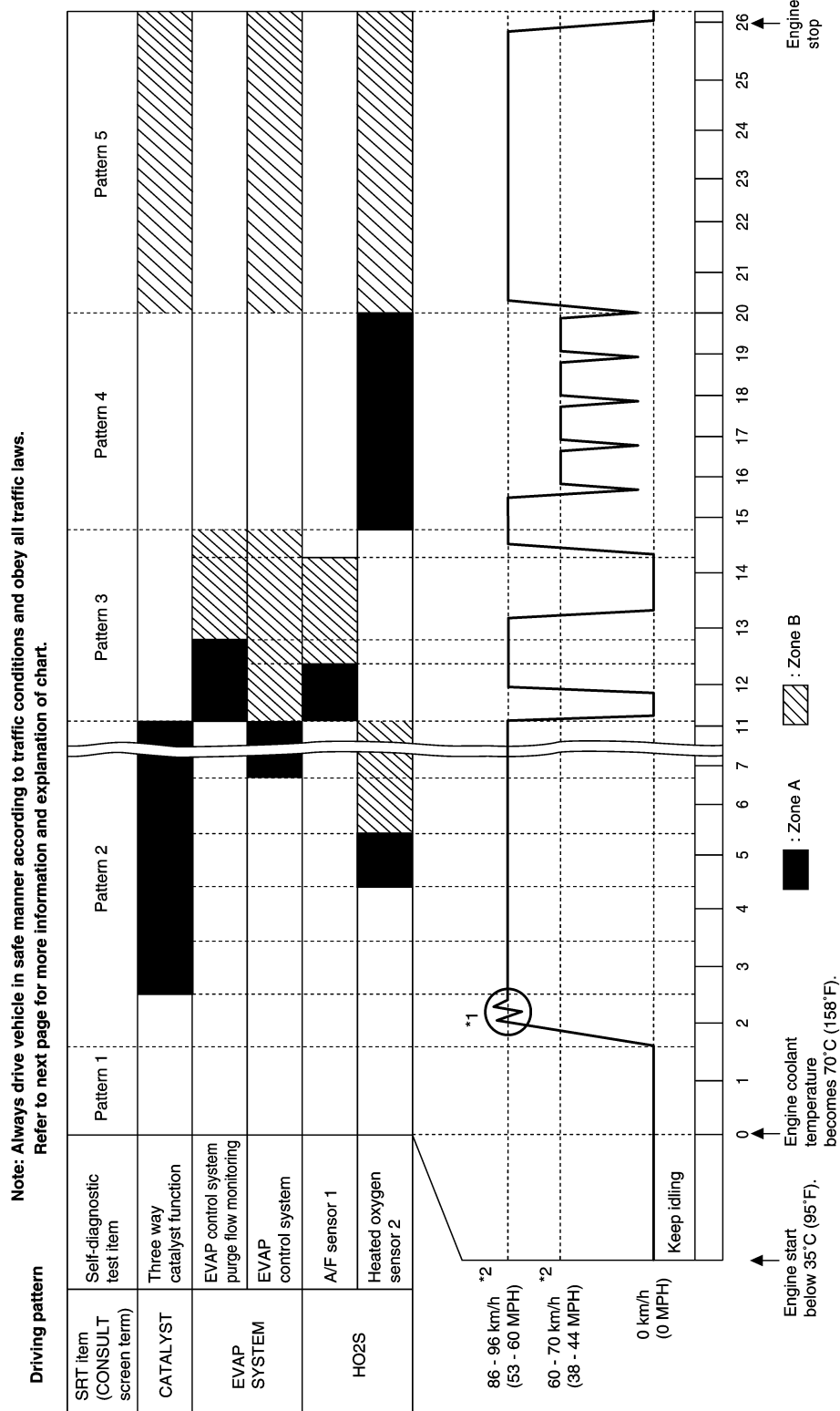
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HOW TO SET SRT CODE

< BASIC INSPECTION >

[VK56DE]

Always drive the vehicle in safe manner according to traffic conditions and obey all traffic laws.



JSBTA1924GB

*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.

*2: Checking the vehicle speed with GST is advised.

• The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.

Zone A refers to the range where the time, required for the diagnosis under normal conditions*, is the shortest.

HOW TO SET SRT CODE

[VK56DE]

< BASIC INSPECTION >

Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

- Sea level
 - Flat road
 - Ambient air temperature: 20 - 30°C (68 - 86°F)
 - Diagnosis is performed as quickly as possible under normal conditions.
- Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

Work Procedure

INFOID:000000007799382

1. CHECK DTC

Check DTC.

Is any DTC detected?

- YES >> Repair malfunction(s) and erase DTC. Refer to [EC-555, "DTC Index"](#).
- NO >> GO TO 2.

2. CHECK SRT STATUS

WITH CONSULT

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.

WITHOUT CONSULT

Perform "SRT status" mode with [EC-530, "On Board Diagnosis Function"](#).

WITH GST

Select Service \$01 with GST.

Is SRT code(s) set?

- YES >> GO TO 11.
- NO-1 >> With CONSULT: GO TO 3.
- NO-2 >> Without CONSULT: GO TO 4.

3. DTC CONFIRMATION PROCEDURE

1. Select "SRT WORK SUPPORT" in "DTC & SRT CONFIRMATION" mode with CONSULT.
2. For SRT(s) that is not set, perform the corresponding "DTC CONFIRMATION PROCEDURE" according to the "Performance Priority" in the "SRT ITEM" table. Refer to [EC-600, "Description"](#).
3. Check DTC.

Is any DTC detected?

- YES >> Repair malfunction(s) and erase DTC. Refer to [EC-555, "DTC Index"](#).
- NO >> GO TO 10.

4. PERFORM ROAD TEST

- Check the "Performance Priority" in the "SRT ITEM" table. Refer to [EC-600, "Description"](#).
- Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to [EC-601, "SRT Set Driving Pattern"](#).

In order to set all SRTs, the SRT set driving pattern must be performed at least once.

>> GO TO 5.

5. PATTERN 1

1. Check the vehicle condition;
 - Engine coolant temperature is -10 to 35°C (14 to 95°F).
 - Fuel tank temperature is more than 0°C (32°F).
2. Start the engine.
3. Keep engine idling until the engine coolant temperature is greater than 70°C (158°F)

NOTE:

ECM terminal voltage is follows;

- Engine coolant temperature
 - -10 to 35°C (14 to 95°F): 3.0 - 4.3 V
 - 70°(158°F): Less than 1.4 V

HOW TO SET SRT CODE

[VK56DE]

< BASIC INSPECTION >

- Fuel tank temperature: Less than 4.1 V
Refer to [EC-545, "ECM Terminal and Reference Value"](#).

>> GO TO 6.

6.PATTERN 2

1. Drive the vehicle. And depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds.
2. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again

NOTE:

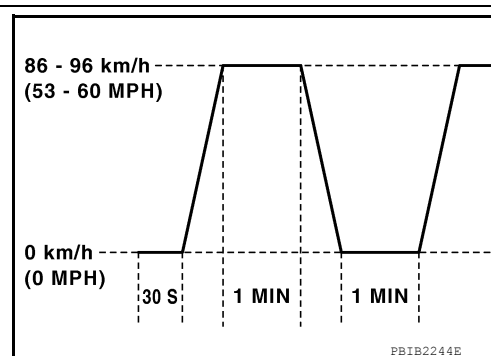
- Checking the vehicle speed with GST is advised.
- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

>> GO TO 7.

7.PATTERN 3

- Operate vehicle following the driving pattern shown in the figure.
- Release the accelerator pedal during deceleration of vehicle speed from 90 km/h (56 MPH) to 0 km/h (0 MPH).

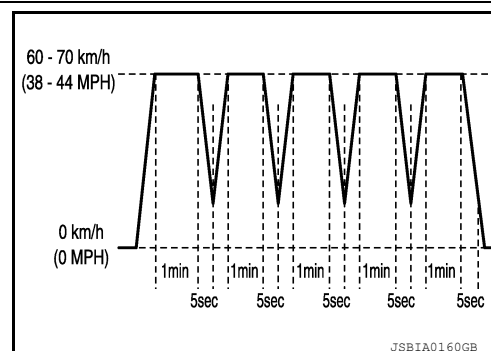
>> GO TO 8.



8.PATTERN 4

- Operate vehicle following the driving pattern shown in the figure.
- Drive the vehicle in a proper gear at 60 km/h (38 MPH) and maintain the speed.
- Release the accelerator pedal fully at least 5 seconds.
- Repeat the above two steps at least 5 times.

>> GO TO 9.



9.PATTERN 5

- The accelerator pedal must be held very steady during steady-state driving.
- If the accelerator pedal is moved, the test must be conducted again.

>> GO TO 10.

10.CHECK SRT STATUS

WITH CONSULT

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.

WITHOUT CONSULT

Perform "SRT status" mode with [EC-530, "On Board Diagnosis Function"](#).

WITH GST

Select Service \$01 with GST.

Is SRT(s) set?

YES >> GO TO 11.

NO >> Call TECH LINE or take appropriate action.

HOW TO SET SRT CODE

< BASIC INSPECTION >

[VK56DE]

11.CHECK PERMANENT DTC

NOTE:

Permanent DTC cannot be checked with a tool other than CONSULT or GST.

 With CONSULT

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.

 With GST

Select Service \$0A with GST.

Is permanent DTC(s) detected?

YES >> Refer to [EC-606. "Description"](#).

NO >> END

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HOW TO ERASE PERMANENT DTC

< BASIC INSPECTION >

[VK56DE]

HOW TO ERASE PERMANENT DTC

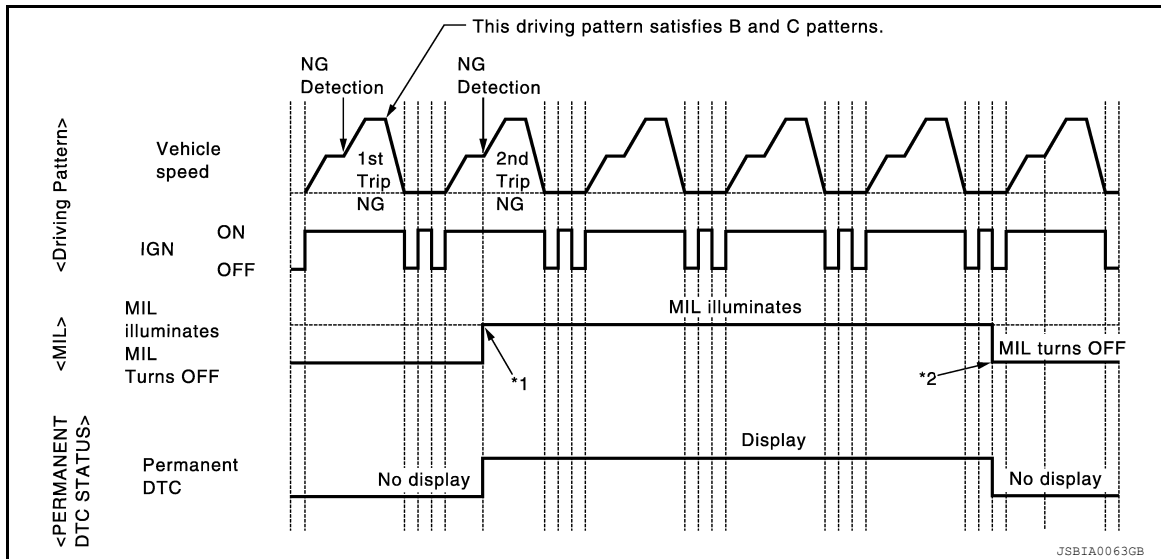
Description

INFOID:000000007799383

OUTLINE

When a DTC is stored in ECM

When a DTC is stored in ECM and MIL is ON, a permanent DTC is erased with MIL shutoff if the same malfunction is not detected after performing the driving pattern for MIL shutoff three times in a row.



*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.

*2: MIL will turn off after vehicle is driven 3 times (driving pattern B) without any malfunctions.

When a DTC is not stored in ECM

The erasing method depends on a permanent DTC stored in ECM. Refer to the following table.

NOTE:

If the applicable permanent DTC includes multiple groups, perform the procedure of Group B first. If the permanent DTC is not erased, perform the procedure of Group A.

×: Applicable —: Not applicable

Group*	Perform "DTC CONFIRMATION PROCEDURE" for applicable DTCs.	Driving pattern		Reference
		B	D	
A	×	—	—	EC-607
B	—	×	×	EC-609

*: For group, refer to [EC-555. "DTC Index"](#).

PERMANENT DTC ITEM

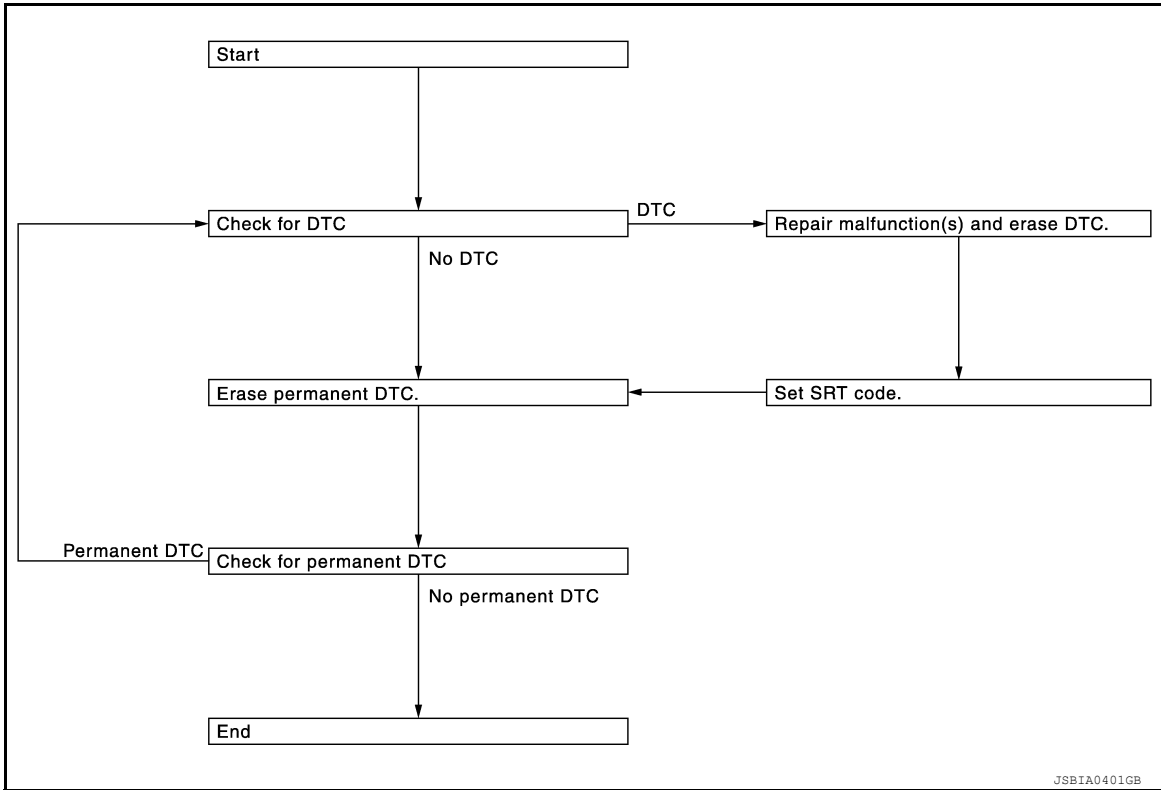
For permanent DTC items, MIL turns ON. Refer to [EC-555. "DTC Index"](#).

HOW TO ERASE PERMANENT DTC

< BASIC INSPECTION >

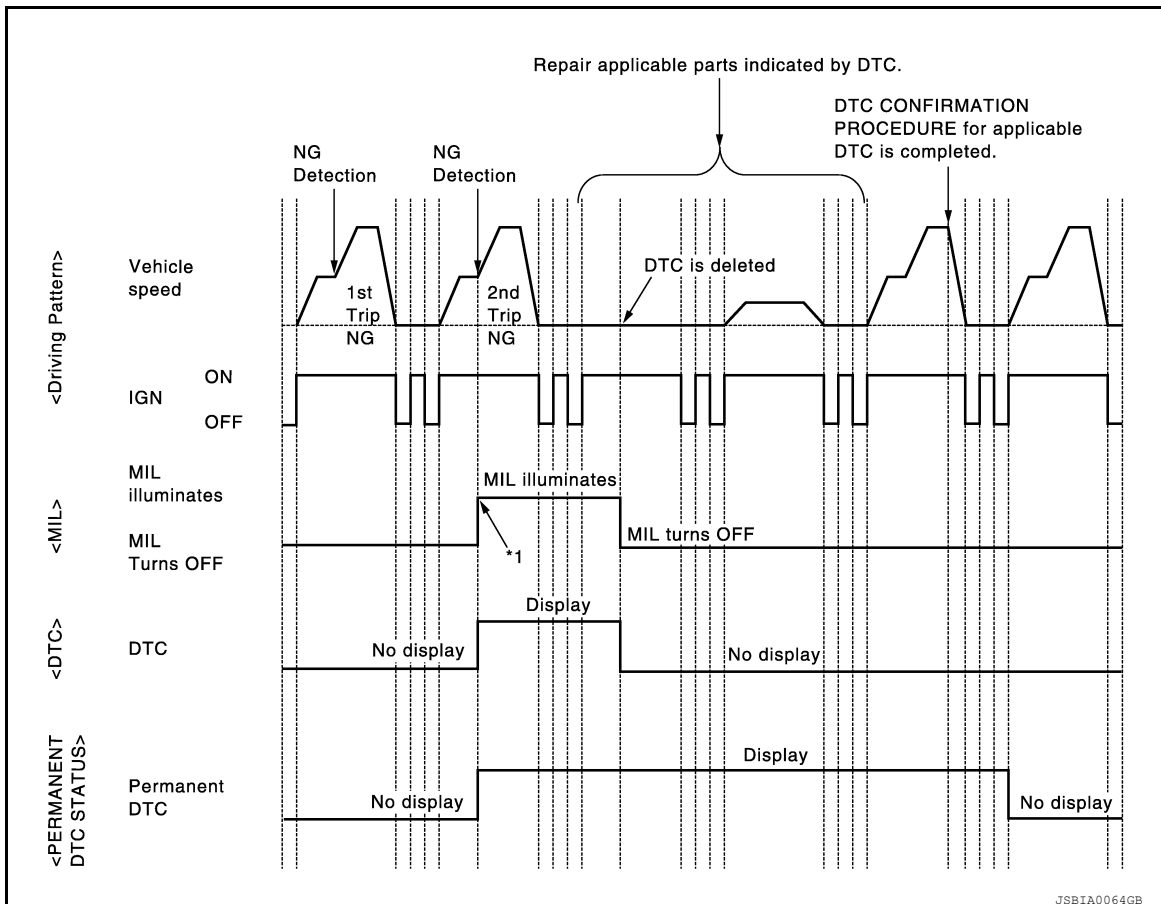
[VK56DE]

PERMANENT DTC SERVICE PROCEDURE



Work Procedure (Group A)

INFOID:000000007799384



HOW TO ERASE PERMANENT DTC

[VK56DE]

< BASIC INSPECTION >

*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.

1. CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to [EC-533. "CONSULT Function"](#), [EC-530. "On Board Diagnosis Function"](#).

NO >> GO TO 2.

2. CHECK PERMANENT DTC

 With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.

 With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

YES >> GO TO 3.

NO >> END

3. PERFORM DTC CONFIRMATION PROCEDURE

Perform "DTC CONFIRMATION PROCEDURE" for DTCs which are the same as permanent DTCs stored in ECM. Refer to [EC-533. "CONSULT Function"](#), [EC-530. "On Board Diagnosis Function"](#).

>> GO TO 4.

4. CHECK PERMANENT DTC

 With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.

 With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

YES >> GO TO 1.

NO >> END

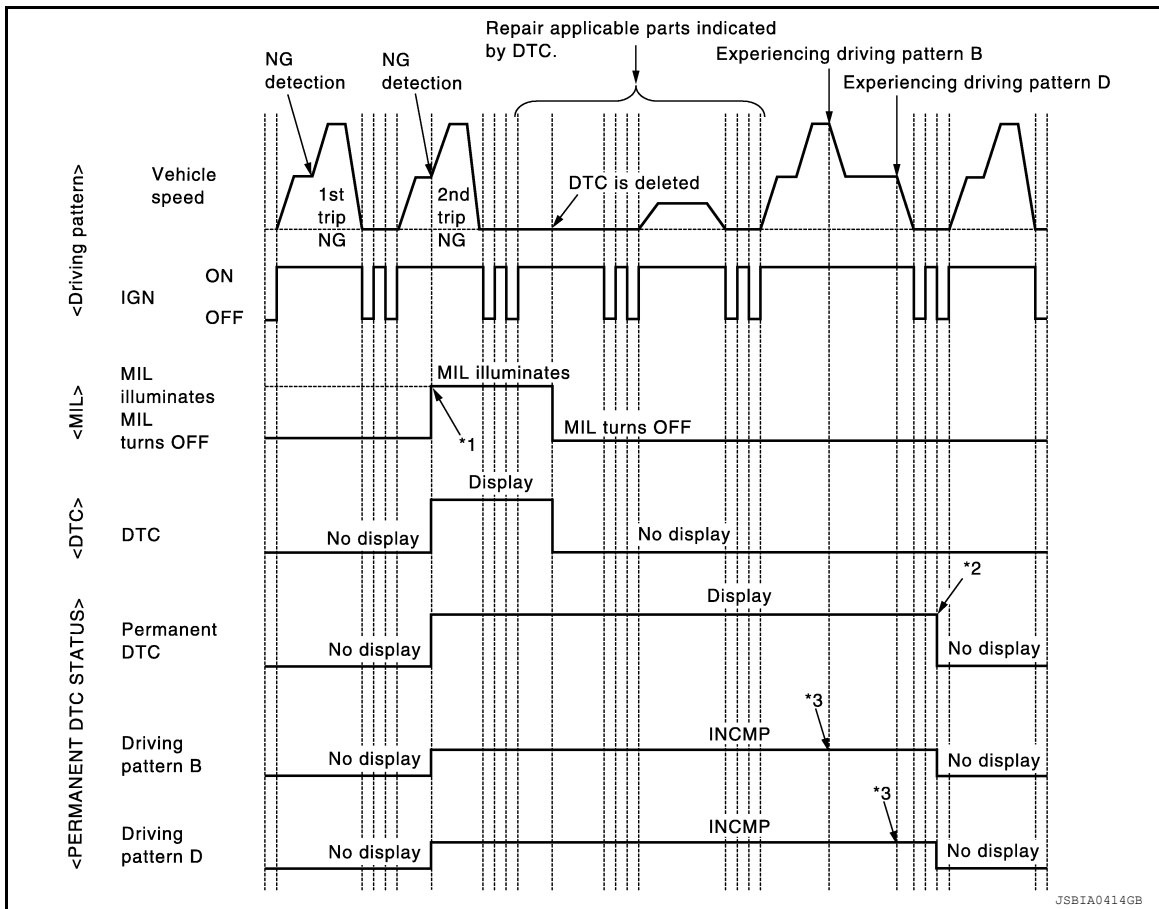
HOW TO ERASE PERMANENT DTC

< BASIC INSPECTION >

[VK56DE]

Work Procedure (Group B)

INFOID:000000007799385



*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.

*2: After experiencing driving pattern B and D, permanent DTC is erased.

*3: Indication does not change unless the ignition switch is turned from ON to OFF twice even after experiencing driving pattern B or D.

NOTE:

Drive the vehicle according to only driving patterns indicating "INCMP" in driving patterns B and D on the "PERMANENT DTC STATUS" screen.

1. CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to [EC-533. "CONSULT Function"](#), [EC-530. "On Board Diagnosis Function"](#).

NO >> GO TO 2.

2. CHECK PERMANENT DTC

With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.

With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

< BASIC INSPECTION >

4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

- YES >> GO TO 3.
 NO >> END

3. DRIVE DRIVING PATTERN B

CAUTION:

- Always drive at a safe speed.
- Never erase self-diagnosis results.
- If self-diagnosis results are erased during the trip of driving pattern B or D, the counter of driving pattern B and D is reset.

Ⓟ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Use "PERMANENT DTC WORK SUPPORT" mode with CONSULT to drive the vehicle according to driving pattern B. Refer to [EC-533, "CONSULT Function"](#), [EC-527, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

Ⓢ With GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle according to driving pattern B. Refer to [EC-527, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

>> GO TO 4.

4. CHECK PERMANENT DTC

Ⓟ With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.

Ⓢ With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

- YES >> GO TO 5.
 NO >> END

5. DRIVE DRIVING PATTERN D

CAUTION:

- Always drive at a safe speed.
- Never erase self-diagnosis results.
- If self-diagnosis results are erased during the trip of driving pattern B or D, the counter of driving pattern B and D is reset.

Drive the vehicle according to driving pattern D. Refer to [EC-527, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

>> GO TO 6.

6. CHECK PERMANENT DTC

Ⓟ With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.

HOW TO ERASE PERMANENT DTC

[VK56DE]

< BASIC INSPECTION >

5. Select "PERMANENT DTC STATUS" mode with CONSULT.

 With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

- YES >> GO TO 1.
NO >> END

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DTC/CIRCUIT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

INFOID:000000007358466

The specification (SP) value indicates the tolerance of the value that is displayed in "SPEC" of "DATA MONITOR" mode of CONSULT during normal operation of the Engine Control System. When the value in "SPEC" of "DATA MONITOR" mode is within the SP value, the Engine Control System is confirmed OK. When the value in "SPEC" of "DATA MONITOR" mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.

The SP value is used to detect malfunctions that may affect the Engine Control System, but will not illuminate the MIL.

The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1/B2 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Testing Condition

INFOID:000000007358467

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 - 104.3 kPa (1.003 - 1.064 kg/cm², 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Engine speed: Idle
- Transmission: Warmed-up
- After the engine is warmed up to normal operating temperature, drive vehicle until "ATF TEMP SE 1" (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
- Electrical load: Not applied
- Rear window defogger switch, air conditioner switch, lighting switch are OFF. Steering wheel is straight ahead.

Inspection Procedure

INFOID:000000007358468

NOTE:

Perform "SPEC" in "DATA MONITOR" mode in maximum scale display.

1. Perform [EC-592, "Basic Inspection"](#).
2. Check that the testing conditions indicated above are met.
3. Select "B/FUEL SCHDL", "A/F ALPHA-B1", "A/F ALPHA-B2" and "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode with CONSULT.
4. Check that monitor items are within the SP value.
5. If NG, go to [EC-613, "Diagnosis Procedure"](#).

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

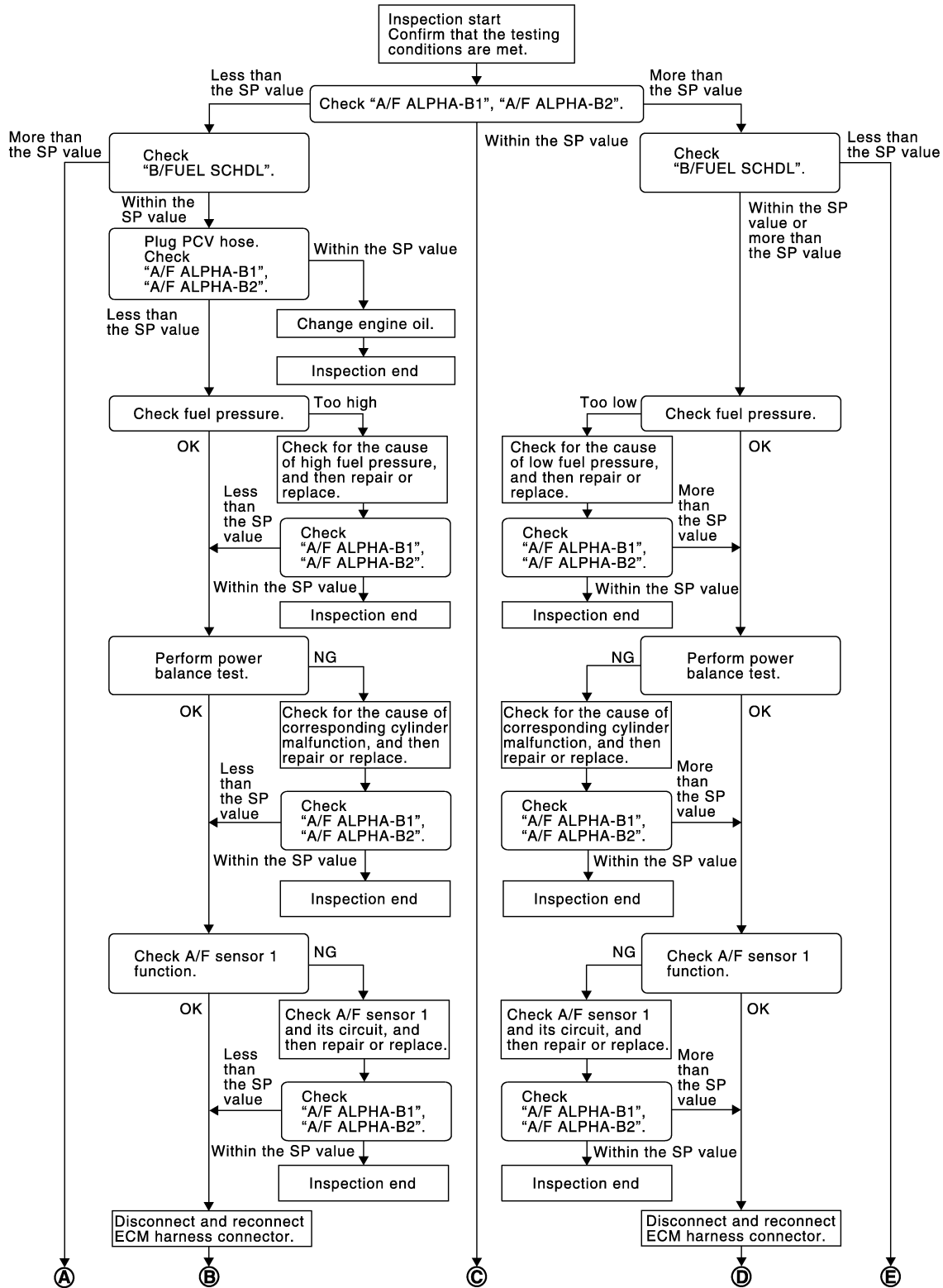
< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

INFOID:000000007358469

Diagnosis Procedure

OVERALL SEQUENCE

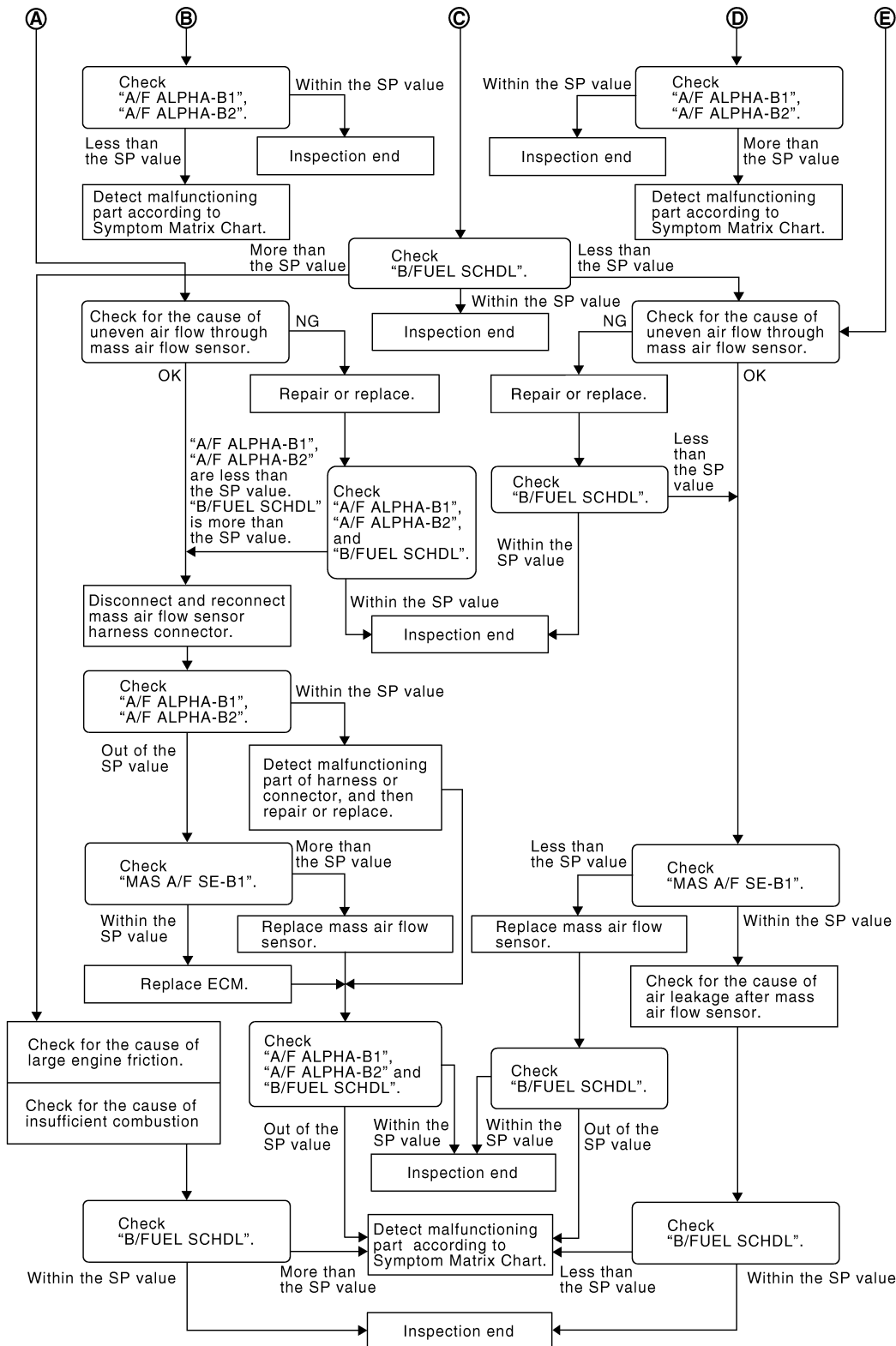


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TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]



PBIB3214E

DETAILED PROCEDURE

1. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Check that the testing conditions are met. Refer to [EC-612. "Testing Condition"](#).
3. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

NOTE:

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Check "A/F ALPHA-B1", "A/F ALPHA-B2" for approximately 1 minute because they may fluctuate. It is NG if the indication is out of the SP value even a little.

OK or NG

OK >> GO TO 17.

NG (Less than the SP value)>>GO TO 2.

NG (More than the SP value)>>GO TO 3.

2.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

OK or NG

OK >> GO TO 4.

NG (More than the SP value)>>GO TO 19.

3.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

OK or NG

OK >> GO TO 6.

NG (More than the SP value)>>GO TO 6.

NG (Less than the SP value)>>GO TO 25.

4.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Stop the engine.

2. Disconnect PCV hose, and then plug it.

3. Start engine.

4. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

OK or NG

OK >> GO TO 5.

NG >> GO TO 6.

5.CHANGE ENGINE OIL

1. Stop the engine.

2. Change engine oil.

NOTE:

This symptom may occur when a large amount of gasoline is mixed with engine oil because of driving conditions (such as when engine oil temperature does not rise enough since a journey distance is too short during winter). The symptom will not be detected after changing engine oil or changing driving conditions.

>> INSPECTION END

6.CHECK FUEL PRESSURE

Check fuel pressure. (Refer to [EC-952, "Fuel Pressure Check"](#).)

OK or NG

OK >> GO TO 9.

NG (Fuel pressure is too high)>>Replace "fuel level sensor unit, fuel filter and fuel pump assembly", refer to [FL-11](#), and then GO TO 8.

NG (Fuel pressure is too low)>>GO TO 7.

7.DETECT MALFUNCTIONING PART

1. Check the following.

- Clogged and bent fuel hose and fuel tube

- Clogged fuel filter

- Fuel pump and its circuit (Refer to [EC-928, "Diagnosis Procedure"](#).)

2. If NG, repair or replace the malfunctioning part. (Refer to [EC-952, "Fuel Pressure Check"](#).)

If OK, replace "fuel level sensor unit, fuel filter and fuel pump assembly". Refer to [FL-11](#).

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

>> GO TO 8.

8. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

OK or NG

- OK >> **INSPECTION END**
NG >> GO TO 9.

9. PERFORM POWER BALANCE TEST

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Check that each cylinder produces a momentary engine speed drop.

OK or NG

- OK >> GO TO 12.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

1. Check the following below.
 - Ignition coil and its circuit (Refer to [EC-931, "Diagnosis Procedure"](#).)
 - Fuel injector and its circuit (Refer to [EC-925, "Diagnosis Procedure"](#).)
 - Intake air leakage
 - Low compression pressure (Refer to [EM-162, "Compression Pressure"](#).)
2. If NG, repair or replace the malfunctioning part.
If OK, replace malfunctioning fuel injector. (It may be caused by leakage from fuel injector or clogging.)

>> GO TO 11.

11. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

OK or NG

- OK >> **INSPECTION END**
NG >> GO TO 12.

12. CHECK A/F SENSOR 1 FUNCTION

Perform all DTC Confirmation Procedure related with A/F sensor 1.

- For DTC P0130, P0150, refer to [EC-676, "DTC Confirmation Procedure"](#).
- For DTC P0131, P0151, refer to [EC-680, "DTC Confirmation Procedure"](#).
- For DTC P0132, P0152, refer to [EC-684, "DTC Confirmation Procedure"](#).
- For DTC P0133, P0153, refer to [EC-688, "DTC Confirmation Procedure"](#).
- For DTC P2A00, P2A03, refer to [EC-911, "DTC Confirmation Procedure"](#).

OK or NG

- OK >> GO TO 15.
NG >> GO TO 13.

13. CHECK A/F SENSOR 1 CIRCUIT

Perform Diagnostic Procedure according to corresponding DTC.

>> GO TO 14.

14. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

OK or NG

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

- OK >> **INSPECTION END**
NG >> GO TO 15.

15.DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR

1. Stop the engine.
2. Disconnect ECM harness connector.
3. Check pin terminals and connector for damage, and then reconnect it.

>> GO TO 16.

16.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

OK or NG

- OK >> **INSPECTION END**
NG >> Detect malfunctioning part according to [EC-947. "Symptom Matrix Chart"](#).

17.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

OK or NG

- OK >> **INSPECTION END**
NG (More than the SP value)>>GO TO 18.
NG (Less than the SP value)>>GO TO 25.

18.DETECT MALFUNCTIONING PART

1. Check for the cause of large engine friction. Refer to the following.
 - Engine oil level is too high
 - Engine oil viscosity
 - Belt tension of power steering, alternator, A/C compressor, etc. is excessive
 - Noise from engine
 - Noise from transmission, etc.
2. Check for the cause of insufficient combustion. Refer to the following.
 - Valve clearance malfunction
 - Intake valve timing control function malfunction
 - Camshaft sprocket installation malfunction, etc.

>> Repair or replace malfunctioning part, and then GO TO 30.

19.CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of intake air system

OK or NG

- OK >> GO TO 21.
NG >> Repair or replace malfunctioning part, and then GO TO 20.

20.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2", AND "B/FUEL SCHDL"

Select "A/F ALPHA-B1", "A/F ALPHA-B2", and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

OK or NG

- OK >> **INSPECTION END**
NG ("B/FUEL SCHDL" is more, "A/F ALPHA-B1", "A/F ALPHA-B2" are less than the SP value)>>GO TO 21.

21.DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Stop the engine.
2. Disconnect mass air flow sensor harness connector.
3. Check pin terminals and connector for damage, and then reconnect it again.

>> GO TO 22.

22.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

OK or NG

- OK >> 1. Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to [EC-648, "Diagnosis Procedure"](#).
2. GO TO 29.

NG >> GO TO 23.

23.CHECK "MAS A/F SE-B1"

Select "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

OK or NG

OK >> GO TO 24.

NG (More than the SP value)>>Replace mass air flow sensor, refer to [EM-164, "Exploded View"](#), and then GO TO 29.

24.REPLACE ECM

1. Replace ECM.
2. Perform initialization of NVIS(NATS) system and registration of all NVIS(NATS) ignition key IDs. Refer to [SEC-10, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (With intelligent key system), [SEC-120, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (Without intelligent key system).
3. Perform [EC-596, "VIN Registration"](#).
4. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
5. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
6. Perform [EC-597, "Idle Air Volume Learning"](#).

>> GO TO 29.

25.CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

- Crushed air ducts
- Malfunctioning seal in air cleaner element
- Uneven dirt in air cleaner element
- Improper specification in intake air system

OK or NG

OK >> GO TO 27.

NG >> Repair or replace malfunctioning part, and then GO TO 26.

26.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

OK or NG

OK >> **INSPECTION END**

NG (Less than the SP value)>>GO TO 27.

27.CHECK "MAS A/F SE-B1"

Select "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

OK or NG

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

OK >> GO TO 28.

NG (Less than the SP value)>>Replace mass air flow sensor, refer to [EM-164, "Exploded View"](#),and then GO TO 30.

28.CHECK INTAKE SYSTEM

Check for the cause of air leakage after the mass air flow sensor. Refer to the following.

- Disconnection, looseness, and cracks in air duct
- Looseness of oil filler cap
- Disconnection of oil level gauge
- Open stuck, breakage, hose disconnection, or cracks in PCV valve
- Disconnection or cracks in EVAP purge hose, stuck open EVAP canister purge volume control solenoid valve
- Malfunctioning seal in rocker cover gasket
- Disconnection, looseness, or cracks in hoses, such as a vacuum hose, connecting to intake air system parts
- Malfunctioning seal in intake air system, etc.

>> GO TO 30.

29.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2", AND "B/FUEL SCHDL"

Select "A/F ALPHA-B1", "A/F ALPHA-B2", and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

OK or NG

OK >> **INSPECTION END**

NG >> Detect malfunctioning part according to [EC-947, "Symptom Matrix Chart"](#).

30.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and then check that the indication is within the SP value.

OK or NG

OK >> **INSPECTION END**

NG >> Detect malfunctioning part according to [EC-947, "Symptom Matrix Chart"](#).

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

INFOID:000000007358470

1. INSPECTION START

Start engine.

Is engine running?

Yes or No

Yes >> GO TO 7.

No >> GO TO 2.

2. CHECK ECM POWER SUPPLY CIRCUIT-I

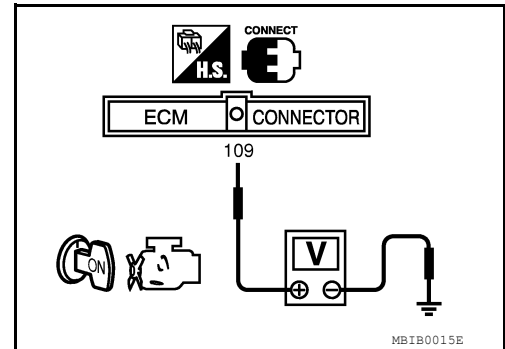
1. Turn ignition switch OFF and then ON.
2. Check voltage between ECM terminal 109 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

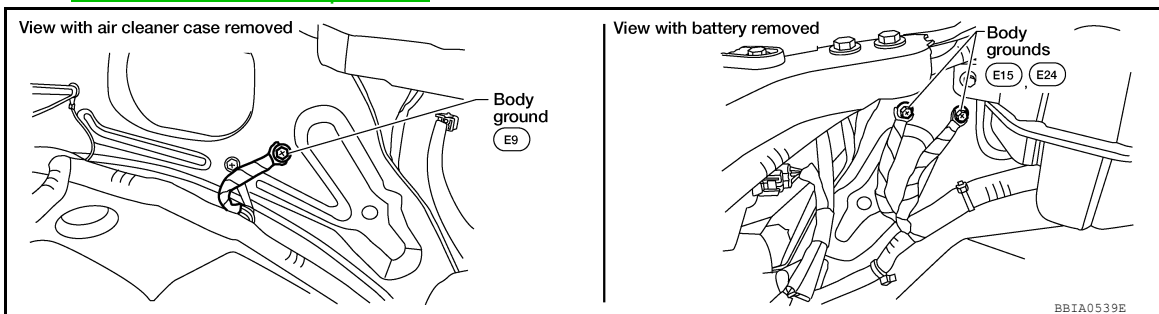
Check the following.

- Harness connectors E152, M31
- Fuse block harness connector M4
- 10A fuse (No. 1)
- Harness for open or short between ECM and fuse block

>> Repair harness or connectors.

4. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623. "Ground Inspection"](#).



OK or NG

OK >> GO TO 5.

NG >> Repair or replace ground connections.

5. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 115, 116 and ground.
Refer to Wiring Diagram.

Continuity should exist.

POWER SUPPLY AND GROUND CIRCUIT

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Also check harness for short to power.

OK or NG

OK >> GO TO 6.

NG >> Repair open circuit or short to power in harness or connectors.

6. CHECK ECM POWER SUPPLY CIRCUIT-II

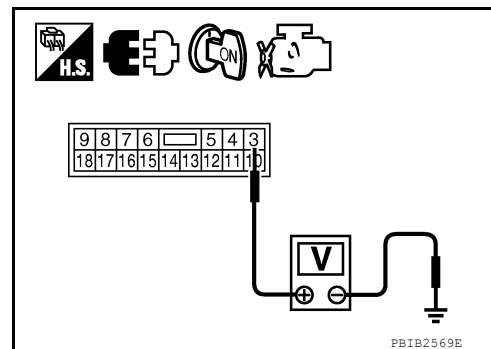
1. Reconnect ECM harness connector.
2. Turn ignition switch ON.
3. Check voltage between IPDM E/R terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> Go to [EC-931. "Diagnosis Procedure"](#).

NG >> GO TO 7.



7. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON and then OFF.
3. Check voltage between ECM terminals 119, 120 and ground with CONSULT or tester.

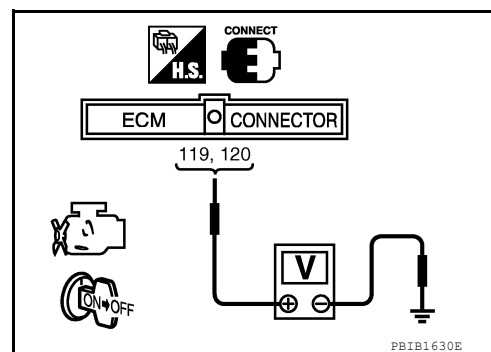
Voltage: After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop to approximately 0 V.

OK or NG

OK >> GO TO 12.

NG (Battery voltage does not exist.)>>GO TO 8.

NG (Battery voltage exists for more than a few seconds.)>>GO TO 10.



8. CHECK ECM POWER SUPPLY CIRCUIT-IV

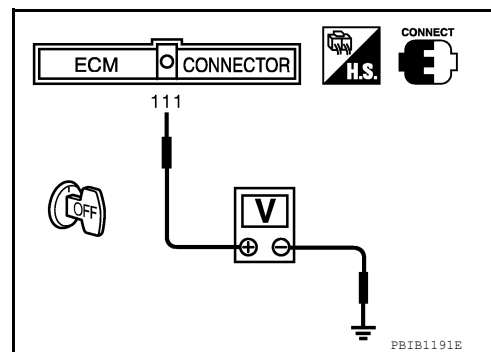
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Check voltage between ECM terminal 111 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 9.

NG >> GO TO 10.



9. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E119.
3. Check harness continuity between ECM terminals 119, 120 and IPDM E/R terminal 4. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

POWER SUPPLY AND GROUND CIRCUIT

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

OK >> GO TO 12.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK ECM POWER SUPPLY CIRCUIT-VI

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E119.
3. Check harness continuity between ECM terminal 111 and IPDM E/R terminal 7.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 11.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK FUSE

Check 20 A fuse (No. 53).

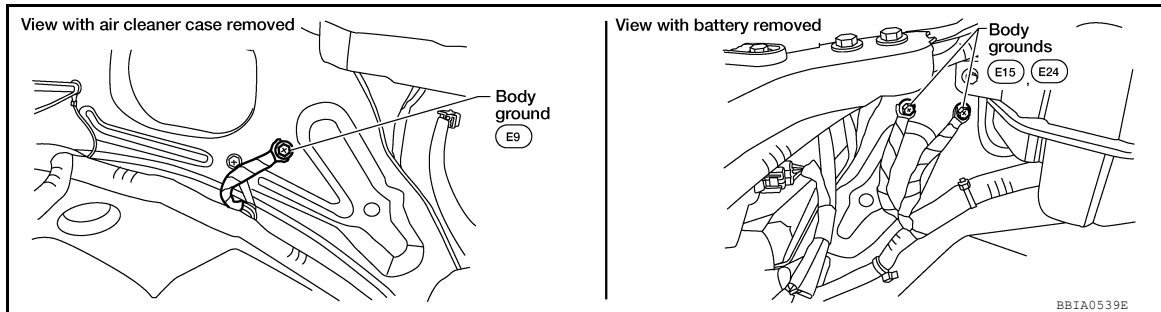
OK or NG

OK >> GO TO 14.

NG >> Replace 20 A fuse.

12. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623, "Ground Inspection"](#).



OK or NG

OK >> GO TO 13.

NG >> Repair or replace ground connections.

13. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 115, 116 and ground.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 14.

NG >> Repair open circuit or short to power in harness or connectors.

14. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

OK or NG

OK >> Replace IPDM E/R. Refer to [PCS-29](#).

NG >> Repair open circuit or short to power in harness or connectors.

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Ground Inspection

INFOID:000000007358471

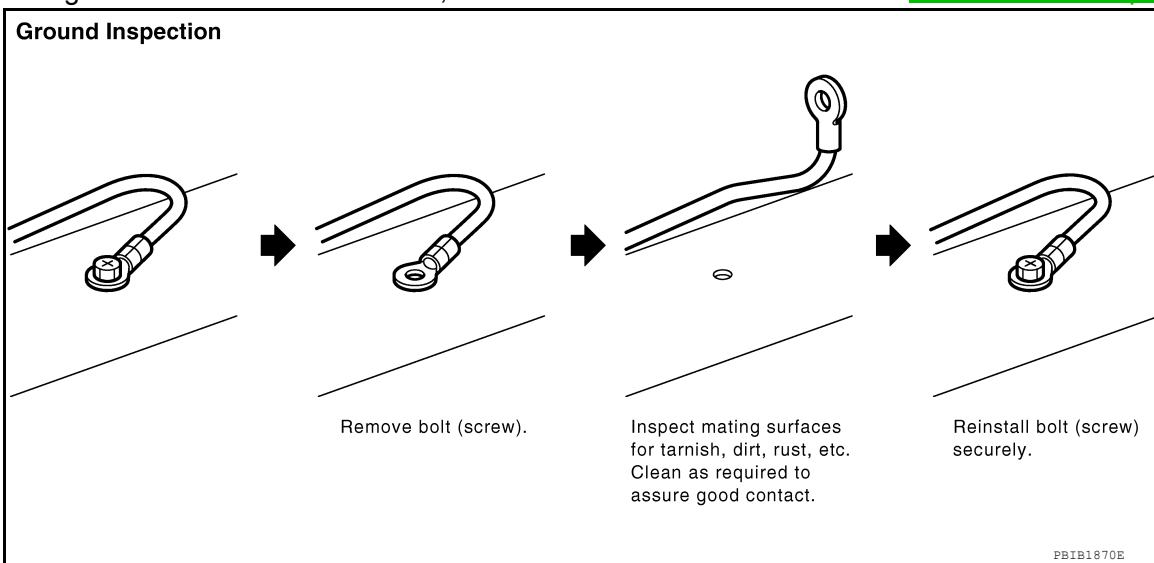
Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This unwanted resistance can change the way a circuit works.

Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can easily affect the circuit. Even when the ground connection looks clean, there can be a thin film of rust on the surface.

When inspecting a ground connection follow these rules:

- Remove the ground bolt or screw.
- Inspect all mating surfaces for tarnish, dirt, rust, etc.
- Clean as required to assure good contact.
- Reinstall bolt or screw securely.
- Inspect for “add-on” accessories which may be interfering with the ground circuit.
- If several wires are crimped into one ground eyelet terminal, check for proper crimps. Check that all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are cased in one eyelet, check that no ground wires have excess wire insulation.

For detailed ground distribution information, refer to “GROUND INSPECTION” in [GI-40. "Circuit Inspection"](#).



U0101 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

U0101 CAN COMM CIRCUIT

Description

INFOID:000000007358472

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

INFOID:000000007358473

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U0101 0101	Lost communication with TCM	When ECM is not transmitting or receiving CAN communication signal of OBD (emission-related diagnosis) with TCM for 2 seconds or more.	<ul style="list-style-type: none">CAN communication line between TCM and ECM (CAN communication line is open or shorted)

DTC Confirmation Procedure

INFOID:000000007358474

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check DTC.
3. If DTC is detected, go to [EC-624. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358475

Go to [LAN-53. "CAN Communication Signal Chart"](#).

U1001 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

U1001 CAN COMM CIRCUIT

Description

INFOID:000000007358476

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

INFOID:000000007358477

MIL will not illuminate for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1001 1001	CAN communication line	When ECM is not transmitting or receiving CAN communication signal other than OBD (emission-related diagnosis) for 2 seconds or more.	<ul style="list-style-type: none">• Harness or connectors (CAN communication line is open or shorted)

DTC Confirmation Procedure

INFOID:000000007358478

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-625, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358479

Go to [LAN-53, "CAN Communication Signal Chart"](#).

P0011, P0021 IVT CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0011, P0021 IVT CONTROL

On Board Diagnosis Logic

INFOID:000000007358480

NOTE:

- If DTC P0011 or P0021 is displayed with DTC P0075, P0081, first perform the trouble diagnosis for DTC P0075, P0081. Refer to [EC-640, "DTC Confirmation Procedure"](#).
- If DTC P0011 or P0021 is displayed with DTC P1140 or P1145, first perform the trouble diagnosis for DTC P1140, P1145. Refer to [EC-842, "DTC Confirmation Procedure"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0011 0011 (Bank 1)	Intake valve timing control performance	A	The alignment of the intake valve timing control has been misregistered.	<ul style="list-style-type: none"> • Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.) • Harness or connectors (Intake valve timing control position sensor circuit is open or shorted.) • Intake valve timing control solenoid valve • Intake valve timing control position sensor • Crankshaft position sensor (POS) • Camshaft position sensor (PHASE) • Accumulation of debris to the signal pick-up portion of the camshaft sprocket • Timing chain installation • Foreign matter caught in the oil groove for intake valve timing control
P0021 0021 (Bank 2)		B	There is a gap between angle of target and phase-control angle degree.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode.

Detected items	Engine operating condition in fail-safe mode
Intake valve timing control	The signal is not energized to the solenoid valve and the valve control does not function

DTC Confirmation Procedure

INFOID:000000007358481

CAUTION:

Always drive at a safe speed.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10 V and 16 V at idle.

PROCEDURE FOR MALFUNCTION A

Ⓟ With CONSULT

1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT.
3. Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	More than 2,000 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

< DTC/CIRCUIT DIAGNOSIS >

4. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	Idle
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	P or N position

5. Check 1st trip DTC.

6. If 1st trip DTC is detected, go to [EC-627, "Diagnosis Procedure"](#).

 With GST

Follow the procedure "With CONSULT" above.

PROCEDURE FOR MALFUNCTION B

 With CONSULT

1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT.
3. Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	1,700 - 3,175 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

4. Check 1st trip DTC.

5. If 1st trip DTC is detected, go to [EC-627, "Diagnosis Procedure"](#).

 With GST

Follow the procedure "With CONSULT" above.

Diagnosis Procedure

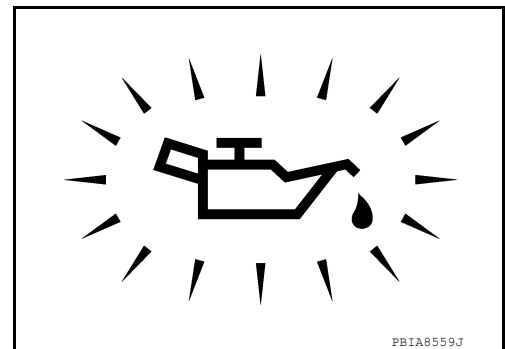
INFOID:000000007358482

1. CHECK OIL PRESSURE WARNING LAMP

1. Start engine.
2. Check oil pressure warning lamp and confirm it is not illuminated.

OK or NG

- OK >> GO TO 2.
- NG >> Go to [LU-26, "Inspection"](#).



2. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

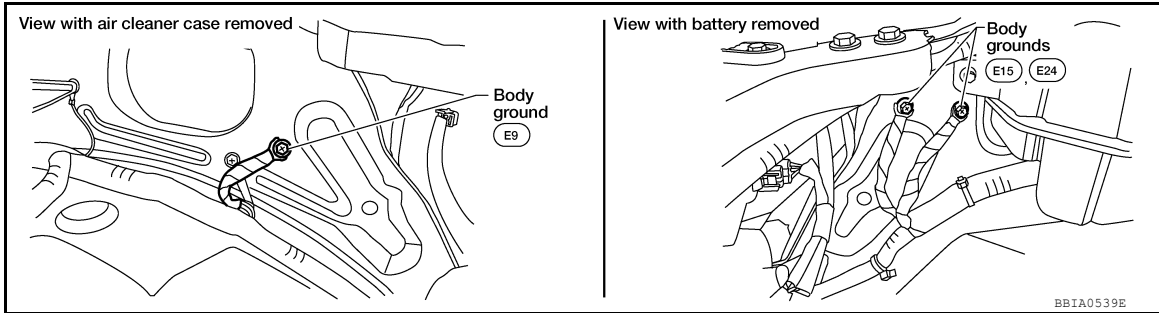
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P0011, P0021 IVT CONTROL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Refer to [EC-623, "Ground Inspection"](#).



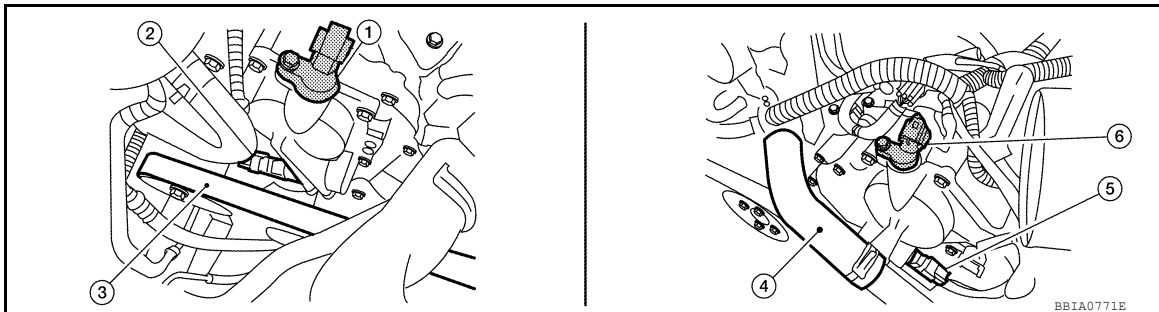
OK or NG

OK >> GO TO 3.

NG >> Repair or replace ground connections.

3. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect intake valve timing control position sensor harness connector.



- | | | |
|---|--|---|
| 1. Intake valve timing control position sensor (bank 2) | 2. Intake valve timing control solenoid valve (bank 2) | 3. Drive belt |
| 4. Radiator hose | 5. Intake valve timing control solenoid valve (bank 1) | 6. Intake valve timing control position sensor (bank 1) |

2. Turn ignition switch ON.

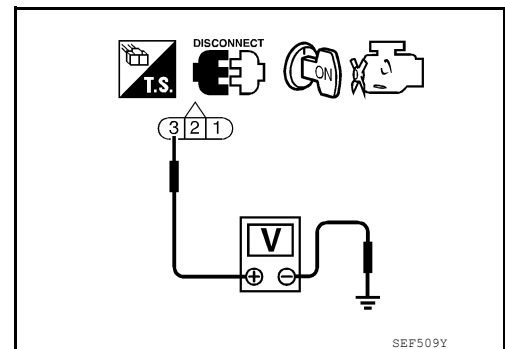
3. Check voltage between intake valve timing control position sensor terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- Harness for open or short between intake valve timing control position sensor and ECM
- Harness for open or short between intake valve timing control position sensor and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

P0011, P0021 IVT CONTROL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check harness continuity between intake valve timing control position sensor terminal 1 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between intake valve timing control position sensor and ground

>> Repair open circuit or short to power in harness or connectors.

7. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between the following;
ECM terminal 72 and intake valve timing control position sensor (bank 1) terminal 2 or
ECM terminal 53 and intake valve timing control position sensor (bank 2) terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR

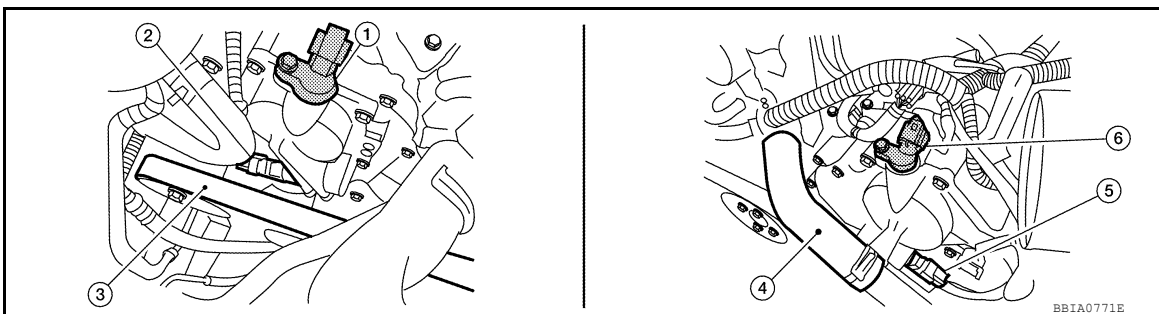
Refer to [EC-631, "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace malfunctioning intake valve timing control position sensor. Refer to [EM-193](#).

9. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Reconnect ECM harness connector.
2. Disconnect intake valve timing control solenoid valve harness connector.



- | | | |
|---|--|---|
| 1. Intake valve timing control position sensor (bank 2) | 2. Intake valve timing control solenoid valve (bank 2) | 3. Drive belt |
| 4. Radiator hose | 5. Intake valve timing control solenoid valve (bank 1) | 6. Intake valve timing control position sensor (bank 1) |

3. Turn ignition switch ON.

P0011, P0021 IVT CONTROL

[VK56DE]

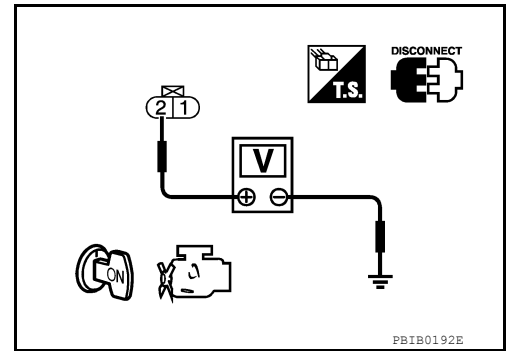
< DTC/CIRCUIT DIAGNOSIS >

4. Check voltage between intake valve timing control solenoid valve terminal 2 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 10.



10. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- Harness for open or short between intake valve timing control solenoid valve and IPDM E/R.

>> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between the following;
ECM terminal 10 and intake valve timing control solenoid valve (bank 1) terminal 1 or
ECM terminal 11 and intake valve timing control solenoid valve (bank 2) terminal 1.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 12.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to [EC-631, "Component Inspection"](#).

OK or NG

- OK >> GO TO 13.
- NG >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-193](#).

13. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to [EC-747, "Component Inspection"](#).

OK or NG

- OK >> GO TO 14.
- NG >> Replace crankshaft position sensor (POS). Refer to [EM-227](#).

14. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to [EC-751, "Component Inspection"](#).

OK or NG

- OK >> GO TO 15.
- NG >> Replace malfunctioning camshaft position sensor (PHASE). Refer to [EM-193](#).

15. CHECK CAMSHAFT SPROCKET

Check accumulation of debris or the signal pick-up portion of the camshaft sprocket. Refer to [EM-199, "Removal and Installation"](#).

OK or NG

P0011, P0021 IVT CONTROL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- OK >> GO TO 16.
- NG >> Remove debris and clean the signal pick-up cutout of camshaft sprocket.

16. CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misaligned.

Are there any service records that may cause timing chain misaligned?

Yes or No

- Yes >> Check timing chain installation. Refer to [EM-194. "Removal and Installation"](#).
- No >> GO TO 17.

17. CHECK LUBRICATION CIRCUIT

Refer to [LU-24. "Lubrication Circuit"](#).

OK or NG

- OK >> GO TO 18.
- NG >> Clean lubrication line.

18. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

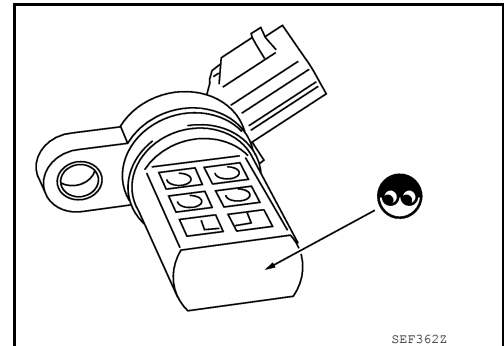
>> **INSPECTION END**

Component Inspection

INFOID:000000007358483

INTAKE VALVE TIMING CONTROL POSITION SENSOR

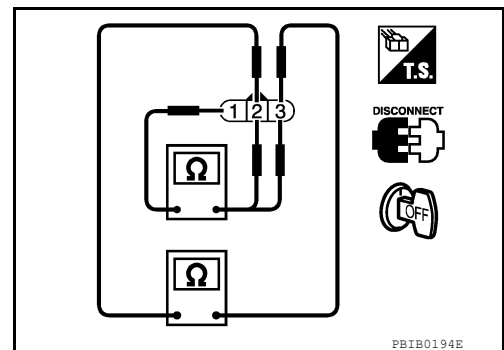
1. Disconnect intake valve timing control position sensor harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown below.

Terminal No. (Polarity)	Resistance [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞ Ω
2 (+) - 1 (-)	
3 (+) - 2 (-)	

6. If NG, replace intake valve timing control position sensor. Refer to [EM-193](#).



INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.

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P0011, P0021 IVT CONTROL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check resistance between intake valve timing control solenoid valve terminals as per the following.

Terminals	Resistance [at 20°C (68°F)]
1 and 2	7.1 - 7.7 Ω
1 or 2 and ground	∞ Ω (Continuity should not exist)

If NG, replace intake valve timing control solenoid valve. Refer to [EM-193](#).

If OK, go to next step.

3. Remove intake valve timing control solenoid valve. Refer to [EM-193](#).

4. Provide 12 V DC between intake valve timing control solenoid valve terminals and then interrupt it. Check that the plunger moves as shown in the figure.

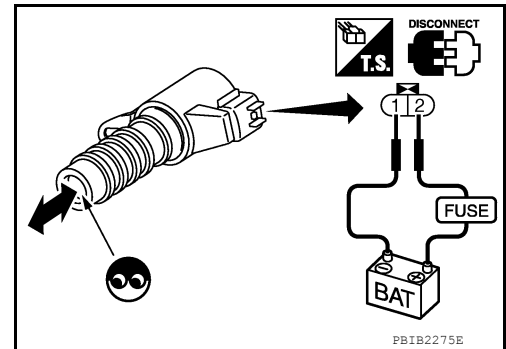
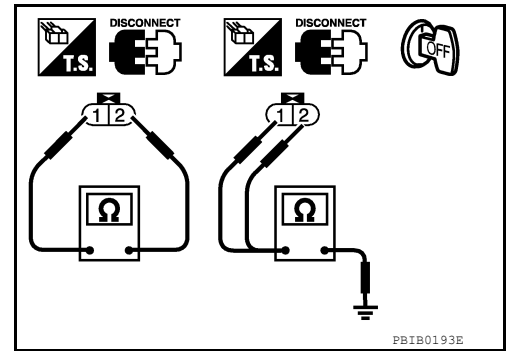
CAUTION:

Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

If NG, replace intake valve timing control solenoid valve. Refer to [EM-193](#).

NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.



P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

Description

INFOID:000000007358484

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Air fuel ratio (A/F) sensor 1 heater control	Air fuel ratio (A/F) sensor 1 heater
Mass air flow sensor	Amount of intake air		

The ECM performs ON/OFF duty control of the A/F sensor 1 heater corresponding to the engine operating condition to keep the temperature of A/F sensor 1 element at the specified range.

On Board Diagnosis Logic

INFOID:000000007358485

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031 0031 (Bank 1)	Air fuel ratio (A/F) sensor 1 heater control circuit low	The current amperage in the air fuel ratio (A/F) sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.)	<ul style="list-style-type: none"> • Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) • A/F sensor 1 heater
P0051 0051 (Bank 2)			
P0032 0032 (Bank 1)	Air fuel ratio (A/F) sensor 1 heater control circuit high	The current amperage in the air fuel ratio (A/F) sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.)	<ul style="list-style-type: none"> • Harness or connectors (The A/F sensor 1 heater circuit is shorted.) • A/F sensor 1 heater
P0052 0052 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358486

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10.5 V and 16 V at idle.

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-633, "Diagnosis Procedure"](#)

Diagnosis Procedure

INFOID:000000007358487

1. CHECK GROUND CONNECTIONS

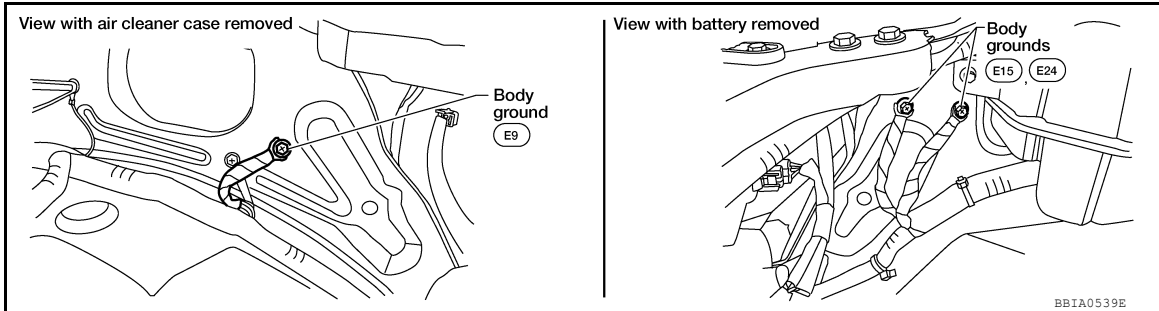
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Refer to [EC-623, "Ground Inspection"](#).

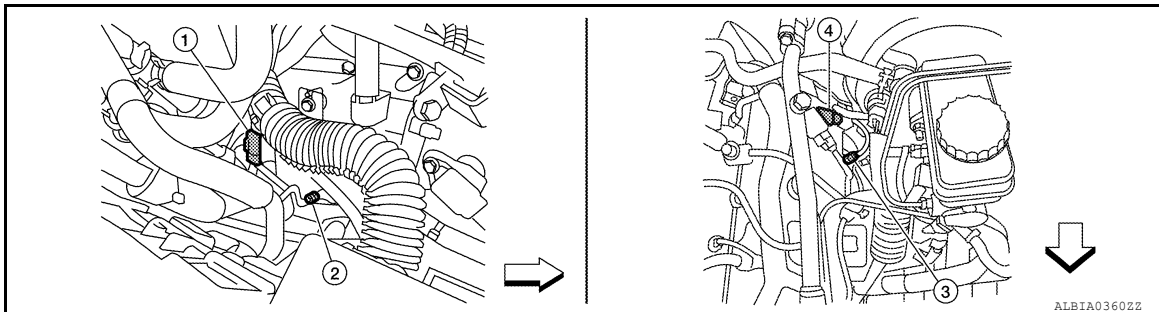


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.



- 1. A/F sensor 1 (bank 2) harness connector
- 2. A/F sensor 1 (bank 2)
- 3. A/F sensor 1 (bank 1)
- 4. A/F sensor 1 (bank 1) harness connector

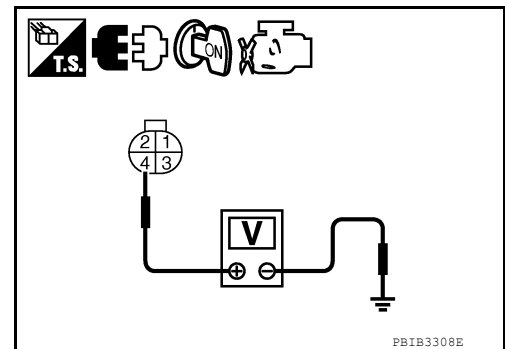
↶ : Vehicle front

2. Turn ignition switch ON.
3. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- 15 A fuse (No. 54)
- Harness for open or short between A/F sensor 1 and IPDM E/R

>> Repair or replace harness or connectors.

4. CHECK A/F SENSOR 1 HEATER OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Check harness continuity between ECM terminal 2 and A/F sensor 1 (bank 1) terminal 3, or ECM terminals 24, 43 and A/F sensor 1 (bank 2) terminal 3.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK A/F SENSOR 1 HEATER

Refer to [EC-635](#), "Component Inspection".

OK or NG

OK >> GO TO 6.

NG >> Replace malfunctioning A/F sensor 1. Refer to [EM-169](#).

6. CHECK INTERMITTENT INCIDENT

Perform [GI-37](#), "Intermittent Incident".

>> **INSPECTION END**

Component Inspection

INFOID:000000007358488

AIR FUEL RATIO (A/F) SENSOR 1 HEATER

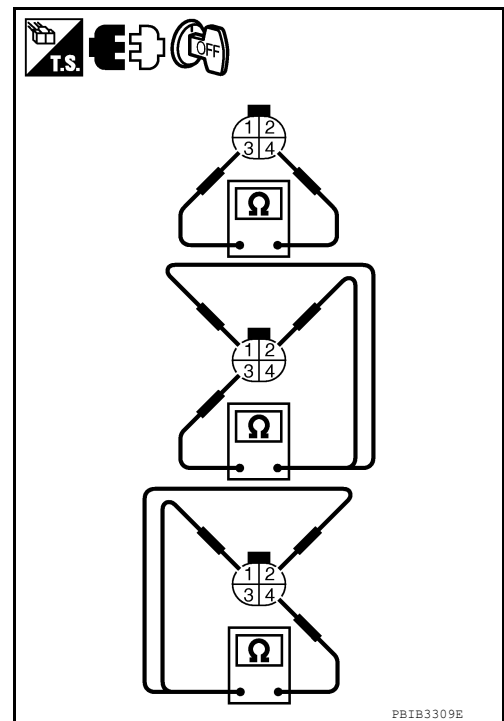
1. Check resistance between A/F sensor 1 terminals as per the following.

Terminal No.	Resistance [at 25°C (77°F)]
3 and 4	1.98 - 2.66 Ω
3 and 1, 2	∞ Ω (Continuity should not exist)
4 and 1, 2	

2. If NG, replace A/F sensor 1. Refer to [EM-169](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [Commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (Commercial service tool).



P0037, P0038, P0057, P0058 HO2S2 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0037, P0038, P0057, P0058 HO2S2 HEATER

Description

INFOID:000000007358489

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Engine coolant temperature sensor	Engine coolant temperature		
Mass air flow sensor	Amount of intake air		

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

OPERATION

Engine speed	Heated oxygen sensor 2 heater
Above 3,600 rpm	OFF
Below 3,600 rpm after the following conditions are met. <ul style="list-style-type: none">• Engine: After warming up• Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	ON

On Board Diagnosis Logic

INFOID:000000007358490

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037 0037 (Bank 1) P0057 0057 (Bank 2)	Heated oxygen sensor 2 heater control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	<ul style="list-style-type: none">• Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.)• Heated oxygen sensor 2 heater
P0038 0038 (Bank 1) P0058 0058 (Bank 2)	Heated oxygen sensor 2 heater control circuit high	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	<ul style="list-style-type: none">• Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.)• Heated oxygen sensor 2 heater

DTC Confirmation Procedure

INFOID:000000007358491

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10.5 V and 16 V at idle.

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start the engine and keep the engine speed between 3,500 rpm and 4,000 rpm for at least 1 minute under no load.

P0037, P0038, P0057, P0058 HO2S2 HEATER

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

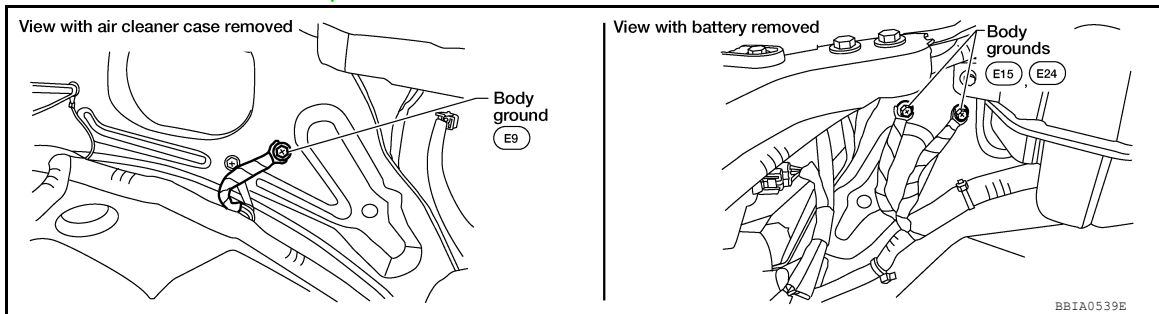
6. Let engine idle for 1 minute.
7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to [EC-637. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358492

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623. "Ground Inspection"](#).

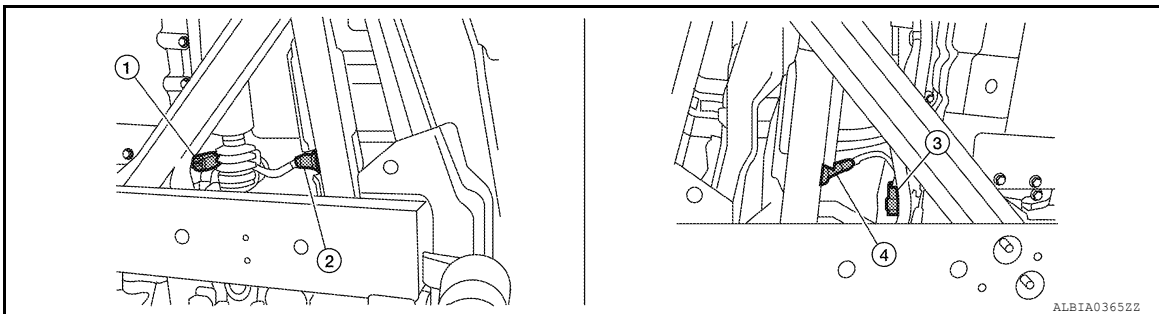


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK HEATED OXYGEN SENSOR 2 HEATER POWER SUPPLY CIRCUIT

1. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.



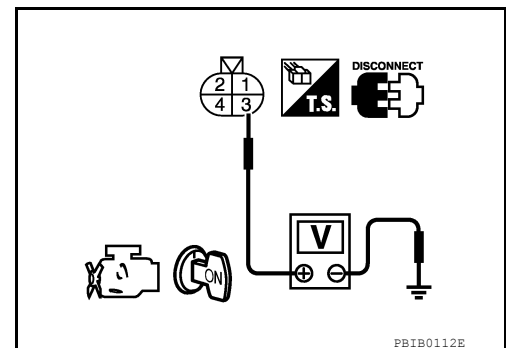
1. Heated oxygen sensor 2 (bank 1)
2. Heated oxygen sensor 2 (bank 1)
3. Heated oxygen sensor (bank 2) harness connector
4. Heated oxygen sensor 2 (bank 2)

2. Turn ignition switch ON.
3. Check voltage between HO2S2 terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119

P0037, P0038, P0057, P0058 HO2S2 HEATER

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- 15 A fuse (No. 54)
- Harness for open or short between heated oxygen sensor 2 and IPDM E/R

>> Repair harness or connectors.

4. CHECK HO2S2 HEATER OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal and HO2S2 terminal as per the following. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0037, P0038	6	2	1
P0057, P0058	25	2	2

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to [EC-638, "Component Inspection"](#).

OK or NG

OK >> GO TO 6.

NG >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-6](#).

6. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358493

HEATED OXYGEN SENSOR 2 HEATER

P0037, P0038, P0057, P0058 HO2S2 HEATER

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

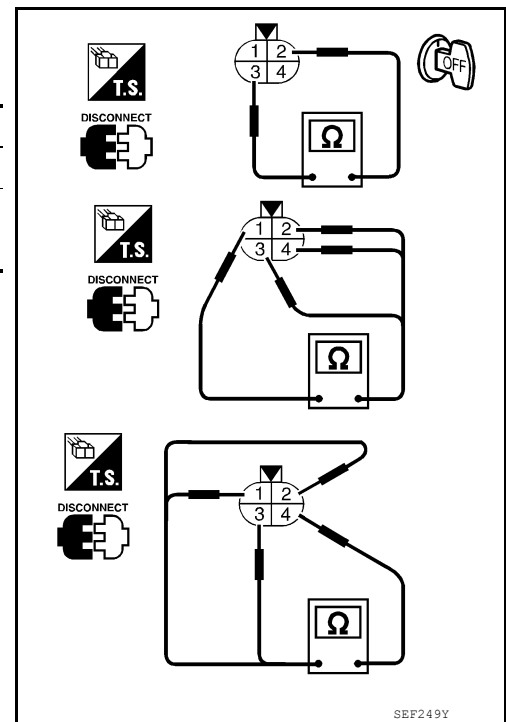
1. Check resistance between HO2S2 terminals as per the following.

Terminal No.	Resistance [at 25°C (77°F)]
2 and 3	8 - 10 Ω
1 and 2, 3, 4	∞ Ω (Continuity should not exist)
4 and 1, 2, 3	

2. If NG, replace heated oxygen sensor 2. Refer to [EX-6](#).

CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [Commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (Commercial service tool).



SEP249Y

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P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0075, P0081 IVT CONTROL SOLENOID VALVE

Component Description

INFOID:000000007358494

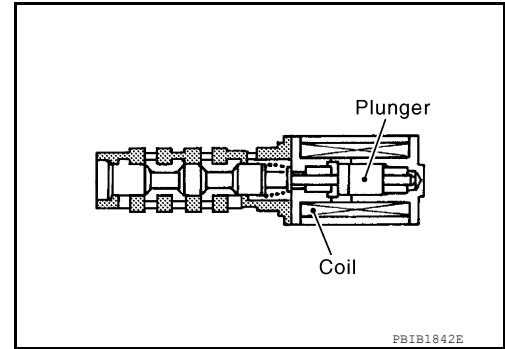
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



On Board Diagnosis Logic

INFOID:000000007358495

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0075 0075 (Bank 1)	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	<ul style="list-style-type: none">• Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.)• Intake valve timing control solenoid valve
P0081 0081 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358496

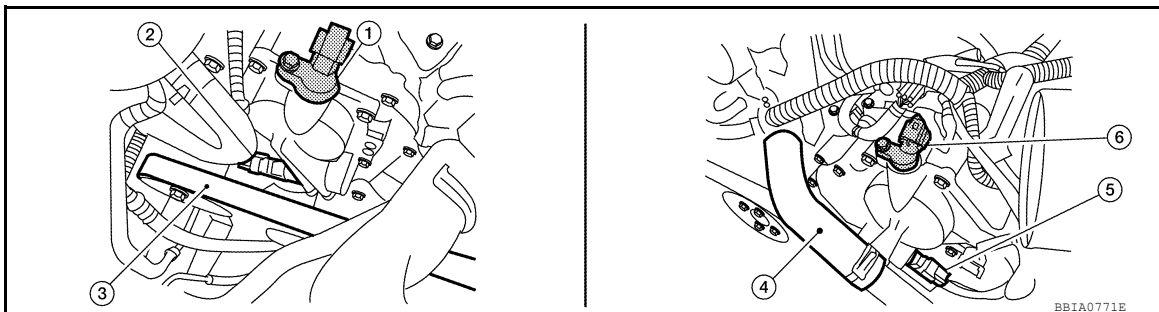
1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to [EC-640. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358497

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.



P0075, P0081 IVT CONTROL SOLENOID VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

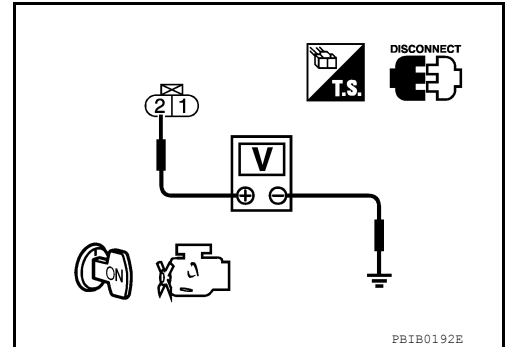
- | | | |
|---|--|---|
| 1. Intake valve timing control position sensor (bank 2) | 2. Intake valve timing control solenoid valve (bank 2) | 3. Drive belt |
| 4. Radiator hose | 5. Intake valve timing control solenoid valve (bank 1) | 6. Intake valve timing control position sensor (bank 1) |

3. Turn ignition switch ON.
4. Check voltage between intake valve timing control solenoid valve terminal 2 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- Harness for open or short between intake valve timing control solenoid valve and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between the following;
ECM terminal 10 and intake valve timing control solenoid valve (bank 1) terminal 1 or
ECM terminal 11 and intake valve timing control solenoid valve (bank 2) terminal 1.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to [EC-641, "Component Inspection"](#).

OK or NG

- OK >> GO TO 5.
NG >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-193](#).

5. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358498

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.

P0075, P0081 IVT CONTROL SOLENOID VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check resistance between intake valve timing control solenoid valve terminals as per the following.

Terminals	Resistance [at 20°C (68°F)]
1 and 2	7.1 - 7.7 Ω
1 or 2 and ground	∞ Ω (Continuity should not exist)

If NG, replace intake valve timing control solenoid valve. Refer to [EM-193](#).
If OK, go to next step.

- Remove intake valve timing control solenoid valve. Refer to [EM-193](#).

- Provide 12 V DC between intake valve timing control solenoid valve terminals and then interrupt it. Check that the plunger moves as shown in the figure.

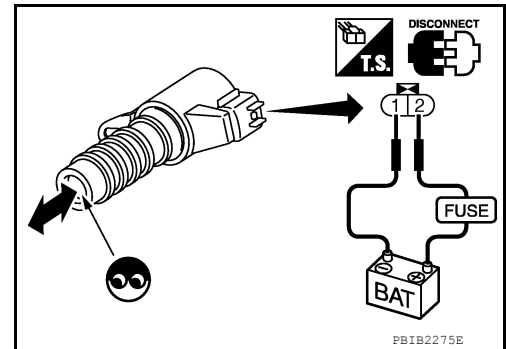
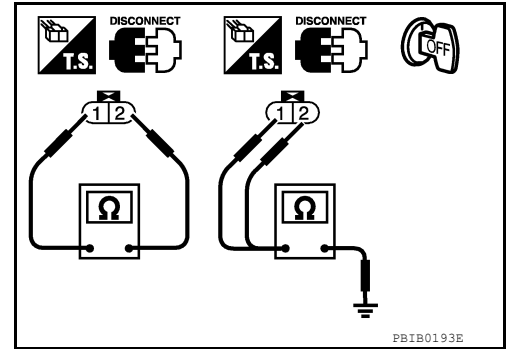
CAUTION:

Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

If NG, replace intake valve timing control solenoid valve. Refer to [EM-193](#).

NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.



P0101 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

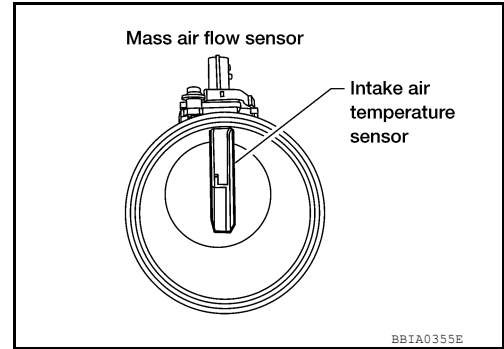
P0101 MAF SENSOR

Component Description

INFOID:000000007358499

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The greater air flow, the greater the heat loss.

Therefore, the electric current supplied to the hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



DTC Logic

INFOID:000000007358500

DTC DETECTION LOGIC

NOTE:

If DTC P0101 is displayed with other DTC, first perform the trouble diagnosis for other DTC.

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0101	MAF SEN/CIRCUIT-B1 [Mass air flow (MAF) sensor circuit range/performance]	<ul style="list-style-type: none"> A high voltage from the sensor is sent to ECM under light load driving condition. A low voltage from the sensor is sent to ECM under heavy load driving condition. 	<ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted.) Intake air leaks MAF sensor EVAP control system pressure sensor Intake air temperature sensor

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle for at least 5 seconds under the following conditions:

CAUTION:

Always drive vehicle at safe speed.

Selector lever	Suitable position
Vehicle speed	40 km/h (25 MPH) or more

NOTE:

- The gear must be fixed while driving the vehicle.
 - Keep the accelerator pedal as steady as possible during cruising.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-644, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

P0101 MAF SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

INFOID:000000007358501

Diagnosis Procedure

1. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct and intake manifold

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Reconnect the parts.

2. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E24. Refer to Ground Inspection in [EC-623. "Ground Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Repair or replace ground connection.

3. CHECK MASS AIR FLOW (MAF) SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between MAF sensor harness connector and ground.

MAF sensor		Ground	Voltage
Connector	Terminal		
F53	2	Ground	Battery voltage

Is the inspection result normal?

- YES >> GO TO 5.
NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between mass air flow sensor and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between MAF sensor harness connector and ECM harness connector.

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F53	3	F79	67	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 6.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between MAF sensor harness connector and ECM harness connector.

P0101 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F53	4	F79	51	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK INTAKE AIR TEMPERATURE SENSOR

Check intake air temperature sensor. Refer to [EC-656, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace MAF sensor (with intake air temperature sensor). Refer to [EM-164](#).

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check EVAP control system pressure sensor. Refer to [EC-788, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

9. CHECK MAF SENSOR

Check MAF sensor. Refer to [EC-645, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace MAF sensor. Refer to [EM-164](#).

10. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000007358502

MASS AIR FLOW SENSOR

Ⓟ With CONSULT

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Connect CONSULT and select "DATA MONITOR" mode.
4. Select "MAS A/F SE-B1" and check indication under the following conditions.

Condition	MAS A/F SE-B1 (V)
Ignition switch ON (Engine stopped.)	Approx. 0.4
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.7 - 2.1
Idle to approximately 4,000 rpm	1.0 - 1.3 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to approximately 4,000 rpm.

5. If the voltage is out of specification, proceed the following.
 - a. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
 - Crushed air ducts
 - Malfunctioning seal of air cleaner element

P0101 MAF SENSOR

[VK56DE]

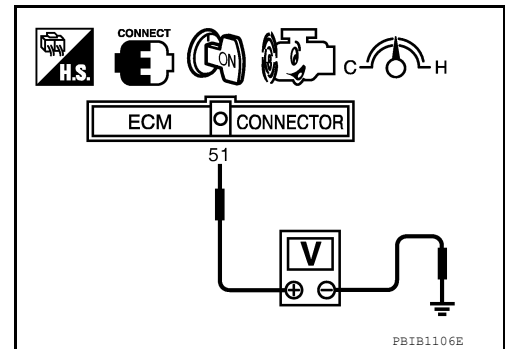
< DTC/CIRCUIT DIAGNOSIS >

- Uneven dirt of air cleaner element
 - Improper specification of intake air system parts
- b. If NG, repair or replace malfunctioning part and perform steps 2 to 4 again. If OK, go to next step.
 6. Turn ignition switch OFF.
 7. Disconnect mass air flow sensor harness connector and reconnect it again.
 8. Perform steps 2 to 4 again.
 9. If NG, clean or replace mass air flow sensor. Refer to [EM-164](#).

⊗ Without CONSULT

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 51 (Mass air flow sensor signal) and ground.

Condition	MAS A/F SE-B1 (V)
Ignition switch ON (Engine stopped.)	Approx. 0.4
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.7 - 2.1
Idle to approximately 4,000 rpm	1.0 - 1.3 to Approx. 2.4*



*: Check for linear voltage rise in response to engine being increased to approximately 4,000 rpm.

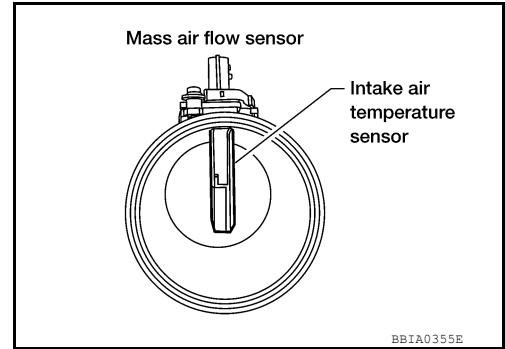
4. If the voltage is out of specification, proceed the following.
 - a. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
 - Crushed air ducts
 - Malfunctioning seal of air cleaner element
 - Uneven dirt of air cleaner element
 - Improper specification of intake air system parts
 - b. If NG, repair or replace malfunctioning part and perform steps 2 and 3 again. If OK, go to next step.
 5. Turn ignition switch OFF.
 6. Disconnect mass air flow sensor harness connector and reconnect it again.
 7. Perform steps 2 and 3 again.
 8. If NG, clean or replace mass air flow sensor. Refer to [EM-164](#).

P0102, P0103 MAF SENSOR

Component Description

INFOID:000000007358503

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The greater air flow, the greater the heat loss. Therefore, the electric current supplied to the hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



On Board Diagnosis Logic

INFOID:000000007358504

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102 0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Intake air leakage • Mass air flow sensor
P0103 0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL illuminates.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

INFOID:000000007358505

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

PROCEDURE FOR DTC P0102

1. Start engine and wait at least 5 seconds.
2. Check DTC.
3. If DTC is detected, go to [EC-648, "Diagnosis Procedure"](#).

PROCEDURE FOR DTC P0103

1. Turn ignition switch ON.
2. Wait at least 5 seconds.
3. Check DTC.
4. If DTC is detected, go to [EC-648, "Diagnosis Procedure"](#).
If DTC is not detected, go to next step.
5. Start engine and wait at least 5 seconds.
6. Check DTC.
7. If DTC is detected, go to [EC-648, "Diagnosis Procedure"](#).

P0102, P0103 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

INFOID:000000007358506

Diagnosis Procedure

1. INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.

P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

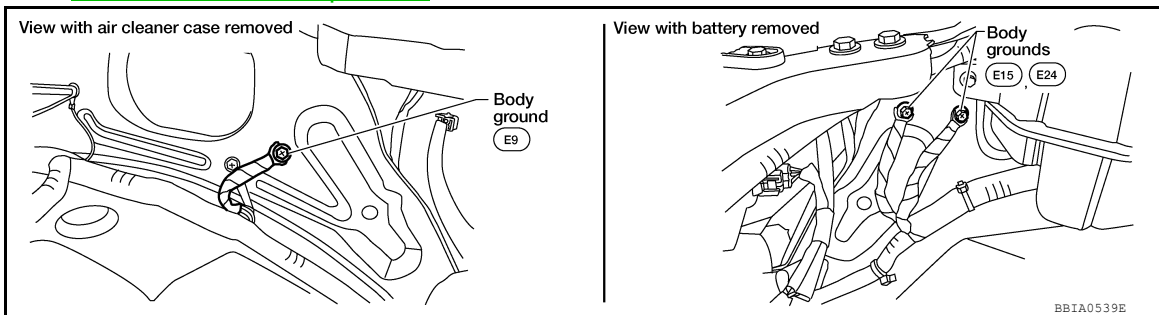
OK or NG

OK >> GO TO 3.

NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623. "Ground Inspection"](#).



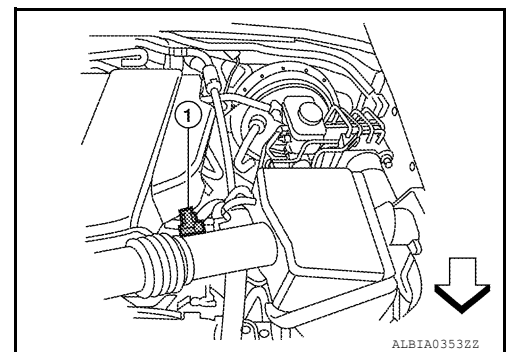
OK or NG

OK >> GO TO 4.

NG >> Repair or replace ground connections.

4. CHECK MASS AIR FLOW SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor (1) harness connector.
- ←: Vehicle front
2. Turn ignition switch ON.



P0102, P0103 MAF SENSOR

[VK56DE]

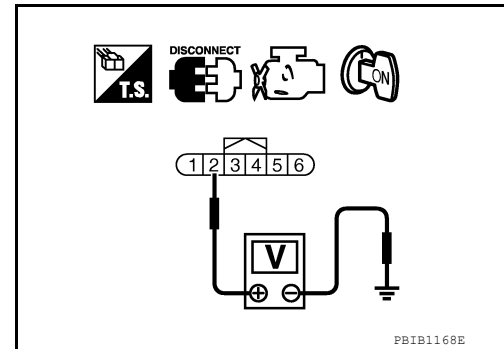
< DTC/CIRCUIT DIAGNOSIS >

3. Check voltage between MAF sensor terminal 2 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 6.
- NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- Harness for open or short between mass air flow sensor and IPDM E/R
- Harness for open or short between mass air flow sensor and ECM

>> Repair harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 4 and ECM terminal 51. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to [EC-649, "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace mass air flow sensor. Refer to [EM-164](#).

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358507

MASS AIR FLOW SENSOR

P0102, P0103 MAF SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Ⓟ With CONSULT

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Connect CONSULT and select "DATA MONITOR" mode.
4. Select "MAS A/F SE-B1" and check indication under the following conditions.

Condition	MAS A/F SE-B1 (V)
Ignition switch ON (Engine stopped.)	Approx. 0.4
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.7 - 2.1
Idle to approximately 4,000 rpm	1.0 - 1.3 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to approximately 4,000 rpm.

5. If the voltage is out of specification, proceed the following.
 - a. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
 - Crushed air ducts
 - Malfunctioning seal of air cleaner element
 - Uneven dirt of air cleaner element
 - Improper specification of intake air system parts
 - b. If NG, repair or replace malfunctioning part and perform steps 2 to 4 again. If OK, go to next step.
6. Turn ignition switch OFF.
7. Disconnect mass air flow sensor harness connector and reconnect it again.
8. Perform steps 2 to 4 again.
9. If NG, clean or replace mass air flow sensor. Refer to [EM-164](#).

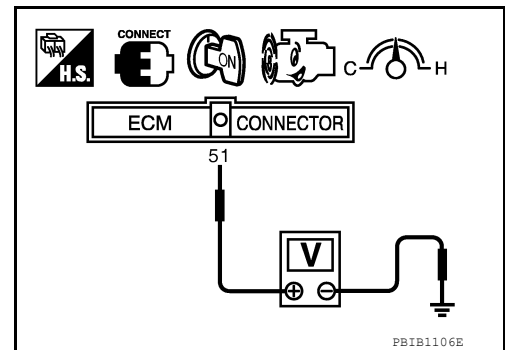
ⓧ Without CONSULT

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 51 (Mass air flow sensor signal) and ground.

Condition	MAS A/F SE-B1 (V)
Ignition switch ON (Engine stopped.)	Approx. 0.4
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.7 - 2.1
Idle to approximately 4,000 rpm	1.0 - 1.3 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to approximately 4,000 rpm.

4. If the voltage is out of specification, proceed the following.
 - a. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
 - Crushed air ducts
 - Malfunctioning seal of air cleaner element
 - Uneven dirt of air cleaner element
 - Improper specification of intake air system parts
 - b. If NG, repair or replace malfunctioning part and perform steps 2 and 3 again. If OK, go to next step.
5. Turn ignition switch OFF.
6. Disconnect mass air flow sensor harness connector and reconnect it again.
7. Perform steps 2 and 3 again.



PB1B1106E

P0102, P0103 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

8. If NG, clean or replace mass air flow sensor. Refer to [EM-164](#).

A

EC

C

D

E

F

G

H

I

J

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L

M

N

O

P

P0111 IAT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

P0111 IAT SENSOR

DTC Logic

INFOID:000000007358508

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0111	IAT SENSOR 1 B1 [Intake air temperature (IAT) sensor circuit range/perfor- mance]	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, and FTT sensor) shows that the voltage signal of the IAT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.	<ul style="list-style-type: none">• Harness or connectors (High or low resistance in the IAT sensor circuit)• IAT sensor

DTC CONFIRMATION PROCEDURE

1. INSPECTION START

Is it necessary to erase permanent DTC?

YES >> GO TO 3.

NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-653, "Component Function Check"](#).

NOTE:

Use the component function check to check the overall function of the IAT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-653, "Diagnosis Procedure"](#).

3. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.

NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

CAUTION:

Never turn ignition switch ON during soaking.

NOTE:

The vehicle must be cooled with the hood open.

4. Start engine and let it idle for 5 minutes or more.

CAUTION:

Never turn ignition switch OFF during idling.

P0111 IAT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-653, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Component Function Check

INFOID:000000007358509

1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as follows.

Terminals	Condition	Resistance (kΩ)
5 and 6	Temperature [°C (°F)]	25 (77)
		1.800 – 2.200

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Proceed to [EC-653, "Diagnosis Procedure"](#).

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-37, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-653, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358510

1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

Check intake air temperature sensor. Refer to [EC-653, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-164](#).

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000007358511

1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as follows.

Terminals	Condition	Resistance (kΩ)
5 and 6	Temperature [°C (°F)]	25 (77)
		1.800 – 2.200

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-164](#).

P0112, P0113 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

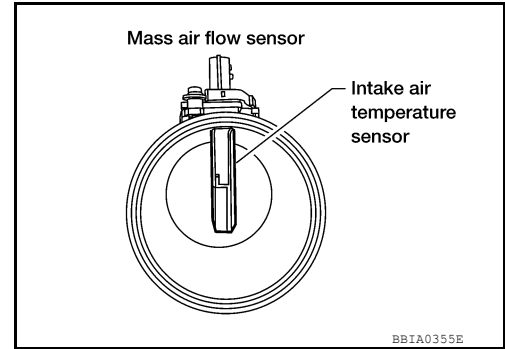
P0112, P0113 IAT SENSOR

Component Description

INFOID:000000007358512

The intake air temperature sensor is built-into the mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



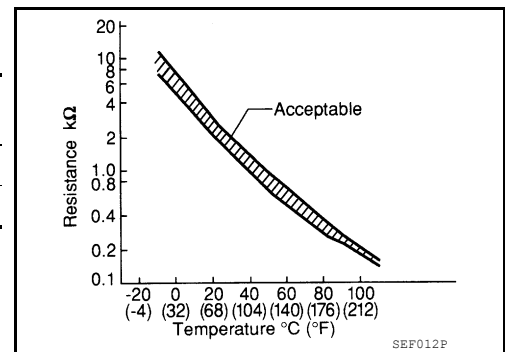
<Reference data>

Intake air temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
25 (77)	3.3	1.800 - 2.200
80 (176)	1.2	0.283 - 0.359

*: This data is reference value and is measured between ECM terminal 34 (Intake air temperature sensor) and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



On Board Diagnosis Logic

INFOID:000000007358513

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0112 0112	Intake air temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Intake air temperature sensor
P0113 0113	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

INFOID:000000007358514

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Wait at least 5 seconds.
4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to [EC-654, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358515

1. CHECK GROUND CONNECTIONS

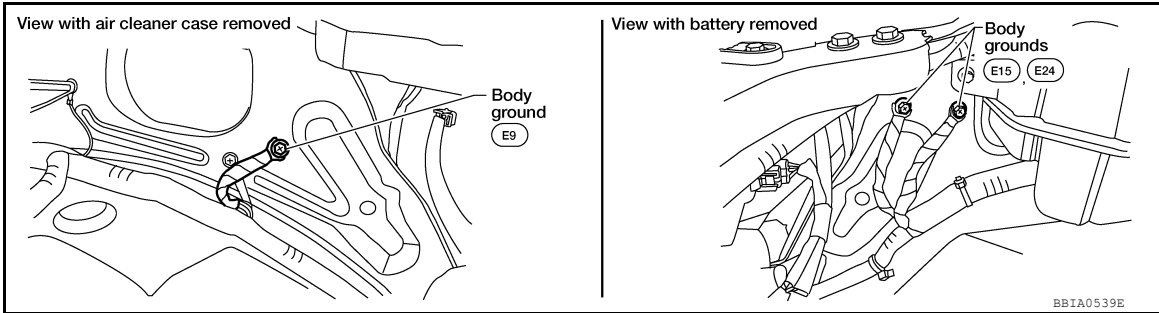
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P0112, P0113 IAT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Refer to [EC-623, "Ground Inspection"](#).



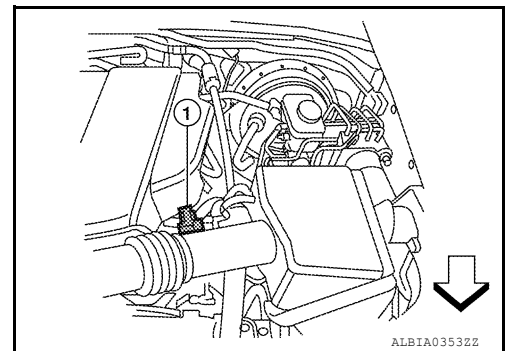
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow sensor (with intake air temperature sensor) (1) harness connector.
 - ⇐: Vehicle front
2. Turn ignition switch ON.



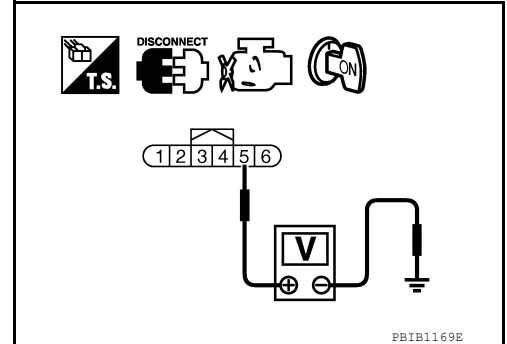
3. Check voltage between mass air flow sensor terminal 5 and ground.

Voltage: Approximately 5 V

OK or NG

OK >> GO TO 3.

NG >> Repair harness or connectors.



3. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between mass air flow sensor terminal 6 and ECM terminal 67.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to [EC-656, "Component Inspection"](#).

OK or NG

OK >> GO TO 5.

NG >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-164](#).

P0112, P0113 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

5. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

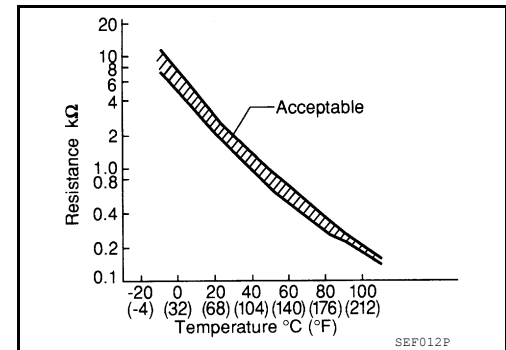
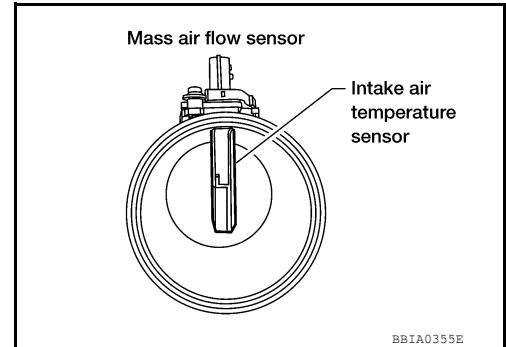
INFOID:000000007358516

INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between intake air temperature sensor terminals 5 and 6 under the following conditions.

Intake air temperature [°C (°F)]	Resistance (kΩ)
25 (77)	1.800 - 2.200

2. If NG, replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-164](#).



P0116 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

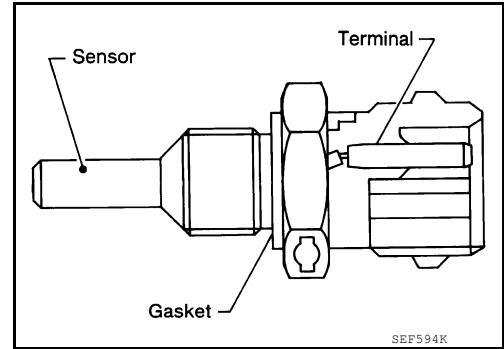
[VK56DE]

P0116 ECT SENSOR

Component Description

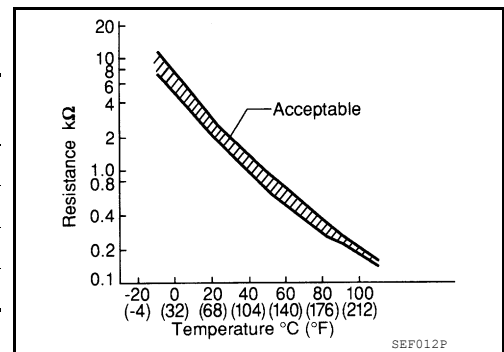
INFOID:000000007358517

The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260



*: This data is reference value and is measured between ECM terminal 73 (Engine coolant temperature sensor) and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

DTC Logic

INFOID:000000007358518

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0116	ECT SEN/CIRC [Engine coolant temperature (ECT) sensor circuit range/performance]	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, and FTT sensor) shows that the voltage signal of the ECT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.	<ul style="list-style-type: none"> • Harness or connectors (High or low resistance in the ECT sensor circuit) • ECT sensor

DTC CONFIRMATION PROCEDURE

1. INSPECTION START

Is it necessary to erase permanent DTC?

- YES >> GO TO 3.
- NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-658, "Component Function Check"](#).

NOTE:

Use the component function check to check the overall function of the ECT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-659, "Diagnosis Procedure"](#).

3. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.

NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

CAUTION:

Never turn ignition switch ON during soaking.

NOTE:

The vehicle must be cooled with the hood open.

4. Start engine and let it idle for 20 minutes or more.

CAUTION:

Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-659, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

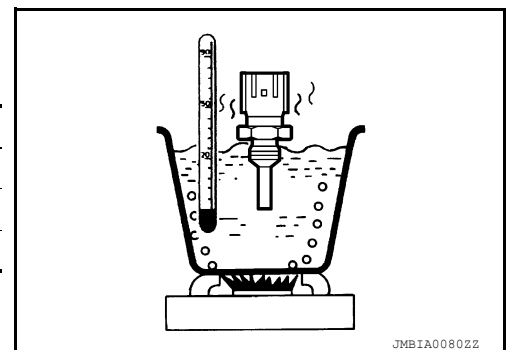
Component Function Check

INFOID:000000007358519

1. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect ECT sensor harness connector.
3. Remove ECT sensor. Refer to [EM-214, "Exploded View"](#).
4. Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance (kΩ)	
1 and 2	Temperature [°C (°F)]	20 (68)	2.1 – 2.9
		50 (122)	0.68 – 1.00
		90 (194)	0.236 – 0.260



Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Proceed to [EC-659, "Diagnosis Procedure"](#).

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-37, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-659, "Diagnosis Procedure"](#).

P0116 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Diagnosis Procedure

INFOID:000000007358520

1. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Check ECT sensor. Refer to [EC-659, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace ECT sensor. Refer to [EM-214, "Exploded View"](#).

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000007358521

1. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

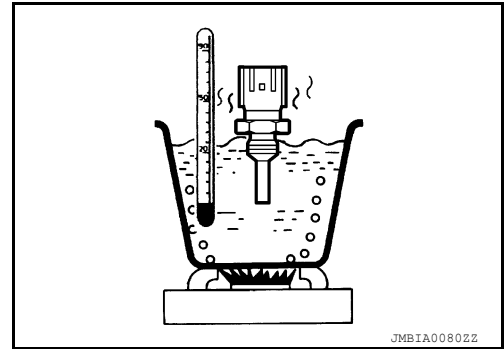
1. Turn ignition switch OFF.
2. Disconnect ECT sensor harness connector.
3. Remove ECT sensor. Refer to [EM-214, "Exploded View"](#).
4. Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance (kΩ)	
1 and 2	Temperature [°C (°F)]	20 (68)	2.1 – 2.9
		50 (122)	0.68 – 1.00
		90 (194)	0.236 – 0.260

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ECT sensor. Refer to [EM-214, "Exploded View"](#).



P0117, P0118 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

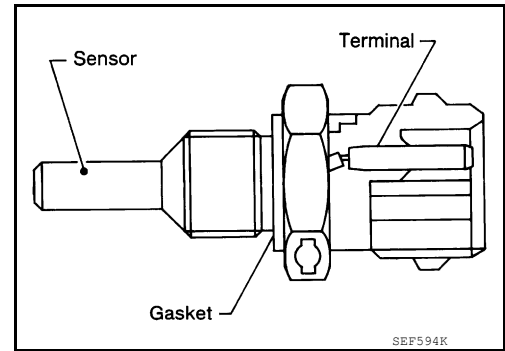
[VK56DE]

P0117, P0118 ECT SENSOR

Component Description

INFOID:000000007358522

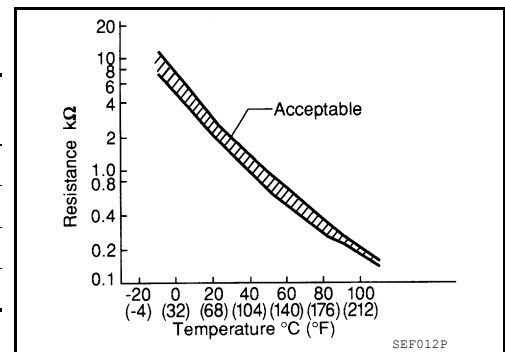
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: This data is reference value and is measured between ECM terminal 73 (Engine coolant temperature sensor) and ground.



CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

INFOID:000000007358523

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL illuminates.

Detected items	Engine operating condition in fail-safe mode	
Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the following condition. CONSULT displays the engine coolant temperature decided by ECM.	
	Condition	Engine coolant temperature decided (CONSULT display)
	Just as ignition switch is turned ON or START	40°C (104°F)
	Approx. 4 minutes or more after engine starting	80°C (176°F)
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.		

P0117, P0118 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

DTC Confirmation Procedure

INFOID:000000007358524

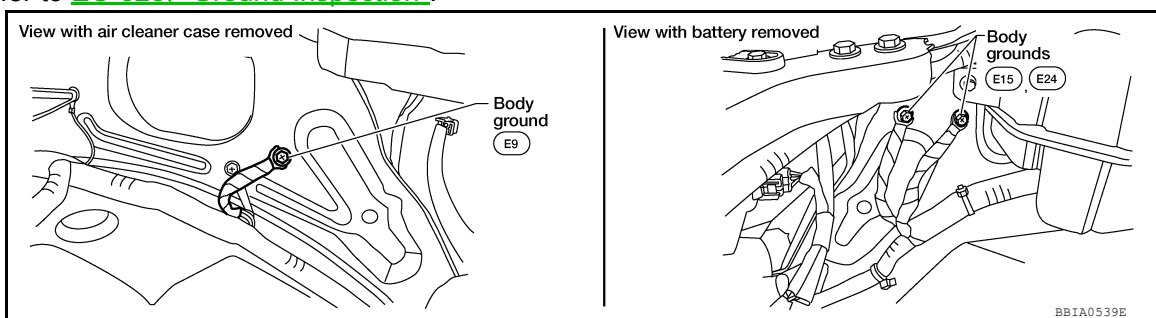
1. If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Wait at least 5 seconds.
4. Check DTC.
5. If DTC is detected, go to [EC-661, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358525

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623, "Ground Inspection"](#).

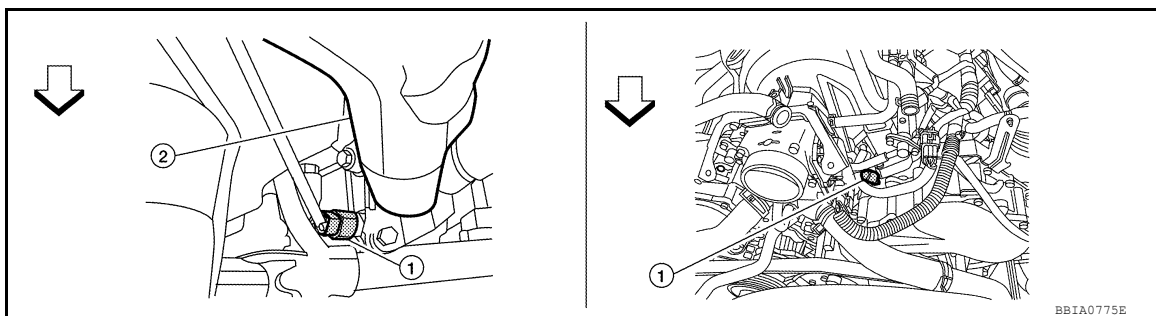


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK ENGINE COOLANT TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect engine coolant temperature (ECT) sensor harness connector.



1. Engine coolant temperature (ECT) sensor
2. Intake manifold sensor

↔ : Vehicle front

2. Turn ignition switch ON.

P0117, P0118 ECT SENSOR

[VK56DE]

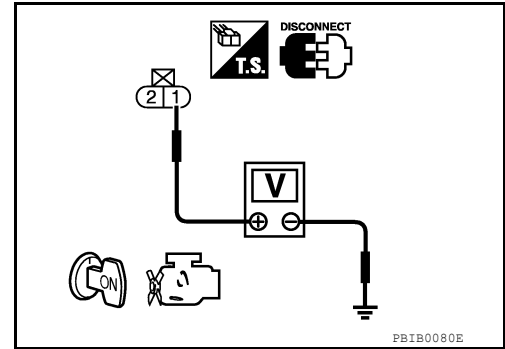
< DTC/CIRCUIT DIAGNOSIS >

3. Check voltage between ECT sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connector F38, F275
- Harness for open or short between ECM and engine coolant temperature sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECT sensor terminal 2 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connector F38, F275
- Harness for open and short between ECT sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to [EC-662, "Component Inspection"](#).

OK or NG

- OK >> GO TO 7.
NG >> Replace engine coolant temperature sensor. Refer to [EM-214](#).

7. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358526

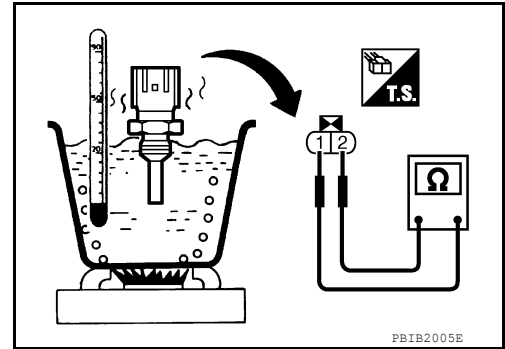
ENGINE COOLANT TEMPERATURE SENSOR

P0117, P0118 ECT SENSOR

[VK56DE]

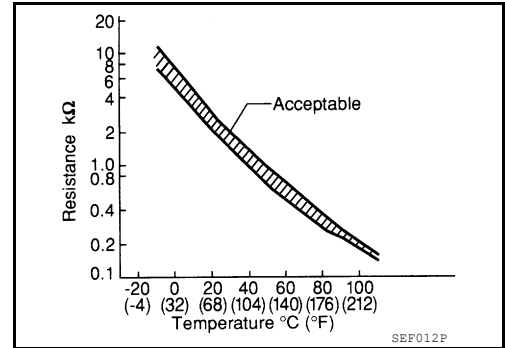
< DTC/CIRCUIT DIAGNOSIS >

1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



Engine coolant temperature [°C (°F)]	Resistance (kΩ)
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

2. If NG, replace engine coolant temperature sensor. Refer to [EM-214](#).



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P0122, P0123 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

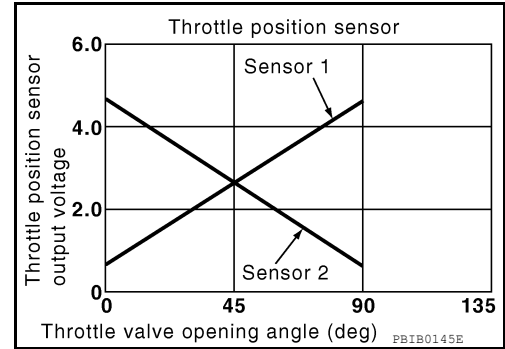
P0122, P0123 TP SENSOR

Component Description

INFOID:000000007358527

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve in response to driving conditions via the throttle control motor.



On Board Diagnosis Logic

INFOID:000000007358528

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0122 0122	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	<ul style="list-style-type: none"> Harness or connectors (TP sensor 2 circuit is open or shorted.) (APP sensor 2 circuit is shorted.) Electric throttle control actuator (TP sensor 2) Accelerator pedal position sensor (APP sensor 2)
P0123 0123	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operation condition in fail-safe mode

The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.

The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.

So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:000000007358529

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to [EC-664, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358530

1. CHECK GROUND CONNECTIONS

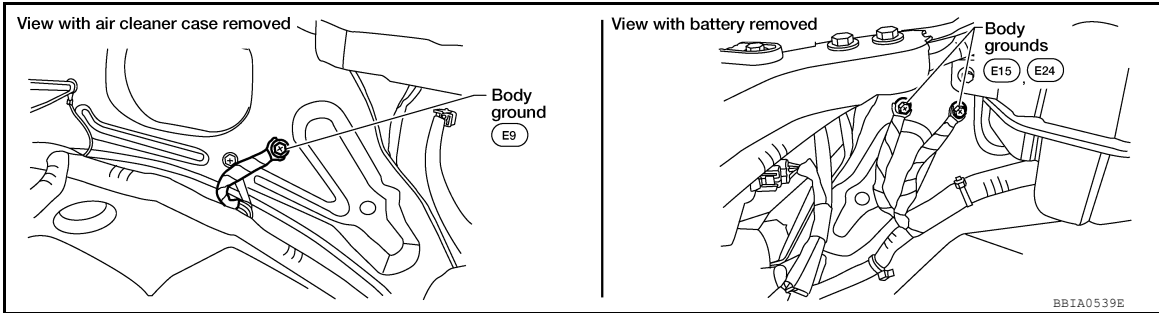
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P0122, P0123 TP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Refer to [EC-623, "Ground Inspection"](#).

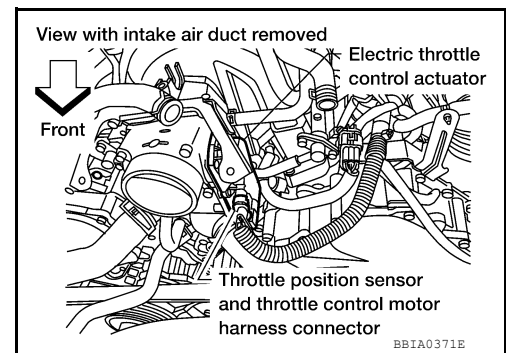


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch ON.

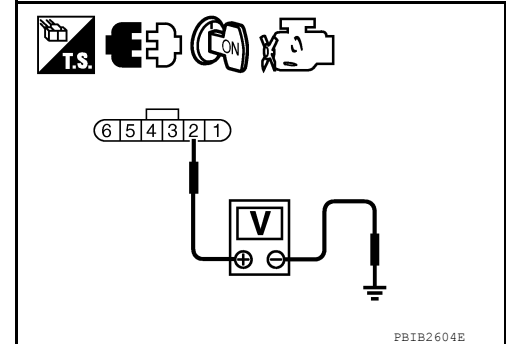


3. Check voltage between electric throttle control actuator terminal 2 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 3.



3. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 2 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 2	EC-567, "Wiring Diagram"
91	Accelerator pedal position sensor terminal 1	

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P0122, P0123 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

OK or NG

- OK >> GO TO 5.
- NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK ACCELERATOR PEDAL POSITION SENSOR

Refer to [EC-902. "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace the accelerator pedal assembly. Refer to [ACC-4. "Removal and Installation"](#).
2. Perform [EC-597. "Accelerator Pedal Released Position Learning"](#).
3. Perform [EC-597. "Throttle Valve Closed Position Learning"](#).
4. Perform [EC-597. "Idle Air Volume Learning"](#).

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 4 and ECM terminal 66. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 69 and electric throttle control actuator terminal 3. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to [EC-667. "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator. Refer to [EM-165. "Removal and Installation"](#).
2. Perform [EC-597. "Throttle Valve Closed Position Learning"](#).
3. Perform [EC-597. "Idle Air Volume Learning"](#).

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

P0122, P0123 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

>> INSPECTION END

Component Inspection

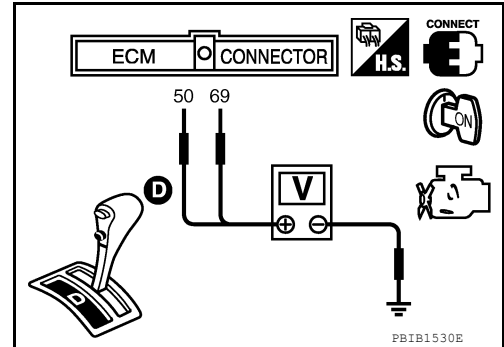
INFOID:000000007358531

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
3. Turn ignition switch ON.
4. Shift selector lever to the D position.
5. Check voltage between ECM terminals 50 (TP sensor 1 signal) and ground, 69 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
69 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V

6. If NG, replace electric throttle control actuator and go to the next step. Refer to [EM-165](#).
7. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
8. Perform [EC-597, "Idle Air Volume Learning"](#).



P0125 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

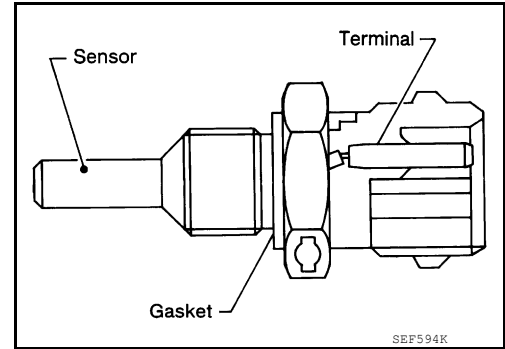
[VK56DE]

P0125 ECT SENSOR

Component Description

INFOID:000000007358532

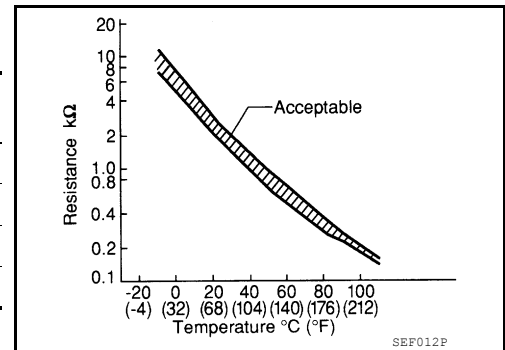
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: This data is reference value and is measured between ECM terminal 73 (Engine coolant temperature sensor) and ground.



CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

INFOID:000000007358533

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0125 0125	Insufficient engine coolant temperature for closed loop fuel control	<ul style="list-style-type: none"> Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine. Engine coolant temperature is insufficient for closed loop fuel control. 	<ul style="list-style-type: none"> Harness or connectors (High resistance in the circuit) Engine coolant temperature sensor Thermostat

DTC Confirmation Procedure

INFOID:000000007358534

CAUTION:

Be careful not to overheat engine.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Ⓟ WITH CONSULT

1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT.
3. Check that "COOLAN TEMP/S" indication is above 31°C (88°F).
If it is above 31°C (88°F), the test result will be OK.
If it is below 31°C (88°F), go to following step.
4. Start engine and run it for 65 minutes at idle speed.

P0125 ECT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

If "COOLAN TEMP/S" indication increases to more than 31°C (88°F) within 65 minutes, stop engine because the test result will be OK.

5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to [EC-669. "Diagnosis Procedure"](#).

 WITH GST

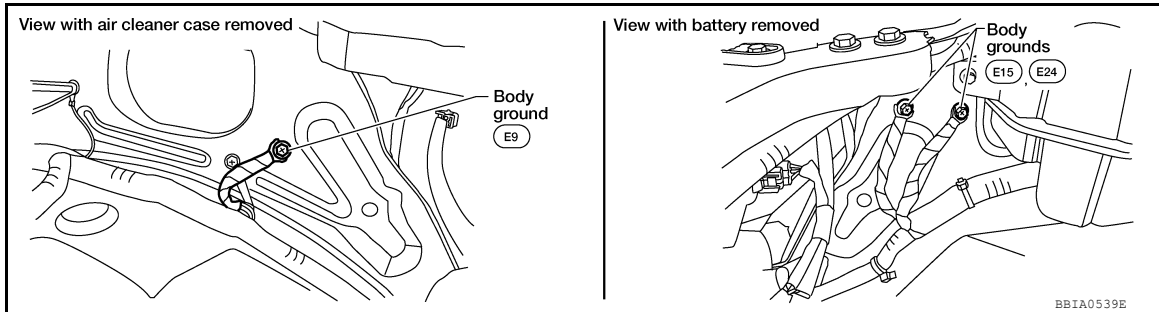
Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358535

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623. "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to [EC-669. "Component Inspection"](#).

OK or NG

- OK >> GO TO 3.
- NG >> Replace engine coolant temperature sensor. Refer to [EM-214](#).

3. CHECK THERMOSTAT OPERATION

When the engine is cold [lower than 70°C (158°F)] condition, grasp lower radiator hose and check that the engine coolant does not flow.

OK or NG

- OK >> GO TO 4.
- NG >> Repair or replace thermostat. Refer to [CO-54. "Removal and Installation"](#).

4. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000007358536

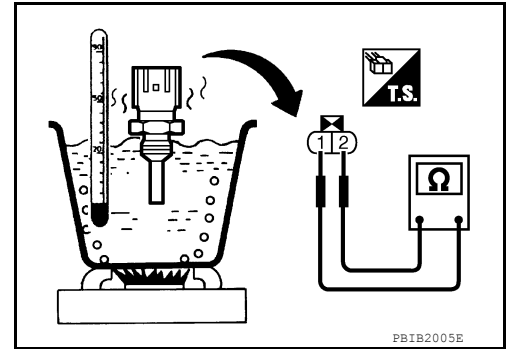
ENGINE COOLANT TEMPERATURE SENSOR

P0125 ECT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

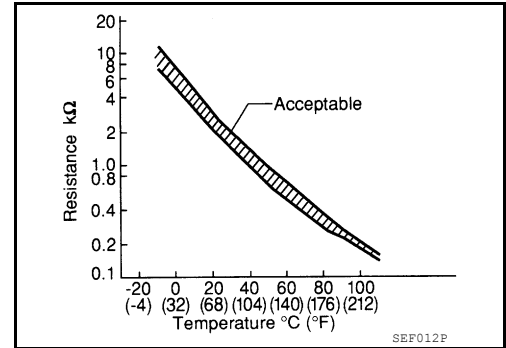
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



PBIB2005E

Engine coolant temperature [°C (°F)]	Resistance (kΩ)
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

2. If NG, replace engine coolant temperature sensor. Refer to [EM-214](#).



SEF012P

P0127 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

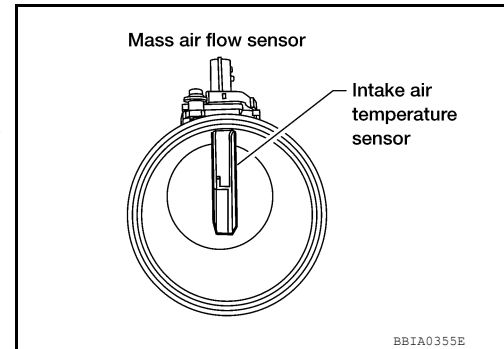
P0127 IAT SENSOR

Component Description

INFOID:000000007358537

The intake air temperature sensor is built-into the mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



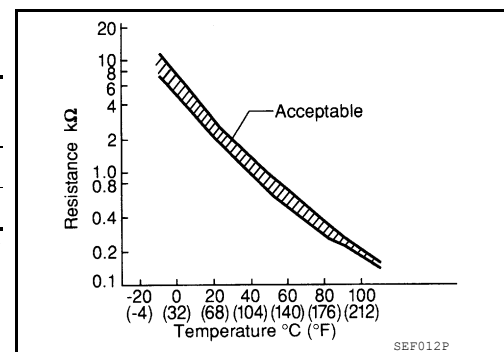
<Reference data>

Intake air temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
25 (77)	3.3	1.800 - 2.200
80 (176)	1.2	0.283 - 0.359

*: This data is reference value and is measured between ECM terminal 34 (Intake air temperature sensor) and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



On Board Diagnosis Logic

INFOID:000000007358538

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0127 0127	Intake air temperature too high	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.	<ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted) Intake air temperature sensor

DTC Confirmation Procedure

INFOID:000000007358539

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Ⓟ WITH CONSULT

- Wait until engine coolant temperature is less than 96°C (205°F)
 - Turn ignition switch ON.
 - Select "DATA MONITOR" mode with CONSULT.
 - Check the engine coolant temperature.

P0127 IAT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- d. If the engine coolant temperature is not less than 96°C (205°F), turn ignition switch OFF and cool down engine.
 - Perform the following steps before engine coolant temperature is above 96°C (205°F).
2. Turn ignition switch ON.
3. Select "DATA MONITOR" mode with CONSULT.
4. Start engine.
5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.
6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to [EC-672, "Diagnosis Procedure"](#).

WITH GST

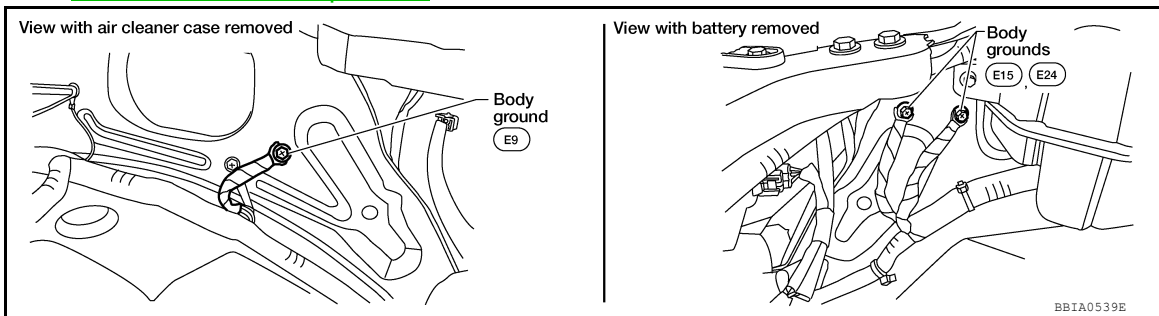
Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358540

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623, "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to [EC-672, "Component Inspection"](#).

OK or NG

- OK >> GO TO 3.
- NG >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-164](#).

3. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358541

INTAKE AIR TEMPERATURE SENSOR

P0127 IAT SENSOR

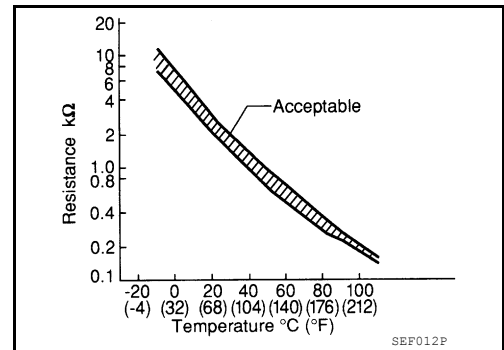
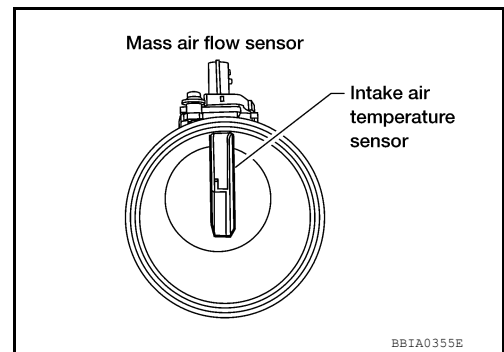
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Check resistance between intake air temperature sensor terminals 5 and 6 under the following conditions.

Intake air temperature [°C (°F)]	Resistance (kΩ)
25 (77)	1.800 - 2.200

2. If NG, replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-164](#).



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P0128 THERMOSTAT FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0128 THERMOSTAT FUNCTION

On Board Diagnosis Logic

INFOID:000000007358542

NOTE:

If DTC P0128 is displayed with DTC P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307 or P0308, first perform the trouble diagnosis for DTC P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308. Refer to [EC-735, "DTC Confirmation Procedure"](#).

Engine coolant temperature has not risen enough to open the thermostat even though the engine has run long enough.

This is due to a leakage in the seal or the thermostat being stuck open.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0128 0128	Thermostat function	The engine coolant temperature does not reach to specified temperature even though the engine has run long enough.	<ul style="list-style-type: none">• Thermostat• Leakage from sealing portion of thermostat• Engine coolant temperature sensor

DTC Confirmation Procedure

INFOID:000000007358543

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Ⓟ WITH CONSULT

TESTING CONDITION:

- For best results, perform at ambient temperature of -10°C (14°F) or higher.
- For best results, perform at engine coolant temperature of -10°C (14°F) to 56°C (133°F).
- Before performing the following procedure, do not add fuel.

1. Turn A/C switch OFF.
2. Turn blower fan switch OFF.
3. Turn ignition switch ON.
4. Select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
5. Check the indication of "COOLAN TEMP/S".
If it is below 56°C (133°F), go to next step.
If it is above 56°C (133°F), cool down the engine to less than 56°C (133°F). Then go to next steps.
6. Start engine and drive vehicle for 10 consecutive minutes under the following conditions.

VHCL SPEED SE	More than 56 km/h (35 MP)
---------------	---------------------------

If "COOLAN TEMP/S" increases to more than 75°C (167°F) within 10 minutes, turn ignition switch OFF because the test result will be OK.

7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to [EC-674, "Diagnosis Procedure"](#).

Ⓟ WITH GST

Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358544

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to [EC-675, "Component Inspection"](#).

OK or NG

- OK >> GO TO 2.
- NG >> Replace engine coolant temperature sensor. Refer to [EM-214](#).

P0128 THERMOSTAT FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

2. CHECK THERMOSTAT

Refer to [CO-54](#), "Removal and Installation".

OK or NG

OK >> **INSPECTION END**

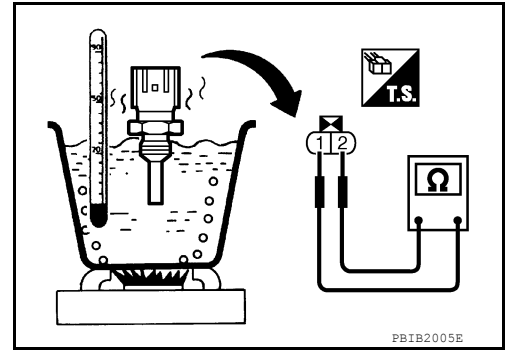
NG >> Replace thermostat. Refer to [CO-54](#).

Component Inspection

INFOID:000000007358545

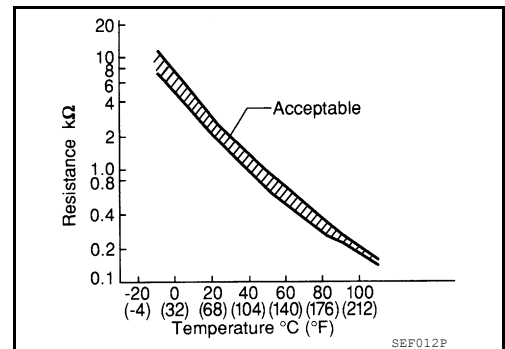
ENGINE COOLANT TEMPERATURE SENSOR

1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



Engine coolant temperature [°C (°F)]	Resistance (kΩ)
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

2. If NG, replace engine coolant temperature sensor. Refer to [EM-214](#).

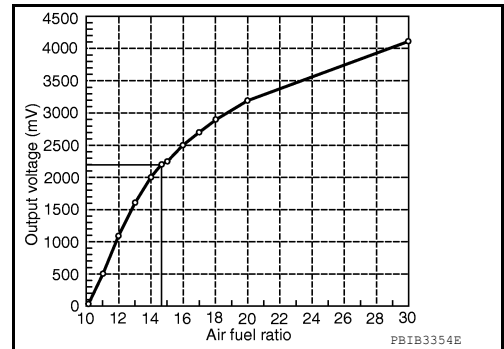
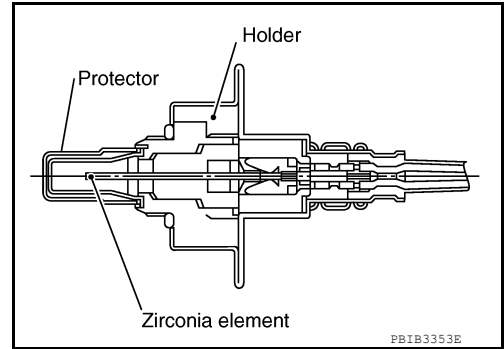


P0130, P0150 A/F SENSOR 1

Component Description

INFOID:000000007358546

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element. The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich. Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of approximately 800°C (1,472°F).



On Board Diagnosis Logic

INFOID:000000007358547

To judge malfunctions, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal fluctuates according to fuel feedback control.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0130 0130 (Bank 1)	Air fuel ratio (A/F) sensor 1 circuit	A)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 2.2V.	<ul style="list-style-type: none"> • Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • Air fuel ratio (A/F) sensor 1
P0150 0150 (Bank 2)		B)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2V.	

DTC Confirmation Procedure

INFOID:000000007358548

Perform PROCEDURE FOR MALFUNCTION A first.

If the DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to normal operating temperature.
2. Let engine idle for 2 minutes.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to [EC-677. "Diagnosis Procedure"](#).

PROCEDURE FOR MALFUNCTION B

P0130, P0150 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

CAUTION:

Always drive vehicle at a safe speed.

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.
If the indication is constantly approximately 2.2 V and does not fluctuate, go to [EC-677. "Diagnosis Procedure"](#).
If the indication fluctuates approximately 2.2 V, go to next step.
4. Select "A/F SEN1 (B1) P1276" (for DTC P0130) or "A/F SEN1 (B2) P1286" (for DTC P0150) of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT.
5. Touch "START".
6. When the following conditions are met, "TESTING" will be displayed on the CONSULT screen.

ENG SPEED	850 - 3,200 rpm
VHCL SPEED SE	More than 64 km/h (40 MPH)
B/FUEL SCHDL	1.0 - 8.0 msec
Selector lever	D position

If "TESTING" is not displayed after 20 seconds, retry from step 2.

7. Release accelerator pedal fully.
NOTE:
Never apply brake when releasing the accelerator pedal.
8. Check that "TESTING" changes to "COMPLETED".
If "TESTING" changed to "OUT OF CONDITION", retry from step 6.
9. Check that "OK" is displayed after touching "SELF-DIAG RESULT".
If "NG" is displayed, go to [EC-677. "Diagnosis Procedure"](#).

Overall Function Check

INFOID:000000007358549

PROCEDURE FOR MALFUNCTION B

Use this procedure to check the overall function of the A/F sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

With GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in the suitable gear position.
3. Set selector lever to the D position, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (31 MPH).
NOTE:
Never apply brake when releasing the accelerator pedal.
4. Repeat steps 2 and 3 for 5 times.
5. Stop the vehicle and turn ignition switch OFF.
6. Turn ignition switch ON.
7. Turn ignition switch OFF and wait at least 10 seconds.
8. Restart engine.
9. Repeat steps 2 and 3 for 5 times.
10. Stop the vehicle and connect GST to the vehicle.
11. Check that no 1st trip DTC is displayed.
If the 1st trip DTC is displayed, go to [EC-677. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358550

1. CHECK GROUND CONNECTIONS

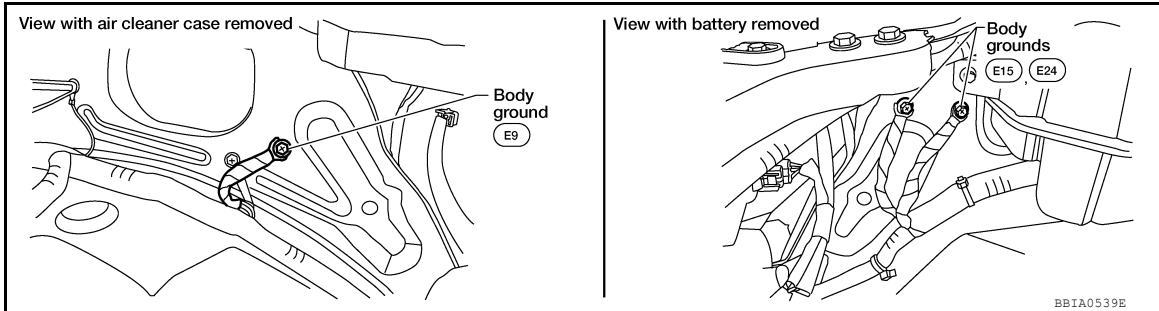
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P0130, P0150 A/F SENSOR 1

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Refer to [EC-623, "Ground Inspection"](#).



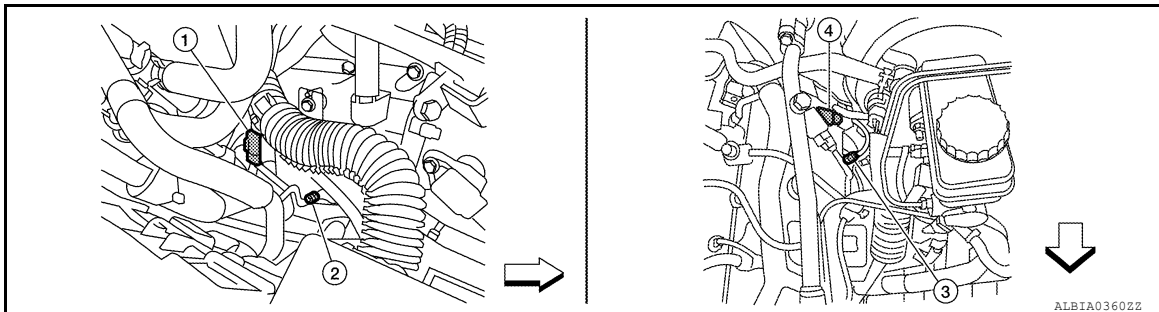
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2. CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.



1. A/F sensor 1 (bank 2) harness connector

2. A/F sensor 1 (bank 2)

3. A/F sensor 1 (bank 1)

4. A/F sensor 1 (bank 1) harness connector

↶ : Vehicle front

2. Turn ignition switch ON.

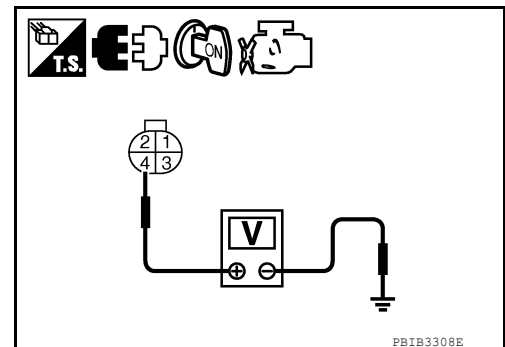
3. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- 15 A fuse (No. 54)
- Harness for open or short between A/F sensor 1 and IPDM E/R

>> Repair or replace harness or connectors.

4. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.

3. Check harness continuity between A/F sensor 1 terminals and ECM terminals as per the following.

P0130, P0150 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

4. Check harness continuity between the following terminals and ground.
Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Perform [GI-37. "Intermittent Incident"](#).

OK or NG

OK >> GO TO 6.

NG >> Repair or replace malfunctioning part.

6. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to [EM-169](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [Commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (Commercial service tool).

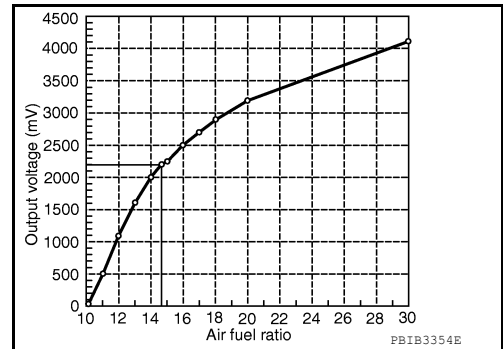
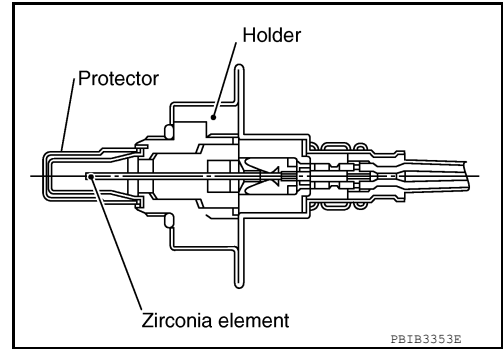
>> INSPECTION END

P0131, P0151 A/F SENSOR 1

Component Description

INFOID:000000007358551

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element. The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich. Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of approximately 800°C (1,472°F).



On Board Diagnosis Logic

INFOID:000000007358552

To judge malfunctions, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal is not inordinately low.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0131 0131 (Bank 1)	Air fuel ratio (A/F) sensor 1 circuit low voltage	• The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 0V.	<ul style="list-style-type: none"> • Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • Air fuel ratio (A/F) sensor 1
P0151 0151 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358553

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

Ⓜ WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.
If the indication is constantly approximately 0 V, go to [EC-681, "Diagnosis Procedure"](#).
If the indication is not constantly approximately 0 V, go to next step.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.

P0131, P0151 A/F SENSOR 1

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

6. Turn ignition switch OFF and wait at least 10 seconds.
7. Restart engine.
8. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
9. Maintain the following conditions for approximately 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 MPH)
B/FUEL SCHDL	1.5 - 9.0 msec
Selector lever	Suitable position

NOTE:

- Keep the accelerator pedal as steady as possible during cruising.
- If this procedure is not completed within 1 minute after restarting engine at step 7, return to step 4.

10. Check 1st trip DTC.
11. If 1st trip DTC is displayed, go to [EC-681. "Diagnosis Procedure"](#).

Ⓢ WITH GST

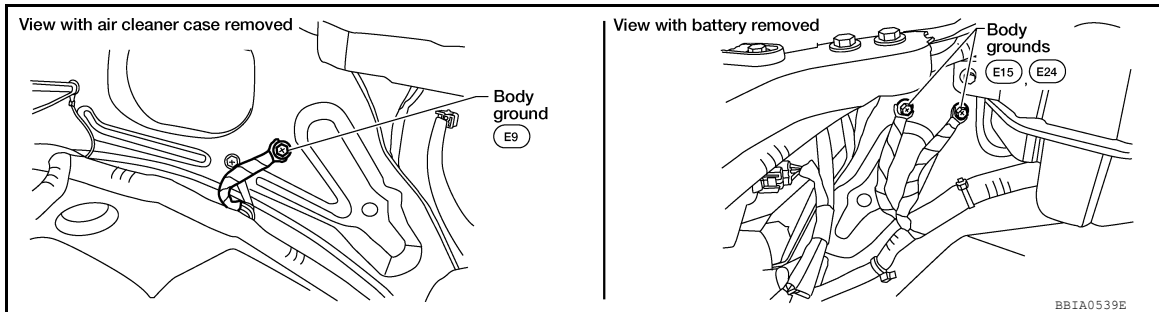
Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358554

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623. "Ground Inspection"](#).

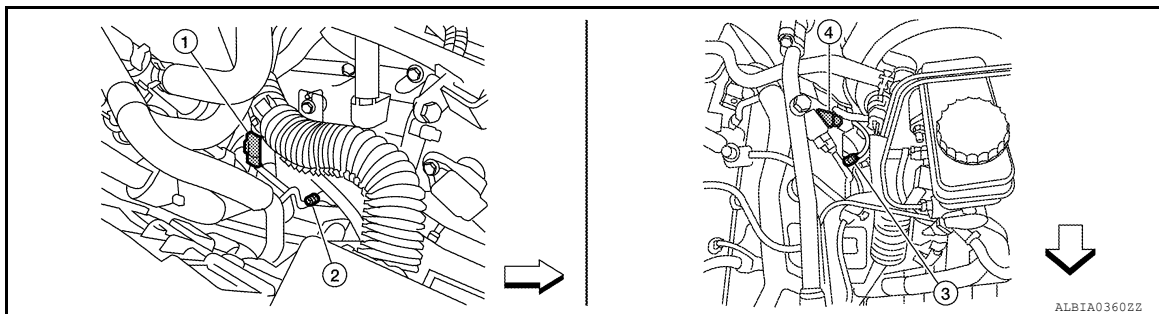


OK or NG

- OK >> GO TO 2.
NG >> Repair or replace ground connections.

2. CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.



1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 2)
3. A/F sensor 1 (bank 1)
4. A/F sensor 1 (bank 1) harness connector

↶ : Vehicle front

2. Turn ignition switch ON.

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P0131, P0151 A/F SENSOR 1

[VK56DE]

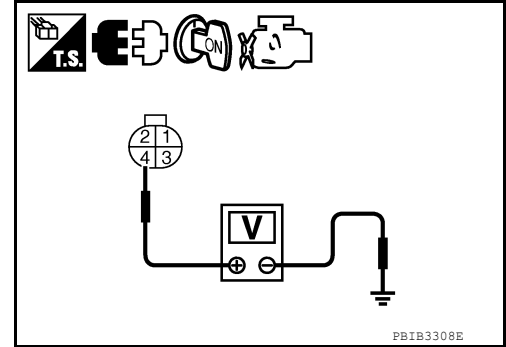
< DTC/CIRCUIT DIAGNOSIS >

- Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- 15 A fuse (No. 54)
- Harness for open or short between A/F sensor 1 and IPDM E/R

>> Repair or replace harness or connectors.

4. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between A/F sensor 1 terminals and ECM terminals as per the following. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

- Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

- Also check harness for short to power.

OK or NG

- OK >> GO TO 5.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Perform [GI-37. "Intermittent Incident"](#).

OK or NG

- OK >> GO TO 6.
- NG >> Repair or replace malfunctioning part.

P0131, P0151 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

6. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to [EM-169](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [Commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (Commercial service tool).

>> INSPECTION END

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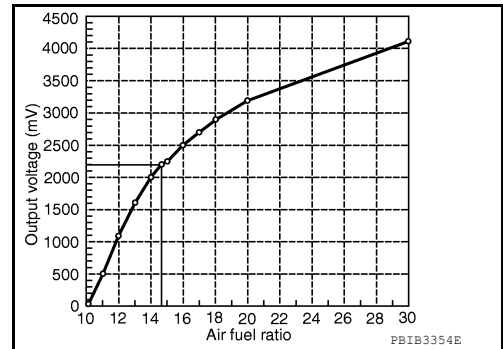
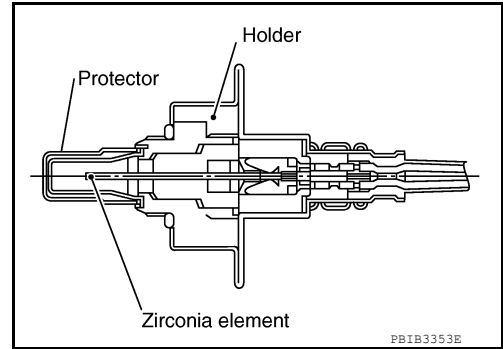
P

P0132, P0152 A/F SENSOR 1

Component Description

INFOID:000000007358555

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element. The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich. Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of approximately 800°C (1,472°F).



On Board Diagnosis Logic

INFOID:000000007358556

To judge malfunctions, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal is not inordinately high.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0132 0132 (Bank 1)	Air fuel ratio (A/F) sensor 1 circuit high voltage	• The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 5 V.	<ul style="list-style-type: none"> • Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • Air fuel ratio (A/F) sensor 1
P0152 0152 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358557

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

Ⓜ WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.
If the indication is constantly approximately 5 V, go to [EC-685. "Diagnosis Procedure"](#).
If the indication is not constantly approximately 5 V, go to next step.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.

P0132, P0152 A/F SENSOR 1

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

6. Turn ignition switch OFF and wait at least 10 seconds.
7. Restart engine.
8. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
9. Maintain the following conditions for approximately 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 MPH)
B/FUEL SCHDL	1.5 - 9.0 msec
Gear position	Suitable position

NOTE:

- Keep the accelerator pedal as steady as possible during cruising.
- If this procedure is not completed within 1 minute after restarting engine at step 7, return to step 4.

10. Check 1st trip DTC.
11. If 1st trip DTC is displayed, go to [EC-685. "Diagnosis Procedure"](#).

 WITH GST

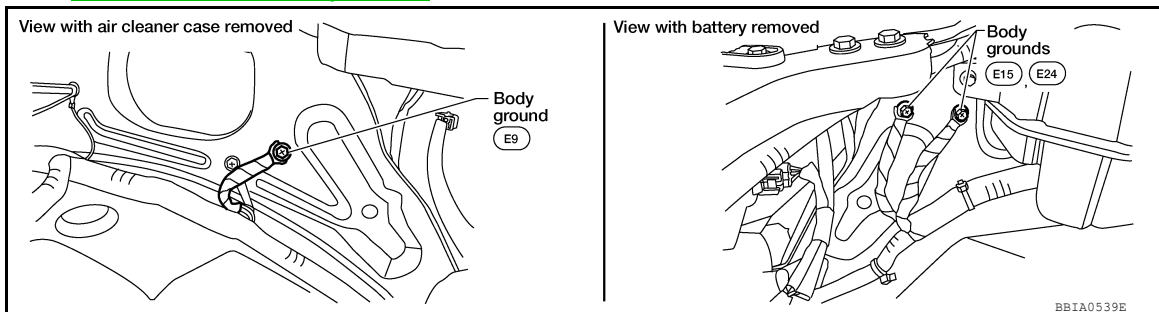
Follow the procedure "WITH CONSULT" above.

Diagnosis Procedure

INFOID:000000007358558

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623. "Ground Inspection"](#).

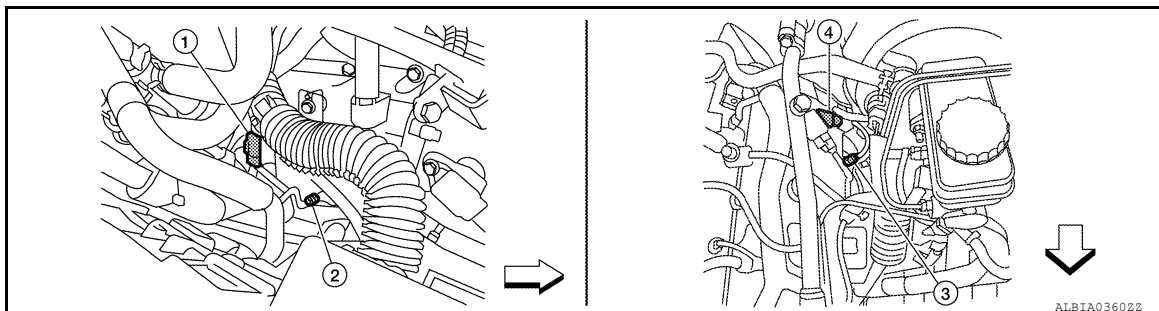


OK or NG

- OK >> GO TO 2.
 NG >> Repair or replace ground connections.

2. CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.



1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 2)
3. A/F sensor 1 (bank 1)
4. A/F sensor 1 (bank 1) harness connector

 : Vehicle front

2. Turn ignition switch ON.

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P0132, P0152 A/F SENSOR 1

[VK56DE]

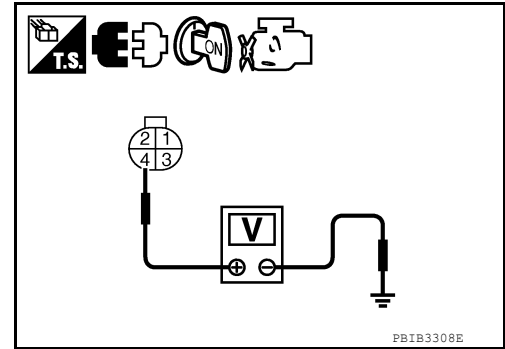
< DTC/CIRCUIT DIAGNOSIS >

- Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- 15 A fuse (No. 54)
- Harness for open or short between A/F sensor 1 and IPDM E/R

>> Repair or replace harness or connectors.

4. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between A/F sensor 1 terminals and ECM terminals as per the following. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

- Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

- Also check harness for short to power.

OK or NG

- OK >> GO TO 5.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Perform [GI-37. "Intermittent Incident"](#).

OK or NG

- OK >> GO TO 6.
- NG >> Repair or replace malfunctioning part.

P0132, P0152 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

6. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to [EM-169](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [Commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (Commercial service tool).

>> INSPECTION END

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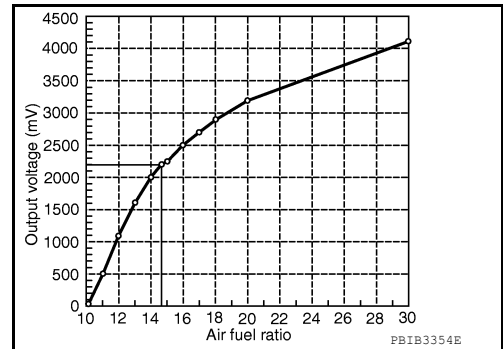
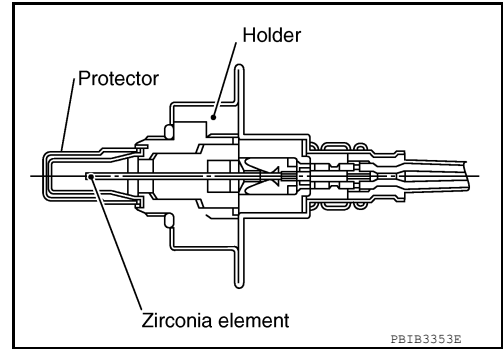
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P0133, P0153 A/F SENSOR 1

Component Description

INFOID:000000007358559

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element. The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich. Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of approximately 800°C (1,472°F).



On Board Diagnosis Logic

INFOID:000000007358560

To judge malfunctions, this diagnosis measures response time of the A/F signal computed by ECM from the A/F sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and the A/F sensor 1 temperature index. Judgment is based on whether the compensated time (the A/F signal cycling time index) is inordinately long or not.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0133 0133 (Bank 1)	Air fuel ratio (A/F) sensor 1 circuit slow response	<ul style="list-style-type: none"> The response of the A/F signal computed by ECM from A/F sensor 1 signal takes more than the specified time. 	<ul style="list-style-type: none"> Harness or connectors (The A/F sensor 1 circuit is open or shorted.) A/F sensor 1 A/F sensor 1 heater Fuel pressure Fuel injector Intake air leakage Exhaust gas leakage PCV Mass air flow sensor
P0153 0153 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358561

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

Ⓜ WITH CONSULT

1. Start engine and warm it up to normal operating temperature.

P0133, P0153 A/F SENSOR 1

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Select "A/F SEN1(B1) P1278/P1279" (for DTC P0133) or "A/F SEN1(B2) P1288/P1289" (for DTC P0153) of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT.
8. Touch "START".
If "COMPLETED" appears on CONSULT screen, go to step 10.
If "COMPLETED" does not appear on CONSULT screen, go to the following step.
9. After perform the following procedure, "TESTING" will be displayed on the CONSULT screen.
 - a. Increase the engine speed up to between 4,000 and 5,000 rpm and maintain that speed for 10 seconds.
 - b. Fully release accelerator pedal and then let engine idle for approximately 10 seconds.
If "TESTING" is not displayed after 10 seconds, go to [EC-612, "Inspection Procedure"](#).
10. Wait for approximately 20 seconds at idle under the condition that "TESTING" is displayed on the CONSULT screen.
11. Check that "TESTING" changes to "COMPLETED".
If "TESTING" changed to "OUT OF CONDITION", go to [EC-612, "Inspection Procedure"](#).
12. Check that "OK" is displayed after touching "SELF-DIAG RESULT".
If "NG" is displayed, go to [EC-689, "Diagnosis Procedure"](#).

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Select Service \$01 with GST.
3. Calculate the total value of "Short-term fuel trim" and "Long-term fuel trim" indications.
Check that the total percentage should be within $\pm 15\%$.
If OK, go to the following step.
If NG, check the following.
 - Intake air leakage
 - Exhaust gas leakage
 - Incorrect fuel pressure
 - Lack of fuel
 - Fuel injector
 - Incorrect PCV hose connection
 - PCV valve
 - Mass air flow sensor
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
8. Let engine idle for 1 minute.
9. Increase the engine speed up to between 4,000 and 5,000 rpm and maintain that speed for 10 seconds.
10. Fully release accelerator pedal and then let engine idle for approximately 1 minute.
11. Select Service \$07 with GST.
If the 1st trip DTC is displayed, go to [EC-689, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358562

1. CHECK GROUND CONNECTIONS

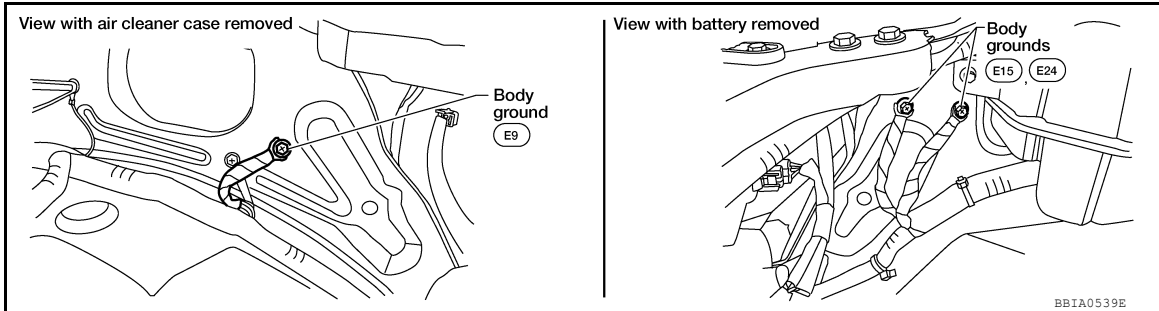
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P0133, P0153 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Refer to [EC-623, "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

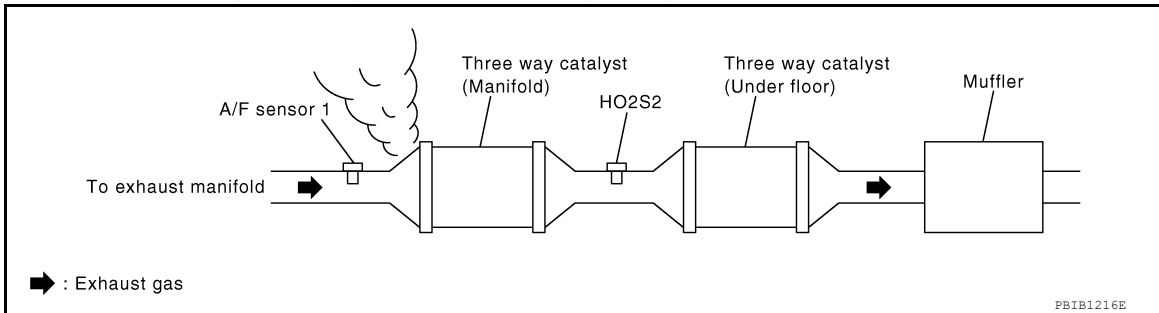
2. RETIGHTEN AIR FUEL RATIO SENSOR 1

Loosen and retighten air fuel ratio (A/F) sensor 1.
Refer to [EM-169, "Removal and Installation"](#).

>> GO TO 3.

3. CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before three way catalyst (manifold).



OK or NG

- OK >> GO TO 4.
- NG >> Repair or replace malfunctioning part.

4. CHECK FOR INTAKE AIR LEAKAGE

Listen for an intake air leakage after the mass air flow sensor.

OK or NG

- OK >> GO TO 5.
- NG >> Repair or replace malfunctioning part.

5. CLEAR THE SELF-LEARNING DATA

ⓑ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR" or "START".
4. Run engine for at least 10 minutes at idle speed.
Is the 1st trip DTC P0171, P172, P0174 or P0175 detected? Is it difficult to start engine?

ⓧ Without CONSULT

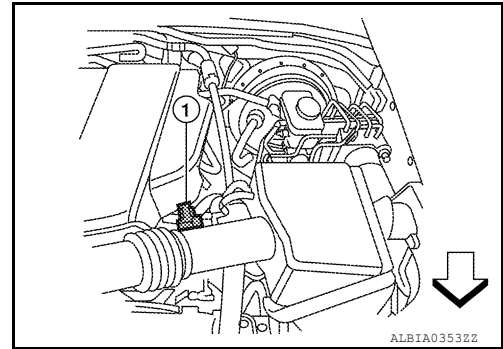
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.

P0133, P0153 A/F SENSOR 1

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Disconnect mass air flow sensor (1) harness connector.
- ⇐: Vehicle front
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Check that DTC P0102 is displayed.
7. Erase the DTC memory.
8. Check that DTC P0000 is displayed.
9. Run engine for at least 10 minutes at idle speed.
**Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
Is it difficult to start engine?**



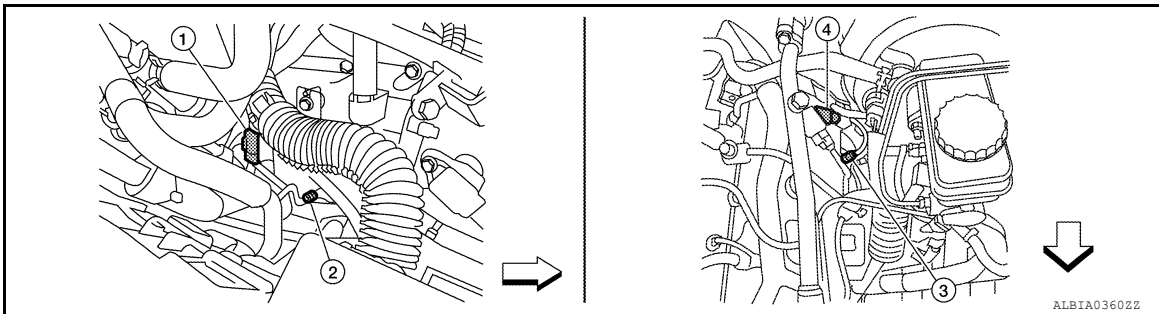
Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to [EC-716. "Diagnosis Procedure"](#) or [EC-720. "Diagnosis Procedure"](#).

No >> GO TO 6.

6. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.



1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 2)
3. A/F sensor 1 (bank 1)
4. A/F sensor 1 (bank 1) harness connector

⇐ : Vehicle front

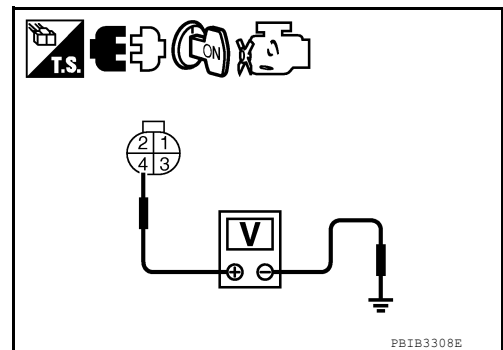
3. Turn ignition switch ON.
4. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 8.

NG >> GO TO 7.



7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- 15 A fuse (No. 54)
- Harness for open or short between A/F sensor 1 and IPDM E/R

>> Repair or replace harness or connectors.

8. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

P0133, P0153 A/F SENSOR 1

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect ECM harness connector.
3. Check harness continuity between A/F sensor 1 terminals and ECM terminals as per the following. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

4. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 9.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK A/F SENSOR 1 HEATER

Refer to [EC-635, "Component Inspection"](#).

OK or NG

OK >> GO TO 10.

NG >> GO TO 13.

10. CHECK MASS AIR FLOW SENSOR

Refer to [EC-649, "Component Inspection"](#).

OK or NG

OK >> GO TO 11.

NG >> Replace mass air flow sensor. Refer to [EM-164](#).

11. CHECK PCV VALVE

Refer to [EC-942, "Component Inspection"](#).

OK or NG

OK >> GO TO 12.

NG >> Repair or replace PCV valve. Refer to [EM-178](#).

12. CHECK INTERMITTENT INCIDENT

Perform [GI-37, "Intermittent Incident"](#).

OK or NG

OK >> GO TO 13.

NG >> Repair or replace malfunctioning part.

13. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to [EM-169](#).

CAUTION:

P0133, P0153 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [Commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (Commercial service tool).

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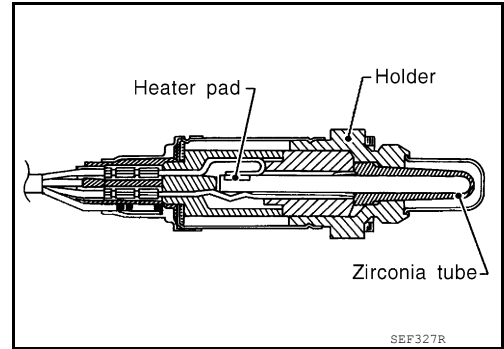
P

P0137, P0157 HO2S2

Component Description

INFOID:000000007358563

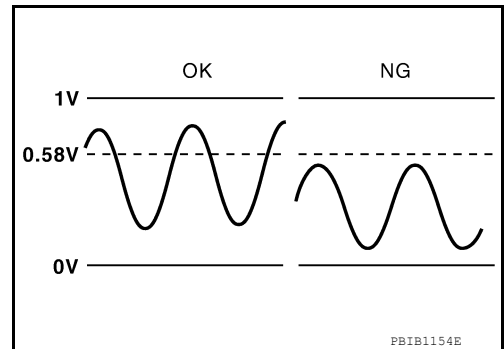
The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank. Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2. This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions. Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



On Board Diagnosis Logic

INFOID:000000007358564

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0137 0137 (Bank 1)	Heated oxygen sensor 2 circuit low voltage	The maximum voltage from the sensor does not reach the specified voltage.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector • Intake air leakage
P0157 0157 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358565

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Ⓜ WITH CONSULT

TESTING CONDITION:

For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.

< DTC/CIRCUIT DIAGNOSIS >

8. Check that "COOLAN TEMP/S" indicates more than 70°C (158°F).
If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
9. Open engine hood.
10. Select "HO2S2 (B1) P1147" (for DTC P0137) or "HO2S2 (B2) P1167" (for DTC P0157) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
11. Follow the instructions displayed.
NOTE:
It will take at most 10 minutes until "COMPLETED" is displayed.
12. Check that "OK" is displayed after touching "SELF-DIAG RESULTS".
If "NG" is displayed, go to [EC-695, "Diagnosis Procedure"](#).
If "CAN NOT BE DIAGNOSED" is displayed, perform the following procedure.
 - a. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
 - b. Return to step 1.

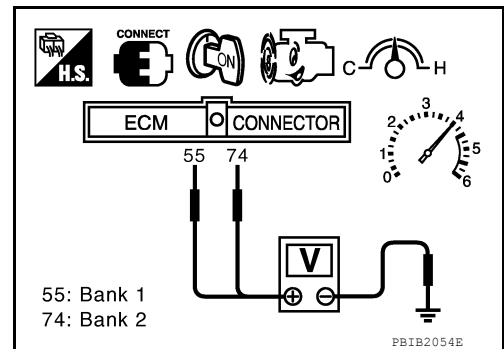
Overall Function Check

INFOID:000000007358566

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

 WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Set voltmeter probes between ECM terminal 55 [HO2S2 (B1) signal] and ground, or 74 [HO2S2 (B2) signal] and ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)
The voltage should be above 0.58V at least once during this procedure.
If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in the D position.
The voltage should be above 0.58V at least once during this procedure.
8. If NG, go to [EC-695, "Diagnosis Procedure"](#).

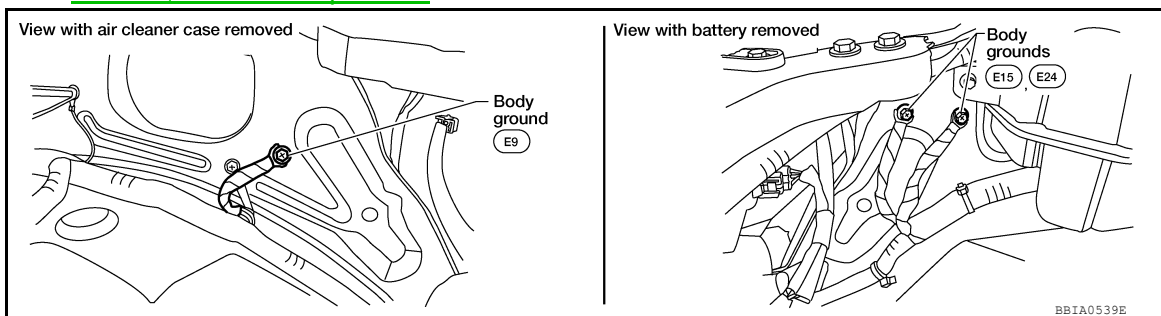


Diagnosis Procedure

INFOID:000000007358567

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623, "Ground Inspection"](#).



OK or NG

< DTC/CIRCUIT DIAGNOSIS >

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

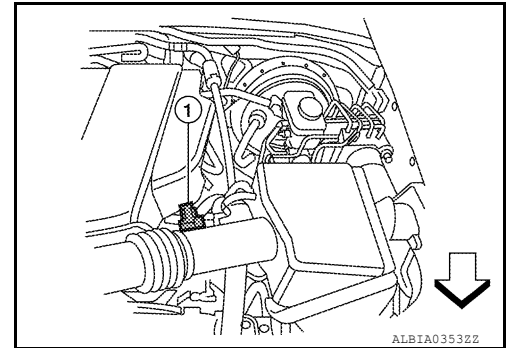
2. CLEAR THE SELF-LEARNING DATA

With CONSULT

1. Start engine and warm it up to normal operating temperature.
 2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
 3. Clear the self-learning control coefficient by touching "CLEAR".
 4. Run engine for at least 10 minutes at idle speed.
- Is the 1st trip DTC P0171 or P0174 detected?
Is it difficult to start engine?**

Without CONSULT

1. Start engine and warm it up to normal operating temperature.
 2. Turn ignition switch OFF.
 3. Disconnect mass air flow sensor (1) harness connector.
 - ⇐: Vehicle front
 4. Restart engine and let it idle for at least 5 seconds.
 5. Stop engine and reconnect mass air flow sensor harness connector.
 6. Check that DTC P0102 is displayed.
 7. Erase the DTC memory.
 8. Check that DTC P0000 is displayed.
 9. Run engine for at least 10 minutes at idle speed.
- Is the 1st trip DTC P0171 or P0174 detected?
Is it difficult to start engine?**

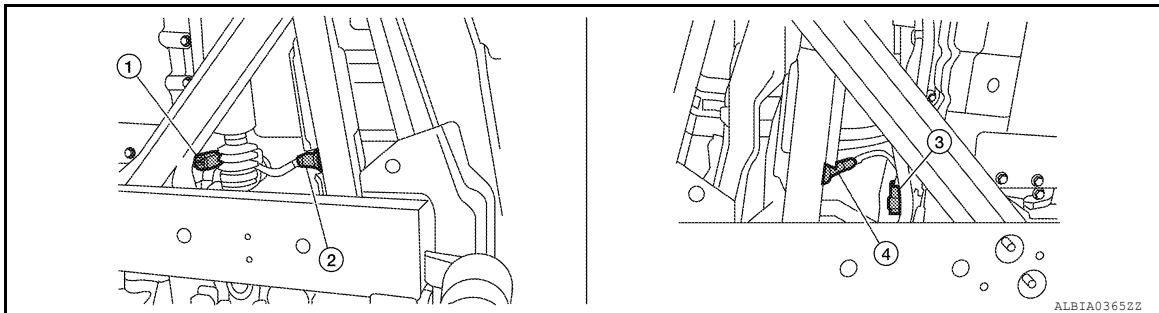


Yes or No

- Yes >> Perform trouble diagnosis for DTC P0171 or P0174. Refer to [EC-716. "Diagnosis Procedure"](#).
- No >> GO TO 3.

3. CHECK HEATED OXYGEN SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.



- | | | |
|--|------------------------------------|--|
| 1. Heated oxygen sensor 2 (bank 1) harness connector | 2. Heated oxygen sensor 2 (bank 1) | 3. Heated oxygen sensor 2 (bank 2) harness connector |
| 4. Heated oxygen sensor 2 (bank 2) | | |

3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to power.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

< DTC/CIRCUIT DIAGNOSIS >

1. Check harness continuity between ECM terminal and HO2S2 terminal as per the following. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0137	55	1	1
P0157	74	1	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0137	55	1	1
P0157	74	1	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to [EC-697, "Component Inspection"](#).

OK or NG

OK >> GO TO 6.

NG >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-6](#).

6. CHECK INTERMITTENT INCIDENT


Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000007358568

HEATED OXYGEN SENSOR 2

 With CONSULT

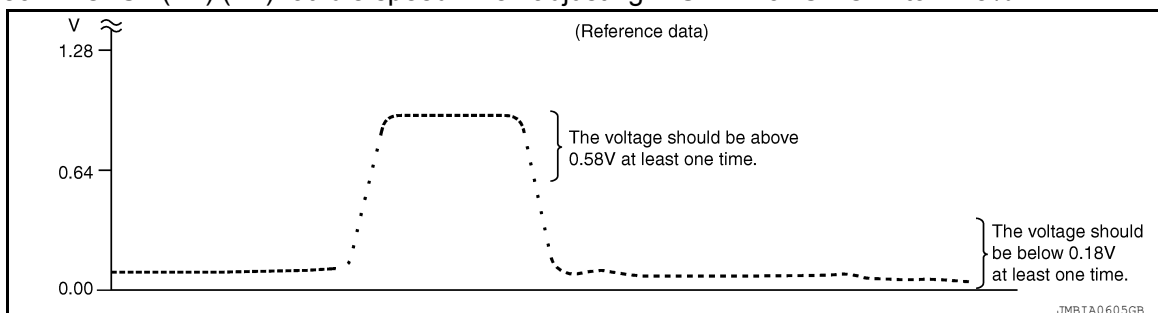
1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.

P0137, P0157 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.



"HO2S2 (B1)/(B2)" should be above 0.58 V at least once when the "FUEL INJECTION" is + 25%.

"HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is - 25%.

CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [Commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (Commercial service tool).

⊗ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Set voltmeter probes between ECM terminal 55 [HO2S2 (B1) signal] and ground, or 74 [HO2S2 (B2) signal] and ground.

6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.

(Depress and release accelerator pedal as soon as possible.)

The voltage should be above 0.58 V at least once during this procedure.

The voltage should be below 0.18 V at least once during this procedure.

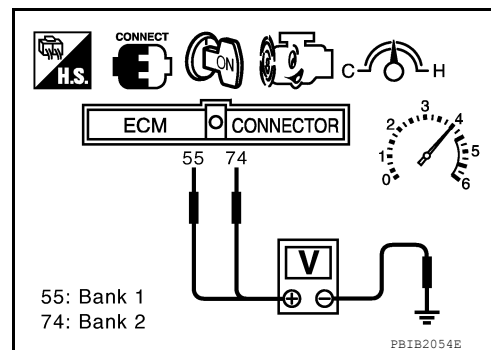
If the voltage can be confirmed at step 6, step 7 is not necessary.

7. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in the D position.

The voltage should be above 0.58 V at least once during this procedure.

The voltage should be below 0.18 V at least once during this procedure.

8. If NG, replace heated oxygen sensor 2. Refer to [EX-6](#).



CAUTION:

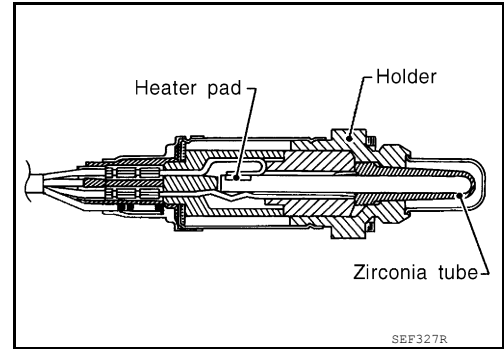
- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [Commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (Commercial service tool).

P0138, P0158 HO2S2

Component Description

INFOID:000000007358569

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank. Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2. This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions. Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



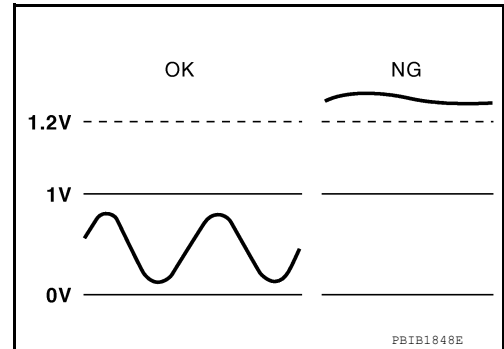
On Board Diagnosis Logic

INFOID:000000007358570

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time.

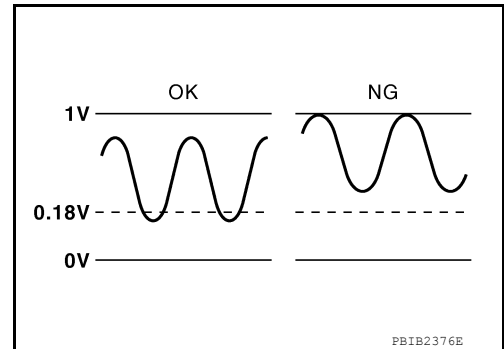
MALFUNCTION A

To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during various driving conditions such as fuel cut.



MALFUNCTION B

To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138 0138 (Bank 1)	Heated oxygen sensor 2 circuit high voltage	A) An excessively high voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2
P0158 0158 (Bank 2)		B) The minimum voltage from the sensor is not reached to the specified voltage.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector

DTC Confirmation Procedure

INFOID:000000007358571

Perform PROCEDURE FOR MALFUNCTION A first.

< DTC/CIRCUIT DIAGNOSIS >

If 1st trip DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

PROCEDURE FOR MALFUNCTION A

 With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 2 minutes.
8. Check 1st trip DTC.
9. If 1st trip DTC is detected, go to [EC-701, "Diagnosis Procedure"](#).

 With GST

Follow the procedure "With CONSULT" above.

PROCEDURE FOR MALFUNCTION B

 With CONSULT
TESTING CONDITION:

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Check that "COOLAN TEMP/S" indicates more than 70°C (158°F).
If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
9. Open engine hood.
10. Select "HO2S2 (B1) P1146" (for DTC P0138) or "HO2S2 (B2) P1166" (for DTC P0158) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
11. Follow the instructions displayed.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Check that "OK" is displayed after touching "SELF-DIAG RESULTS".
If "NG" is displayed, go to [EC-701, "Diagnosis Procedure"](#).
If "CAN NOT BE DIAGNOSED" is displayed, perform the following procedure.
 - a. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
 - b. Return to step 1.

Overall Function Check

INFOID:000000007358572

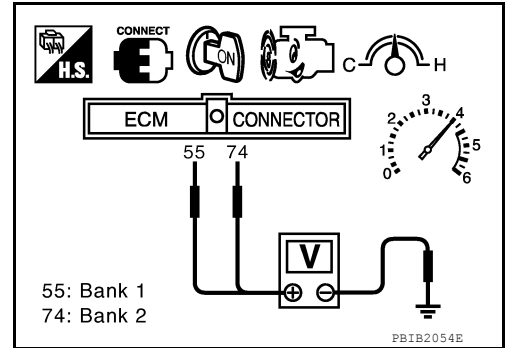
PROCEDURE FOR MALFUNCTION B

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

 With GST

< DTC/CIRCUIT DIAGNOSIS >

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Set voltmeter probes between ECM terminal 55 [HO2S2 (B2) signal] and ground, or 74 [HO2S2 (B1) signal] and ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)
The voltage should be below 0.18 V at least once during this procedure.
If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in the D position.
The voltage should be below 0.18 V at least once during this procedure.
8. If NG, go to [EC-701, "Diagnosis Procedure"](#).



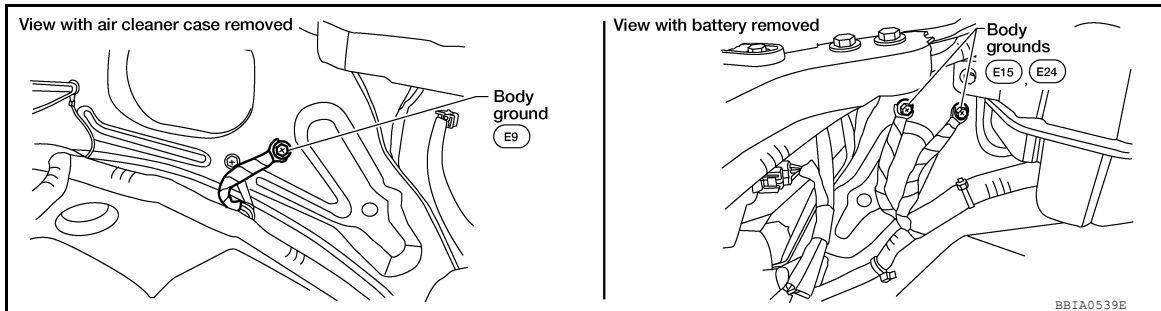
Diagnosis Procedure

INFOID:000000007358573

PROCEDURE FOR MALFUNCTION A

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623, "Ground Inspection"](#).

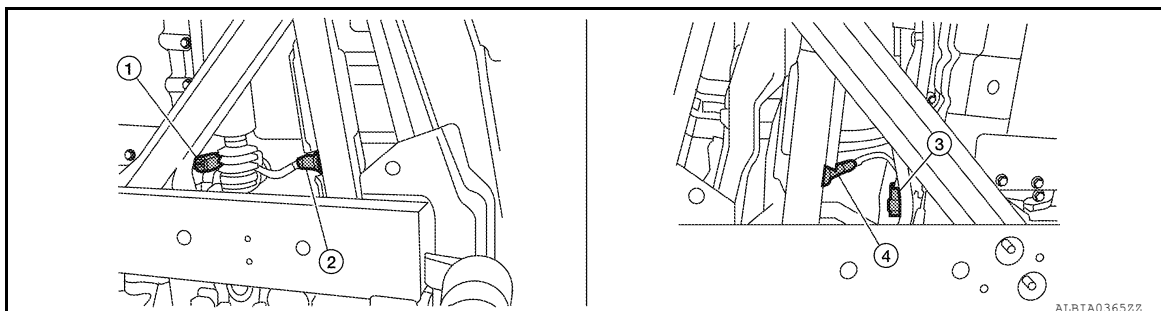


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK HEATED OXYGEN SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.



1. Heated oxygen sensor 2 (bank 1) harness connector
 2. Heated oxygen sensor 2 (bank 1)
 3. Heated oxygen sensor 2 (bank 2) harness connector
 4. Heated oxygen sensor 2 (bank 2)
2. Disconnect ECM harness connector.
 3. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as per the following. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	55	1	1
P0158	74	1	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	55	1	1
P0158	74	1	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S2 CONNECTOR FOR WATER

Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.

NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to [EC-705, "Component Inspection"](#).

OK or NG

OK >> GO TO 6.

NG >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-6](#).

6. CHECK INTERMITTENT INCIDENT

< DTC/CIRCUIT DIAGNOSIS >

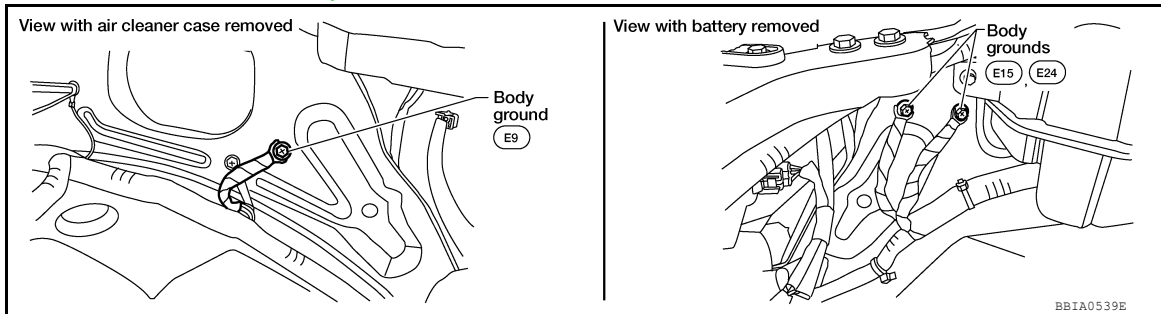
Refer to [GI-37. "Intermittent Incident"](#).

>> INSPECTION END

PROCEDURE FOR MALFUNCTION B

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623. "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

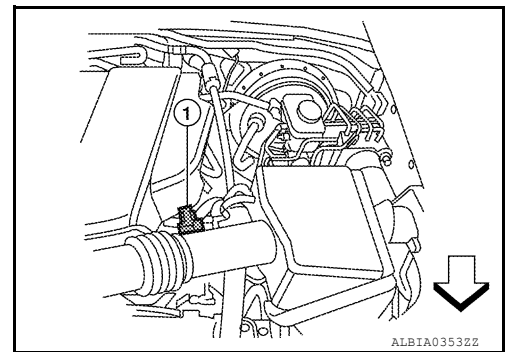
2. CLEAR THE SELF-LEARNING DATA

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.
Is the 1st trip DTC P0172 or P0175 detected?
Is it difficult to start engine?

Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor (1) harness connector.
- : Vehicle front
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Check that DTC P0102 is displayed.
7. Erase the DTC memory.
8. Check that DTC P0000 is displayed.
9. Run engine for at least 10 minutes at idle speed.
Is the 1st trip DTC P0172 or P0175 detected?
Is it difficult to start engine?

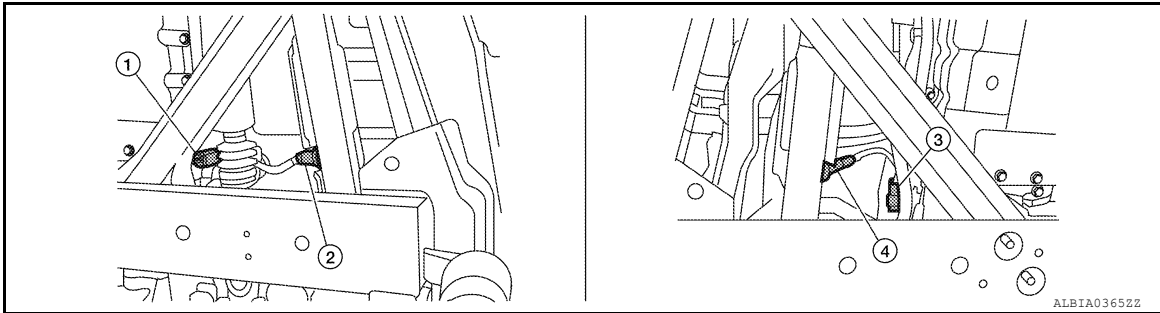


Yes or No

- Yes >> Perform trouble diagnosis for DTC P0172, P0175. Refer to [EC-720. "Diagnosis Procedure"](#).
- No >> GO TO 3.

3. CHECK HEATED OXYGEN SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.



- 1. Heated oxygen sensor 2 (bank 1) harness connector
- 2. Heated oxygen sensor 2 (bank 1)
- 3. Heated oxygen sensor 2 (bank 2) harness connector

- 4. Heated oxygen sensor 2 (bank 2)

- 3. Disconnect ECM harness connector.
- 4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4. Refer to Wiring Diagram.

Continuity should exist.

- 5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Check harness continuity between ECM terminal and HO2S2 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	55	1	1
P0158	74	1	2

Continuity should exist.

- 2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	55	1	1
P0158	74	1	2

Continuity should not exist.

- 3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to [EC-705. "Component Inspection"](#).

OK or NG

OK >> GO TO 6.

< DTC/CIRCUIT DIAGNOSIS >

NG >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-6](#).

6. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

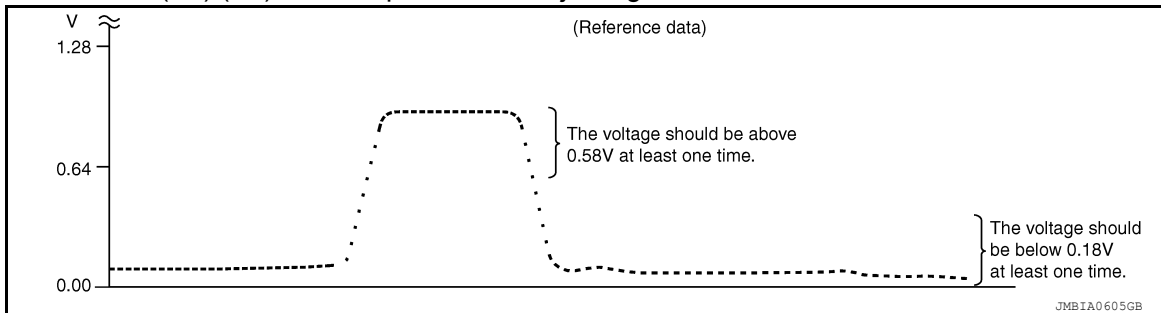
Component Inspection

INFOID:000000007358574

HEATED OXYGEN SENSOR 2

Ⓟ With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.
7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.



"HO2S2 (B1)/(B2)" should be above 0.58 V at least once when the "FUEL INJECTION" is + 25%.
 "HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is - 25%.

CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [Commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (Commercial service tool).

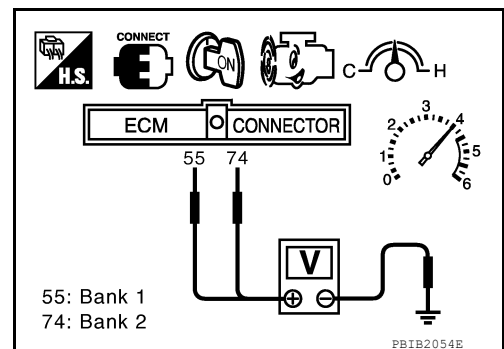
ⓧ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Set voltmeter probes between ECM terminal 55 [HO2S2 (B1) signal] and ground, or 74 [HO2S2 (B2) signal] and ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
 (Depress and release accelerator pedal as soon as possible.)

The voltage should be above 0.58 V at least once during this procedure.

The voltage should be below 0.18 V at least once during this procedure.

If the voltage can be confirmed at step 6, step 7 is not necessary.



P0138, P0158 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

7. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in the D position.
The voltage should be above 0.58 V at least once during this procedure.
The voltage should be below 0.18 V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2. Refer to [EX-6](#).

CAUTION:

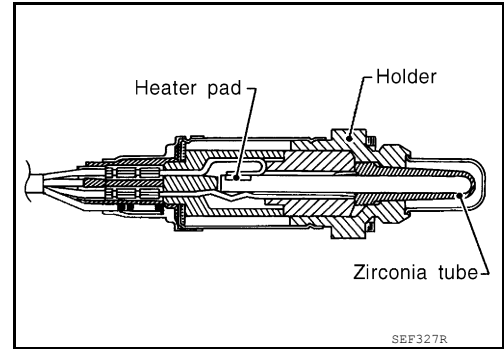
- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [Commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (Commercial service tool).

P0139, P0159 HO2S2

Component Description

INFOID:000000007358575

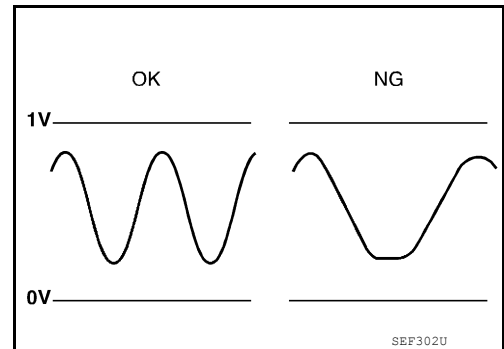
The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank. Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2. This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions. Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



On Board Diagnosis Logic

INFOID:000000007358576

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139 0139 (Bank 1)	Heated oxygen sensor 2 (bank 1) circuit slow response	The switching time between rich and lean of a heated oxygen sensor 2 signal delays more than the specified time computed by ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector • Intake air leakage
P0159 0159 (Bank 2)	Heated oxygen sensor 2 (bank 2) circuit slow response		

DTC Confirmation Procedure

INFOID:000000007358577

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 7.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

>> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

Ⓟ With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
9. Drive the vehicle in a proper gear at 60 km/h (38MPH) and maintain the speed.

CAUTION:

Always drive vehicle at a safe speed.

10. Release the accelerator pedal fully at least 5 seconds.

CAUTION:

- **Enable the engine brake.**
- **Always drive carefully.**
- **Never apply brake when releasing the accelerator pedal.**

11. Repeat step 9 and 10 at least 8 times.
12. Check the following item of "DATA MONITOR".

DTC	Data monitor item	Status
P0139	HO2 S2 DIAG1 (B1)	CMPLT
	HO2 S2 DIAG2 (B1)	
P0159	HO2 S2 DIAG1 (B2)	
	HO2 S2 DIAG2 (B2)	

Is "CMPLT" displayed on CONSULT screen?

YES >> GO TO 6.

NO-1: "CMPLT" is not displayed on DIAG 1>>Perform DTC confirmation procedure again.

NO-2: "CMPLT" is not displayed on DIAG 2>>GO TO 4.

4. PERFORM DTC WORK SUPPORT

1. Open engine hood.
2. Select "HO2S2 (B1) P0139" or "HO2S2 (B2) P0159" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
3. Start engine and follow the instruction of CONSULT display.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

Is "COMPLETED" displayed on CONSULT screen?

YES >> GO TO 6.

NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 3.

6. PERFORM SELF-DIAGNOSIS

Ⓟ With CONSULT

Perform ECM self-diagnosis.

Is DTC "P0139" or "P0159" detected?

YES >> Proceed to [EC-710, "Diagnosis Procedure"](#).

NO >> INSPECTION END

7. PERFORM COMPONENT FUNCTION CHECK

< DTC/CIRCUIT DIAGNOSIS >

Perform component function check. Refer to [EC-709, "Overall Function Check"](#).

NOTE:

Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-710, "Diagnosis Procedure"](#).

Overall Function Check

INFOID:000000007358578

1.PERFORM COMPONENT FUNCTION CHECK-I

⊗ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following condition.

DTC	ECM			Condition	Voltage
	Connector	Terminal			
		+	-		
P0139	F79	55	78	Revving up to 4,000 rpm under no load at least 10 times	A change of voltage should be more than 0.08 V for 1 second during this procedure.
P0159		74			

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following condition.

DTC	ECM			Condition	Voltage
	Connector	Terminal			
		+	-		
P0139	F79	55	78	Keeping engine at idle for 10 minutes	A change of voltage should be more than 0.08 V for 1 second during this procedure.
P0159		74			

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following condition.

DTC	ECM				Condition	Voltage
	Connector	+	-			
		Terminal	Terminal			
P0139	F79	55	78	Coasting from 80 km/h (50 MPH) on the suitable gear position	A change of voltage should be more than 0.08 V for 1 second during this procedure.	
P0159		74				

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-710, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358579

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in [GI-40, "Circuit Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair or replace ground connection.

2. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to [EC-599, "Mixture Ratio Self-Learning Value Clear"](#).
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

- YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to [EC-714, "On Board Diagnosis Logic"](#) or [EC-719, "On Board Diagnosis Logic"](#).
 NO >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0139	1	F27	4	F79	78	Existed
P0159	2	F28	4			

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0139	1	F27	1	F79	55	Existed
P0159	2	F28	1		74	

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC	HO2S2			Ground	Continuity
	Bank	Connector	Terminal		
P0139	1	F27	1	Ground	Not existed
P0159	2	F28	1		

DTC	ECM			Ground	Continuity
	Bank	Connector	Terminal		
P0139	1	F79	55	Ground	Not existed
P0159	2		74		

< DTC/CIRCUIT DIAGNOSIS >

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to [EC-697, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to [EX-6, "Exploded View"](#).

CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000007358580

1. INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

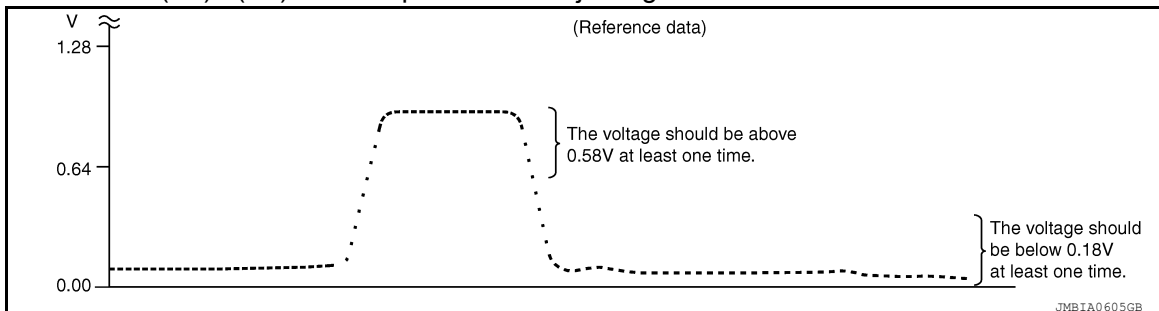
YES >> GO TO 2.

NO >> GO TO 3.

2. CHECK HEATED OXYGEN SENSOR 2

With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.
7. Check "HO2S2 (B1) / (B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.



"HO2S2 (B1)/(B2)" should be above 0.58 V at least once when the "FUEL INJECTION" is +25%.
 "HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is -25%.

Is the inspection result normal?

< DTC/CIRCUIT DIAGNOSIS >

YES >> INSPECTION END
 NO >> GO TO 6.

3. CHECK HEATED OXYGEN SENSOR 2-I

⊗ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following condition.

Connector	ECM		Condition	Voltage
	+	-		
	Terminal	Terminal		
F79	55 [HO2S2 (bank 1)]	78	Revvng up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.58 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	74 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
 NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following condition.

Connector	ECM		Condition	Voltage
	+	-		
	Terminal	Terminal		
F79	55 [HO2S2 (bank 1)]	78	Keeping engine at idle for 10 minutes	The voltage should be above 0.58 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	74 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
 NO >> GO TO 5.

5. CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector terminals under the following condition.

Connector	ECM		Condition	Voltage
	+	-		
	Terminal	Terminal		
F79	55 [HO2S2 (bank 1)]	78	Coasting from 80 km/h (50 MPH) on the suitable gear position	The voltage should be above 0.58 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	74 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
 NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to [EX-6. "Exploded View"](#).

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).**

>> INSPECTION END

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P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

On Board Diagnosis Logic

INFOID:000000007358581

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (the actual mixture ratio is too lean), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0171 0171 (Bank 1)	Fuel injection system too lean	<ul style="list-style-type: none"> Fuel injection system does not operate properly. The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.) 	<ul style="list-style-type: none"> Intake air leakage A/F sensor 1 Fuel injector Exhaust gas leakage Incorrect fuel pressure Lack of fuel Mass air flow sensor Incorrect PCV hose connection
P0174 0174 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358582

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

WITH CONSULT

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
- Clear the self-learning control coefficient by touching "CLEAR".
- Start engine.
If it is difficult to start engine, the fuel injection system has a malfunction. Performing the following procedure is advised.
 - Crank engine while depressing accelerator pedal.

NOTE:
When depressing accelerator pedal three-fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.
 - If engine starts, go to [EC-716, "Diagnosis Procedure"](#).
If engine does not start, check exhaust and intake air leakage visually.
- Keep engine at idle for at least 5 minutes.
- Check 1st trip DTC.
- The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to [EC-716, "Diagnosis Procedure"](#).

NOTE:

If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- a. Turn ignition switch OFF and wait at least 10 seconds.
- b. Start engine.
- c. Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.


VHCL SPEED SE	50 - 120 km/h (31 - 75 MPH)
---------------	-----------------------------

CAUTION:

Always drive vehicle at a safe speed.

- d. Check 1st trip DTC.
- e. If 1st trip DTC is detected, go to [EC-716. "Diagnosis Procedure"](#).

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Disconnect mass air flow sensor (1) harness connector.
 -  : Vehicle front
6. Restart engine and let it idle for at least 5 seconds.
7. Stop engine and reconnect mass air flow sensor harness connector.
8. Select Service \$03 with GST. Check that DTC P0102 is detected.
9. Select Service \$04 with GST and erase the DTC P0102.

10. Start engine.

If it is difficult to start engine, the fuel injection system has a malfunction.

Performing the following procedure is advised.

- a. Crank engine while depressing accelerator pedal.

NOTE:

When depressing accelerator pedal three-fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

- b. If engine starts, go to [EC-716. "Diagnosis Procedure"](#).
If engine does not start, check exhaust and intake air leakage visually.

11. Keep engine at idle for at least 5 minutes.

12. Check 1st trip DTC.

13. The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to [EC-716. "Diagnosis Procedure"](#).

NOTE:

If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

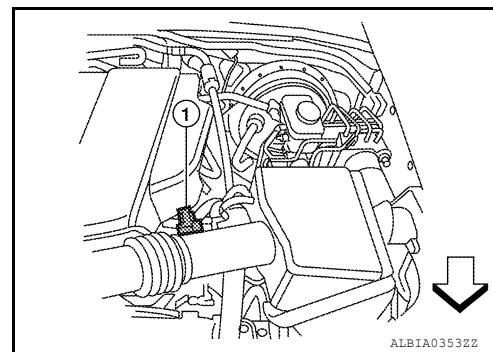
- a. Turn ignition switch OFF and wait at least 10 seconds.
- b. Start engine.
- c. Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

VHCL SPEED SE	50 - 120 km/h (31 - 75 MPH)
---------------	-----------------------------

CAUTION:

Always drive vehicle at a safe speed.

- d. Check 1st trip DTC.
- e. If 1st trip DTC is detected, go to [EC-716. "Diagnosis Procedure"](#).



P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

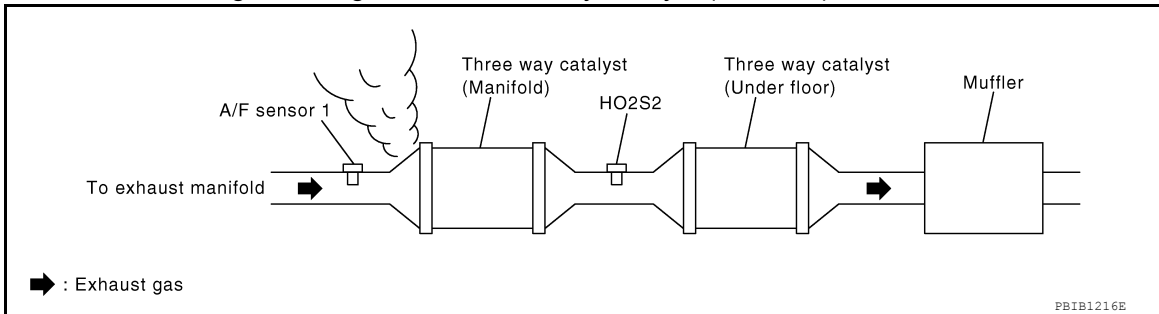
[VK56DE]

INFOID:000000007358583

Diagnosis Procedure

1. CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before three way catalyst (manifold).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace malfunctioning part.

2. CHECK FOR INTAKE AIR LEAKAGE

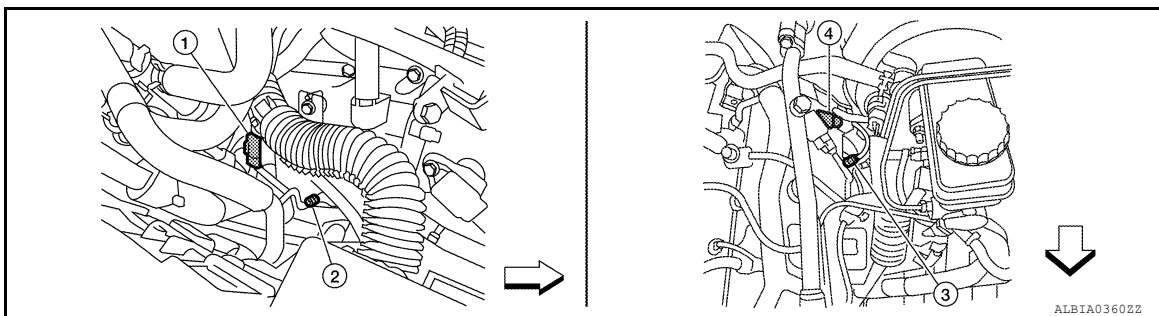
1. Listen for an intake air leakage after the mass air flow sensor.
2. Check PCV hose connection.

OK or NG

- OK >> GO TO 3.
- NG >> Repair or replace malfunctioning part.

3. CHECK AIR FUEL RATIO SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect corresponding air fuel ratio (A/F) sensor 1 harness connector.



1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 2)
3. A/F sensor 1 (bank 1)
4. A/F sensor 1 (bank 1) harness connector

↶ : Vehicle front

3. Disconnect ECM harness connector.
4. Check harness continuity between A/F sensor 1 terminals and ECM terminals as per the following. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

5. Check harness continuity between the following terminals and ground.
Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to [EC-952, "Fuel Pressure Check"](#).
2. Install fuel pressure gauge and check fuel pressure. Refer to [EC-952, "Fuel Pressure Check"](#).

At idling: Approximately 350 kPa (3.57 kg/cm², 51 psi)

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit (Refer to [EC-928, "Diagnosis Procedure"](#).)
- Fuel pressure regulator (Refer to [EC-952, "Fuel Pressure Check"](#).)
- Fuel lines (Refer to [FL-5, "Checking Fuel Line"](#).)
- Fuel filter for clogging

>> Repair or replace malfunctioning part.

6. CHECK MASS AIR FLOW SENSOR

 **With CONSULT**

1. Install all removed parts.
2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.

3.0 - 9.0 g-m/sec: At idling

9.0 - 28.0 g-m/sec: At 2,500 rpm

 **With GST**

1. Install all removed parts.
2. Check mass air flow sensor signal in Service \$01 with GST.

3.0 - 9.0 g-m/sec: at idling

9.0 - 28.0 g-m/sec: at 2,500 rpm

OK or NG

OK >> GO TO 7.

NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to [EC-648, "Diagnosis Procedure"](#).

7. CHECK FUNCTION OF FUEL INJECTOR

 **With CONSULT**

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Check that each circuit produces a momentary engine speed drop.

⊗ **Without CONSULT**

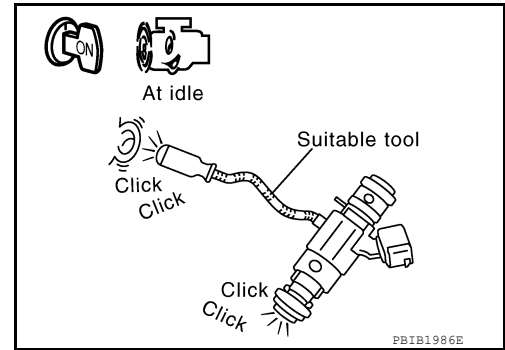
1. Start engine.
2. Listen to each fuel injector operating sound.

Clicking noise should be heard.

OK or NG

OK >> GO TO 8.

NG >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-925. "Diagnosis Procedure"](#).



8. CHECK FUEL INJECTOR

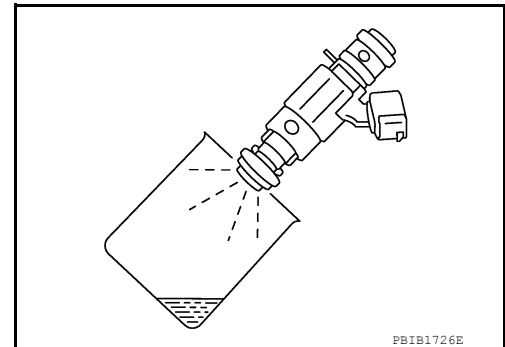
1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch OFF.
3. Disconnect all fuel injector harness connectors.
4. Remove fuel injector gallery assembly. Refer to [EM-180. "Removal and Installation"](#).
Keep fuel hose and all fuel injectors connected to fuel injector gallery.
5. For DTC P0171, reconnect fuel injector harness connectors on bank 1.
For DTC P0174, reconnect fuel injector harness connectors on bank 2.
6. Disconnect all ignition coil harness connectors.
7. Prepare pans or saucers under each fuel injector.
8. Crank engine for approximately 3 seconds.
For DTC P0171, check that fuel sprays out from fuel injectors on bank 1.
For DTC P0174, check that fuel sprays out from fuel injectors on bank 2.

Fuel should be sprayed evenly for each fuel injector.

OK or NG

OK >> GO TO 9.

NG >> Replace fuel injectors from which fuel does not spray out. Refer to [EM-180](#). Always replace O-ring with new ones.



9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

On Board Diagnosis Logic

INFOID:000000007358584

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (the actual mixture ratio is too rich), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0172 0172 (Bank 1)	Fuel injection system too rich	<ul style="list-style-type: none"> Fuel injection system does not operate properly. The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.) 	<ul style="list-style-type: none"> A/F sensor 1 Fuel injector Exhaust gas leakage Incorrect fuel pressure Mass air flow sensor
P0175 0175 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358585

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Ⓟ WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
6. Clear the self-learning control coefficient by touching "CLEAR".
7. Start engine.
If it is difficult to start engine, the fuel injection system has a malfunction. Performing the following procedure is advised.
 - a. Crank engine while depressing accelerator pedal.

NOTE:
When depressing accelerator pedal three-fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.
 - b. If engine starts, go to [EC-720, "Diagnosis Procedure"](#).
If engine does not start, remove ignition plugs and check for fouling, etc. Refer to [EM-177](#).
8. Keep engine at idle for at least 5 minutes.
9. Check 1st trip DTC.
10. The 1st trip DTC P0172 or P0175 should be detected at this stage, if a malfunction exists. If so, go to [EC-720, "Diagnosis Procedure"](#).

NOTE:

If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

- a. Turn ignition switch OFF and wait at least 10 seconds.
- b. Start engine.

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- c. Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

VHCL SPEED SE	50 - 120 km/h (31 - 75 MPH)
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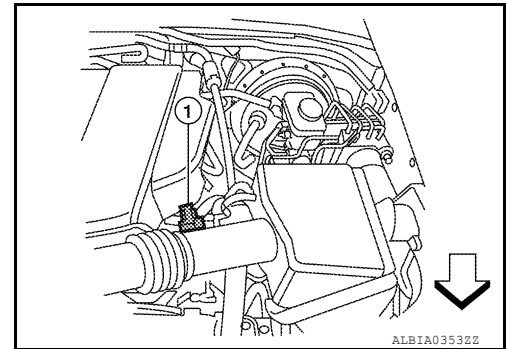
CAUTION:

Always drive vehicle at a safe speed.

- d. Check 1st trip DTC.
e. If 1st trip DTC is detected, go to [EC-720, "Diagnosis Procedure"](#).

 WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Disconnect mass air flow sensor (1) harness connector.
 - ⇐ : Vehicle front
6. Restart engine and let it idle for at least 5 seconds.
7. Stop engine and reconnect mass air flow sensor harness connector.
8. Select Service \$03 with GST. Check that DTC P0102 is detected.
9. Select Service \$04 with GST and erase the DTC P0102.



10. Start engine.
If it is difficult to start engine, the fuel injection system has a malfunction.

Performing the following procedure is advised.

- a. Crank engine while depressing accelerator pedal.

NOTE:

When depressing accelerator pedal three-fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

- b. If engine starts, go to [EC-720, "Diagnosis Procedure"](#).
If engine does not start, remove spark plugs and check for fouling, etc. Refer to [EM-177](#).
11. Keep engine at idle for at least 5 minutes.

12. Check 1st trip DTC.

13. The 1st trip DTC P0172 or P0175 should be detected at this stage, if a malfunction exists. If so, go to [EC-720, "Diagnosis Procedure"](#).

NOTE:

If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

- a. Turn ignition switch OFF and wait at least 10 seconds.
- b. Start engine.
- c. Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

VHCL SPEED SE	50 - 120 km/h (31 - 75 MPH)
---------------	-----------------------------

CAUTION:

Always drive vehicle at a safe speed.

- d. Check 1st trip DTC.
e. If 1st trip DTC is detected, go to [EC-720, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358586

1. CHECK EXHAUST GAS LEAKAGE

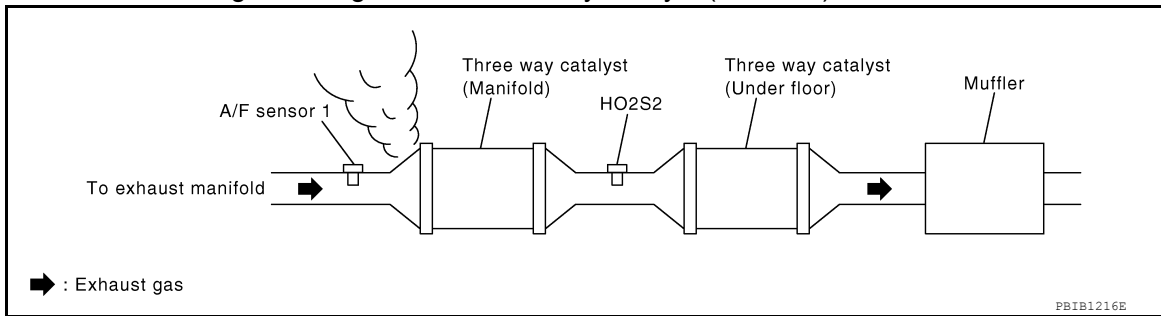
1. Start engine and run it at idle.

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

- Listen for an exhaust gas leakage before three way catalyst (manifold).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace malfunctioning part.

2. CHECK FOR INTAKE AIR LEAKAGE

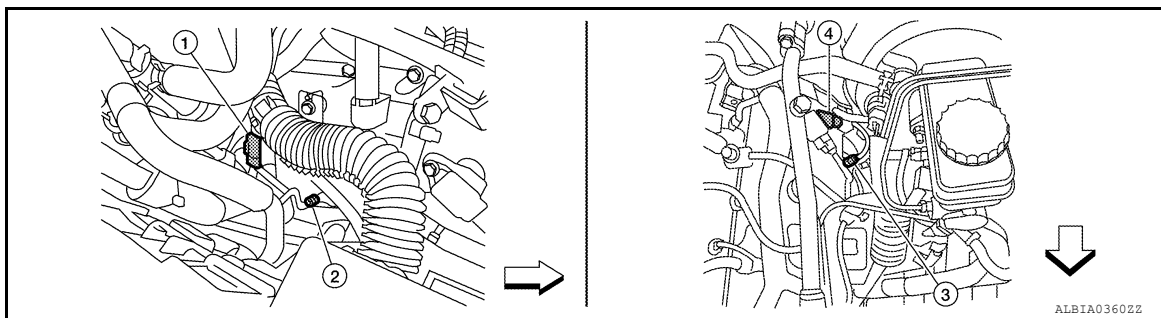
Listen for an intake air leakage after the mass air flow sensor.

OK or NG

- OK >> GO TO 3.
- NG >> Repair or replace malfunctioning part.

3. CHECK AIR FUEL RATIO SENSOR 1 INPUT SIGNAL CIRCUIT

- Turn ignition switch OFF.
- Disconnect corresponding air fuel ratio (A/F) sensor 1 harness connector.



- A/F sensor 1 (bank 2) harness connector
- A/F sensor 1 (bank 2)
- A/F sensor 1 (bank 1)
- A/F sensor 1 (bank 1) harness connector

↙ : Vehicle front

- Disconnect ECM harness connector.
- Check harness continuity between A/F sensor 1 terminals and ECM terminals as per the following. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

- Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to [EC-952. "Fuel Pressure Check"](#).
2. Install fuel pressure gauge and check fuel pressure. Refer to [EC-952. "Fuel Pressure Check"](#).

At idling: Approximately 350 kPa (3.57 kg/cm², 51 psi)

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit (Refer to [EC-928. "Diagnosis Procedure"](#).)
- Fuel pressure regulator (Refer to [EC-952. "Fuel Pressure Check"](#).)

>> Repair or replace malfunctioning part.

6. CHECK MASS AIR FLOW SENSOR

 **With CONSULT**

1. Install all removed parts.
2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.

3.0 - 9.0 g·m/sec: At idling

9.0 - 28.0 g·m/sec: At 2,500 rpm

 **With GST**

1. Install all removed parts.
2. Check mass air flow sensor signal in Service \$01 with GST.

3.0 - 9.0 g·m/sec: At idling

9.0 - 28.0 g·m/sec: At 2,500 rpm

OK or NG

OK >> GO TO 7.

NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to [EC-648. "Diagnosis Procedure"](#).

7. CHECK FUNCTION OF FUEL INJECTOR

 **With CONSULT**

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

 **Without CONSULT**

1. Start engine.

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

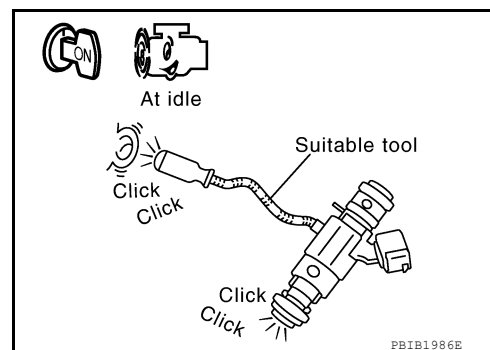
2. Listen to each fuel injector operating sound.

Clicking noise should be heard.

OK or NG

OK >> GO TO 8.

NG >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-925. "Diagnosis Procedure"](#).



8. CHECK FUEL INJECTOR

1. Remove fuel injector assembly. Refer to [EM-180. "Removal and Installation"](#).
Keep fuel hose and all fuel injectors connected to fuel injector gallery.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect all fuel injector harness connectors.
4. Disconnect all ignition coil harness connectors.
5. Prepare pans or saucers under each fuel injector.
6. Crank engine for approximately 3 seconds.
Check that fuel does not drip from fuel injector.

OK or NG

OK (Does not drip.)>>GO TO 9.

NG (Drips.)>>Replace the fuel injectors from which fuel is dripping. Refer to [EM-180](#). Always replace O-ring with new one.

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> INSPECTION END

P0181 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

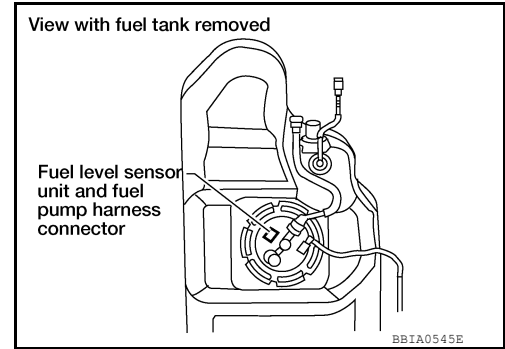
[VK56DE]

P0181 FTT SENSOR

Component Description

INFOID:000000007358587

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



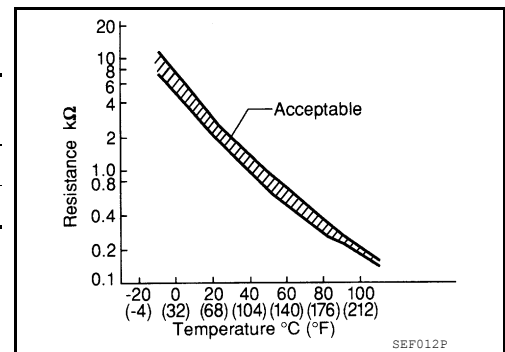
<Reference data>

Fluid temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal 107 (Fuel tank temperature sensor) and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



DTC Logic

INFOID:000000007358588

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition		Possible cause
P0181	FTT SENSOR [Fuel tank temperature (FTT) sensor circuit range/performance]	A)	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from ECT sensor and intake air temperature sensor.	<ul style="list-style-type: none"> Harness or connectors (The FTT sensor circuit is open or shorted) FTT sensor
		B)	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, and FTT sensor) shows that the voltage signal of the FTT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.	<ul style="list-style-type: none"> Harness or connectors (High or low resistance in the FTT sensor circuit) FTT sensor

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

P0181 FTT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-I

1. Turn ignition switch ON and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-726. "Diagnosis Procedure"](#).
- NO >> GO TO 3.

3. CHECK ENGINE COOLANT TEMPERATURE

 With CONSULT

1. Select "COOLAN TEMP/S" in "DATA MONITOR" with CONSULT.
2. Check "COOLAN TEMP/S" value.

 With GST

Follow the procedure "With CONSULT" above.

"COOLAN TEMP/S" less than 60°C (140°F)?

- YES >> INSPECTION END
- NO >> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-II

 With CONSULT

1. Cool engine down until "COOLAN TEMP/S" is less than 60°C (140°F).
2. Wait at least 10 seconds.
3. Check 1st trip DTC.

 With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-726. "Diagnosis Procedure"](#).
- NO >> GO TO 5.

5. PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B)

Perform component function check. Refer to [EC-725. "Component Function Check"](#).

NOTE:

Use the component function check to check the overall function of the FTT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-726. "Diagnosis Procedure"](#).

Component Function Check

INFOID:000000007358589

1. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Remove fuel level sensor unit. Refer to [FL-11](#).
4. Check resistance between fuel level sensor unit and fuel pump terminals by heating with hot water as shown in the figure.

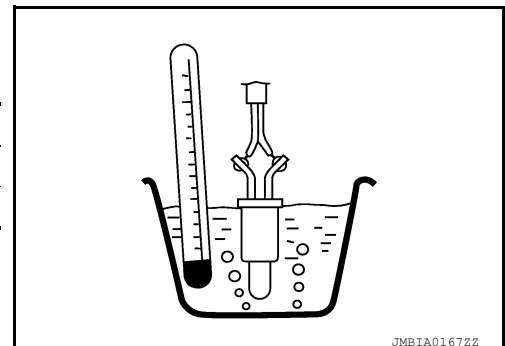
Terminals	Condition	Resistance (kΩ)	
4 and 3	Temperature [°C (°F)]	20 (68)	2.3 – 2.7
		50 (122)	0.79 – 0.90

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Proceed to [EC-726. "Diagnosis Procedure"](#).

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-37. "Intermittent Incident"](#).



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P0181 FTT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-726, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358590

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to [EC-724, "DTC Logic"](#).

Which malfunction is detected?

- A >> GO TO 2.
B >> GO TO 6.

2.CHECK FUEL TANK TEMPERATURE (FTT) SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch ON.
4. Check the voltage between fuel level sensor unit and fuel pump harness connector and ground.

Fuel level sensor unit and fuel pump		Ground	Voltage (V)
Connector	Terminal		
C5	4	Ground	Approx. 5

Is the inspection result normal?

- YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and fuel level sensor unit and fuel pump
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connector.

4.CHECK FTT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between fuel level sensor unit and fuel pump harness connector and ground.

Fuel level sensor unit and fuel pump		Ground	Continuity
Connector	Terminal		
C5	3	Ground	Existed

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 6.
NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between fuel level sensor unit and fuel pump and ground
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connector.

6.CHECK FTT SENSOR

Check FTT sensor. Refer to [EC-727, "Component Inspection"](#).

Is the inspection result normal?

P0181 FTT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> GO TO 7.
- NO >> Replace fuel level sensor unit and fuel pump. Refer to [FL-11](#).

7. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-37. "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000007358591

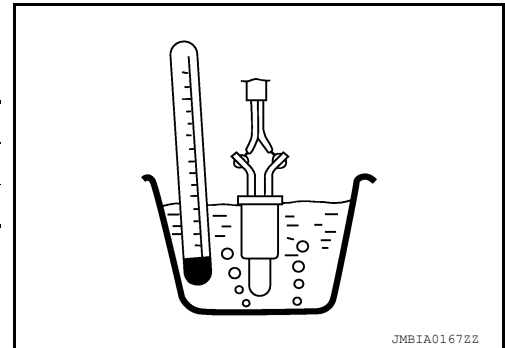
1. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Remove fuel level sensor unit. Refer to [FL-11](#).
4. Check resistance between fuel level sensor unit and fuel pump terminals by heating with hot water as shown in the figure.

Terminals	Condition	Resistance (kΩ)	
4 and 3	Temperature [°C (°F)]	20 (68)	2.3 – 2.7
		50 (122)	0.79 – 0.90

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace fuel level sensor unit and fuel pump. Refer to [FL-11](#).



A
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P0182, P0183 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

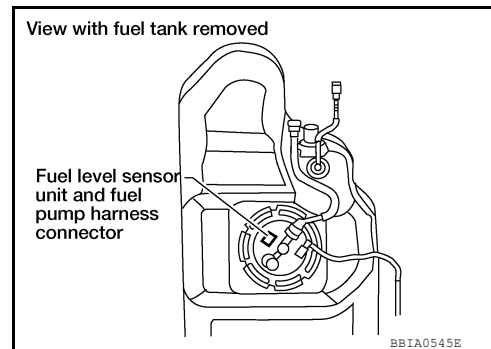
[VK56DE]

P0182, P0183 FTT SENSOR

Component Description

INFOID:000000007358592

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



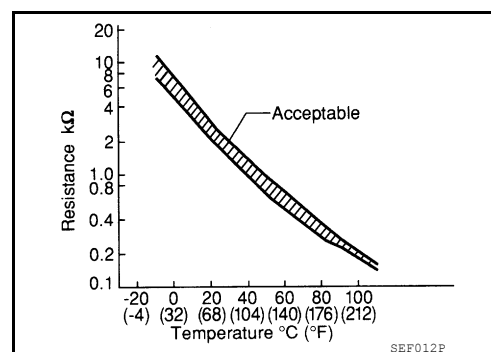
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Fluid temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal 107 (Fuel tank temperature sensor) and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



On Board Diagnosis Logic

INFOID:000000007358593

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0182 0182	Fuel tank temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Fuel tank temperature sensor
P0183 0183	Fuel tank temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

INFOID:000000007358594

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Wait at least 5 seconds.
4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to [EC-728. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358595

1. CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

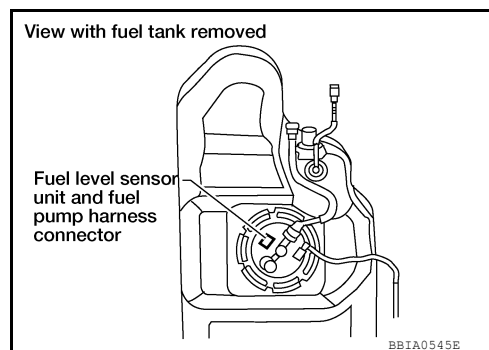
1. Turn ignition switch OFF.

P0182, P0183 FTT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
3. Turn ignition switch ON.

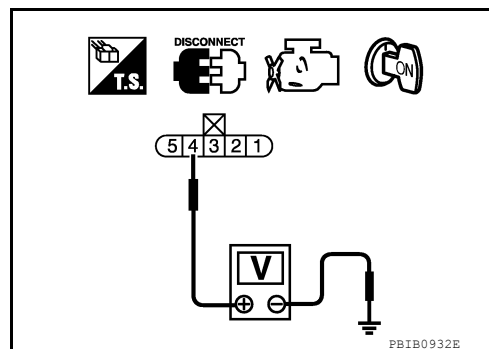


4. Check voltage between "fuel level sensor unit and fuel pump" terminal 4 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 3.
- NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness for open or short between ECM and "fuel level sensor unit and fuel pump"

>> Repair harness or connector.

3. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between "fuel level sensor unit and fuel pump" terminal 3 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness for open or short between "fuel level sensor unit and fuel pump" and ground

>> Repair open circuit or short to power in harness or connector.

5. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to [EC-730. "Component Inspection"](#).

OK or NG

- OK >> GO TO 6.
- NG >> Replace "fuel level sensor unit fuel pump". Refer to [FL-11](#).

6. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

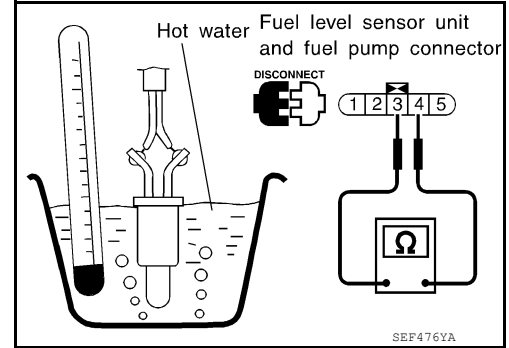
INFOID:000000007358596

FUEL TANK TEMPERATURE SENSOR

1. Remove "fuel level sensor unit and fuel pump". Refer to [FL-11](#).
2. Check resistance between "fuel level sensor unit and fuel pump" terminals 3 and 4 by heating with hot water as shown in the figure.

Temperature [°C (°F)]	Resistance (kΩ)
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

3. If NG, replace "fuel level sensor unit and fuel pump". Refer to [FL-11](#).



P0222, P0223 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

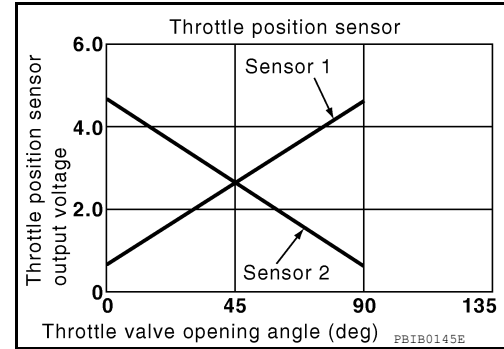
P0222, P0223 TP SENSOR

Component Description

INFOID:000000007358597

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve in response to driving conditions via the throttle control motor.



On Board Diagnosis Logic

INFOID:000000007358598

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222 0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	<ul style="list-style-type: none"> Harness or connectors (TP sensor 1 circuit is open or shorted.) (APP sensor 2 circuit is shorted.) Electric throttle control actuator (TP sensor 1) Accelerator pedal position sensor (APP sensor 2)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operation condition in fail-safe mode

The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.

The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.

So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:000000007358599

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to [EC-731. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358600

1. CHECK GROUND CONNECTIONS

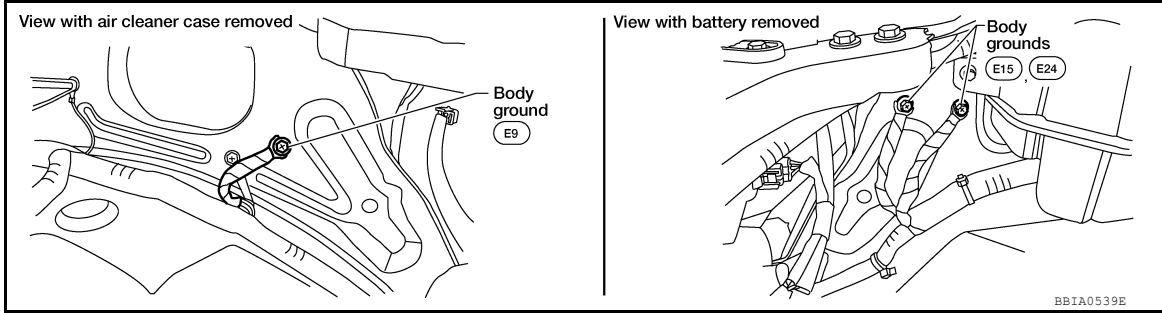
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P0222, P0223 TP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Refer to [EC-623, "Ground Inspection"](#).

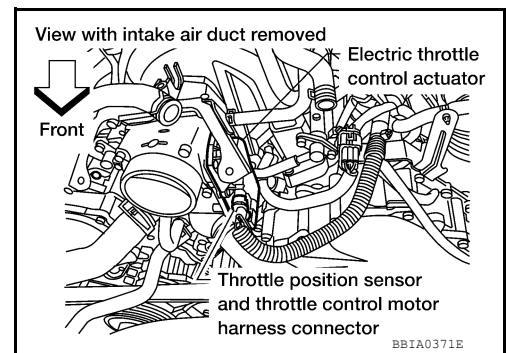


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch ON.

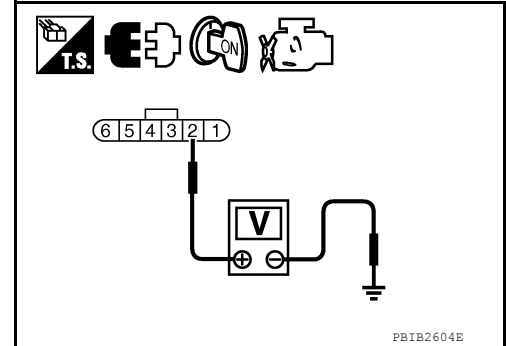


3. Check voltage between electric throttle control actuator terminal 2 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 3.



3. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 2 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 2	EC-567, "Wiring Diagram"
91	APP sensor terminal 1	

P0222, P0223 TP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> GO TO 5.
- NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK ACCELERATOR PEDAL POSITION SENSOR

Refer to [EC-910, "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace the accelerator pedal assembly. Refer to [ACC-4, "Removal and Installation"](#).
2. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
3. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
4. Perform [EC-597, "Idle Air Volume Learning"](#).

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 4 and ECM terminal 66.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 50 and electric throttle control actuator terminal 1.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to [EC-734, "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator. Refer to [EM-165](#).
2. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
3. Perform [EC-597, "Idle Air Volume Learning"](#).

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

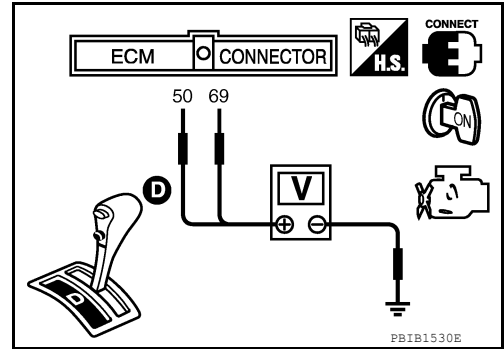
INFOID:000000007358601

Component Inspection

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
3. Turn ignition switch ON.
4. Shift selector lever to the D position.
5. Check voltage between ECM terminals 50 (TP sensor 1 signal) and ground, 69 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
69 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step. Refer to [EM-165](#).
7. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
8. Perform [EC-597, "Idle Air Volume Learning"](#).

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MISFIRE

On Board Diagnosis Logic

INFOID:000000007358602

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

- One Trip Detection Logic (Three Way Catalyst Damage)**
On the 1st trip, when a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.
When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.
When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off.
If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink.
When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain on.
If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
- Two Trip Detection Logic (Exhaust quality deterioration)**
For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only illuminate when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
A misfire malfunction can be detected in any one cylinder or in multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300 0300	Multiple cylinder misfires detected	Multiple cylinder misfire.	<ul style="list-style-type: none">• Improper spark plug• Insufficient compression• Incorrect fuel pressure• The fuel injector circuit is open or shorted• Fuel injector• Intake air leakage• The ignition signal circuit is open or shorted• Lack of fuel• Signal plate• Air fuel ratio (A/F) sensor 1• Incorrect PCV hose connection
P0301 0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	
P0302 0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	
P0303 0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	
P0304 0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	
P0305 0305	No. 5 cylinder misfire detected	No. 5 cylinder misfires.	
P0306 0306	No. 6 cylinder misfire detected	No. 6 cylinder misfires.	
P0307 0307	No. 7 cylinder misfire detected	No. 7 cylinder misfires.	
P0308 0308	No. 8 cylinder misfire detected	No. 8 cylinder misfires.	

DTC Confirmation Procedure

INFOID:000000007358603

CAUTION:

Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws when driving.

- If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
 - Turn ignition switch OFF and wait at least 10 seconds.
 - Turn ignition switch ON.

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

- c. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Restart engine and let it idle for approximately 15 minutes.
7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to [EC-736. "Diagnosis Procedure"](#).

NOTE:

If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

- a. Turn ignition switch OFF and wait at least 10 seconds.
- b. Turn ignition switch ON.
- c. Turn ignition switch OFF and wait at least 10 seconds.
- d. Start engine and drive the vehicle under similar conditions to (1st trip) Freeze Frame Data for a certain time. Refer to the table below.

Hold the accelerator pedal as steady as possible.

Similar conditions to (1st trip) Freeze Frame Data mean that the following conditions should be satisfied at the same time.

Engine speed	Engine speed in the freeze frame data \pm 400 rpm
Vehicle speed	Vehicle speed in the freeze frame data \pm 10 km/h (6 MPH)
Engine coolant temperature (T) condition	When the freeze frame data shows lower than 70°C (158°F), T should be lower than 70°C (158°F).
	When the freeze frame data shows higher than or equal to 70°C (158°F), T should be higher than or equal to 70°C (158°F).

Driving time varies according to the engine speed in the freeze frame data.

Engine speed	Time
Around 1,000 rpm	Approximately 10 minutes
Around 2,000 rpm	Approximately 5 minutes
More than 3,000 rpm	Approximately 3.5 minutes

Diagnosis Procedure

INFOID:000000007358604

1. CHECK FOR INTAKE AIR LEAKAGE AND PCV HOSE

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leakage.
3. Check PCV hose connection.

OK or NG

- OK >> GO TO 2.
NG >> Discover air leakage location and repair.

2. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

OK or NG

- OK >> GO TO 3.
NG >> Repair or replace malfunctioning part.

3. PERFORM POWER BALANCE TEST

With CONSULT

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MISFIRE

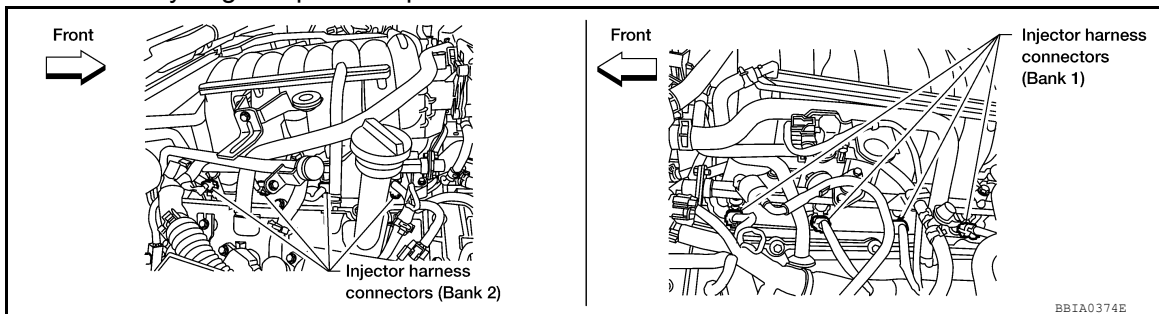
< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

2. Is there any cylinder which does not produce a momentary engine speed drop?

⊗ Without CONSULT

When disconnecting each fuel injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?



Yes or No

Yes >> GO TO 4.

No >> GO TO 7.

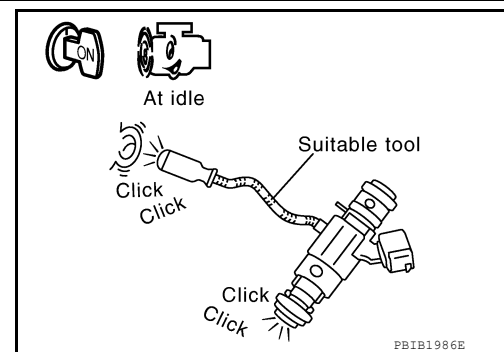
4. CHECK FUEL INJECTOR

Does each fuel injector make an operating sound at idle?

Yes or No

Yes >> GO TO 5.

No >> Check fuel injector(s) and circuit(s). Refer to [EC-925](#).
"Diagnosis Procedure".



5. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

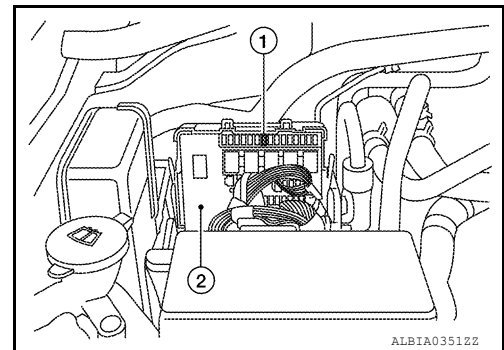
Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

3. Start engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.



P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

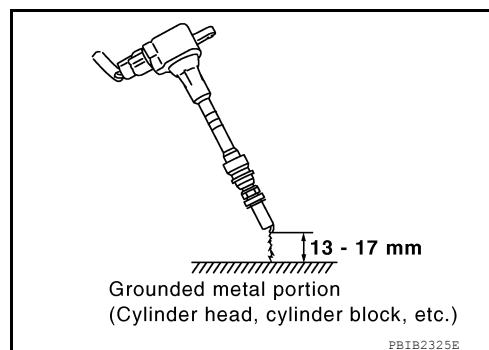
Spark should be generated.

CAUTION:

- Never place the spark plug and the ignition coil within 50 cm each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might damage the ignition coil if the gap of more than 17 mm is made.

NOTE:

When the gap is less than 13 mm, spark might be generated even if the coil is malfunctioning.



OK or NG

OK >> GO TO 9.

NG >> GO TO 6.

6. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

OK or NG

OK >> GO TO 7.

NG >> Check ignition coil, power transistor and their circuits. Refer to [EC-931, "Diagnosis Procedure"](#).

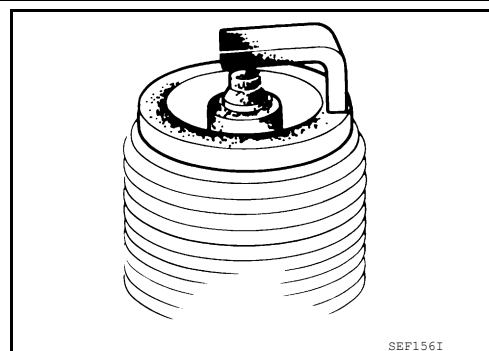
7. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

OK or NG

OK >> Replace malfunctioning spark plug(s) with standard type one(s). For spark plug type, refer to [EM-254, "Standard and Limit"](#).

NG >> 1. Repair or clean spark plug Refer to [EM-177..](#)
2. GO TO 8.



8. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

OK or NG

OK >> **INSPECTION END**

NG >> Replace malfunctioning spark plug(s) with standard type one(s). For spark plug type, refer to [EM-254, "Standard and Limit"](#).

9. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to [EM-162, "Compression Pressure"](#).

OK or NG

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

OK >> GO TO 10.

NG >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

10. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to [EC-952, "Fuel Pressure Check"](#).
3. Install fuel pressure gauge and check fuel pressure. Refer to [EC-952, "Fuel Pressure Check"](#).

At idling: Approximately 350 kPa (3.57 kg/cm², 51 psi)

OK or NG

OK >> GO TO 12.

NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit (Refer to [EC-928, "Diagnosis Procedure"](#).)
- Fuel pressure regulator (Refer to [EC-952, "Fuel Pressure Check"](#).)
- Fuel lines
- Fuel filter for clogging

>> Repair or replace malfunctioning part.

12. CHECK IGNITION TIMING

Check the following items. Refer to [EC-592, "Basic Inspection"](#).

Items	Specifications
Target idle speed	650 ± 50 rpm (in P or N position)
Ignition timing	15 ± 5° BTDC (in P or N position)

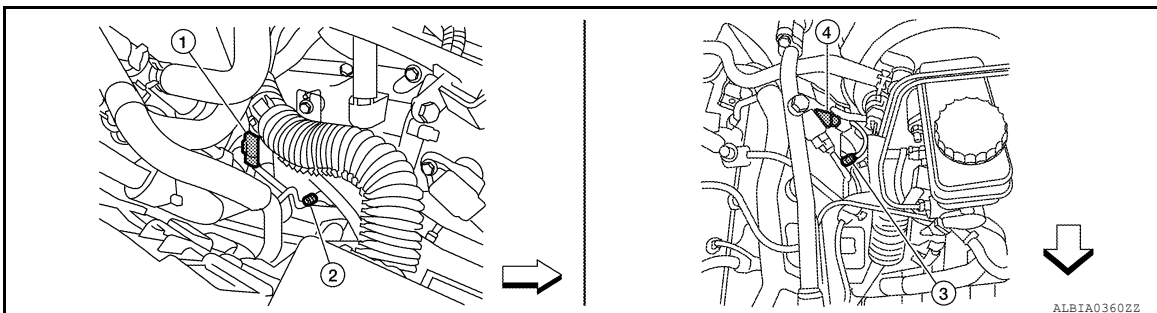
OK or NG

OK >> GO TO 13.

NG >> Follow the [EC-592, "Basic Inspection"](#).

13. CHECK AIR FUEL RATIO SENSOR 1 INPUT SIGNAL FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect air fuel ratio (A/F) sensor 1 harness connector.



1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 2)
3. A/F sensor 1 (bank 1)
4. A/F sensor 1 (bank 1) harness connector

← : Vehicle front

3. Disconnect ECM harness connector.
4. Check harness continuity between A/F sensor 1 terminals and ECM terminals as per the following. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

5. Check harness continuity between the following terminals and ground.
 Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

6. Also check harness for short to power.

OK or NG

- OK >> GO TO 14.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK A/F SENSOR 1 HEATER

Refer to [EC-635, "Component Inspection"](#).

OK or NG

- OK >> GO TO 16.
- NG >> GO TO 15.

15. REPLACE A/F SENSOR 1


Replace malfunctioning A/F sensor 1. Refer to [EM-169](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [Commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (Commercial service tool).

>> **INSPECTION END**

16. CHECK MASS AIR FLOW SENSOR

 **With CONSULT**

Check mass air flow sensor signal in "DATA MONITOR" mode with CONSULT.

- 3.0 - 9.0 g·m/sec: At idling**
- 9.0 - 28.0 g·m/sec: At 2,500 rpm**

 **With GST**

Check mass air flow sensor signal in Service \$01 with GST.

- 3.0 - 9.0 g·m/sec: At idling**
- 9.0 - 28.0 g·m/sec: At 2,500 rpm**

OK or NG

- OK >> GO TO 17.

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to [EC-648, "Diagnosis Procedure"](#).

A

17.CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in [EC-947, "Symptom Matrix Chart"](#).

EC

OK or NG

OK >> GO TO 18.

NG >> Repair or replace malfunctioning part.

C

18.ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.

Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to [EC-555, "DTC Index"](#).

D

>> GO TO 19.

19.CHECK INTERMITTENT INCIDENT

E

Refer to [GI-37, "Intermittent Incident"](#).

F

>> INSPECTION END

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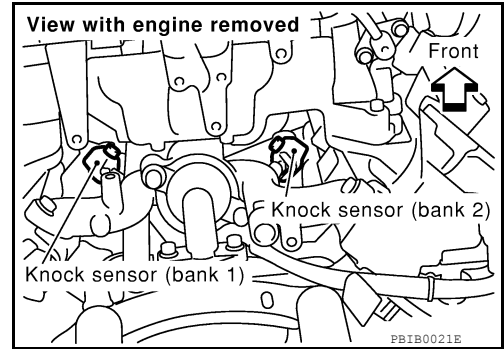
P

P0327, P0328, P0332, P0333 KS

Component Description

INFOID:000000007358605

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



On Board Diagnosis Logic

INFOID:000000007358606

The MIL will not illuminate for these self-diagnoses.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0327 0327 (Bank 1)	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Knock sensor
P0332 0332 (Bank 2)			
P0328 0328 (Bank 1)	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	
P0333 0333 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358607

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

1. Start engine and run it for at least 5 seconds at idle speed.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-742. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358608

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminals 15, 36 and ground. Refer to Wiring Diagram.

NOTE:

It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Resistance: Approximately 532 - 588 kΩ [at 20°C (68°F)]

< DTC/CIRCUIT DIAGNOSIS >

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 2.

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 15 and knock sensor (bank 1) terminal 1, ECM terminal 36 and knock sensor (bank 2) terminal 1.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F38, F275
- Harness for open or short between ECM and knock sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK KNOCK SENSOR

Refer to [EC-744. "Component Inspection"](#).

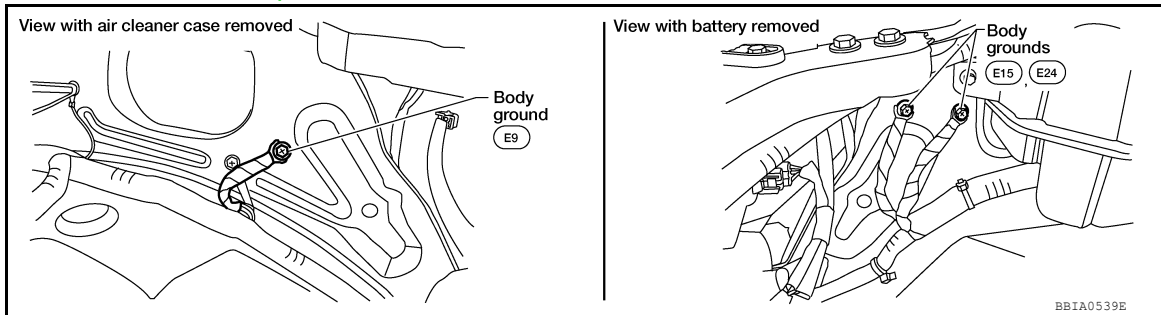
OK or NG

- OK >> GO TO 5.
- NG >> Replace malfunctioning knock sensor. Refer to [EM-227](#).

5. CHECK GROUND CONNECTIONS

Loosen and retighten ground screws on the body.

Refer to [EC-623. "Ground Inspection"](#).



OK or NG

- OK >> GO TO 6.
- NG >> Repair or replace ground connections.

6. CHECK KNOCK SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT

1. Disconnect knock sensor harness connector.
2. Check harness continuity between knock sensor terminal 2 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.

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7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F38, F275
- Harness connectors F14, E5
- Harness for open or short between knock sensor terminal 2 and ground

>> Repair open circuit or short power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000007358609

KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

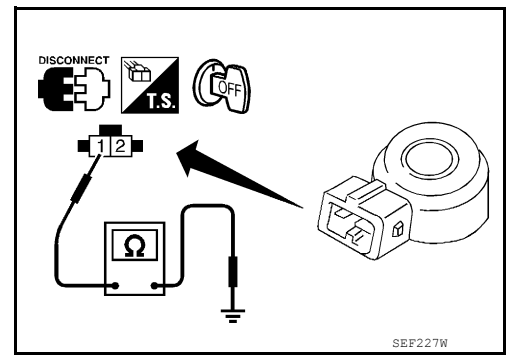
NOTE:

It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Resistance: Approximately 532 - 588 kΩ [at 20°C (68°F)]

CAUTION:

Never use any knock sensors that have been dropped or physically damaged. Use only new ones.



SEP227W

P0335 CKP SENSOR (POS)

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0335 CKP SENSOR (POS)

Component Description

INFOID:000000007358610

The crankshaft position sensor (POS) is located on the A/T assembly facing the gear teeth (cogs) of the signal plate. It detects the fluctuation of the engine revolution.

The sensor consists of a permanent magnet and Hall IC.

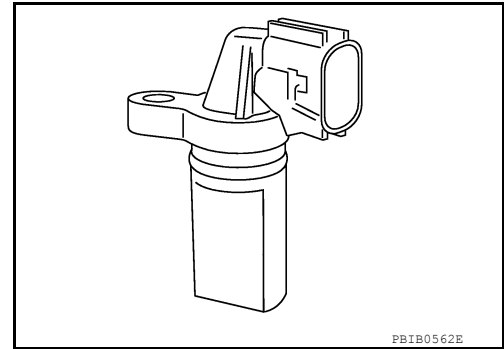
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

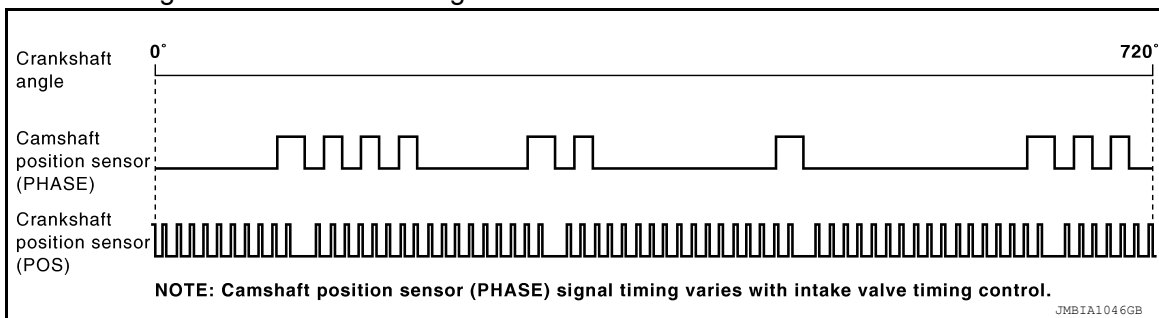
Due to the changing magnetic field, the voltage from the sensor changes.

The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

ECM receives the signals as shown in the figure.



PBIB0562E



On Board Diagnosis Logic

INFOID:000000007358611

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	<ul style="list-style-type: none"> The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. The crankshaft position sensor (POS) signal is not in the normal pattern during engine running. 	<ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted) Crankshaft position sensor (POS) Signal plate

DTC Confirmation Procedure

INFOID:000000007358612

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
2. Check 1st DTC.
3. If 1st trip DTC is detected, go to [EC-745, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358613

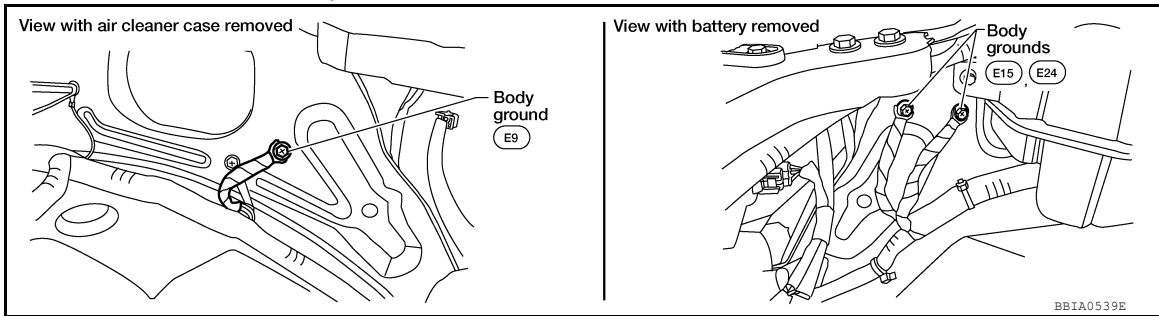
1.CHECK GROUND CONNECTIONS

P0335 CKP SENSOR (POS)

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623. "Ground Inspection"](#).

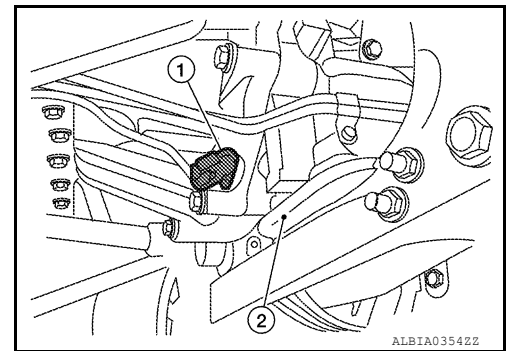


OK or NG

- OK >> GO TO 2.
NG >> Repair or replace ground connections.

2. CHECK CRANKSHAFT POSITION SENSOR (POS) POWER SUPPLY CIRCUIT

1. Disconnect crankshaft position (CKP) sensor (POS) (1) harness connector.
- Engine oil pan (2)
2. Turn ignition switch ON.

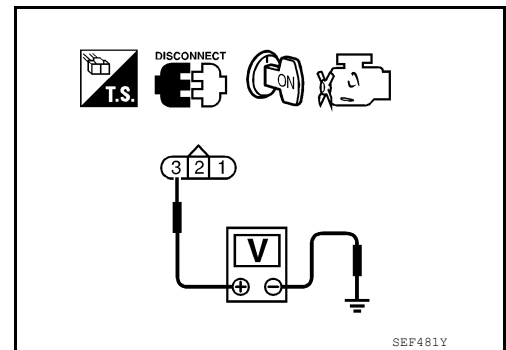


3. Check voltage between CKP sensor (POS) terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F32, E2
- IPDM E/R harness connector E119
- Harness for open or short between crankshaft position sensor (POS) and ECM
- Harness for open or short between crankshaft position sensor (POS) and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between CKP sensor (POS) terminal 1 and ground.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

P0335 CKP SENSOR (POS)

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> GO TO 6.
- NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F32, E2
- Harness for open or short between crankshaft position sensor (POS) and ground

>> Repair open circuit or short to power in harness or connectors.

6. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 13 and CKP sensor (POS) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to [EC-747. "Component Inspection"](#).

OK or NG

- OK >> GO TO 8.
- NG >> Replace crankshaft position sensor (POS). Refer to [EM-227](#).

8. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

OK or NG

- OK >> GO TO 9.
- NG >> Replace the signal plate. Refer to [EM-227](#).

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

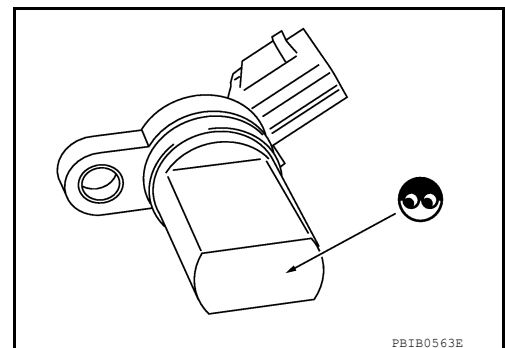
>> **INSPECTION END**

Component Inspection

INFOID:000000007358614

CRANKSHAFT POSITION SENSOR (POS)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



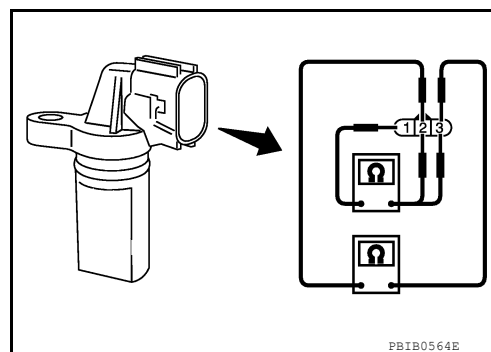
P0335 CKP SENSOR (POS)

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance [at 25°C (77°F)]
1 (+) - 2 (-)	Except 0 or ∞ Ω
1 (+) - 3 (-)	
2 (+) - 3 (-)	



P0340 CMP SENSOR (PHASE)

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0340 CMP SENSOR (PHASE)

Component Description

INFOID:000000007358615

The camshaft position sensor (PHASE) senses the protrusion of exhaust valve cam sprocket to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position. When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.

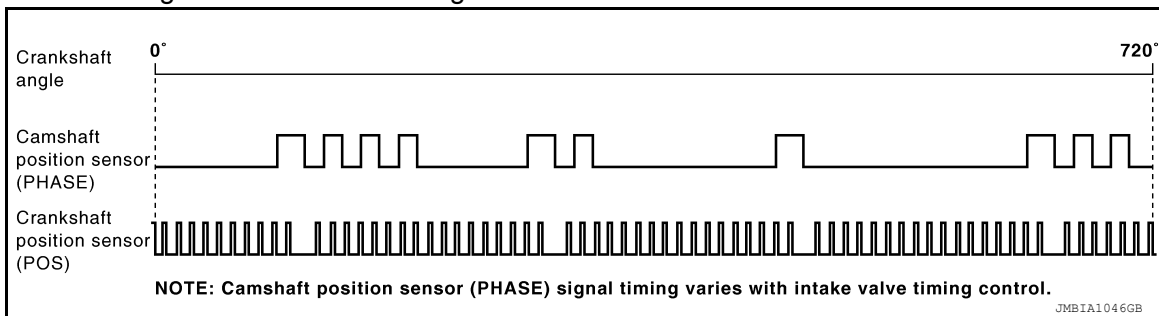
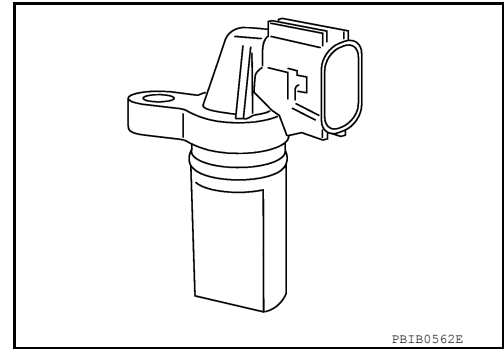
The sensor consists of a permanent magnet and Hall IC.

When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes.

ECM receives the signals as shown in the figure.



On Board Diagnosis Logic

INFOID:0000000007358616

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340	Camshaft position sensor (PHASE) circuit	<ul style="list-style-type: none"> The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. The cylinder No. signal is not sent to ECM during engine running. The cylinder No. signal is not in the normal pattern during engine running. 	<ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted) Camshaft position sensor (PHASE) Camshaft (Exhaust) Starter motor Starting system circuit Dead (Weak) battery

DTC Confirmation Procedure

INFOID:0000000007358617

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

1. Turn ignition switch ON.
2. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to [EC-750, "Diagnosis Procedure"](#).
If 1st trip DTC is not detected, go to next step.
5. Maintaining engine speed at more than 800 rpm for at least 5 seconds.
6. Check 1st trip DTC.

P0340 CMP SENSOR (PHASE)

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

7. If 1st trip DTC is detected, go to [EC-750. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358618

1. CHECK STARTING SYSTEM

Turn ignition switch to the START position.

Does the engine turn over?

Does the starter motor operate?

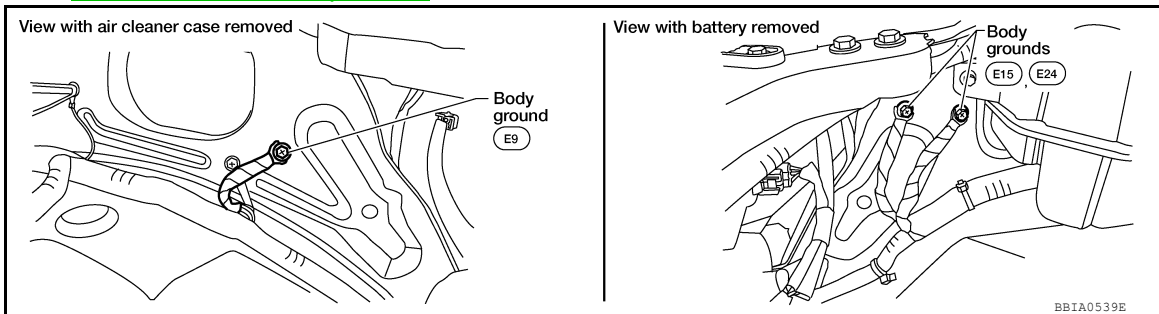
Yes or No

Yes >> GO TO 2.

No >> Check starting system. (Refer to [STR-5. "Work Flow \(With GR8-1200 NI\)"](#) or [STR-9. "Work Flow \(Without GR8-1200 NI\)"](#).)

2. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623. "Ground Inspection"](#).



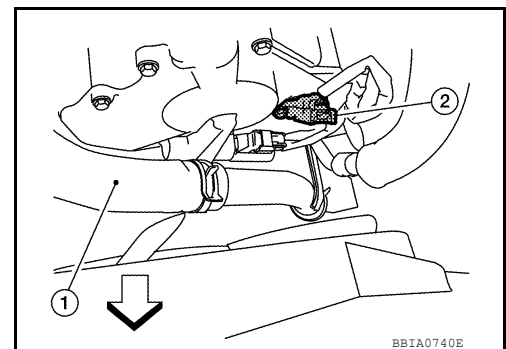
OK or NG

OK >> GO TO 3.

NG >> Repair or replace ground connections.

3. CHECK CAMSHAFT POSITION SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) (2) harness connector.
 - Radiator hose (1)
 - ↙: Vehicle front
2. Turn ignition switch ON.



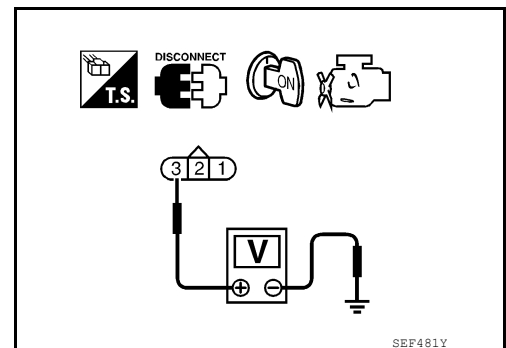
3. Check voltage between CMP sensor (PHASE) terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

P0340 CMP SENSOR (PHASE)

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Check the following.

- Harness connectors F32, E2
- IPDM E/R harness connector E119
- Harness for open or short between camshaft position sensor (PHASE) and ECM
- Harness for open or short between camshaft position sensor (PHASE) and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between CMP sensor (PHASE) terminal 1 and ground.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F32, E2
- Harness for open or short between CMP sensor (PHASE) and ground

>> Repair open circuit or short to power in harness or connectors.

7. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 14 and CMP sensor (PHASE) terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to [EC-751, "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace camshaft position sensor (PHASE). Refer to [EM-193](#).

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358619

CAMSHAFT POSITION SENSOR (PHASE)

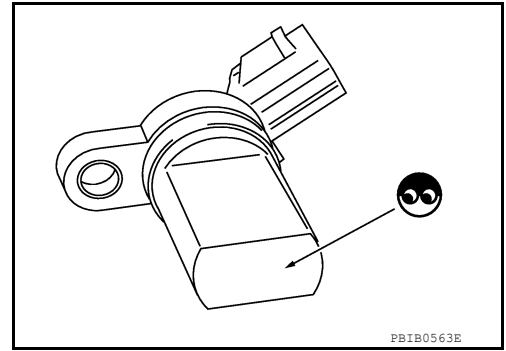
1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor.

P0340 CMP SENSOR (PHASE)

< DTC/CIRCUIT DIAGNOSIS >

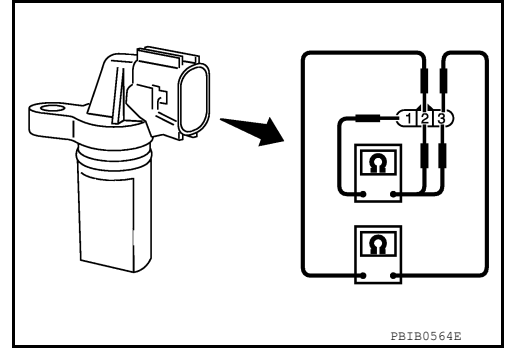
[VK56DE]

4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance [at 25°C (77°F)]
3(+) - 1 (-)	Except 0 or ∞ Ω
2 (+) - 1 (-)	
3 (+) - 2 (-)	



P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0420, P0430 THREE WAY CATALYST FUNCTION

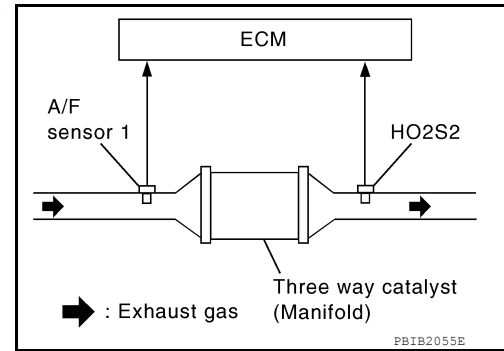
On Board Diagnosis Logic

INFOID:000000007358620

The ECM monitors the switching frequency ratio of air fuel sensor (A/F) sensor 1 and heated oxygen sensor 2.

A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.

When the frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420 0420 (Bank 1)	Catalyst system efficiency below threshold	<ul style="list-style-type: none"> • Three way catalyst (manifold) does not operate properly. • Three way catalyst (manifold) does not have enough oxygen storage capacity. 	<ul style="list-style-type: none"> • Three way catalyst (manifold) • Exhaust tube • Intake air leakage • Fuel injector • Fuel injector leakage • Spark plug • Improper ignition timing
P0430 0430 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358621

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

ⓐ WITH CONSULT

TESTING CONDITION:

Do not hold engine speed for more than the specified minutes below.

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Check that "COOLAN TEMP/S" indicates more than 70°C (158°F).
If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
9. Open engine hood.
10. Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT.
11. Rev engine between 2,000 and 3,000 rpm and hold it for 3 consecutive minutes, then release the accelerator pedal completely.
If "INCMP" of "CATALYST" changed to "CMPLT", go to step 14.
12. Wait 5 seconds at idle.
13. Rev engine between 2,000 and 3,000 rpm and maintain it until "INCMP" of "CATALYST" changes to "CMPLT" (It will take approximately 5 minutes).
If not "CMPLT", stop engine and cool it down to less than 70°C (158°F), and then retest from step 1.
14. Select "SELF-DIAG RESULTS" mode with CONSULT.

P0420, P0430 THREE WAY CATALYST FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

15. Check 1st trip DTC.

If the 1st trip DTC is detected, go to [EC-754, "Diagnosis Procedure"](#).

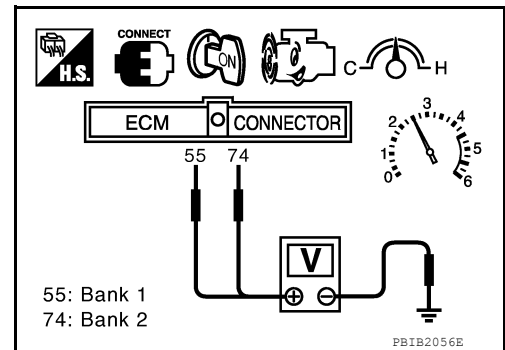
Overall Function Check

INFOID:000000007358622

Use this procedure to check the overall function of the three way catalyst (manifold). During this check, a 1st trip DTC might not be confirmed.

Ⓢ WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Open engine hood.
6. Set voltmeter probes between ECM terminal 55 [HO2S2 (bank 1) signal] and ground, ECM terminal 74 [HO2S2 (bank 2) signal] and ground.
7. Keep engine speed at 2,500 rpm constant under no load.
8. Check that the voltage does not vary for more than 5 seconds.
If the voltage fluctuation cycle takes less than 5 seconds, go to [EC-754, "Diagnosis Procedure"](#).
 - 1 cycle: 0.6 - 1.0 → 0 - 0.3 → 0.6 - 1.0



Diagnosis Procedure

INFOID:000000007358623

1. CHECK EXHAUST SYSTEM

Visually check exhaust tubes and muffler for dents.

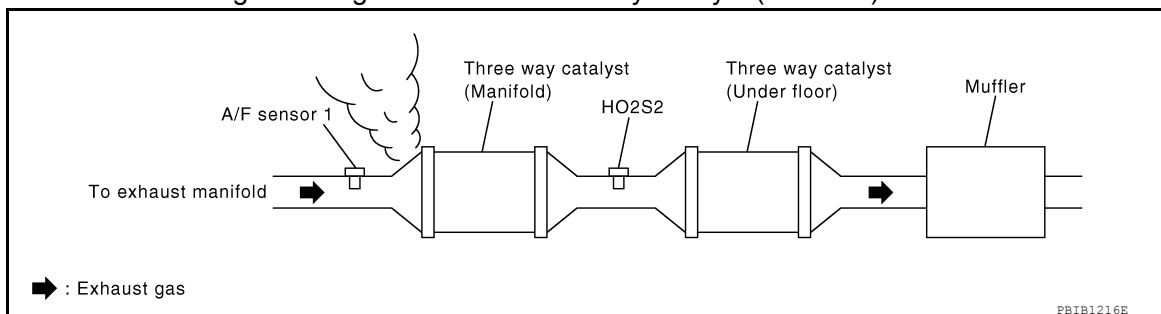
OK or NG

OK >> GO TO 2.

NG >> Repair or replace malfunctioning part.

2. CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before the three way catalyst (manifold).



OK or NG

OK >> GO TO 3.

NG >> Repair or replace malfunctioning part.

3. CHECK INTAKE AIR LEAKAGE

Listen for an intake air leakage after the mass air flow sensor.

OK or NG

OK >> GO TO 4.

NG >> Repair or replace malfunctioning part.

4. CHECK IGNITION TIMING

P0420, P0430 THREE WAY CATALYST FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Check the following items. Refer to [EC-592. "Basic Inspection"](#).

Items	Specifications
Idle speed	650 ± 50 rpm (in P or N position)
Ignition timing	15 ± 5°BTDC (in P or N position)

OK or NG

- OK >> GO TO 5.
- NG >> Follow the instructions on [EC-592. "Basic Inspection"](#).

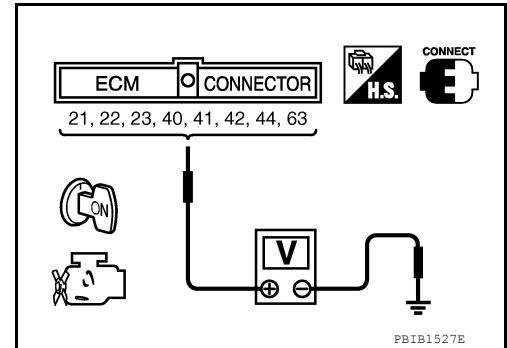
5. CHECK FUEL INJECTOR

1. Stop engine and then turn ignition switch ON.
2. Check voltage between ECM terminals 21, 22, 23, 40, 41, 42, 44, 63 and ground with CONSULT or tester.

Battery voltage should exist.

OK or NG

- OK >> GO TO 6.
- NG >> Perform [EC-925. "Diagnosis Procedure"](#).



6. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

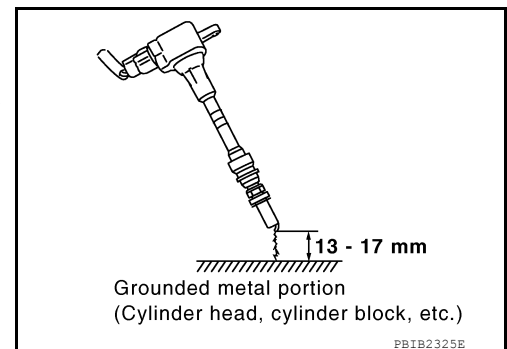
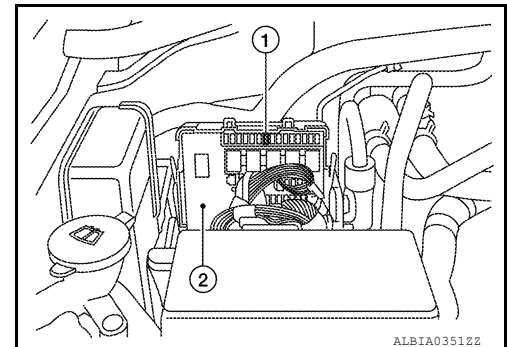
Never following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

3. Start engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked. Refer to [EM-177](#).
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:

- Never place the spark plug and the ignition coil within 50 cm each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might damage the ignition coil if the gap of more than 17 mm is made.

NOTE:

When the gap is less than 13 mm, a spark might be generated even if the coil is malfunctioning.

P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

OK or NG

- OK >> GO TO 10.
- NG >> GO TO 7.

7. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

OK or NG

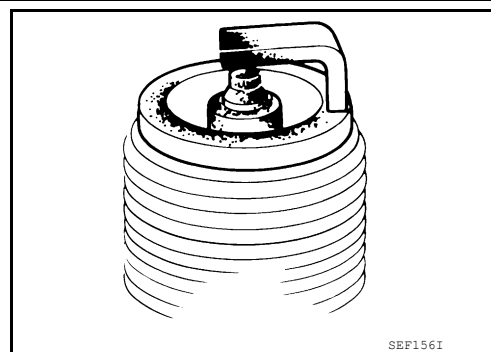
- OK >> GO TO 8.
- NG >> Check ignition coil, power transistor and their circuits. Refer to [EC-931, "Diagnosis Procedure"](#).

8. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

OK or NG

- OK >> Replace malfunctioning spark plug(s) with standard type one(s). For spark plug type, refer to [EM-254, "Standard and Limit"](#).
- NG >> 1. Repair or clean spark plug. Refer to [EM-177](#).
2. GO TO 9.



9. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

OK or NG

- OK >> **INSPECTION END**
- NG >> Replace malfunctioning spark plug(s) with standard type one(s). For spark plug type, refer to [EM-254, "Standard and Limit"](#).

10. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Remove fuel injector assembly. Refer to [EM-180, "Removal and Installation"](#).
Keep fuel hose and all fuel injectors connected to fuel injector gallery.
3. Disconnect all ignition coil harness connectors.
4. Reconnect all fuel injector harness connector disconnected.
5. Turn ignition switch ON.
Make sure fuel does not drip from fuel injector.

OK or NG

- OK (Does not drip.)>>GO TO 11.
- NG (Drips.)>>Replace the fuel injector(s) from which fuel is dripping. Refer to [EM-180](#).

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

Trouble is fixed.>>**INSPECTION END**

Trouble is not fixed.>>Replace malfunctioning three way catalyst assembly. Refer to [EM-169](#).

P0441 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

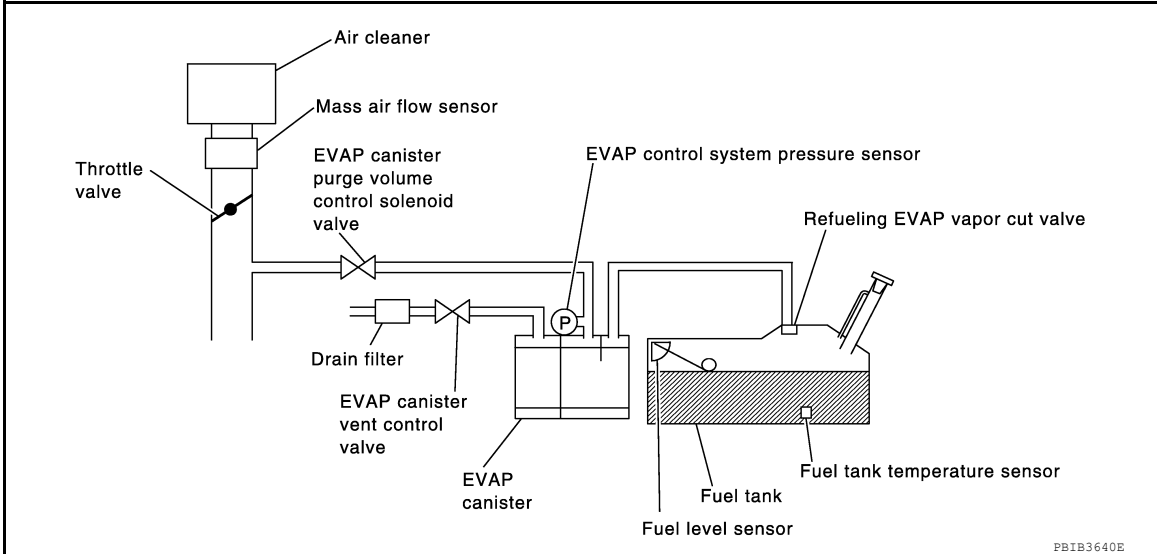
P0441 EVAP CONTROL SYSTEM

System Description

INFOID:000000007358624

NOTE:

If DTC P0441 is displayed with other DTC such as P2122, P2123, P2127, P2128 or P2138, first perform the trouble diagnosis for other DTC.



In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

On Board Diagnosis Logic

INFOID:000000007358625

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a malfunction is determined.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0441 0441	EVAP control system incorrect purge flow	EVAP control system does not operate properly. EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.	<ul style="list-style-type: none"> • EVAP canister purge volume control solenoid valve stuck closed • EVAP control system pressure sensor and the circuit • Loose, disconnected or improper connection of rubber tube • Blocked rubber tube • Cracked EVAP canister • EVAP canister purge volume control solenoid valve circuit • Accelerator pedal position sensor • Blocked purge port • EVAP canister vent control valve • Drain filter

DTC Confirmation Procedure

INFOID:000000007358626

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

P0441 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Always perform test at a temperature of 5°C (41°F) or more.

Ⓜ WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and let it idle for at least 70 seconds.
6. Select "PURG FLOW P0441" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
7. Touch "START".
If "COMPLETED" is displayed, go to step 9.
8. When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 35 seconds.)

Selector lever	Suitable position
VHCL SPEED SE	32 - 120 km/h (20 - 75 MPH)
ENG SPEED	500 - 3,000 rpm
B/FUEL SCHDL	1.0 - 12.0 msec
COOLAN TEMP/S	More than 0 °C (32 °F)

If "TESTING" does not change for a long time, retry from step 2.

9. Check that "OK" is displayed after touching "SELF-DIAG RESULTS".
If "NG" is displayed, go to [EC-758, "Diagnosis Procedure"](#).

Overall Function Check

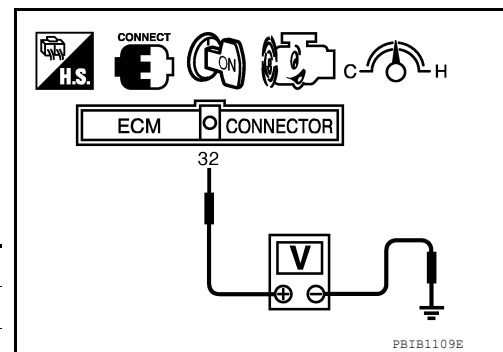
INFOID:000000007358627

Use this procedure to check the overall function of the EVAP control system purge flow monitoring. During this check, a 1st trip DTC might not be confirmed.

Ⓜ WITH GST

1. Lift up drive wheels.
2. Start engine (VDC switch OFF) and warm it up to normal operating temperature.
3. Turn ignition switch OFF, wait at least 10 seconds.
4. Start engine and wait at least 70 seconds.
5. Set voltmeter probes to ECM terminals 32 (EVAP control system pressure sensor signal) and ground.
6. Check EVAP control system pressure sensor value at idle speed and note it.
7. Establish and maintain the following conditions for at least 1 minute.

Air conditioner switch	ON
Headlamp switch	ON
Engine speed	Approx. 3,000 rpm
Selector lever position	Any position other than P, N or R



8. Verify that EVAP control system pressure sensor value stays 0.1 V less than the value at idle speed (measured at step 8) for at least 1 second.
9. If NG, go to [EC-758, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358628

1. CHECK EVAP CANISTER

1. Turn ignition switch OFF.
2. Check EVAP canister for cracks.

P0441 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

OK or NG

- OK (With CONSULT)>>GO TO 2.
- OK (Without CONSULT)>>GO TO 3.
- NG >> Replace EVAP canister. Refer to [FL-16. "Removal and Installation"](#).

2.CHECK PURGE FLOW

With CONSULT

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve and EVAP service port from EVAP service port. For the location of EVAP service port, refer to [EC-516. "Description"](#).
2. Install vacuum gauge between the vacuum hose and EVAP service port.
3. Start engine and let it idle.
4. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT.
5. Rev engine up to 2,000 rpm.
6. Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL C/V" opening and check vacuum existence.

PURG VOL C/V	Vacuum
100%	Should exist.
0%	Should not exist.

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 4.

3.CHECK PURGE FLOW

Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve and EVAP service port from EVAP service port. For the location of EVAP service port, refer to [EC-516. "Description"](#).
4. Install vacuum gauge between the vacuum hose and EVAP service port.
5. Start engine and let it idle.
Never depress accelerator pedal even slightly.
6. Check vacuum gauge indication before 60 seconds pass after starting engine.

Vacuum should not exist.

7. Rev engine up to 2,000 rpm after 100 seconds pass after starting engine.

Vacuum should exist.

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 4.

4.CHECK EVAP PURGE LINE

1. Turn ignition switch OFF.
2. Check EVAP purge line for improper connection or disconnection.
Refer to [EC-516. "Description"](#).

OK or NG

- OK >> GO TO 5.
- NG >> Repair malfunctioning part.

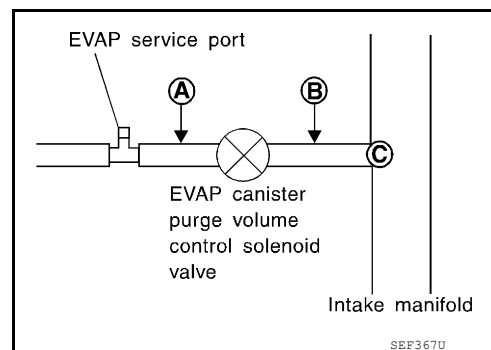
5.CHECK EVAP PURGE HOSE AND PURGE PORT

P0441 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Disconnect purge hoses connected to EVAP service port **A** and EVAP canister purge volume control solenoid valve **B**.
2. Blow air into each hose and EVAP purge port **C**.



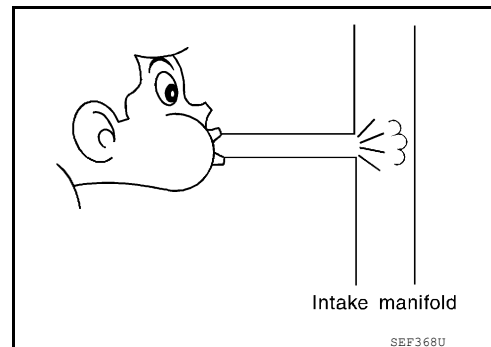
3. Check that air flows freely.

OK or NG

OK (With CONSULT)>>GO TO 6.

OK (Without CONSULT)>>GO TO 7.

NG >> Repair or clean hoses and/or purge port.



6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 8.

NG >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-776, "Component Inspection"](#).

OK or NG

OK >> GO TO 8.

NG >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-165](#).

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 9.

NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to DTC Confirmation Procedure for DTC P0452, [EC-790, "DTC Confirmation Procedure"](#) and for P0453, [EC-794, "DTC Confirmation Procedure"](#).

OK or NG

OK >> GO TO 10.

NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

10. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.

P0441 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 11.

NG >> Clean the rubber tube using an air blower.

11. CHECK DRAIN FILTER

Refer to [EC-761, "Component Inspection"](#).

OK or NG

OK >> GO TO 12.

NG >> Replace drain filter. Refer to [EC-516](#).

12. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to [EC-779, "Component Inspection"](#).

OK or NG

OK >> GO TO 13.

NG >> Replace EVAP canister vent control valve. [FL-16, "Removal and Installation"](#)

13. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.

Refer to [EC-516, "Description"](#).

OK or NG

OK >> GO TO 14.

NG >> Replace malfunctioning part.

14. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 15.

15. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

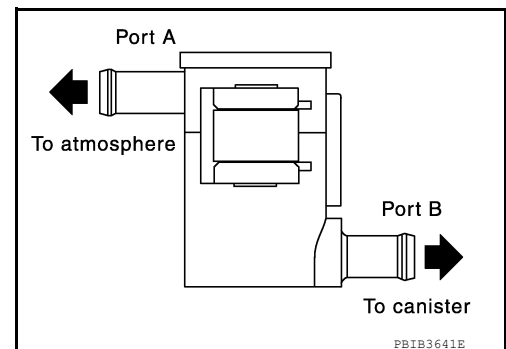
>> **INSPECTION END**

Component Inspection

INFOID:000000007358629

DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter. Refer to [EC-516](#)



P0442 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

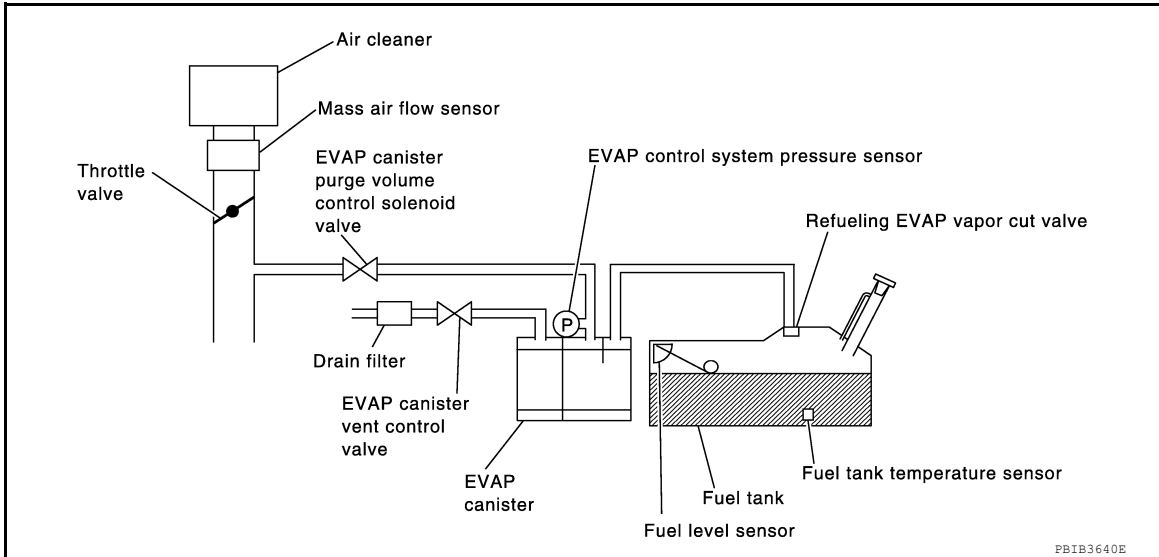
[VK56DE]

P0442 EVAP CONTROL SYSTEM

On Board Diagnosis Logic

INFOID:000000007358630

This diagnosis detects leaks in the EVAP purge line using engine intake manifold vacuum. If pressure does not increase, the ECM will check for leaks in the line between the fuel tank and EVAP canister purge volume control solenoid valve, under the following "Vacuum test" conditions. The EVAP canister vent control valve is closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve will then be opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid valve will be closed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0442 0442	EVAP control system small leak detected (negative pressure)	EVAP control system has a leak, EVAP control system does not operate properly.	<ul style="list-style-type: none"> • Incorrect fuel tank vacuum relief valve • Incorrect fuel filler cap used • Fuel filler cap remains open or does not close • Foreign matter caught in fuel filler cap • Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve • Foreign matter caught in EVAP canister vent control valve • EVAP canister or fuel tank leaks • EVAP purge line (pipe and rubber tube) leaks • EVAP purge line rubber tube bent • Loose or disconnected rubber tube • EVAP canister vent control valve and the circuit • EVAP canister purge volume control solenoid valve and the circuit • Fuel tank temperature sensor • Drain filter • O-ring of EVAP canister vent control valve is missing or damaged • EVAP canister is saturated with water • EVAP control system pressure sensor • Fuel level sensor and the circuit • Refueling EVAP vapor cut valve • ORVR system leaks

CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.
- If the fuel filler cap is not tightened properly, the MIL may illuminate.
- Use only a genuine NISSAN rubber tube as a replacement.

P0442 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

INFOID:000000007358631

DTC Confirmation Procedure

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Perform "DTC WORK SUPPORT" when the fuel level is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.
- Always perform test at a temperature of 0 to 30°C (32 to 86°F).

CONSULT WITH CONSULT

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
4. Check that the following conditions are met.
COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
INT/A TEMP SE: 0 - 30°C (32 - 86°F)
5. Select "EVP V/S LEAK P0456/P1456" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.

Follow the instructions displayed.

NOTE:

If the engine speed cannot be maintained within the range displayed on the CONSULT screen, go to [EC-592, "Basic Inspection"](#).

6. Check that "OK" is displayed.
If "NG" is displayed, go to [EC-763, "Diagnosis Procedure"](#).

NOTE:

Check that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

GST WITH GST

NOTE:

Always read the explanation of "Driving Pattern" in [EC-527, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#) before driving vehicle.

1. Start engine.
2. Drive vehicle according to "Driving Pattern" in [EC-527, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).
3. Stop vehicle.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Select Service \$07 with GST.
 - If P0442 is displayed on the screen, go to [EC-763, "Diagnosis Procedure"](#).
 - If P0441 is displayed on the screen, go to [EC-758, "Diagnosis Procedure"](#).

Diagnosis Procedure

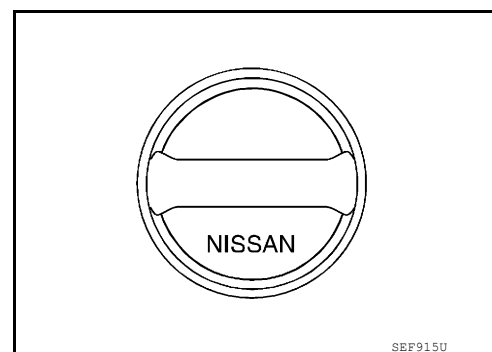
INFOID:000000007358632

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

- OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



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P0442 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.

- NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to [EC-768, "Component Inspection"](#).

OK or NG

OK >> GO TO 5.

NG >> Replace fuel filler cap with a genuine one.

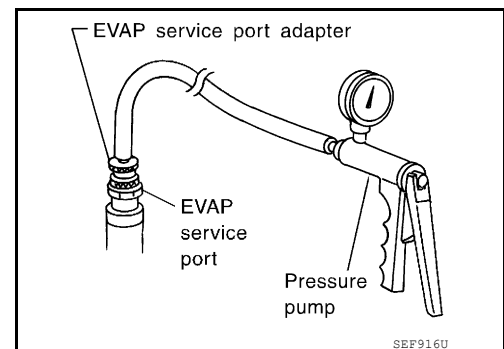
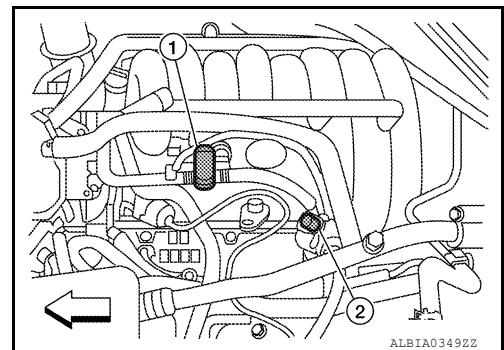
5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port securely.

NOTE:

Improper installation of the EVAP service port adapter (commercial service tool) to the EVAP service port may cause leaking.

- EVAP canister purge volume control solenoid valve (1)
- EVAP service port (2)
- ↶: Vehicle front



With CONSULT>>GO TO 6.

Without CONSULT>>GO TO 7.

6. CHECK FOR EVAP LEAK

With CONSULT

1. Turn ignition switch ON.
2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

CAUTION:

- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

P0442 EVAP CONTROL SYSTEM

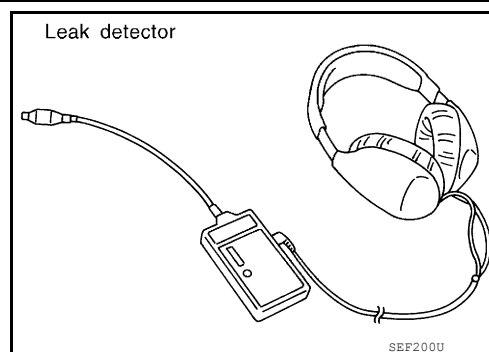
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Using EVAP leak detector (commercial service tool), locate the EVAP leak. For the leak detector (commercial service tool), refer to the instruction manual for more details.

OK or NG

- OK >> GO TO 8.
NG >> Repair or replace malfunctioning part.



7. CHECK FOR EVAP LEAK

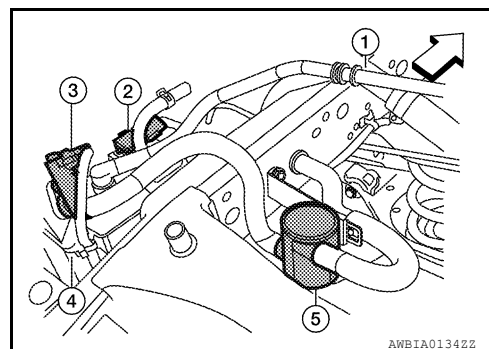
⊗ Without CONSULT

1. Turn ignition switch OFF.
2. Apply 12 volts DC to EVAP canister vent control valve (3). The valve will close. (Continue to apply 12 volts until the end of test.)
 - Fuel filler pipe (top of frame view) (1)
 - EVAP control system pressure sensor (2)
 - EVAP canister (4)
 - Drain filter (5)
 - ⇐: Vehicle front
3. Pressurize the EVAP line using pressure pump with 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm², 0.2 to 0.4 psi), then remove the pressure pump and EVAP service port adapter (commercial service tool). Refer to [FL-16, "Removal and Installation"](#).

CAUTION:

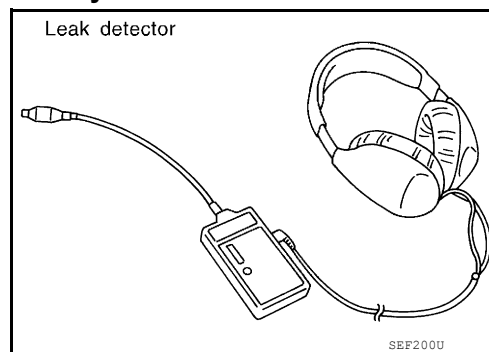
- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

4. Using EVAP leak detector (commercial service tool), locate the EVAP leak. For the leak detector (commercial service tool), refer to the instruction manual for more details.



OK or NG

- OK >> GO TO 8.
NG >> Repair or replace malfunctioning part+.



8. CHECK DRAIN FILTER

Refer to [EC-768, "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
NG >> Replace drain filter. Refer to [EC-516](#).

9. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

- EVAP canister vent control valve is installed properly. Refer to [FL-16, "Component Inspection"](#).
- EVAP canister vent control valve. Refer to [FL-16, "Component Inspection"](#).

OK or NG

- OK >> GO TO 10.
NG >> Repair or replace EVAP canister vent control valve and O-ring. Refer to [FL-16, "Removal and Installation"](#).

10. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

P0442 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

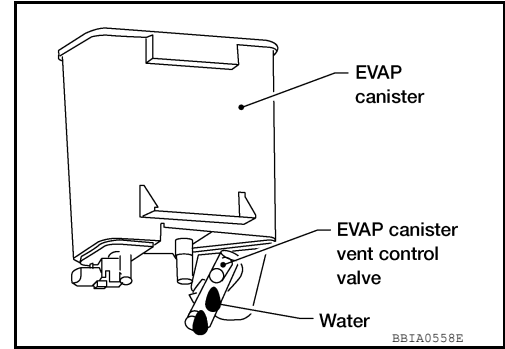
1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16, "Removal and Installation"](#).
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 11.

No (With CONSULT)>>GO TO 13.

No (Without CONSULT)>>GO TO 14.



11. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

OK (With CONSULT)>>GO TO 13.

OK (Without CONSULT)>>GO TO 14.

NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and drain filter for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-16, "Removal and Installation"](#).

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Ⓟ With CONSULT

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve and EVAP service port from EVAP service port.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qu" on CONSULT screen to increase "PURG VOL C/V" opening to 100%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 16.

NG >> GO TO 15.

14. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

ⓧ Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve and EVAP service port from EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 17.

NG >> GO TO 15.

P0442 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

15. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to [EC-516, "Description"](#).

OK or NG

OK >> GO TO 16.

NG >> Repair or reconnect the hose.

16. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-776, "Component Inspection"](#).

OK or NG

OK >> GO TO 17.

NG >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-165](#).

17. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to [EC-730, "Component Inspection"](#).

OK or NG

OK >> GO TO 18.

NG >> Replace "fuel level sensor unit and fuel pump". Refer to [FL-18](#).

18. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-788, "Component Inspection"](#).

OK or NG

OK >> GO TO 19.

NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

19. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.

Refer to [EC-516, "Description"](#).

OK or NG

OK >> GO TO 20.

NG >> Repair or reconnect the hose.

20. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 21.

21. CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kinks, looseness and improper connection. For location, refer to [EC-937, "System Description"](#).

OK or NG

OK >> GO TO 22.

NG >> Repair or replace hoses and tubes.

22. CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kinks, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 23.

NG >> Repair or replace hose, tube or filler neck tube.

23. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to [EC-940, "Component Inspection"](#).

OK or NG

OK >> GO TO 24.

NG >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-16, "Removal and Installation"](#).

P0442 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

24. CHECK FUEL LEVEL SENSOR

Refer to [MWI-34, "Component Function Check"](#).

OK or NG

OK >> GO TO 25.

NG >> Replace fuel level sensor unit. Refer to [FL-18](#).

25. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

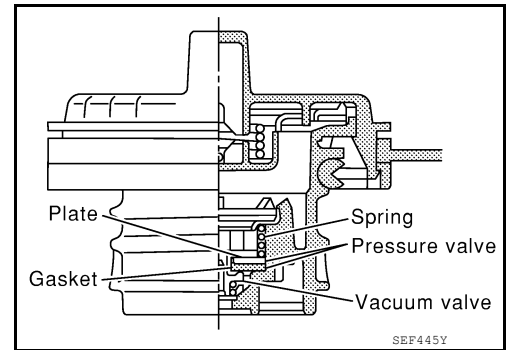
>> INSPECTION END

Component Inspection

INFOID:000000007358633

FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.



2. Check valve opening pressure and vacuum.

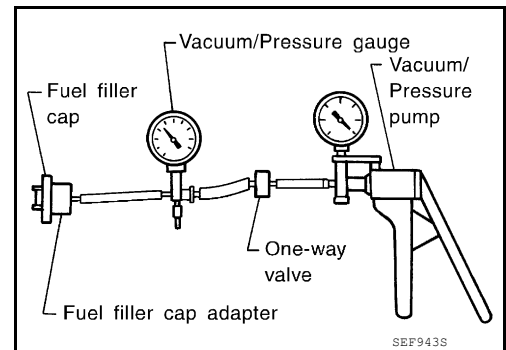
Pressure: 15.3 - 20.0 kPa (0.156 - 0.204 kg/cm², 2.22 - 2.90 psi)

Vacuum: -6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm², -0.87 to -0.48 psi)

3. If out of specification, replace fuel filler cap as an assembly.

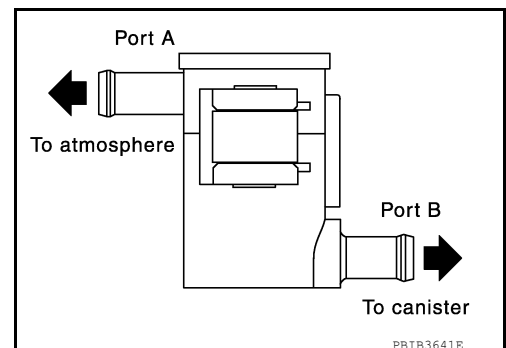
CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.



DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter.



P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

INFOID:000000007358634

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
Unified meter control unit	Vehicle speed*2		

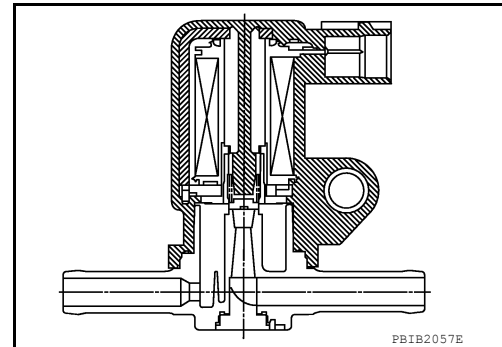
*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to the ECM via the CAN communication line.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve is used to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



On Board Diagnosis Logic

INFOID:000000007358635

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0443 0443	EVAP canister purge volume control solenoid valve	The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.	<ul style="list-style-type: none"> • EVAP control system pressure sensor • EVAP canister purge volume control solenoid valve (The valve is stuck open.) • EVAP canister vent control valve • Drain filter • EVAP canister • Hoses (Hoses are connected incorrectly or clogged.)

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

DTC Confirmation Procedure

INFOID:000000007358636

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

CONSULT WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select "PURG VOL CN/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
7. Touch "START".
8. Start engine and let it idle until "TESTING" on CONSULT changes to "COMPLETED". (It will take approximately 10 seconds.)
If "TESTING" is not displayed after 5 minutes, retry from step 2.
9. Check that "OK" is displayed after touching "SELF-DIAG RESULTS".
If "NG" is displayed, go to [EC-770. "Diagnosis Procedure"](#).

GST WITH GST

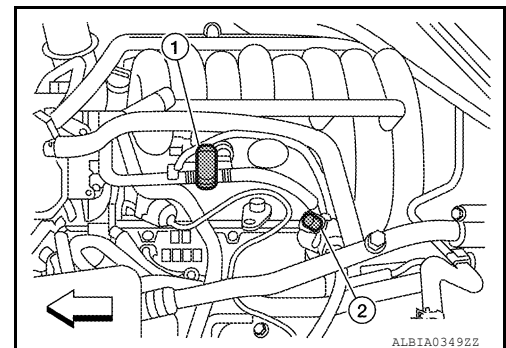
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and let it idle for at least 20 seconds.
6. Select Service \$07 with GST.
7. If 1st trip DTC is detected, go to [EC-770. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358637

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve
(1) harness connector.
- EVAP service port (2)
- ⇐: Vehicle front
3. Turn ignition switch ON.



P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

[VK56DE]

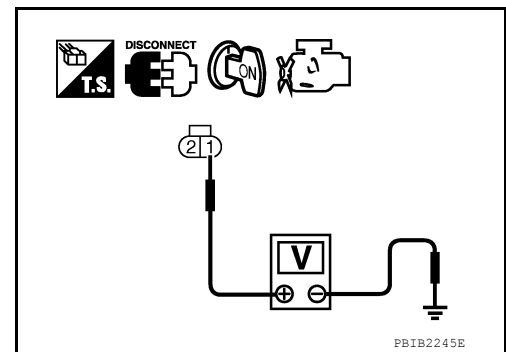
< DTC/CIRCUIT DIAGNOSIS >

4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 3.
- NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 45 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

- OK >> GO TO 5.
- NG >> Replace EVAP control system pressure sensor. Refer to [FL-16. "Removal and Installation"](#).

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-788. "Component Inspection"](#).

OK or NG

- OK (With CONSULT) >> GO TO 6.
- OK (Without CONSULT) >> GO TO 7.
- NG >> Replace EVAP control system pressure sensor. Refer to [FL-16. "Removal and Installation"](#).

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine.
4. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT.
5. Check that engine speed varies according to the valve opening.

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-773, "Component Inspection"](#).

OK or NG

- OK >> GO TO 8.
- NG >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-165](#).

8. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

- OK >> GO TO 9.
- NG >> Clean the rubber tube using an air blower.

9. CHECK DRAIN FILTER

Refer to [EC-761, "Component Inspection"](#).

OK or NG

- OK >> GO TO 10.
- NG >> Replace drain filter. Refer to [EC-516](#).

10. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to [EC-779, "Component Inspection"](#).

OK or NG

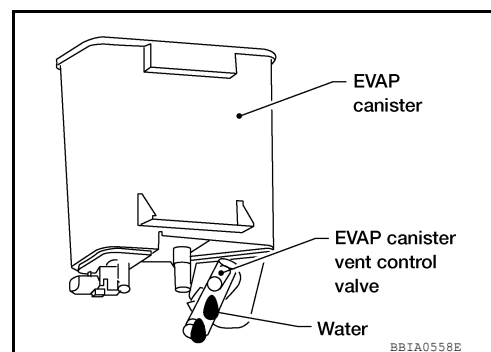
- OK >> GO TO 11.
- NG >> Replace EVAP canister vent control valve. Refer to [FL-16, "Removal and Installation"](#).

11. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16, "Removal and Installation"](#).
2. Check if water will drain from the EVAP canister.

Yes or No

- Yes >> GO TO 12.
- No >> GO TO 14.



12. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

- OK >> GO TO 14.
- NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and drain filter for clogging or poor connection

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

>> Repair hose or replace EVAP canister. Refer to [FL-16, "Removal and Installation"](#).

14. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

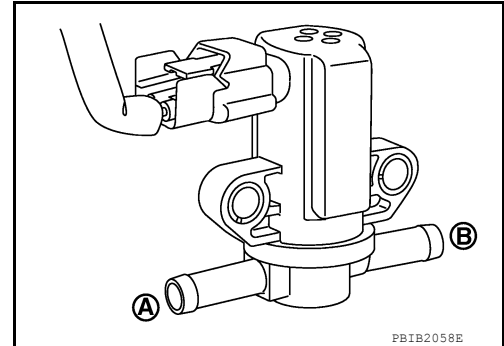
INFOID:000000007358638

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

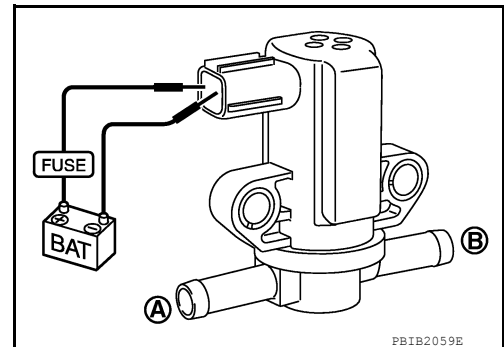
Condition (PURG VOL C/V value)	Air passage continuity between A and B
100%	Yes
0%	No



Without CONSULT

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No



A
EC
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P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

INFOID:000000007358639

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
Unified meter control unit	Vehicle speed*2		

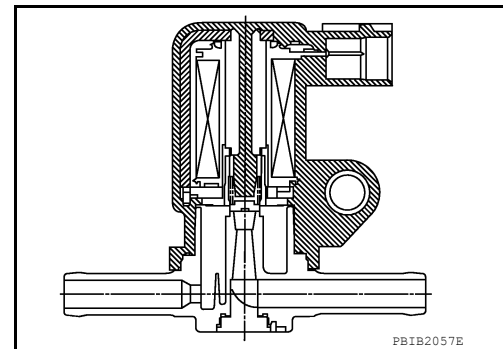
*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to the ECM via the CAN communication line.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve is used to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



On Board Diagnosis Logic

INFOID:000000007358640

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444 0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve	<ul style="list-style-type: none"> Harness or connectors (The solenoid valve circuit is open or shorted.) EVAP canister purge volume control solenoid valve
P0445 0445	EVAP canister purge volume control solenoid valve circuit shorted	An excessively high voltage signal is sent to ECM through the valve	<ul style="list-style-type: none"> Harness or connectors (The solenoid valve circuit is shorted.) EVAP canister purge volume control solenoid valve

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

DTC Confirmation Procedure

INFOID:000000007358641

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

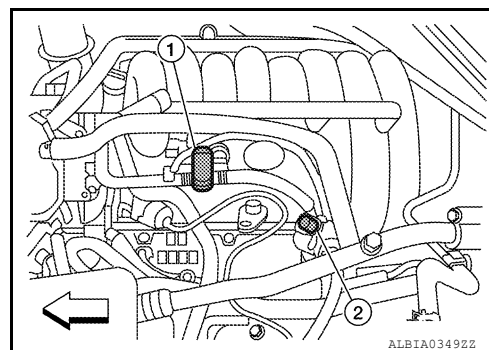
1. Start engine and let it idle for at least 13 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-775. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358642

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve (1) harness connector.
 - EVAP service port (2)
 - ↶: Vehicle front
3. Turn ignition switch ON.

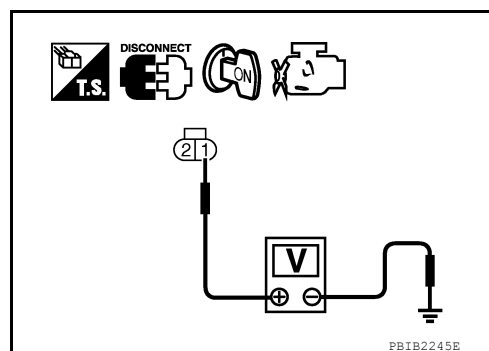


4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 45 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Also check harness for short to ground and short to power.

OK or NG

OK (With CONSULT)>>GO TO 4.

OK (Without CONSULT)>>GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

1. Reconnect all harness connectors disconnected.

2. Start engine.

3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

5.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-776, "Component Inspection"](#).

OK or NG

OK >> GO TO 6.

NG >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-165](#).

6.CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

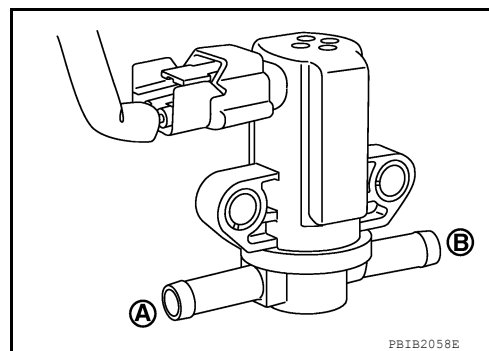
INFOID:000000007358643

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition (PURG VOL C/V value)	Air passage continuity between A and B
100%	Yes
0%	No

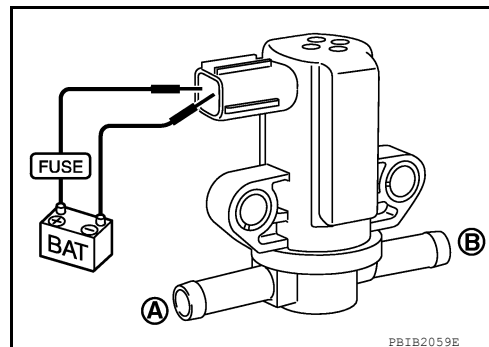


PBIB2058E

Without CONSULT

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No



PBIB2059E

P0447 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

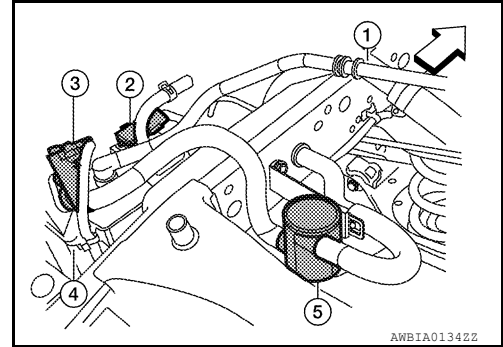
P0447 EVAP CANISTER VENT CONTROL VALVE

Component Description

INFOID:000000007358644

The EVAP canister vent control valve (3) is located on the EVAP canister (4) and is used to seal the canister vent.

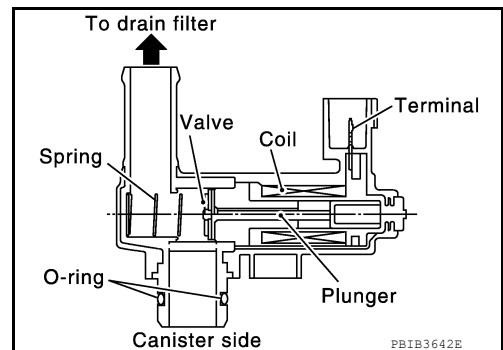
- Fuel filler pipe (top of frame view) (1)
- EVAP control system pressure sensor (2)
- Drain filter (5)
- ←: Vehicle front



This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System" diagnosis.



On Board Diagnosis Logic

INFOID:000000007358645

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0447 0447	EVAP canister vent control valve circuit open	An improper voltage signal is sent to ECM through EVAP canister vent control valve.	<ul style="list-style-type: none"> • Harness or connectors (The valve circuit is open or shorted.) • EVAP canister vent control valve • Drain filter

DTC Confirmation Procedure

INFOID:000000007358646

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

1. Start engine and wait at least 8 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-777, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358647

1. INSPECTION START

Will CONSULT be used?

Yes or No

- Yes >> GO TO 2.
- No >> GO TO 3.

P0447 EVAP CANISTER VENT CONTROL VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT

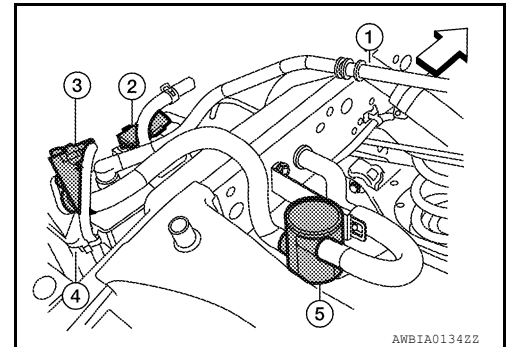
1. Turn ignition switch OFF and then ON.
2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.
3. Touch "ON/OFF" on CONSULT screen.
4. Check for operating sound of the valve.
Clicking noise should be heard.

OK or NG

- OK >> GO TO 7.
NG >> GO TO 3.

3. CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
 - Disconnect EVAP canister vent control valve (3) harness connector.
 - Fuel filler pipe (top of frame view) (1)
 - EVAP control system pressure sensor (2)
 - EVAP canister (4)
 - Drain filter (5)
 - ↵: Vehicle front
2. Turn ignition switch ON.

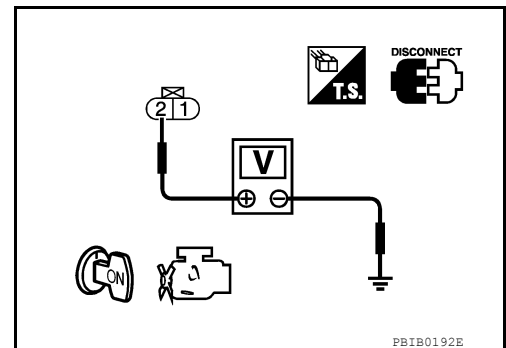


3. Check voltage between EVAP canister vent control valve terminal 2 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E41, C1
- IPDM E/R harness connector E119
- Harness for open or short between EVAP canister vent control valve and IPDM E/R

>> Repair harness or connectors.

5. CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 117 and EVAP canister vent control valve terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
NG >> GO TO 6.

P0447 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E41, C1
- Harness for open or short between EVAP canister vent control valve and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 8.

NG >> Clean the rubber tube using an air blower.

8. CHECK DRAIN FILTER

Refer to [EC-779, "Component Inspection"](#).

OK or NG

OK >> GO TO 9.

NG >> Replace drain filter. Refer to [EC-516](#).

9. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to [EC-779, "Component Inspection"](#).

OK or NG

OK >> GO TO 10.

NG >> Replace EVAP canister vent control valve. Refer to [FL-16, "Removal and Installation"](#).

10. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

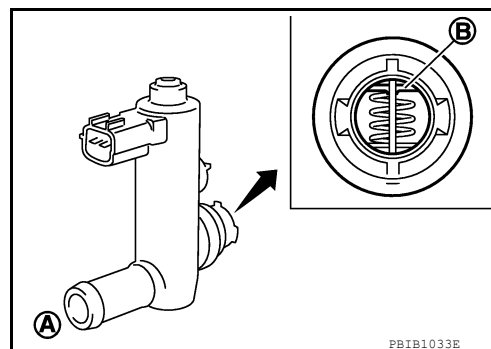
Component Inspection

INFOID:000000007358648

EVAP CANISTER VENT CONTROL VALVE

Ⓟ With CONSULT

1. Remove EVAP canister vent control valve from EVAP canister. Refer to [FL-16, "Removal and Installation"](#).
2. Check portion B of EVAP canister vent control valve for being rusted.
If NG, replace EVAP canister vent control valve. Refer to [FL-16, "Removal and Installation"](#).
If OK, go to next step.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch ON.
5. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
6. Check air passage continuity and operation delay time.
Check that new O-ring is installed properly.



VENT CONTROL/V Condition	Air passage continuity between A and B
ON	No
OFF	Yes

Operation takes less than 1 second.

If NG, go to next step.

7. Clean the air passage (portion A to B) of EVAP canister vent control valve using an air blower.

P0447 EVAP CANISTER VENT CONTROL VALVE

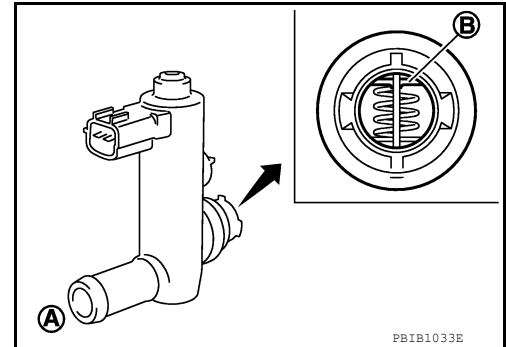
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

8. Perform step 6 again.
9. If NG, replace EVAP canister vent control valve. Refer to [FL-16, "Removal and Installation"](#).

⊗ Without CONSULT

1. Remove EVAP canister vent control valve from EVAP canister. Refer to [FL-16, "Removal and Installation"](#).
2. Check portion B of EVAP canister vent control valve for rust.

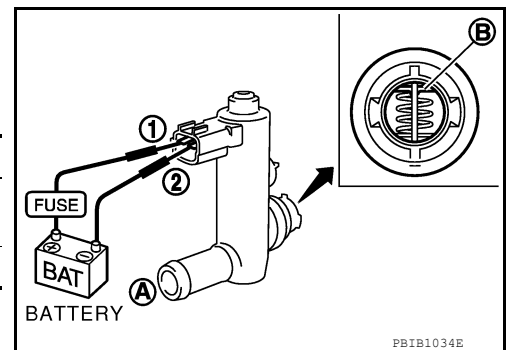


3. Check air passage continuity and operation delay time under the following conditions.
Check that new O-ring is installed properly.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	No
OFF	Yes

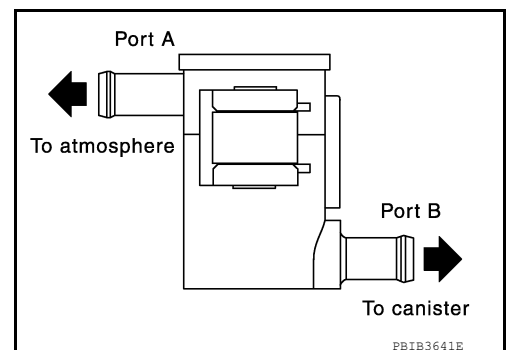
Operation takes less than 1 second.
If NG, go to next step.

4. Clean the air passage (portion A to B) of EVAP canister vent control valve using an air blower.
5. Perform step 3 again.
6. If NG, replace EVAP canister vent control valve. Refer to [FL-16, "Removal and Installation"](#).



DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter. Refer to [EC-516](#).



P0448 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

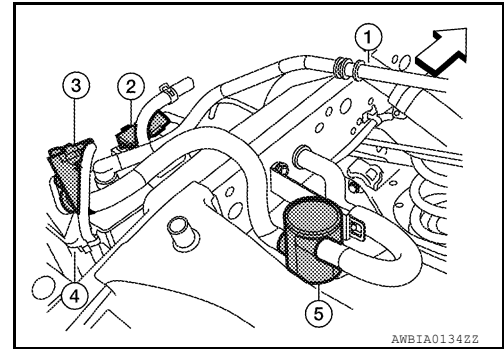
P0448 EVAP CANISTER VENT CONTROL VALVE

Component Description

INFOID:000000007358649

The EVAP canister vent control valve (3) is located on the EVAP canister (4) and is used to seal the canister vent.

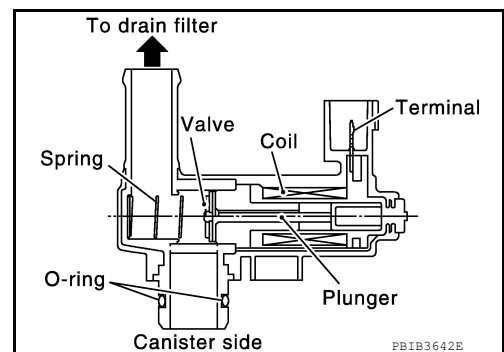
- Fuel filler pipe (top of frame view) (1)
- EVAP control system pressure sensor (2)
- Drain filter (5)
- ⇐: Vehicle front



This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System" diagnosis.



On Board Diagnosis Logic

INFOID:000000007358650

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0448 0448	EVAP canister vent control valve close	EVAP canister vent control valve remains closed under specified driving conditions.	<ul style="list-style-type: none"> • EVAP canister vent control valve • EVAP control system pressure sensor and the circuit • Blocked rubber tube to EVAP canister vent control valve • Drain filter • EVAP canister is saturated with water

DTC Confirmation Procedure

INFOID:000000007358651

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON and wait at least 5 seconds.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and let it idle for at least 1 minute.
5. Repeat next procedures 3 times.
 - a. Rev engine between 3,000 and 3,500 rpm, then maintain that speed for 2 minutes and 50 seconds to 3 minutes.
Do not exceed 3 minutes.
 - b. Fully released accelerator pedal and keep engine idle for approximately 5 seconds.
6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to [EC-782. "Diagnosis Procedure"](#).

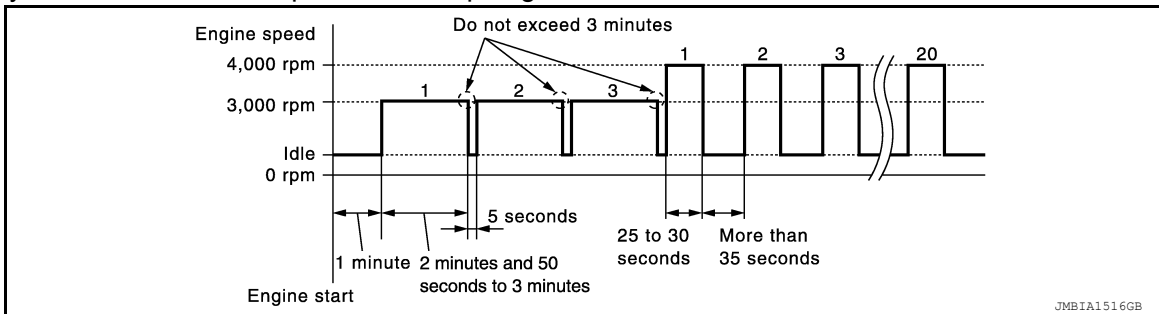
P0448 EVAP CANISTER VENT CONTROL VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

If 1st trip DTC is not detected, go to the next step.

8. Repeat next procedure 20 times.
 - a. Quickly rev engine between 4,000 and 4,500 rpm or more, then maintain that speed for 25 to 30 seconds.
 - b. Fully released accelerator pedal and keep engine idle for at least 35 seconds.



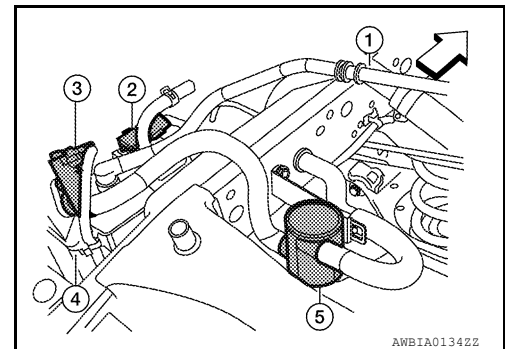
9. Check 1st trip DTC.
10. If 1st trip DTC is detected, go to [EC-782, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358652

1. CHECK RUBBER TUBE

1. Turn ignition switch OFF.
2. Disconnect rubber tube connected to EVAP canister vent control valve (3).
 - Fuel filler pipe (top of frame view) (1)
 - EVAP control system pressure sensor (2)
 - EVAP canister (4)
 - Drain filter (5)
 - ←: Vehicle front
3. Check the rubber tube for clogging.



OK or NG

- OK >> GO TO 2.
- NG >> Clean rubber tube using an air blower.

2. CHECK DRAIN FILTER

Refer to [EC-783, "Component Inspection"](#).

OK or NG

- OK >> GO TO 3.
- NG >> Replace drain filter. Refer to [EC-516](#).

3. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to [EC-783, "Component Inspection"](#).

OK or NG

- OK >> GO TO 4.
- NG >> Replace EVAP canister vent control valve. Refer to [FL-16, "Removal and Installation"](#).

4. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16, "Removal and Installation"](#).

P0448 EVAP CANISTER VENT CONTROL VALVE

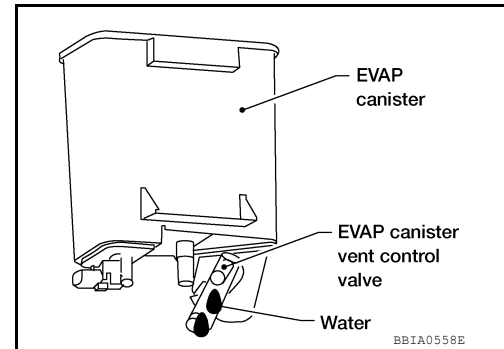
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check if water will drain from the EVAP canister.

Yes or No

- Yes >> GO TO 5.
- No >> GO TO 7.



5. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and drain filter for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-16, "Removal and Installation"](#).

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

- OK >> GO TO 8.
- NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-788, "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358653

EVAP CANISTER VENT CONTROL VALVE

Ⓟ With CONSULT

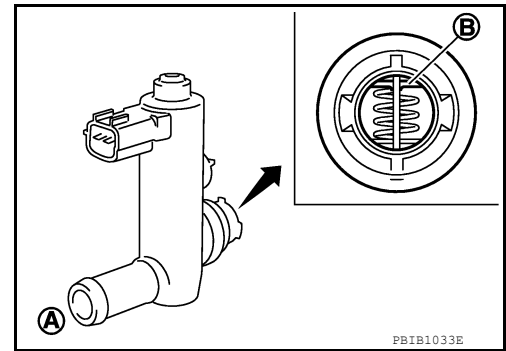
1. Remove EVAP canister vent control valve from EVAP canister. Refer to [FL-16, "Removal and Installation"](#).

P0448 EVAP CANISTER VENT CONTROL VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check portion B of EVAP canister vent control valve for being rusted.
If NG, replace EVAP canister vent control valve. Refer to [FL-16. "Removal and Installation"](#).
If OK, go to next step.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch ON.
5. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
6. Check air passage continuity and operation delay time.
Check that new O-ring is installed properly.



VENT CONTROL/V Condition	Air passage continuity between A and B
ON	No
OFF	Yes

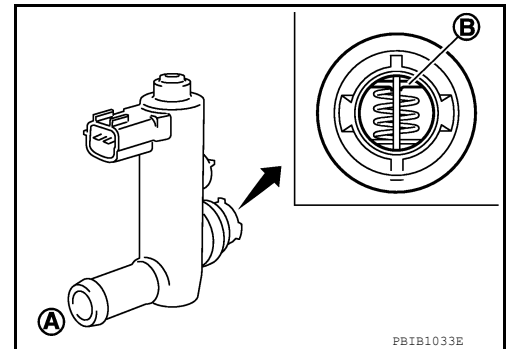
Operation takes less than 1 second.

If NG, go to next step.

7. Clean the air passage (portion A to B) of EVAP canister vent control valve using an air blower.
8. Perform step 6 again.
9. If NG, replace EVAP canister vent control valve. Refer to [FL-16. "Removal and Installation"](#).

⊗ Without CONSULT

1. Remove EVAP canister vent control valve from EVAP canister. Refer to [FL-16. "Removal and Installation"](#).
2. Check portion B of EVAP canister vent control valve for rust.



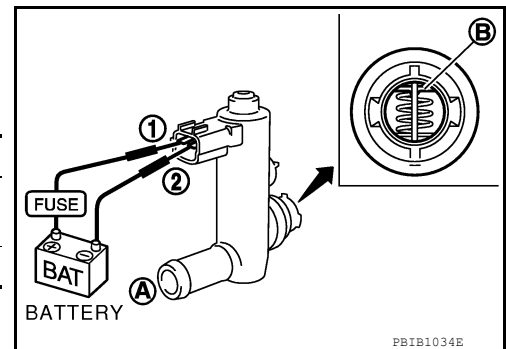
3. Check air passage continuity and operation delay time under the following conditions.
Check that new O-ring is installed properly.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	No
OFF	Yes

Operation takes less than 1 second.

If NG, go to next step.

4. Clean the air passage (portion A to B) of EVAP canister vent control valve using an air blower.
5. Perform step 3 again.
6. If NG, replace EVAP canister vent control valve. Refer to [FL-16. "Removal and Installation"](#).



DRAIN FILTER

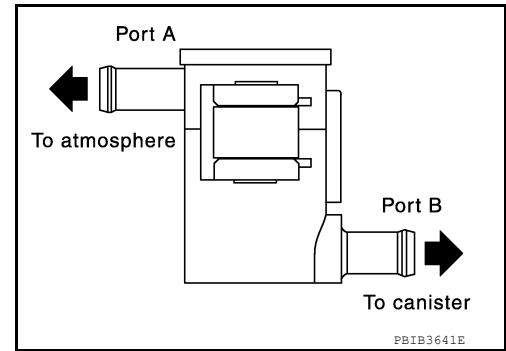
1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.

P0448 EVAP CANISTER VENT CONTROL VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter. Refer to [EC-516](#).



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P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

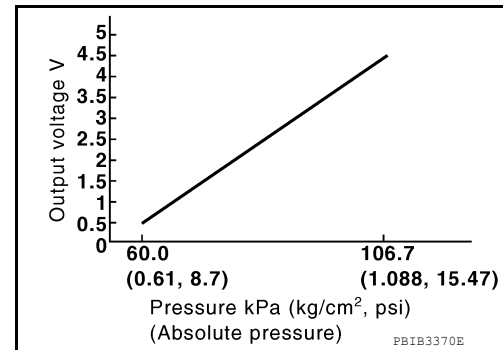
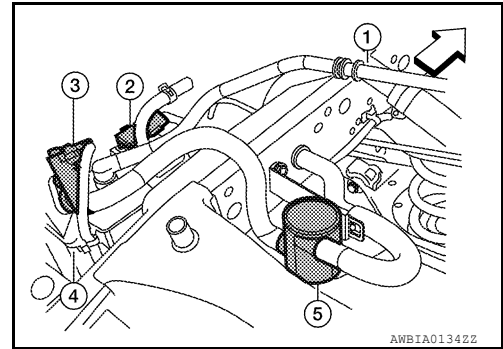
P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

Component Description

INFOID:000000007358654

The EVAP control system pressure sensor (2) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- Fuel filler pipe (top of frame view) (1)
- EVAP canister vent control valve (3)
- EVAP canister (4)
- Drain filter (5)
- ↖: Vehicle front



On Board Diagnosis Logic

INFOID:000000007358655

NOTE:

If DTC P0451 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-836, "DTC Confirmation Procedure"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0451 0451	EVAP control system pressure sensor performance	ECM detects a sloshing signal from the EVAP control system pressure sensor	<ul style="list-style-type: none"> • Harness or connectors • EVAP control system pressure sensor

DTC Confirmation Procedure

INFOID:000000007358656

NOTE:

Never remove fuel filler cap during DTC confirmation procedure.

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

With CONSULT>>GO TO 2.

Without CONSULT>>GO TO 5.

2. PERFORM DTC CONFIRMATION PROCEDURE-1

Ⓜ With CONSULT

1. Start engine and let it idle for least 40 seconds.

NOTE:

Do not depress accelerator pedal even slightly.

2. Check 1st trip DTC.

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Is 1st trip DTC detected?

- YES >> Proceed to [EC-787, "Diagnosis Procedure"](#).
- NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-2

 With CONSULT

1. Select "EVAP DIAG READY" in "DATA MONITOR" mode of "ENGINE".
2. Let it idle until "OFF" of "EVAP DIAG READY" changes to "ON".

NOTE:

It will take at most 2 hours until "OFF" of "EVAP DIAG READY" changes to "ON".

3. Turn ignition switch OFF and wait at least 90 minutes.

NOTE:

Never turn ignition switch ON during 90 minutes.

4. Turn ignition switch ON.
5. Select "EVAP LEAK DIAG" in "DATA MONITOR" mode of "ENGINE".
6. Check that "EVAP LEAK DIAG" indication.

Which is displayed on CONSULT?

CMPLT >> GO TO 4.

- YET >> 1. Perform DTC CONFIRMATION PROCEDURE again.
- 2. GO TO 1.

4.PERFORM DTC CONFIRMATION PROCEDURE-3

 With CONSULT

Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-787, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

5.PERFORM DTC CONFIRMATION PROCEDURE-4

 With GST

1. Start engine and let it idle for least 40 seconds.

NOTE:

Do not depress accelerator pedal even slightly.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-787, "Diagnosis Procedure"](#).
- NO >> GO TO 6.

6.PERFORM DTC CONFIRMATION PROCEDURE-5

 With GST

1. Let it idle for at least 2 hours.
2. Turn ignition switch OFF and wait at least 90 minutes.

NOTE:

Never turn ignition switch ON during 90 minutes.

3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-787, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007358657

1.CHECK GROUND CONNECTIONS

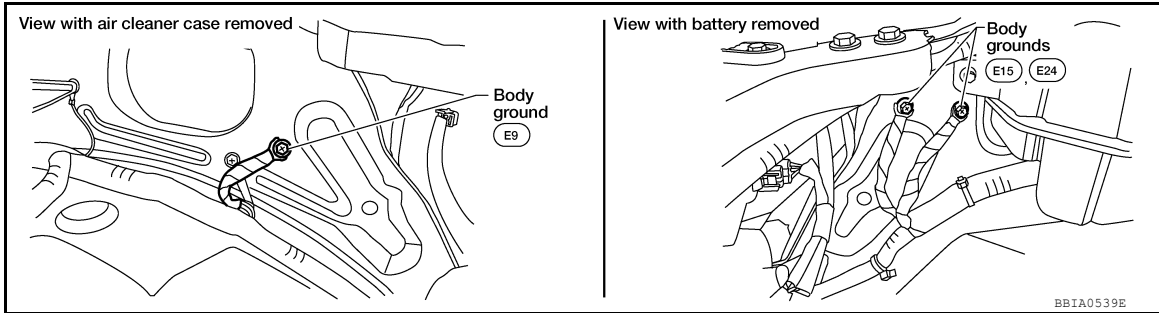
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Refer to [EC-623, "Ground Inspection"](#).

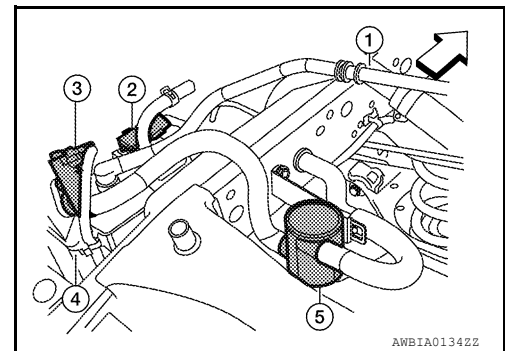


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

1. Disconnect EVAP control system pressure sensor (2) harness connector.
 - Fuel filler pipe (top of frame view) (1)
 - EVAP canister vent control valve (3)
 - EVAP canister (4)
 - Drain filter (5)
 - ↙: Vehicle front
2. Check sensor harness connector for water.



Water should not exist.

OK or NG

- OK >> GO TO 3.
- NG >> Repair or replace harness connector.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-788, "Component Inspection"](#).

OK or NG

- OK >> GO TO 4.
- NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

4. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000007358658

EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector. Refer to [FL-16, "Removal and Installation"](#).
Always replace O-ring with a new one.
2. Install a vacuum pump to EVAP control system pressure sensor.

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VK56DE]

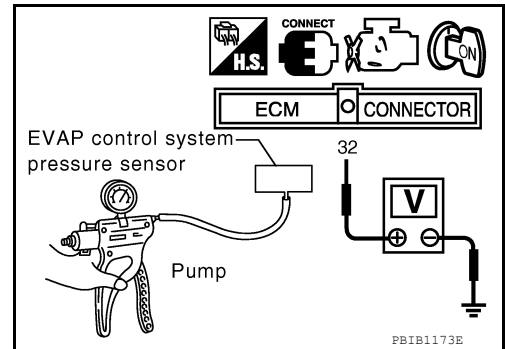
< DTC/CIRCUIT DIAGNOSIS >

- Turn ignition switch ON and check output voltage between ECM terminal 32 and ground under the following conditions.

Applied vacuum [kPa (kg/cm ² , psi)]	Voltage
Not applied	1.8 - 4.8 V
-26.7 (-0.272, -3.87)	2.1 to 2.5 V lower than above value

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm², 14.69 psi).
- If NG, replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).



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P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

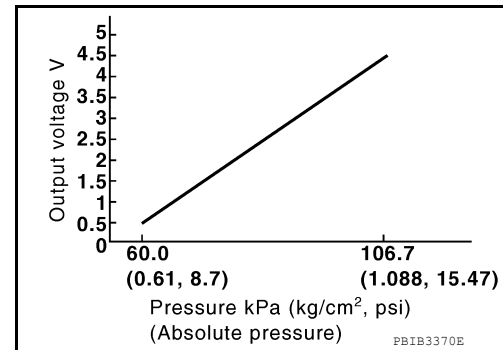
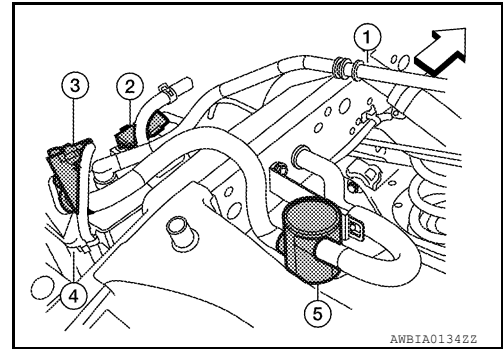
P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

Component Description

INFOID:000000007358659

The EVAP control system pressure sensor (2) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- Fuel filler pipe (top of frame view) (1)
- EVAP canister vent control valve (3)
- EVAP canister (4)
- Drain filter (5)
- ↖: Vehicle front



On Board Diagnosis Logic

INFOID:000000007358660

NOTE:

If DTC P0452 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-831, "DTC Confirmation Procedure"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0452 0452	EVAP control system pressure sensor low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • EVAP control system pressure sensor

DTC Confirmation Procedure

INFOID:000000007358661

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

Ⓟ WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select "DATA MONITOR" mode with CONSULT.
7. Check that "FUEL T/TMP SE" is more than 0°C (32°F).

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

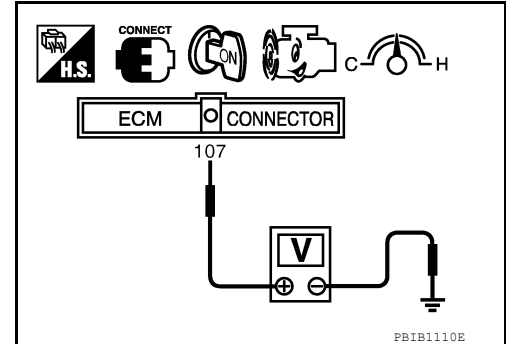
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.
10. If 1st trip DTC is detected, go to [EC-791. "Diagnosis Procedure"](#).

Ⓢ WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal 107 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and wait at least 20 seconds.
7. Select Service \$07 with GST.
If 1st trip DTC is detected, go to [EC-791. "Diagnosis Procedure"](#).

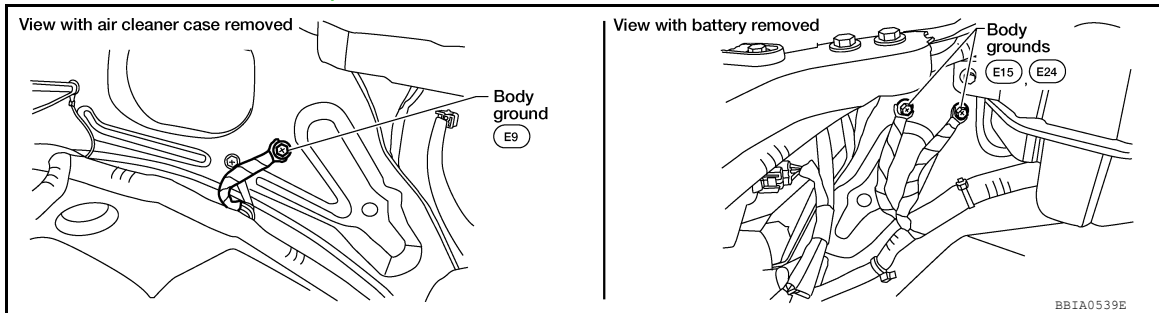


Diagnosis Procedure

INFOID:000000007358662

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623. "Ground Inspection"](#).

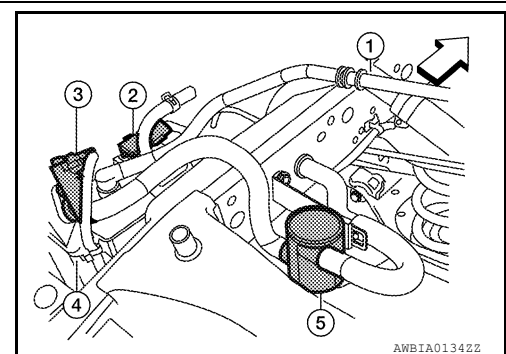


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2.CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor (2) harness connector.
 - Fuel filler pipe (top of frame view) (1)
 - EVAP canister vent control valve (3)
 - EVAP canister (4)
 - Drain filter (5)
 - ⇐: Vehicle front
2. Check sensor harness connector for water.



Water should not exist.

OK or NG

- OK >> GO TO 3.
- NG >> Repair or replace harness connector.

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VK56DE]

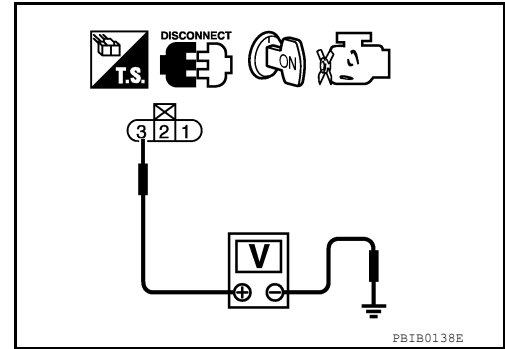
< DTC/CIRCUIT DIAGNOSIS >

2. Check voltage between EVAP control system pressure sensor terminal 3 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness connectors E5, F14
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between EVAP control system pressure sensor terminal 1 and ECM terminal 67.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness connectors E5, F14
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 32 and EVAP control system pressure sensor terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness connectors E5, F14

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-793. "Component Inspection"](#).

OK or NG

OK >> GO TO 10.

NG >> Replace EVAP control system pressure sensor. Refer to [FL-16. "Removal and Installation"](#).

10. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000007358663

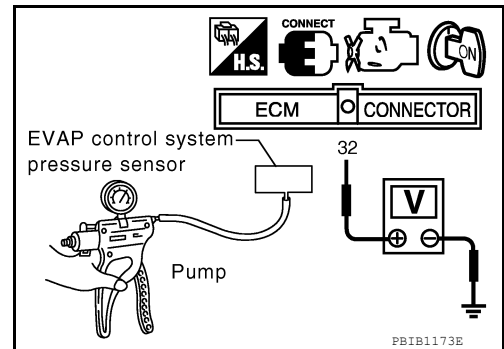
EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector. Refer to [FL-16. "Removal and Installation"](#).
Always replace O-ring with a new one.
2. Install a vacuum pump to EVAP control system pressure sensor.
3. Turn ignition switch ON and check output voltage between ECM terminal 32 and ground under the following conditions.

Applied vacuum [kPa (kg/cm ² , psi)]	Voltage
Not applied	1.8 - 4.8 V
-26.7 (-0.272, -3.87)	2.1 to 2.5 V lower than above value

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm², 14.69 psi).
4. If NG, replace EVAP control system pressure sensor. Refer to [FL-16. "Removal and Installation"](#).



P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

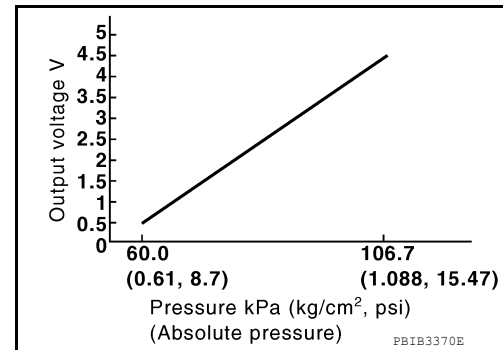
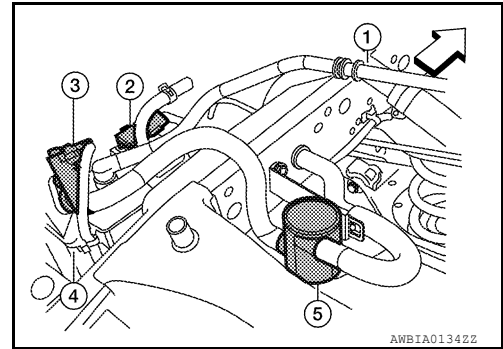
P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

Component Description

INFOID:000000007358664

The EVAP control system pressure sensor (2) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- Fuel filler pipe (top of frame view) (1)
- EVAP canister vent control valve (3)
- EVAP canister (4)
- Drain filter (5)
- ↖: Vehicle front



On Board Diagnosis Logic

INFOID:000000007358665

NOTE:

If DTC P0453 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-836, "DTC Confirmation Procedure"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0453 0453	EVAP control system pressure sensor high input	An excessively high voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • EVAP control system pressure sensor • EVAP canister vent control valve • EVAP canister • Drain filter • Rubber hose from EVAP canister vent control valve to drain filter

DTC Confirmation Procedure

INFOID:000000007358666

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

④ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

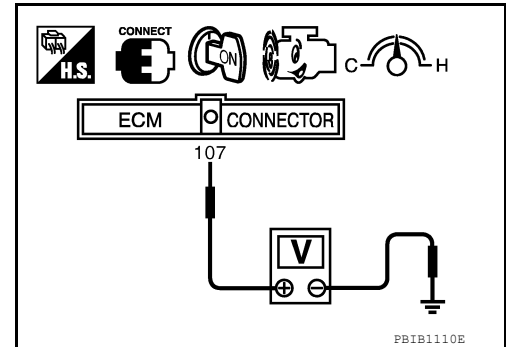
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select "DATA MONITOR" mode with CONSULT.
7. Check that "FUEL T/TMP SE" is more than 0°C (32°F).
8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.
10. If 1st trip DTC is detected, go to [EC-795, "Diagnosis Procedure"](#).

With GST

1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal 107 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and wait at least 20 seconds.
7. Select Service \$07 with GST.
If 1st trip DTC is detected, go to [EC-795, "Diagnosis Procedure"](#).

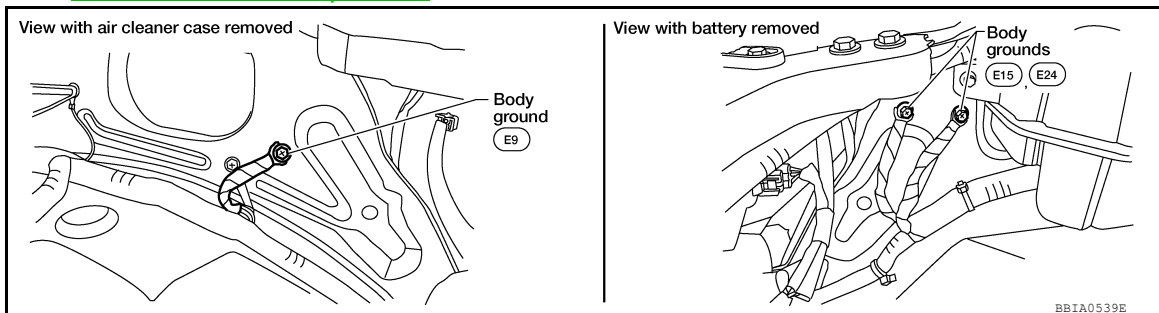


Diagnosis Procedure

INFOID:000000007358667

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623, "Ground Inspection"](#).

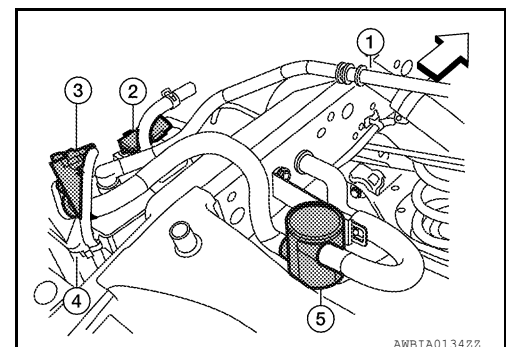


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor (2) harness connector.
 - Fuel filler pipe (top of frame view) (1)
 - EVAP canister vent control valve (3)
 - EVAP canister (4)
 - Drain filter (5)
 - ⇄: Vehicle front
2. Check sensor harness connector for water.



Water should not exist.

OK or NG

- OK >> GO TO 3.
- NG >> Repair or replace harness connector.

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

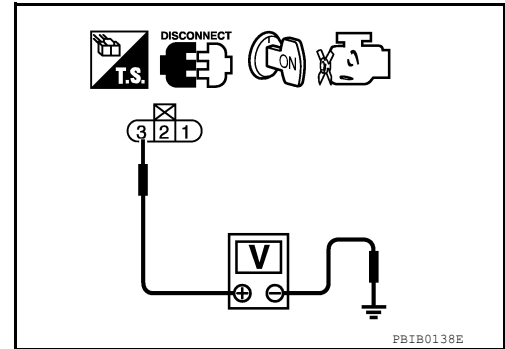
3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.
2. Check voltage between EVAP control system pressure sensor terminal 3 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness connectors E5, F14
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between EVAP control system pressure sensor terminal 1 and ECM terminal 67.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors C1, E41
- Harness connectors E5, F14
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 32 and EVAP control system pressure sensor terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Check the following.

- Harness connectors C1, E41
- Harness connectors E5, F14
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK RUBBER TUBE

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging, vent or kinked.

OK or NG

- OK >> GO TO 10.
- NG >> Clean the rubber tube using an air blower, repair or replace rubber tube.

10. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to [EC-783. "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> Replace EVAP canister vent control valve. Refer to [FL-16. "Removal and Installation"](#).

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-798. "Component Inspection"](#).

OK or NG

- OK >> GO TO 12.
- NG >> Replace EVAP control system pressure sensor.

12. CHECK DRAIN FILTER

Refer to [EC-783. "Component Inspection"](#).

OK or NG

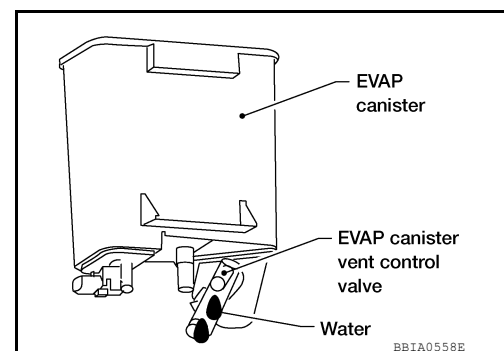
- OK >> GO TO 13.
- NG >> Replace drain filter. Refer to [EC-516](#).

13. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16. "Removal and Installation"](#).
2. Check if water will drain from the EVAP canister.

Yes or No

- Yes >> GO TO 14.
- No >> GO TO 16.



14. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

- OK >> GO TO 16.
- NG >> GO TO 15.

15. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

- EVAP hose between EVAP canister and drain filter for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-16. "Removal and Installation"](#).

16. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358668

EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector. Refer to [FL-16. "Removal and Installation"](#).

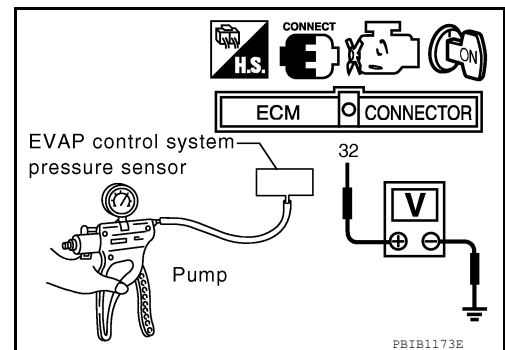
Always replace O-ring with a new one.

2. Install a vacuum pump to EVAP control system pressure sensor.
3. Turn ignition switch ON and check output voltage between ECM terminal 32 and ground under the following conditions.

Applied vacuum [kPa (kg/cm ² , psi)]	Voltage
Not applied	1.8 - 4.8 V
-26.7 (-0.272, -3.87)	2.1 to 2.5 V lower than above value

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm², 14.69 psi).
4. If NG, replace EVAP control system pressure sensor. Refer to [FL-16. "Removal and Installation"](#).



P0455 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

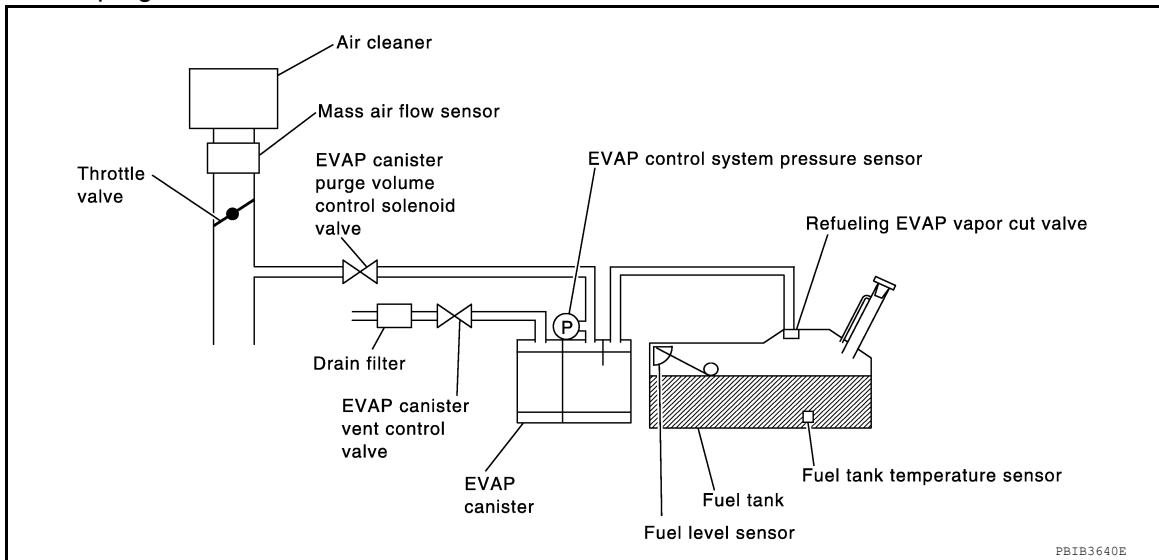
[VK56DE]

P0455 EVAP CONTROL SYSTEM

On Board Diagnosis Logic

INFOID:000000007358669

This diagnosis detects a very large leak (fuel filler cap fell off etc.) in EVAP system between the fuel tank and EVAP canister purge volume control solenoid valve.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0455 0455	EVAP control system gross leak detected	EVAP control system has a very large leak such as fuel filler cap fell off, EVAP control system does not operate properly.	<ul style="list-style-type: none"> • Fuel filler cap remains open or does not close • Incorrect fuel tank vacuum relief valve • Incorrect fuel filler cap used • Foreign matter caught in fuel filler cap • Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve • Foreign matter caught in EVAP canister vent control valve • EVAP canister or fuel tank leaks • EVAP purge line (pipe and rubber tube) leaks • EVAP purge line rubber tube bent. • Loose or disconnected rubber tube • EVAP canister vent control valve and the circuit • Drain filter • EVAP canister purge volume control solenoid valve and the circuit • Fuel tank temperature sensor • O-ring of EVAP canister vent control valve is missing or damaged. • EVAP control system pressure sensor • Refueling EVAP vapor cut valve • ORVR system leaks

CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.
- If the fuel filler cap is not tightened properly, the MIL may illuminate.
- Use only a genuine NISSAN rubber tube as a replacement.

DTC Confirmation Procedure

INFOID:000000007358670

CAUTION:

Never remove fuel filler cap during the DTC Confirmation Procedure.

NOTE:

- Check that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

P0455 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.
 1. Turn ignition switch OFF and wait at least 10 seconds.
 2. Turn ignition switch ON.
 3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Perform “DTC WORK SUPPORT” when the fuel level is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.
- Open engine hood before conducting the following procedures.

Ⓜ WITH CONSULT

1. Tighten fuel filler cap securely until ratcheting sound is heard.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT.
5. Check that the following conditions are met.
COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
INT/A TEMP SE: 0 - 60°C (32 - 140°F)
6. Select “EVP V/S LEAK P0456/P1456” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT.
Follow the instructions displayed.

NOTE:

If the engine speed cannot be maintained within the range displayed on the CONSULT screen, go to [EC-592, "Basic Inspection"](#).

7. Check that “OK” is displayed.
If “NG” is displayed, select “SELF-DIAG RESULTS” mode and check that P0455 is displayed. If it is displayed, go to [EC-800, "Diagnosis Procedure"](#).
If P0442 is displayed, perform Diagnostic Procedure for DTC P0442, [EC-763, "Diagnosis Procedure"](#).

Ⓜ WITH GST

NOTE:

Be sure to read the explanation on “Driving Pattern” in [EC-527, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#) before driving vehicle.

1. Start engine.
2. Drive vehicle according to “Driving Pattern” in [EC-527, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).
3. Stop vehicle.
4. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
5. Select Service \$07 with GST.
 - If P0441 is displayed, go to [EC-758, "Diagnosis Procedure"](#).
 - If P0442 is displayed, go to [EC-763, "Diagnosis Procedure"](#).
 - If P0455 is displayed, go to [EC-800, "Diagnosis Procedure"](#).

Diagnosis Procedure

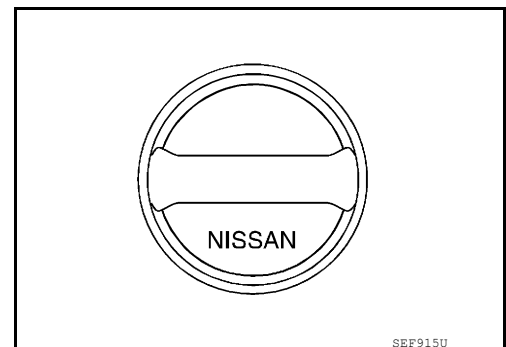
INFOID:000000007358671

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

- OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



SEP915U

P0455 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

2. CHECK FUEL FILLER CAP INSTALLATION

Check that the fuel filler cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.

NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to [EC-805, "Component Inspection"](#).

OK or NG

OK >> GO TO 5.

NG >> Replace fuel filler cap with a genuine one.

5. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks, improper connection or disconnection.

Refer to [EC-516, "Description"](#).

OK or NG

OK >> GO TO 6.

NG >> Repair or reconnect the hose.

6. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 7.

7. CHECK DRAIN FILTER

Refer to [EC-805, "Component Inspection"](#).

OK or NG

OK >> GO TO 8.

NG >> Replace drain filter. Refer to [EC-516](#).

8. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

• EVAP canister vent control valve is installed properly.

Refer to [FL-16, "Component Inspection"](#).

• EVAP canister vent control valve.

Refer to [EC-783, "Component Inspection"](#).

OK or NG

OK >> GO TO 9.

NG >> Repair or replace EVAP canister vent control valve and O-ring. Refer to [FL-16, "Removal and Installation"](#).

9. INSTALL THE PRESSURE PUMP

P0455 EVAP CONTROL SYSTEM

[VK56DE]

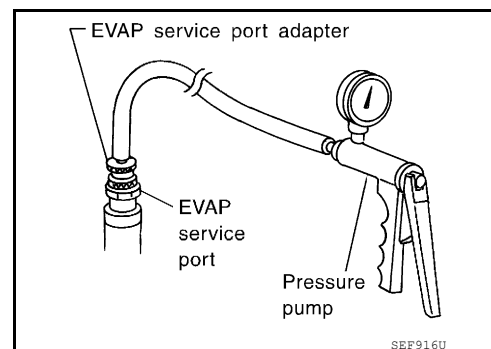
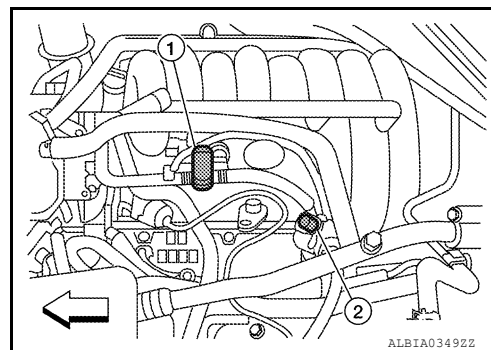
< DTC/CIRCUIT DIAGNOSIS >

To locate the EVAP leak, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port securely.

NOTE:

Improper installation of the EVAP service port adapter (commercial service tool) to the EVAP service port may cause leaking.

- EVAP canister purge volume control solenoid valve (1). Refer to [EM-165](#).
- EVAP service port (2)
- ↶: Vehicle front



With CONSULT>>GO TO 10.

Without CONSULT>>GO TO 11.

10. CHECK FOR EVAP LEAK

Ⓟ With CONSULT

1. Turn ignition switch ON.
2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

CAUTION:

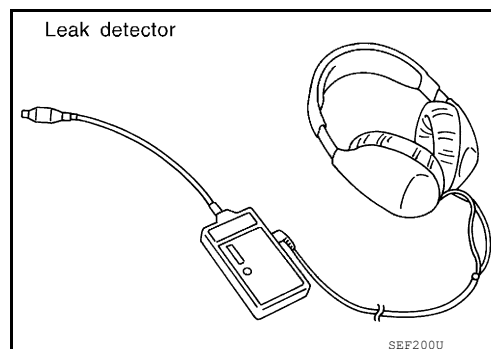
- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

4. Using EVAP leak detector (commercial service tool), locate the EVAP leak. For the leak detector (commercial service tool), refer to the instruction manual for more details.

OK or NG

OK >> GO TO 12.

NG >> Repair or replace.



11. CHECK FOR EVAP LEAK

ⓧ Without CONSULT

1. Turn ignition switch OFF.

P0455 EVAP CONTROL SYSTEM

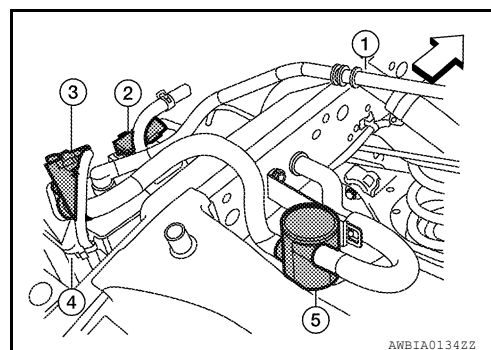
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Apply 12 volts DC to EVAP canister vent control valve (3). The valve will close. (Continue to apply 12 volts until the end of test.)
- Pressurize the EVAP line using pressure pump with 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm², 0.2 to 0.4 psi), then remove pump and EVAP service port adapter (commercial service tool). Refer to [FL-16. "Removal and Installation"](#).

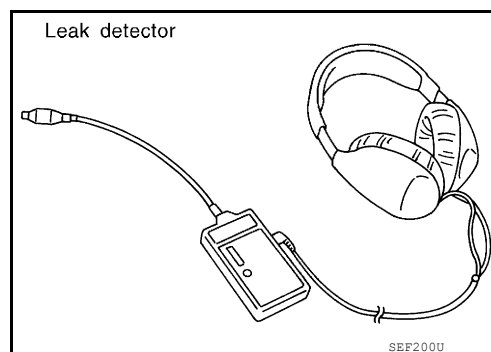
CAUTION:

- **Never use compressed air or a high pressure pump.**
 - **Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.**
- Fuel filler pipe (top of frame view) (1)
 - EVAP control system pressure sensor (2)
 - EVAP canister (4)
 - Drain filter (5)
- ↔: Vehicle front
- Using EVAP leak detector (commercial service tool), locate the EVAP leak. For the leak detector (commercial service tool), refer to the instruction manual for more details.



OK or NG

- OK >> GO TO 13.
NG >> Repair or replace malfunctioning part.



12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

- Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve and EVAP service port from EVAP service port.
- Start engine.
- Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
- Touch "Qu" on CONSULT screen to increase "PURG VOL C/V" opening to 100%.
- Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

- OK >> GO TO 15.
NG >> GO TO 14.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT

- Start engine and warm it up to normal operating temperature.
- Stop engine.
- Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve and EVAP service port from EVAP service port.
- Start engine and let it idle for at least 80 seconds.
- Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

- OK >> GO TO 16.
NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to [EC-516. "Description"](#).

OK or NG

P0455 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- OK (With CONSULT)>>GO TO 15.
- OK (Without CONSULT)>>GO TO 16.
- NG >> Repair or reconnect the hose.

15.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

OK or NG

- OK >> GO TO 17.
- NG >> GO TO 16.

16.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-776, "Component Inspection"](#).

OK or NG

- OK >> GO TO 17.
- NG >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-165](#).

17.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to [EC-730, "Component Inspection"](#).

OK or NG

- OK >> GO TO 18.
- NG >> Replace "fuel level sensor unit and fuel pump". Refer to [FL-18](#).

18.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-788, "Component Inspection"](#).

OK or NG

- OK >> GO TO 19.
- NG >> Replace EVAP control system pressure sensor. Refer to [FL-16, "Removal and Installation"](#).

19.CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kinks, looseness and improper connection. For location, refer to [EC-937, "System Description"](#).

OK or NG

- OK >> GO TO 20.
- NG >> Repair or replace hoses and tubes.

20.CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kinks, cracks, looseness and improper connection.

OK or NG

- OK >> GO TO 21.
- NG >> Repair or replace hose, tube or filler neck tube.

21.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to [EC-940, "Component Inspection"](#).

OK or NG

- OK >> GO TO 22.
- NG >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-16, "Removal and Installation"](#).

22.CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

P0455 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

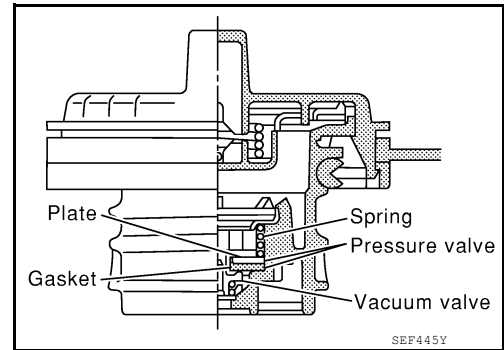
[VK56DE]

Component Inspection

INFOID:000000007358672

FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.



2. Check valve opening pressure and vacuum.

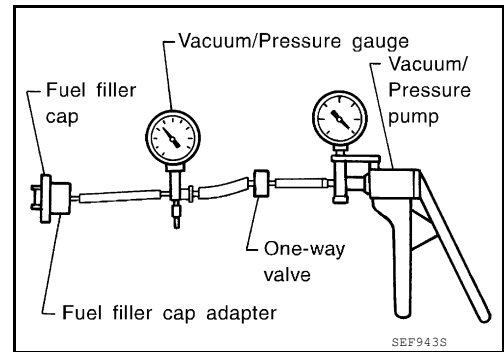
Pressure: 15.3 - 20.0 kPa (0.156 - 0.204 kg/cm², 2.22 - 2.90 psi)

Vacuum: -6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm², -0.87 to -0.48 psi)

3. If out of specification, replace fuel filler cap as an assembly.

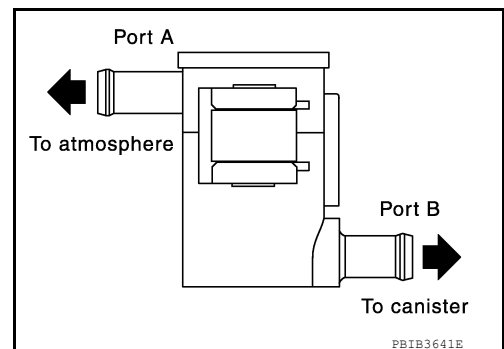
CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.



DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter. Refer to [EC-516](#).



P0456 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0456 EVAP CONTROL SYSTEM

On Board Diagnosis Logic

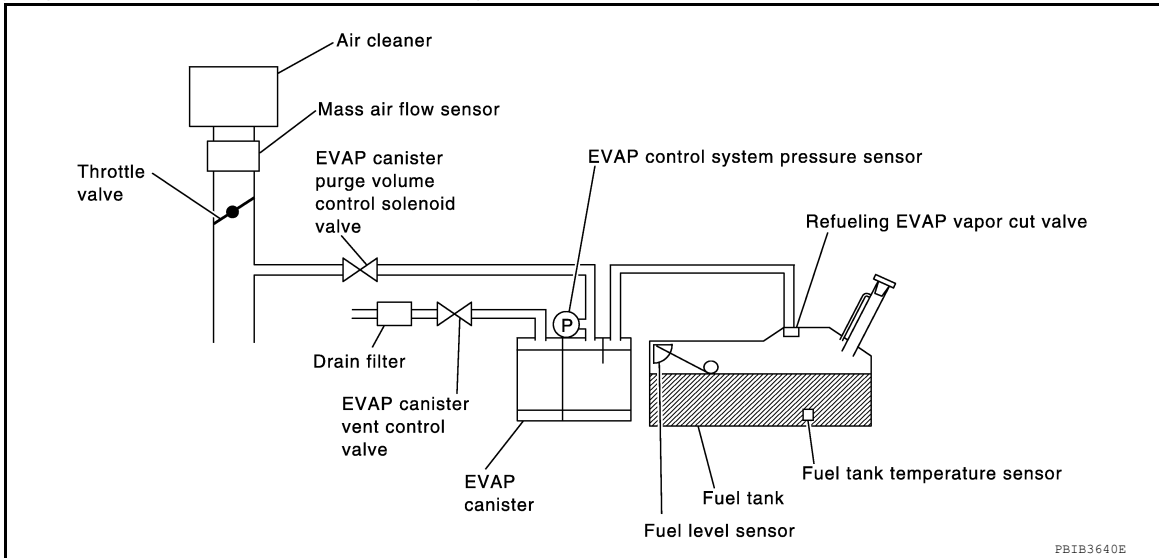
INFOID:000000007358673

This diagnosis detects very small leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using the negative pressure.

If ECM judges a leak which corresponds to a very small leak, the very small leak P0456 will be detected.

If ECM judges a leak equivalent to a small leak, EVAP small leak P0442 will be detected.

If ECM judges that there are no leaks, the diagnosis will be OK.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0456 0456	Evaporative emission control system very small leak (negative pressure check)	<ul style="list-style-type: none"> • EVAP system has a very small leak. • EVAP system does not operate properly. 	<ul style="list-style-type: none"> • Incorrect fuel tank vacuum relief valve • Incorrect fuel filler cap used • Fuel filler cap remains open or does not close • Foreign matter caught in fuel filler cap • Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve • Foreign matter caught in EVAP canister vent control valve • EVAP canister or fuel tank leaks • EVAP purge line (pipe and rubber tube) leaks • EVAP purge line rubber tube bent • Loose or disconnected rubber tube • EVAP canister vent control valve and the circuit • EVAP canister purge volume control solenoid valve and the circuit • Fuel tank temperature sensor • Drain filter • O-ring of EVAP canister vent control valve is missing or damaged • EVAP canister is saturated with water • EVAP control system pressure sensor • Refueling EVAP vapor cut valve • ORVR system leaks • Fuel level sensor and the circuit • Foreign matter caught in EVAP canister purge volume control solenoid valve

CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.
- If the fuel filler cap is not tightened properly, the MIL may illuminate.
- Use only a genuine NISSAN rubber tube as a replacement.

P0456 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

DTC Confirmation Procedure

INFOID:000000007358674

NOTE:

- If DTC P0456 is displayed with P0442, first perform the trouble diagnosis for DTC P0456.
- Check that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.
- After repair, check that the hoses and clips are installed properly.
- If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
 1. Turn ignition switch OFF and wait at least 10 seconds.
 2. Turn ignition switch ON.
 3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Open engine hood before conducting the following procedure.
- If any of following conditions are met just before the DTC confirmation procedure, leave the vehicle for more than 1 hour.
 - Fuel filler cap is removed.
 - Fuel is refilled or drained.
 - EVAP component part/parts is/are removed.
- Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

WITH CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Check that the following conditions are met.
 - FUEL LEVEL SE: 0.25 - 1.4 V**
 - COOLAN TEMP/S: 0 - 32°C (32 - 90°F)**
 - FUEL T/TMP SE: 0 - 35°C (32 - 95°F)**
 - INT/A TEMP SE: More than 0°C (32°F)**If NG, turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle), or refill/drain fuel until the output voltage of the "FUEL LEVEL SE" meets within the range above and leave the vehicle for more than 1 hour. Then start from step 1.
3. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
4. Select "EVP V/S LEAK P0456/P1456" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
Follow the instructions displayed.
5. Check that "OK" is displayed.
If "NG" is displayed, go to [EC-808. "Diagnosis Procedure"](#).

NOTE:

- If the engine speed cannot be maintained within the range displayed on CONSULT screen, go to [EC-592. "Basic Inspection"](#).

Overall Function Check

INFOID:000000007358675

WITH GST

Use this procedure to check the overall function of the EVAP very small leak function. During this check, a 1st trip DTC might not be confirmed.

CAUTION:

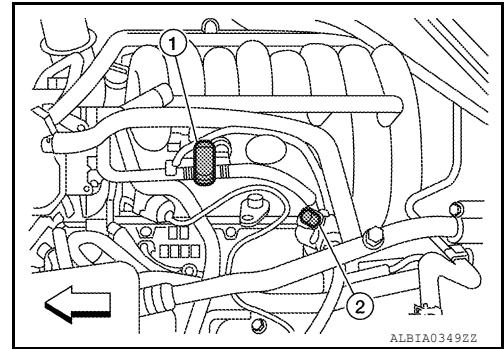
- Never use compressed air, doing so may damage the EVAP system.
- Never start engine.
- Never exceeded 4.12 kPa (0.042 kg/cm², 0.6 psi).

P0456 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Attach the EVAP service port adapter (commercial service tool) securely to the EVAP service port (2).
 - EVAP canister purge volume control solenoid valve (1)
 - ↵: Vehicle front



2. Set the pressure pump and a hose.
3. Also set a vacuum gauge via 3-way connector and a hose.
4. Turn ignition switch ON.
5. Connect GST and select Service \$08.
6. Using Service \$08, control the EVAP canister vent control valve (close).

NOTE:

For more information, refer to GST Instruction Manual.

7. Apply pressure and check that the following conditions are satisfied.

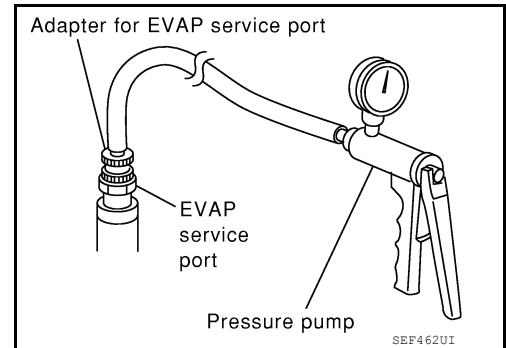
Pressure to be applied: 2.7 kPa (0.028 kg/cm², 0.39 psi)

Time to be waited after the pressure drawn in to the EVAP system and the pressure to be dropped: 60 seconds and the pressure should not be dropped more than 0.4 kPa (0.004 kg/cm², 0.06 psi).

If NG, go to [EC-808, "Diagnosis Procedure"](#).

If OK, go to next step.

8. Disconnect GST.
9. Start engine and warm it up to normal operating temperature.
10. Turn ignition switch OFF and wait at least 10 seconds.
11. Restart engine and let it idle for 90 seconds.
12. Keep engine speed at 2,000 rpm for 30 seconds.
13. Turn ignition switch OFF.



the pressure should not be dropped

Diagnosis Procedure

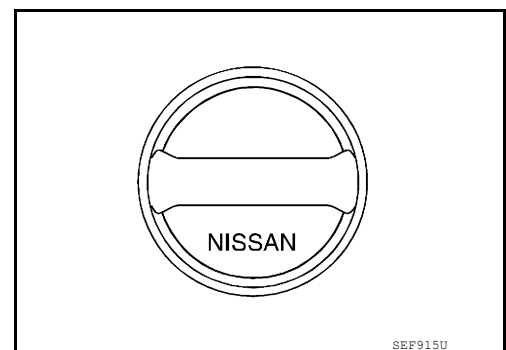
INFOID:000000007358676

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

- OK >> GO TO 2.
- NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the fuel filler cap is tightened properly by rotating the cap clockwise.

OK or NG

- OK >> GO TO 3.
- NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

P0456 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to [EC-516, "Description"](#).

OK or NG

OK >> GO TO 5.

NG >> Replace fuel filler cap with a genuine one. Refer to [FL-6, "Removal and Installation"](#).

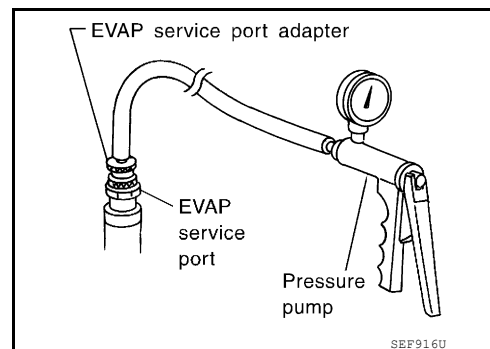
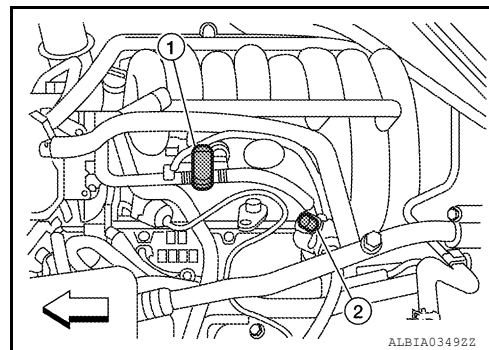
5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port (2) securely.

NOTE:

Improper installation of the EVAP service port adapter (commercial service tool) to the EVAP service port may cause leaking.

- EVAP canister purge volume control solenoid valve (1)
- ↵: Vehicle front



With CONSULT>>GO TO 6.

Without CONSULT>>GO TO 7.

6. CHECK FOR EVAP LEAK

With CONSULT

1. Turn ignition switch ON.
2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

CAUTION:

- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

P0456 EVAP CONTROL SYSTEM

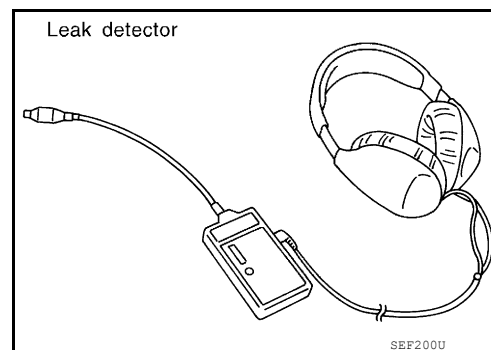
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Using EVAP leak detector (commercial service tool), locate the EVAP leak. For the leak detector (commercial service tool), refer to the instruction manual for more details.

OK or NG

- OK >> GO TO 8.
NG >> Repair or replace malfunctioning part.



7. CHECK FOR EVAP LEAK

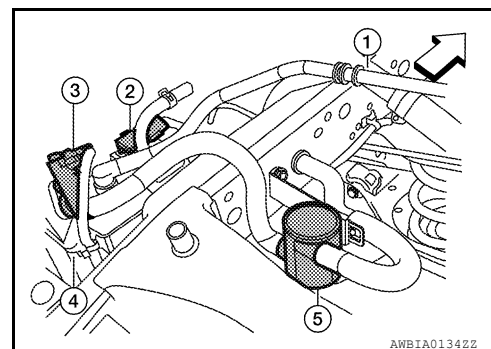
⊗ Without CONSULT

- Turn ignition switch OFF.
- Apply 12 volts DC to EVAP canister vent control valve (3). The valve will close. (Continue to apply 12 volts until the end of test.)
 - Fuel filler pipe (top of frame view) (1)
 - EVAP control system pressure sensor (2)
 - EVAP canister (4)
 - Drain filter (5)
 - ↔: Vehicle front
- Pressurize the EVAP line using pressure pump with 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm², 0.2 to 0.4 psi), then remove pump and EVAP service port adapter (commercial service tool). Refer to [FL-16. "Removal and Installation"](#).

CAUTION:

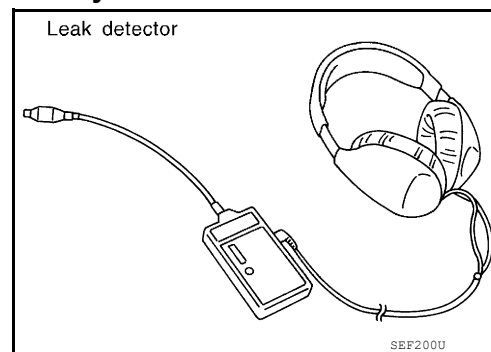
- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

- Using EVAP leak detector (commercial service tool), locate the EVAP leak. For the leak detector (commercial service tool), refer to the instruction manual for more details.



OK or NG

- OK >> GO TO 8.
NG >> Repair or replace malfunctioning part.



8. CHECK DRAIN FILTER

Refer to [EC-813. "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
NG >> Replace drain filter. Refer to [EC-516](#).

9. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

- EVAP canister vent control valve is installed properly.
Refer to [FL-16. "Component Inspection"](#).
- EVAP canister vent control valve.
Refer to [EC-779. "Component Inspection"](#).

OK or NG

- OK >> GO TO 10.
NG >> Repair or replace EVAP canister vent control valve and O-ring. Refer to [FL-16. "Removal and Installation"](#).

10. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

P0456 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

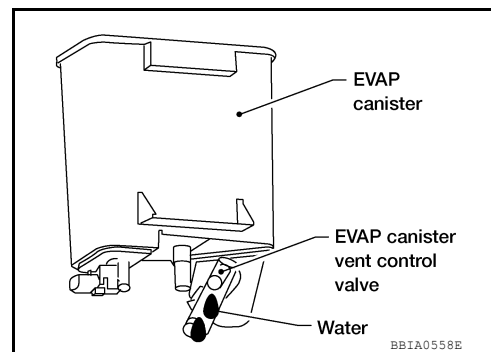
1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16, "Removal and Installation"](#).
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 11.

No (With CONSULT)>>GO TO 13.

No (Without CONSULT)>>GO TO 14.



11. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

SWB models: The weight should be less than 2.5 kg (5.5 lb).

LWB models: The weight should be less than 3.2 kg (7.1 lb).

OK or NG

OK (With CONSULT)>>GO TO 13.

OK (Without CONSULT)>>GO TO 14.

NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and drain filter for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-16, "Removal and Installation"](#).

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve and EVAP service port from EVAP service port.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qu" on CONSULT screen to increase "PURG VOL C/V" opening to 100%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 16.

NG >> GO TO 15.

14. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve and EVAP service port from EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

P0456 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- OK >> GO TO 17.
- NG >> GO TO 15.

15. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to [EC-516. "Description"](#).

OK or NG

- OK >> GO TO 16.
- NG >> Repair or reconnect the hose.

16. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-776. "Component Inspection"](#).

OK or NG

- OK >> GO TO 17.
- NG >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-165](#).

17. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to [EC-730. "Component Inspection"](#).

OK or NG

- OK >> GO TO 18.
- NG >> Replace "fuel level sensor unit and fuel pump". Refer to [FL-18](#).

18. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-788. "Component Inspection"](#).

OK or NG

- OK >> GO TO 19.
- NG >> Replace EVAP control system pressure sensor. Refer to [FL-16. "Removal and Installation"](#).

19. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to [EC-516. "Description"](#).

OK or NG

- OK >> GO TO 20.
- NG >> Repair or reconnect the hose.

20. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 21.

21. CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kinks, looseness and improper connection. For location, refer to [EC-937. "System Description"](#).

OK or NG

- OK >> GO TO 22.
- NG >> Repair or replace hoses and tubes.

22. CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kinks, cracks, looseness and improper connection.

OK or NG

- OK >> GO TO 23.
- NG >> Repair or replace hose, tube or filler neck tube.

23. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to [EC-940. "Component Inspection"](#).

OK or NG

- OK >> GO TO 24.

P0456 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

NG >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-16. "Removal and Installation"](#).

24. CHECK FUEL LEVEL SENSOR

Refer to [EC-818. "Diagnosis Procedure"](#).

OK or NG

OK >> GO TO 25.

NG >> Replace "fuel level sensor unit and fuel pump". Refer to [FL-18](#).

25. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

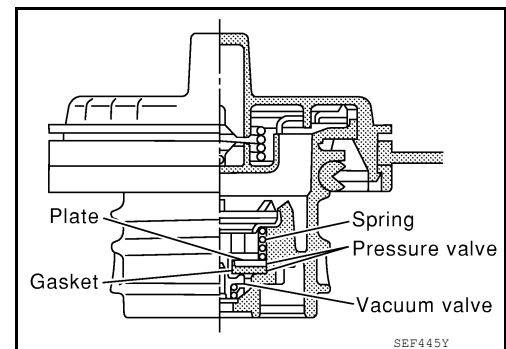
>> INSPECTION END

Component Inspection

INFOID:000000007358677

FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.



2. Check valve opening pressure and vacuum.

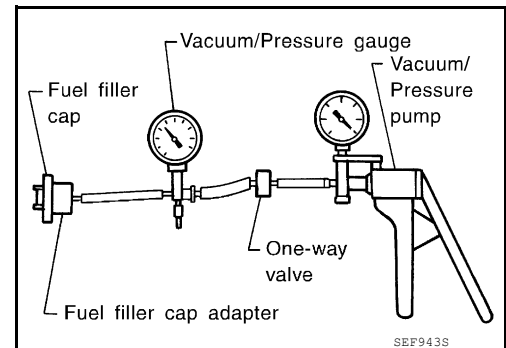
Pressure: 15.3 - 20.0 kPa (0.156 - 0.204 kg/cm², 2.22 - 2.90 psi)

Vacuum: -6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm², -0.87 to -0.48 psi)

3. If out of specification, replace fuel filler cap as an assembly.

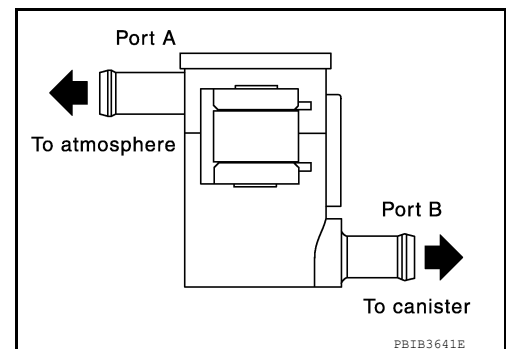
CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.



DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter. Refer to [EC-516](#).



P0460 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

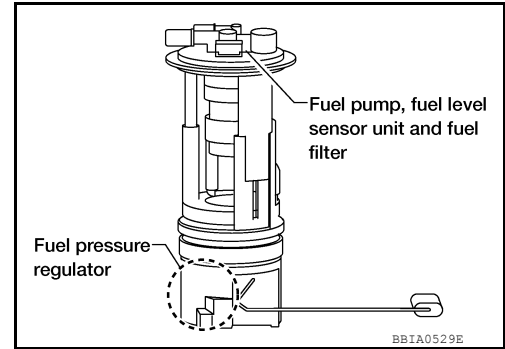
[VK56DE]

P0460 FUEL LEVEL SENSOR

Component Description

INFOID:000000007358678

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM via the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

INFOID:000000007358679

NOTE:

- If DTC P0460 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0460 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-835, "DTC Confirmation Procedure"](#).

When the vehicle is parked, the fuel level in the fuel tank is naturally stable. It means that output signal of the fuel level sensor does not change. If ECM senses sloshing signal from the sensor, fuel level sensor malfunction is detected.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0460 0460	Fuel level sensor circuit noise	Even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM.	<ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted)• Harness or connectors (The sensor circuit is open or shorted)• Combination meter• Fuel level sensor

DTC Confirmation Procedure

INFOID:000000007358680

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and wait maximum of 2 consecutive minutes.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to [EC-814, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358681

1. CHECK COMBINATION METER FUNCTION

Refer to [MWI-4, "Work Flow"](#).

OK or NG

OK >> GO TO 2.

NG >> Go to [MWI-34, "Component Function Check"](#).

2. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

P0460 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

>> INSPECTION END

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P0461 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

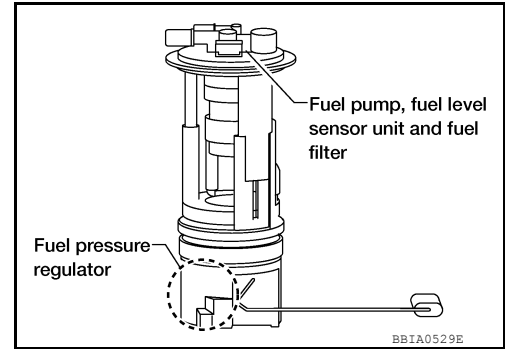
[VK56DE]

P0461 FUEL LEVEL SENSOR

Component Description

INFOID:000000007358682

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM via the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

INFOID:000000007358683

NOTE:

- If DTC P0461 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0461 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-835, "DTC Confirmation Procedure"](#).

Driving long distances naturally affect fuel gauge level.

This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0461 0461	Fuel level sensor circuit range/performance	The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long distance.	<ul style="list-style-type: none"> • Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (The sensor circuit is open or shorted) • Combination meter • Fuel level sensor

Overall Function Check

INFOID:000000007358684

Use this procedure to check the overall function of the fuel level sensor. During this check, a 1st trip DTC might not be confirmed.

WARNING:

When performing the following procedure, always observe the handling of the fuel. Refer to [FL-11, "Removal and Installation"](#).

TESTING CONDITION:

Before starting overall function check, preparation of draining fuel and refilling fuel is required.

Ⓜ WITH CONSULT

NOTE:

Start from step 10, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line, refer to [EC-952, "Fuel Pressure Check"](#).
3. Remove the fuel feed hose on the fuel level sensor unit. Refer to [FL-11](#).
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch OFF and wait at least 10 seconds then turn ON.
6. Select "FUEL LEVEL SE" in "DATA MONITOR" mode with CONSULT.
7. Check "FUEL LEVEL SE" output voltage and note it.
8. Select "FUEL PUMP" in "ACTIVE TEST" mode with CONSULT.
9. Touch "ON" and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
10. Check "FUEL LEVEL SE" output voltage and note it.
11. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
12. Check "FUEL LEVEL SE" output voltage and note it.

P0461 FUEL LEVEL SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

13. Confirm whether the voltage changes more than 0.03V during step 7 to 10 and 10 to 12.
If NG, go to [EC-817, "Diagnosis Procedure"](#).

 WITH GST

NOTE:

Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line. Refer to [EC-952, "Fuel Pressure Check"](#).
3. Remove the fuel feed hose on the fuel level sensor unit. Refer to [FL-11](#).
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch ON.
6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
7. Confirm that the fuel gauge indication varies.
8. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
9. Confirm that the fuel gauge indication varies.
10. If NG, go to [EC-817, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358685

1. CHECK DTC WITH COMBINATION METER

Refer to [MWI-4, "Work Flow"](#).

OK or NG

OK >> GO TO 2.

NG >> Go to [MWI-34, "Component Function Check"](#).

2. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

P0462, P0463 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

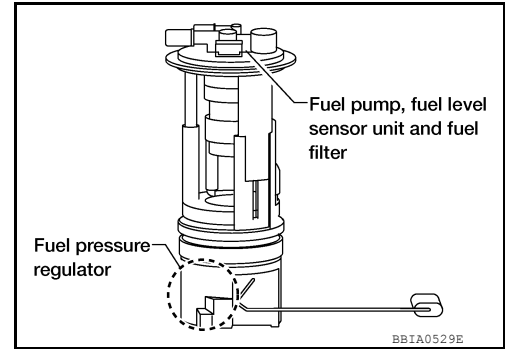
[VK56DE]

P0462, P0463 FUEL LEVEL SENSOR

Component Description

INFOID:000000007358686

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM via the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

INFOID:000000007358687

NOTE:

- If DTC P0462 or P0463 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0462 or P0463 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-835, "DTC Confirmation Procedure"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0462 0462	Fuel level sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted)• Harness or connectors (The sensor circuit is open or shorted)• Combination meter• Fuel level sensor
P0463 0463	Fuel level sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

INFOID:000000007358688

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at ignition switch ON.

1. Turn ignition switch ON.
2. Wait at least 5 seconds.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to [EC-818, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358689

1. CHECK COMBINATION METER FUNCTION

Refer to [MWI-4, "Work Flow"](#).

OK or NG

- OK >> GO TO 2.
- NG >> Go to [MWI-34, "Component Function Check"](#).

2. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

P0462, P0463 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

>> INSPECTION END

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P0500 VSS

Description

INFOID:000000007358690

ECM receives vehicle speed signals from two different paths via CAN communication line: One is from the ABS actuator and electric unit (control unit) via the combination unit and the other is from TCM.

DTC Logic

INFOID:000000007358691

DTC DETECTION LOGIC

NOTE:

- If DTC P0500 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0500 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-820, "DTC Logic"](#).

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0500	VEH SPEED SEN/CIRC (Vehicle speed sensor)	At 20 km/h (13 MPH), ECM detects the following status continuously for 5 seconds or more: The difference between a vehicle speed calculated by a output speed sensor transmitted from TCM to ECM via CAN communication and the vehicle speed indicated on the combination meter exceeds 15km/h (10 MPH).	<ul style="list-style-type: none"> • Harness or connector (The CAN communication line is open or shorted.) • Combination meter • ABS actuator and electric unit (control unit) • Wheel sensor • TCM • Output speed sensor

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.
2. Shift the selector lever to D range and wait at least for 2 seconds.
3. Drive the vehicle at least 5 seconds at 20 km/h (13 MPH) or more.

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-820, "Diagnosis Procedure"](#)
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007358692

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to [TM-37, "CONSULT Function \(TRANSMISSION\)"](#).

Is the inspection result normal?

- YES >> GO TO 2.

P0500 VSS

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

NO >> Perform trouble shooting relevant to DTC indicated.

2.CHECK DTC WITH ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)

Check DTC with ABS actuator and electric unit (control unit). Refer to [BRC-138, "CONSULT Function \(ABS\)"](#).

Is the inspection result normal?

YES >> GO TO 3.

NO >> Perform trouble shooting relevant to DTC indicated.

3.CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to [MWI-27, "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

YES >> GO TO 4.

NO >> Perform trouble shooting relevant to DTC indicated.

4.CHECK OUTPUT SPEED SENSOR

Check output speed sensor. Refer to [TM-56, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace or replace error-detected parts.

5.CHECK WHEEL SENSOR

Check wheel sensor. Refer to [BRC-48, "Component Inspection"](#) (TYPE 1) or [BRC-158, "Component Inspection"](#) (TYPE 2).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-37, "Intermittent Incident"](#).

NO >> Replace or replace error-detected parts.

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P0506 ISC SYSTEM

Description

INFOID:000000007358693

NOTE:

If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.

The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

On Board Diagnosis Logic

INFOID:000000007358694

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0506 0506	Idle speed control system RPM lower than expected	The idle speed is less than the target idle speed by 100 rpm or more.	<ul style="list-style-type: none"> • Electric throttle control actuator • Intake air leak

DTC Confirmation Procedure

INFOID:000000007358695

NOTE:

- **If the target idle speed is out of the specified value, perform [EC-597, "Idle Air Volume Learning"](#), before conducting DTC Confirmation Procedure. For the target idle speed, refer to [EC-956, "Idle Speed and Ignition Timing"](#).**
- If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
 1. Turn ignition switch OFF and wait at least 10 seconds.
 2. Turn ignition switch ON.
 3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.**
- **Always perform the test at a temperature above -10°C(14°F).**
 1. Open engine hood.
 2. Start engine and warm it up to normal operating temperature.
 3. Turn ignition switch OFF and wait at least 10 seconds.
 4. Turn ignition switch ON.
 5. Turn ignition switch OFF and wait at least 10 seconds.
 6. Start engine and run it for at least 1 minute at idle speed.
 7. Check 1st trip DTC.
 8. If 1st trip DTC is detected, go to [EC-822, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358696

1. CHECK INTAKE AIR LEAKAGE

1. Start engine and let it idle.
2. Listen for an intake air leakage after the mass air flow sensor.

OK or NG

- OK >> GO TO 2.
- NG >> Discover air leakage location and repair.

2. REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform initialization of NVIS(NATS) system and registration of all NVIS(NATS) ignition key IDs. Refer to [SEC-10, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (with intelligent key

P0506 ISC SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

- system) or [SEC-120, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (without intelligent key system).
4. Perform [EC-596, "VIN Registration"](#).
 5. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
 6. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
 7. Perform [EC-597, "Idle Air Volume Learning"](#).

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>> INSPECTION END

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P0507 ISC SYSTEM

Description

INFOID:000000007358697

NOTE:

If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.

The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

On Board Diagnosis Logic

INFOID:000000007358698

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0507 0507	Idle speed control system RPM higher than expected	The idle speed is more than the target idle speed by 200 rpm or more.	<ul style="list-style-type: none"> • Electric throttle control actuator • Intake air leak • PCV system

DTC Confirmation Procedure

INFOID:000000007358699

NOTE:

• **If the target idle speed is out of the specified value, perform [EC-597, "Idle Air Volume Learning"](#), before conducting DTC Confirmation Procedure. For the target idle speed, refer to [EC-956, "Idle Speed and Ignition Timing"](#).**

• If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

• **Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.**

• **Always perform the test at a temperature above -10°C(14°F).**

1. Open engine hood.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and run it for at least 1 minute at idle speed.
7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to [EC-824, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358700

1. CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace malfunctioning part.

2. CHECK INTAKE AIR LEAKAGE

1. Start engine and let it idle.
2. Listen for an intake air leakage after the mass air flow sensor.

OK or NG

- OK >> GO TO 3.

P0507 ISC SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

NG >> Discover air leakage location and repair.

3.REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform initialization of NVIS(NATS) system and registration of all NVIS(NATS) ignition key IDs. Refer to [SEC-10, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (with intelligent key system) or [SEC-120, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (without intelligent key system).
4. Perform [EC-596, "VIN Registration"](#).
5. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
6. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
7. Perform [EC-597, "Idle Air Volume Learning"](#).

>> INSPECTION END

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P050E COLD START CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P050E COLD START CONTROL

Description

INFOID:000000007800495

ECM controls ignition timing and engine idle speed when engine is started with pre-warming up condition. This control promotes the activation of three way catalyst by heating the catalyst and reduces emissions.

DTC Logic

INFOID:000000007800496

DTC DETECTION LOGIC

NOTE:

If DTC P050E is displayed with other DTC, first perform the trouble diagnosis for other DTC.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P050E	Cold start engine exhaust temperature too low	The temperature of the catalyst inlet does not rise to the proper temperature when the engine is started with pre-warming up condition.	<ul style="list-style-type: none">• Lack of intake air volume• Fuel injection system• ECM

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

Ⓟ WITH CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Select "DATA MONITOR" mode with CONSULT.
4. Check the indication of "COOLAN TEMP/S".

Ⓢ WITH GST

Follow the procedure "With CONSULT" above.

Is the value of "COOLAN TEMP/S" between 5°C (41°F) and 36°C (97°F)?

YES >> GO TO 3.

NO-1 [If it is below 5°C (41°F)]>>Warm up the engine until the value of "COOLAN TEMP/S" reaches 5°C (41°F) or more. Retry from step 1.

NO-2 [If it is above 36°C (97°F)]>>Cool engine down to less than 36°C (97°F). Retry from step 1.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

Ⓟ WITH CONSULT

1. Set the select lever in N range.
2. Start the engine and warm up in idle with the value of "COOLAN TEMP/S" between 5°C (41°F) and 40°C (104°F) for more than 15 seconds.
3. Check 1st trip DTC.

Ⓢ WITH GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

YES >> Proceed to [EC-827, "Diagnosis Procedure"](#).

NO >> INSPECTION END

P050E COLD START CONTROL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

INFOID:000000007800497

Diagnosis Procedure

1. PERFORM IDLE AIR VOLUME LEARNING

Perform [EC-597, "Idle Air Volume Learning"](#).

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 2.

NO >> Follow the instruction of Idle Air Volume Learning.

2. CHECK INTAKE SYSTEM

Check for the cause of intake air volume lacking. Refer to the following.

- Crushed intake air passage
- Intake air passage clogging
- Clogging of throttle body

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace malfunctioning part

3. CHECK FUEL INJECTION SYSTEM FUNCTION

Perform DTC Confirmation Procedure for DTC P0171, P0174. Refer to [EC-714, "On Board Diagnosis Logic"](#).

Is the inspection result normal?

YES >> GO TO 4.

NO >> Proceed to [EC-716, "Diagnosis Procedure"](#) for DTC P0171, P0174.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
See [EC-826, "DTC Logic"](#).

Is the 1st trip DTC P050E displayed again?

YES >> GO TO 5.

NO >> INSPECTION END

5. REPLACE ECM

Replace ECM. Refer to [EC-500, "Engine Control Component Parts Location"](#) and [EC-596, "Procedure After Replacing ECM"](#).

>> INSPECTION END

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P0550 PSP SENSOR

[VK56DE]

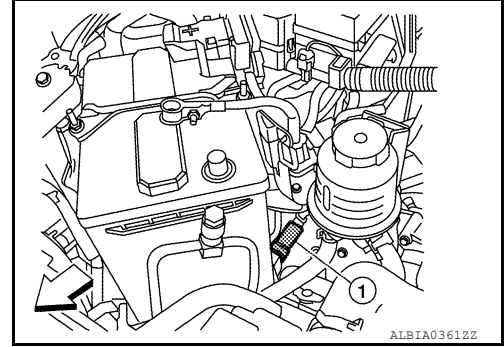
< DTC/CIRCUIT DIAGNOSIS >

P0550 PSP SENSOR

Component Description

INFOID:000000007358701

Power steering pressure (PSP) sensor (1) is installed to the power steering high-pressure tube and detects a power steering load. This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.



On Board Diagnosis Logic

INFOID:000000007358702

The MIL will not illuminate for this self-diagnosis.

NOTE:

If DTC P0550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-836, "DTC Confirmation Procedure"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0550 0550	Power steering pressure sensor circuit	An excessively low or high voltage from the sensor is sent to ECM.	<ul style="list-style-type: none">• Harness or connectors (The sensor circuit is open or shorted)• Power steering pressure sensor

DTC Confirmation Procedure

INFOID:000000007358703

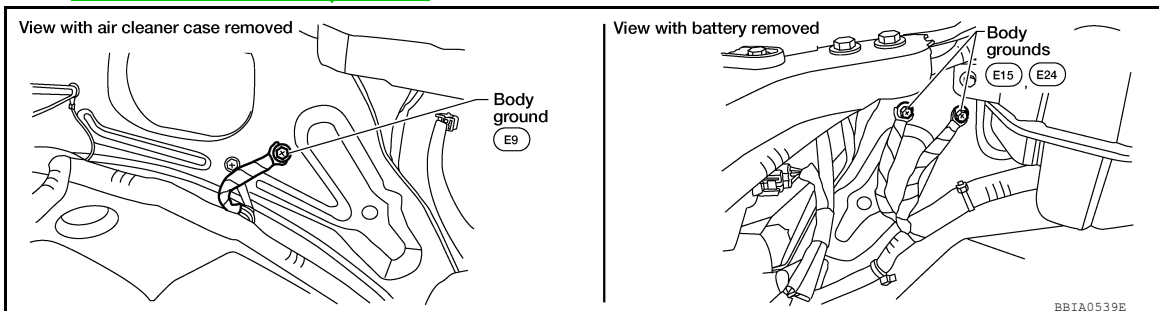
1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and let it idle for at least 5 seconds.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to [EC-828, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358704

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623, "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
NG >> Repair or replace ground connections.

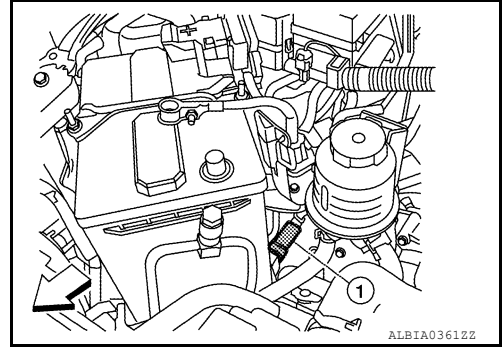
P0550 PSP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect power steering pressure (PSP) sensor (1) harness connector.
2. Turn ignition switch ON.

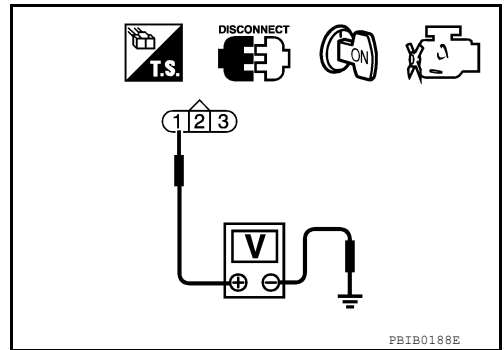


3. Check voltage between PSP sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 3.
- NG >> Repair harness or connectors.



3. CHECK PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between PSP sensor terminal 3 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 12 and PSP sensor terminal 2.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK PSP SENSOR

Refer to [EC-830, "Component Inspection"](#).

OK or NG

- OK >> GO TO 6.
- NG >> Replace PSP sensor. Refer to [ST-25](#).

6. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

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P0550 PSP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

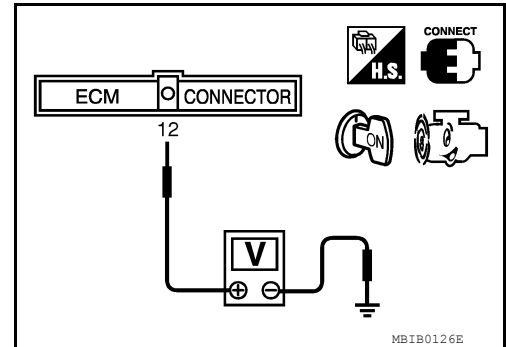
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Component Inspection

POWER STEERING PRESSURE SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and let it idle.
3. Check voltage between ECM terminal 12 and ground under the following conditions.

Condition	Voltage
Steering wheel: Being turned	0.5 - 4.5V
Steering wheel: Not being turned	0.4 - 0.8V



P0603 ECM POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

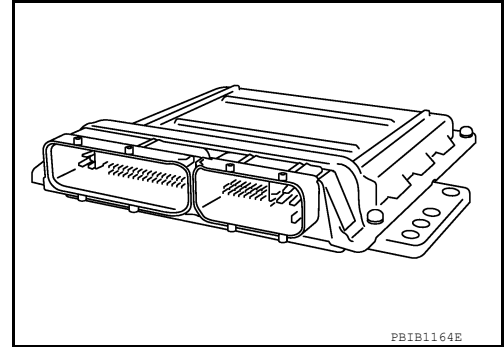
[VK56DE]

P0603 ECM POWER SUPPLY

Component Description

INFOID:000000007358706

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.



On Board Diagnosis Logic

INFOID:000000007358707

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0603 0603	ECM power supply circuit	ECM back up RAM system does not function properly.	<ul style="list-style-type: none">• Harness or connectors [ECM power supply (back up) circuit is open or shorted.]• ECM

DTC Confirmation Procedure

INFOID:000000007358708

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON, wait at least 10 seconds.
3. Turn ignition switch OFF, wait at least 5 minutes.
4. Turn ignition switch ON, wait at least 10 seconds.
5. Repeat steps 2 to 3 for 5 times.
6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to [EC-831, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358709

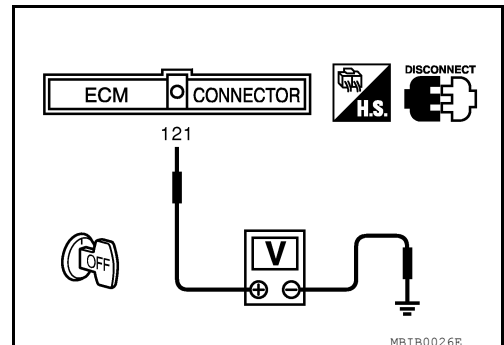
1. CHECK ECM POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 121 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

P0603 ECM POWER SUPPLY

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Check the following.

- IPDM E/R connector E121
- 20 A fuse (No. 53)
- Harness for open or short between ECM and battery

>> Repair or replace harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

OK or NG

OK >> GO TO 4.

NG >> Repair or replace harness or connectors.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure. Refer to [EC-831. "DTC Confirmation Procedure"](#).
4. Is the 1st trip DTC P0603 displayed again?

Yes or No

Yes >> GO TO 5.

No >> **INSPECTION END**

5. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NVIS(NATS) system and registration of all NVIS(NATS) ignition key IDs. Refer to [SEC-10. "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (with intelligent key system) or [SEC-120. "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (without intelligent key system).
3. Perform [EC-596. "VIN Registration"](#).
4. Perform [EC-597. "Accelerator Pedal Released Position Learning"](#).
5. Perform [EC-597. "Throttle Valve Closed Position Learning"](#).
6. Perform [EC-597. "Idle Air Volume Learning"](#).

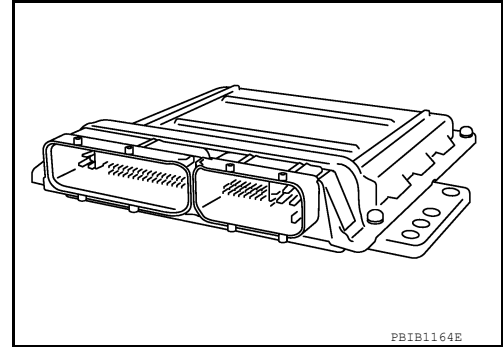
>> **INSPECTION END**

P0605 ECM

Component Description

INFOID:000000007358710

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.



On Board Diagnosis Logic

INFOID:000000007358711

This self-diagnosis has one or two trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 0605	Engine control module	A)	ECM calculation function is malfunctioning.	• ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	

FAIL-SAFE MODE

ECM enters fail-safe mode when the malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode
Malfunction A	<ul style="list-style-type: none"> ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. ECM deactivates ASCD operation.

DTC Confirmation Procedure

INFOID:000000007358712

Perform PROCEDURE FOR MALFUNCTION A first. If the 1st trip DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B. If there is no malfunction on PROCEDURE FOR MALFUNCTION B, perform PROCEDURE FOR MALFUNCTION C.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

PROCEDURE FOR MALFUNCTION A

1. Turn ignition switch ON.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-834. "Diagnosis Procedure"](#).

PROCEDURE FOR MALFUNCTION B

1. Turn ignition switch ON and wait at least 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to [EC-834. "Diagnosis Procedure"](#).

PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and wait at least 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.
3. Repeat step 2 for 32 times.

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< DTC/CIRCUIT DIAGNOSIS >

4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to [EC-834, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358713

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure. Refer to [EC-833, "DTC Confirmation Procedure"](#).
4. Is the 1st trip DTC P0605 displayed again?

Yes or No

- Yes >> GO TO 2.
No >> **INSPECTION END**

2.REPLACE ECM

1. Replace ECM.
2. Perform initialization of NVIS(NATS) system and registration of all NVIS(NATS) ignition key IDs. Refer to [SEC-10, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (with intelligent key system) or [SEC-120, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (without intelligent key system).
3. Perform [EC-596, "VIN Registration"](#).
4. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
5. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
6. Perform [EC-597, "Idle Air Volume Learning"](#).

>> **INSPECTION END**

P0607 ECM

Description

INFOID:000000007358714

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

INFOID:000000007358715

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0607 0607	CAN communication bus	When detecting error during the initial diagnosis of CAN controller of ECM.	• ECM

DTC Confirmation Procedure

INFOID:000000007358716

1. Turn ignition switch ON.
2. Check DTC.
3. If DTC is detected, go to [EC-835, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358717

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure. Refer to [EC-835, "DTC Confirmation Procedure"](#).
4. Is the DTC P0607 displayed again?

Yes or No

- Yes >> GO TO 2.
- No >> **INSPECTION END**

2.REPLACE ECM

1. Replace ECM.
2. Perform initialization of NVIS(NATS) system and registration of all NVIS(NATS) ignition key IDs. Refer to [SEC-10, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (with intelligent key system) or [SEC-120, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#) (without intelligent key system).
3. Perform [EC-596, "VIN Registration"](#).
4. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
5. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
6. Perform [EC-597, "Idle Air Volume Learning"](#).

>> INSPECTION END

P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0643 SENSOR POWER SUPPLY

On Board Diagnosis Logic

INFOID:000000007358718

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0643 0643	Sensor power supply circuit short	ECM detects that the voltage of power source for sensor is excessively low or high.	<ul style="list-style-type: none">• Harness or connectors (APP sensor 1 circuit is shorted.) (Battery current sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (PSP sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.)• Accelerator pedal position sensor• Battery current sensor• EVAP control system pressure sensor• Power steering pressure sensor• Refrigerant pressure sensor

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operation condition in fail-safe mode

ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

INFOID:000000007358719

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

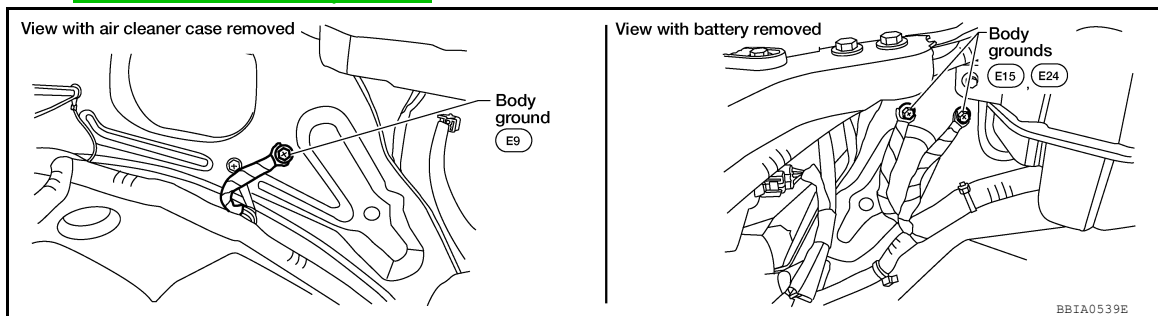
1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to [EC-836, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358720

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623, "Ground Inspection"](#).



OK or NG

OK >> GO TO 2.

P0643 SENSOR POWER SUPPLY

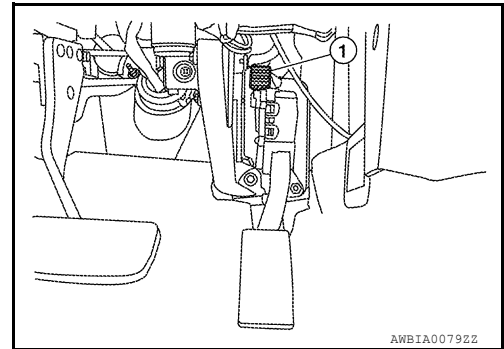
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

NG >> Repair or replace ground connections.

2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor (1) harness connector.
2. Turn ignition switch ON.

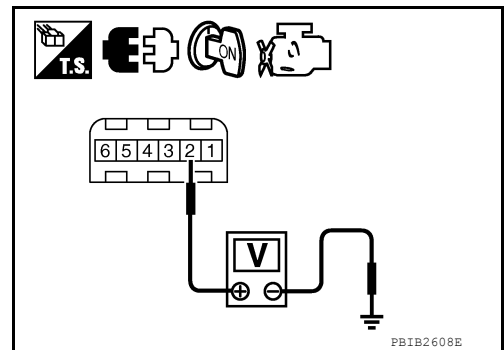


3. Check voltage between APP sensor terminal 2 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 5.
NG >> GO TO 3.



3. CHECK SENSOR POWER SUPPLY CIRCUITS

Check harness for short to power and short to ground, between the following terminals

ECM terminal	Sensor terminal	Reference Wiring Diagram
48	EVAP control system pressure sensor terminal 3	EC-567. "Wiring Diagram"
49	Refrigerant pressure sensor terminal 1	
	Battery current sensor terminal 1	
68	Power steering pressure sensor terminal 1	
90	APP sensor terminal 2	

OK or NG

- OK >> GO TO 4.
NG >> Repair short to ground or short to power in harness or connectors.

4. CHECK COMPONENTS

Check the following.

- EVAP control system pressure sensor (Refer to [EC-788. "Component Inspection"](#).)
- Power steering pressure sensor (Refer to [EC-830. "Component Inspection"](#).)
- Battery current sensor (Refer to [EC-859. "Component Inspection"](#).)
- Refrigerant pressure sensor. (Refer to [EC-944. "Diagnosis Procedure"](#).)

OK or NG

- OK >> GO TO 7.
NG >> Replace malfunctioning components.

5. CHECK ACCELERATOR PEEDAL POSITION SENSOR

Refer to [EC-898. "Component Inspection"](#).

OK or NG

- OK >> GO TO 7.
NG >> GO TO 6.

P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal position assembly. Refer to [ACC-4](#).
2. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
3. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
4. Perform [EC-597, "Idle Air Volume Learning"](#).

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0850 PNP SWITCH

Component Description

INFOID:000000007358721

When the selector lever position is P or N, park/neutral position (PNP) signal is sent to ECM from TCM via combination meter (unified meter control unit).
ECM detects the position because the continuity of the line (the ON signal) exists.

On Board Diagnosis Logic

INFOID:000000007358722

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0850 0850	Park/neutral position switch	The park/neutral position (PNP) signal does not change during driving after engine is started.	<ul style="list-style-type: none"> • Harness or connectors [The park/neutral position (PNP) signal circuit is open or shorted.] • Combination meter (unified meter control unit) • TCM

DTC Confirmation Procedure

INFOID:000000007358723

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Ⓟ WITH CONSULT

1. Turn ignition switch ON.
2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT. Then check the "P/N POSI SW" indication under the following conditions.

Selector lever position	Known-good signal
N or P position	ON
Except the above position	OFF

If NG, go to [EC-840. "Diagnosis Procedure"](#).

If OK, go to following step.

3. Select "DATA MONITOR" mode with CONSULT.
4. Start engine and warm it up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	1,050 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	3.5 - 31.8 msec
VHCL SPEED SE	More than 64 km/h (40 MPH)
Selector lever	Suitable position

6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to [EC-840. "Diagnosis Procedure"](#).

Overall Function Check

INFOID:000000007358724

Use this procedure to check the overall function of the park/neutral position (PNP) signal circuit. During this check, a 1st trip DTC might not be confirmed.

Ⓟ WITH GST

P0850 PNP SWITCH

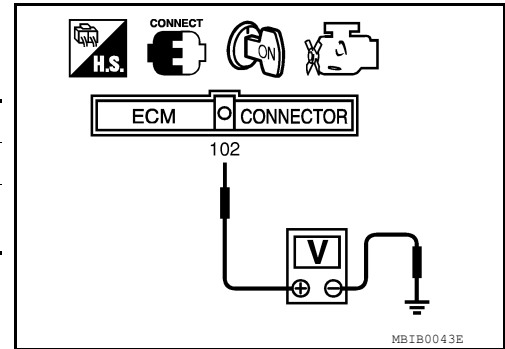
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 102 (PNP signal) and ground under the following conditions.

Selector lever position	Voltage (Known good data)
P or N position	Approx. 0 V
Except the above position	BATTERY VOLTAGE (11 - 14 V)

3. If NG, go to [EC-840. "Diagnosis Procedure"](#).



INFOID:000000007358725

Diagnosis Procedure

1. CHECK DTC WITH TCM

Refer to [TM-35. "OBD-II Diagnostic Trouble Code \(DTC\)"](#).

OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace malfunctioning part.

2. CHECK STARTING SYSTEM

Turn ignition switch OFF, then turn it to START.

Does starter motor operate?

Yes or No

- Yes >> GO TO 3.
- No >> Refer to [STR-5. "Work Flow \(With GR8-1200 NI\)"](#) or [STR-9. "Work Flow \(Without GR8-1200 NI\)"](#).

3. CHECK PNP SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect combination meter harness connector.
4. Check harness continuity between ECM terminal 102 and combination meter terminal 7.
Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M31, E152
- Harness for open or short between ECM and combination meter

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

OK or NG

- OK >> GO TO 6.
- NG >> Repair or replace malfunctioning part.

6. REPLACE COMBINATION METER FUNCTION

Refer to [MWI-89. "Removal and Installation"](#).

P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

>> INSPECTION END

A

EC

C

D

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P

P1140, P1145 IVT CONTROL POSITION SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1140, P1145 IVT CONTROL POSITION SENSOR

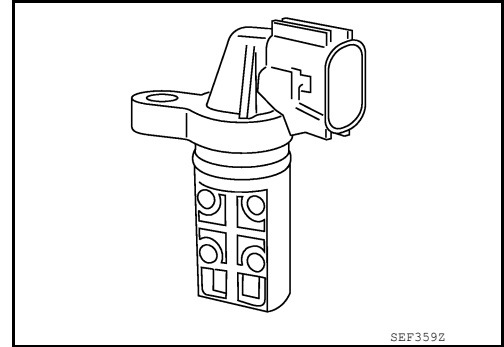
Component Description

INFOID:000000007358726

Intake valve timing control position sensors are located in the front of cylinder heads in both bank 1 and bank 2.

This sensor uses a Hall IC.

The cam position is determined by the intake camshaft sprocket concave (in four places). The ECM provides feedback to the intake valve timing control for appropriate target valve open-close timing according to drive conditions based on detected cam position.



On Board Diagnosis Logic

INFOID:000000007358727

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1140 1140 (Bank 1)	Intake valve timing control position sensor circuit	An excessively high or low voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (Intake valve timing control position sensor circuit is open or shorted) • Intake valve timing control position sensor • Crankshaft position sensor (POS) • Camshaft position sensor (PHASE) • Accumulation of debris to the signal pick-up portion of the camshaft sprocket
P1145 1145 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358728

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Select "DATA MONITOR" mode with CONSULT.
4. Maintain the following conditions for at least 10 seconds.

Engine speed	More than idle speed
Selector lever	P or N position

5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to [EC-842, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358729

1. CHECK GROUND CONNECTIONS

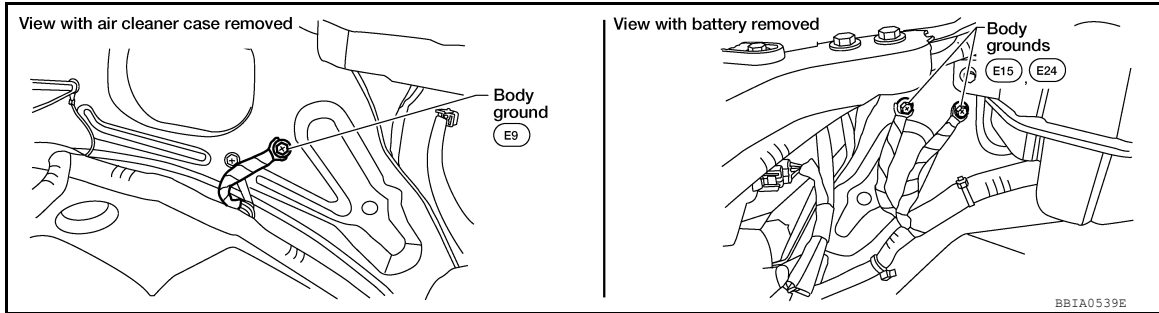
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P1140, P1145 IVT CONTROL POSITION SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Refer to [EC-623](#), "Ground Inspection".



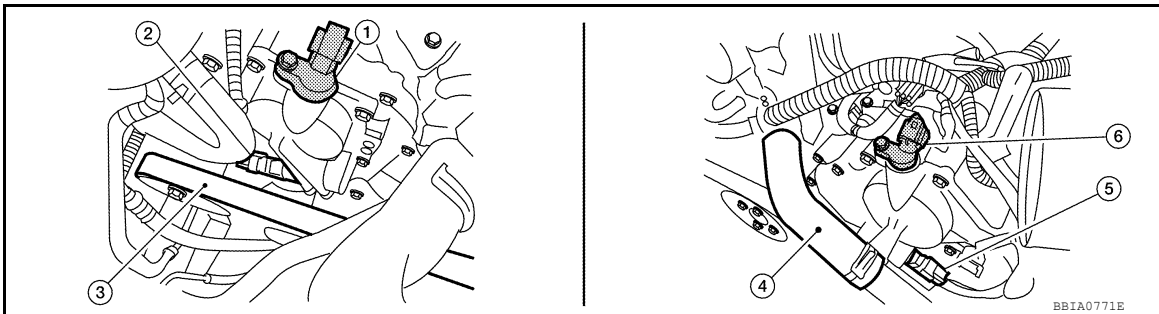
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect intake valve timing control position sensor harness connector.



- | | | |
|---|--|---|
| 1. Intake valve timing control position sensor (bank 2) | 2. Intake valve timing control solenoid valve (bank 2) | 3. Drive belt |
| 4. Radiator hose | 5. Intake valve timing control solenoid valve (bank 1) | 6. Intake valve timing control position sensor (bank 1) |

2. Turn ignition switch ON.

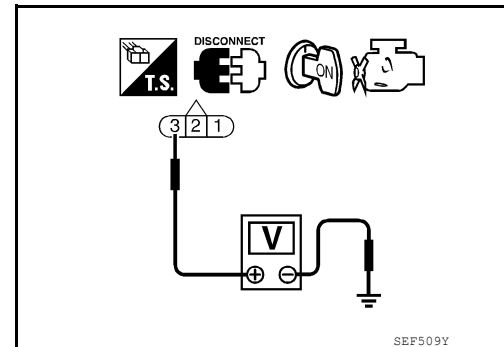
3. Check voltage between intake valve timing control position sensor terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 4.

NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E19
- Harness for open or short between intake valve timing control position sensor and IPDM E/R
- Harness for open or short between intake valve timing control position sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

P1140, P1145 IVT CONTROL POSITION SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

2. Check harness continuity between intake valve timing control position sensor terminal 1 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between intake valve timing control position sensor and ground

>> Repair open circuit or short to power in harness or connectors.

6. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between the following;
ECM terminal 72 and intake valve timing control position sensor (bank 1) terminal 2 or
ECM terminal 53 and intake valve timing control position sensor (bank 2) terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR

Refer to [EC-845, "Component Inspection"](#).

OK or NG

OK >> GO TO 8.

NG >> Replace malfunctioning intake valve timing control position sensor. Refer to [EM-193](#).

8. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to [EC-747, "Component Inspection"](#).

OK or NG

OK >> GO TO 9.

NG >> Replace crankshaft position sensor (POS). Refer to [EM-227](#).

9. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to [EC-751, "Component Inspection"](#).

OK or NG

OK >> GO TO 10.

NG >> Replace camshaft position sensor (PHASE). Refer to [EM-199](#).

10. CHECK CAMSHAFT SPROCKET

Check accumulation of debris to the signal pick-up portion of the camshaft sprocket. Refer to [EM-208, "Inspection after Installation"](#).

OK or NG

OK >> GO TO 11.

NG >> Remove debris and clean the signal pick-up cutout of camshaft sprocket.

11. CHECK INTERMITTENT INCIDENT

P1140, P1145 IVT CONTROL POSITION SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Refer to [GI-37](#). "Intermittent Incident".

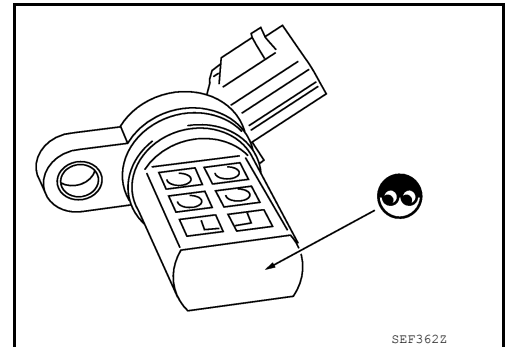
>> INSPECTION END

Component Inspection

INFOID:000000007358730

INTAKE VALVE TIMING CONTROL POSITION SENSOR

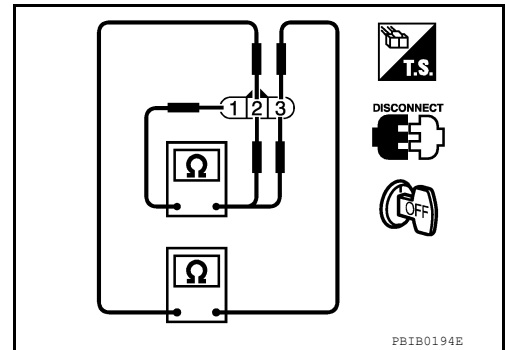
1. Disconnect intake valve timing control position sensor harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown below.

Terminal No. (Polarity)	Resistance [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞ Ω
2 (+) - 1 (-)	
3 (+) - 2 (-)	

6. If NG, replace intake valve timing control position sensor. Refer to [EM-193](#).



P1148, P1168 CLOSED LOOP CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1148, P1168 CLOSED LOOP CONTROL

On Board Diagnosis Logic

INFOID:000000007358731

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1148 1148 (Bank 1)	Closed loop control function	The closed loop control function for bank 1 does not operate even when vehicle is being driven in the specified condition.	<ul style="list-style-type: none">• Harness or connectors [The air fuel ratio (A/F) sensor 1 circuit is open or shorted.]• Air fuel ratio (A/F) sensor 1• Air fuel ratio (A/F) sensor 1 heater
P1168 1168 (Bank 2)		The closed loop control function for bank 2 does not operate even when vehicle is being driven in the specified condition.	

DTC P1148 or P1168 is displayed with another DTC for air fuel ratio (A/F) sensor 1.
Perform the trouble diagnosis for the corresponding DTC.

P1211 TCS CONTROL UNIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1211 TCS CONTROL UNIT

Description

INFOID:000000007358732

The malfunction information related to TCS is transferred to ECM via the CAN communication line from “ABS actuator and electric unit (control unit)”.

Always erase the malfunction information such as DTC not only for “ABS actuator and electric unit (control unit)” but also for ECM after TCS related repair.

On Board Diagnosis Logic

INFOID:000000007358733

**Freeze frame data is not stored in the ECM for this self-diagnosis.
The MIL will not illuminate for this self-diagnosis.**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1211 1211	TCS control unit	ECM receives a malfunction information from “ABS actuator electric unit (control unit)”	<ul style="list-style-type: none">• ABS actuator and electric unit (control unit)• TCS related parts

DTC Confirmation Procedure

INFOID:000000007358734

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

1. Start engine and let it idle for at least 60 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-847, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358735

Go to [BRC-117, "Work Flow"](#).

P1212 TCS COMMUNICATION LINE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1212 TCS COMMUNICATION LINE

Description

INFOID:000000007358736

NOTE:

- If DTC P1212 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1212 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-835, "DTC Confirmation Procedure"](#).

This CAN communication line is used to control the smooth engine operation during the TCS operation. Pulse signals are exchanged between ECM and "ABS actuator and electric unit (control unit)".

Always erase the malfunction information such as DTC not only for "ABS actuator and electric unit (control unit)" but also for ECM after TCS related repair.

On Board Diagnosis Logic

INFOID:000000007358737

**Freeze frame data is not stored in the ECM for this self-diagnosis.
The MIL will not illuminate for this self-diagnosis.**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1212 1212	TCS communication line	ECM can not receive the information from "ABS actuator and electric unit (control unit)" continuously.	<ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted.)• ABS actuator and electric unit (control unit)• Dead (Weak) battery

DTC Confirmation Procedure

INFOID:000000007358738

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-848, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358739

Go to [BRC-117, "Work Flow"](#).

P1217 ENGINE OVER TEMPERATURE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1217 ENGINE OVER TEMPERATURE

On Board Diagnosis Logic

INFOID:000000007358740

NOTE:

- If DTC P1217 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1217 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-835, "DTC Confirmation Procedure"](#).

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217 1217	Engine over temperature (Overheat)	<ul style="list-style-type: none">• Cooling fan does not operate properly (Overheat).• Cooling fan system does not operate properly (Overheat).• Engine coolant level was not added to the system using the proper filling method.• Engine coolant is not within the specified range.	<ul style="list-style-type: none">• Harness or connectors (The cooling fan circuit is open or shorted.)• IPDM E/R• Cooling fan• Cooling fan (Crankshaft driven)• Radiator hose• Radiator• Radiator cap• Reservoir tank• Reservoir tank cap• Water pump• Thermostat <p>For more information, refer to EC-851, "Main 12 Causes of Overheating".</p>

CAUTION:

When a malfunction is indicated, always replace the coolant. Refer to [CO-42, "Changing Engine Coolant"](#). Also, replace the engine oil. Refer to [LU-27, "Changing Engine Oil"](#).

1. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Always use coolant with the proper mixture ratio. Refer to [MA-19, "FOR USA AND CANADA : SAE Viscosity Number"](#).
2. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

Overall Function Check

INFOID:000000007358741

Use this procedure to check the overall function of the cooling system. During this check, a DTC might not be confirmed.

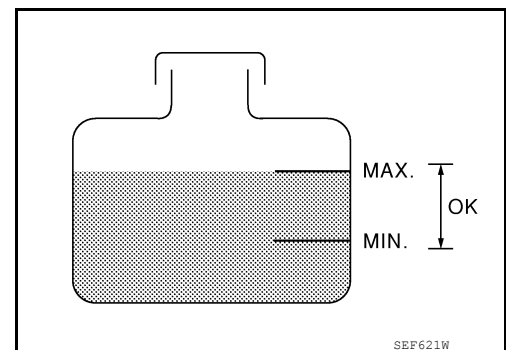
WARNING:

Never remove the radiator cap and/or reservoir tank cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator and/or reservoir tank.

Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT

1. Check the coolant level in the reservoir tank and radiator.
Allow engine to cool before checking coolant level.
If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to [EC-850, "Diagnosis Procedure"](#).
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to [EC-850, "Diagnosis Procedure"](#).
3. Turn ignition switch ON.
4. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.
5. If the results are NG, go to [EC-850, "Diagnosis Procedure"](#).



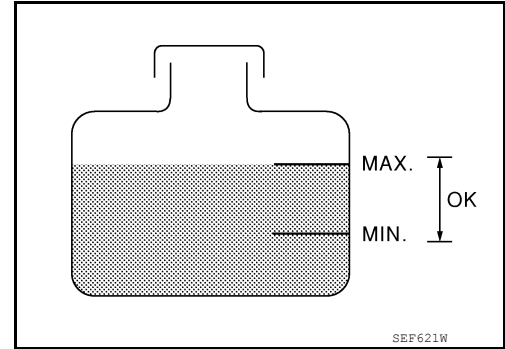
P1217 ENGINE OVER TEMPERATURE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

WITH GST

1. Check the coolant level in the reservoir tank and radiator.
Allow engine to cool before checking coolant level.
If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to [EC-850, "Diagnosis Procedure"](#).
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to [EC-850, "Diagnosis Procedure"](#).
3. Perform IPDM E/R auto active test and check cooling fan motor operation, refer to [PCS-9, "Diagnosis Description"](#).
4. If NG, go to [EC-850, "Diagnosis Procedure"](#).



INFOID:000000007358742

Diagnosis Procedure

1. CHECK COOLING FAN (CRANKSHAFT DRIVEN) OPERATION

1. Start engine and let it idle.
2. Make sure that cooling fan (crankshaft driven) operates normally.

OK or NG

OK (With CONSULT)>>GO TO 2.

OK (Without CONSULT)>>GO TO 3.

NG >> Check cooling fan (crankshaft driven). Refer to [CO-49, "Removal and Installation \(Crankshaft Driven Type\)"](#).

2. CHECK COOLING FAN OPERATION

With CONSULT

1. Start engine and let it idle.
2. Select "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.
3. Make sure that cooling fan operates at each speed (LOW/HI).

OK or NG

OK >> GO TO 4.

NG >> Check cooling fan control circuit. (Go to [EC-921, "Diagnosis Procedure"](#).)

3. CHECK COOLING FAN OPERATION

Without CONSULT

1. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to [PCS-9, "Diagnosis Description"](#).
2. Make sure that cooling fan operates at each speed (Low/High).

OK or NG

OK >> GO TO 4.

NG >> Check cooling fan control circuit. (Go to [EC-921, "Diagnosis Procedure"](#).)

4. CHECK COOLING SYSTEM FOR LEAK

Refer to [CO-41, "System Inspection"](#).

OK or NG

OK >> GO TO 5.

NG >> Check the following for leak. Refer to [CO-41, "System Inspection"](#).

- Hose
- Radiator
- Radiator cap
- Reservoir tank
- Water pump

5. CHECK RESERVOIR TANK CAP

Refer to [CO-41, "System Inspection"](#).

OK or NG

P1217 ENGINE OVER TEMPERATURE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- OK >> GO TO 6.
- NG >> Replace reservoir tank cap.

6. CHECK COMPONENT PARTS

Check the following

- Thermostat. Refer to [CO-54, "Removal and Installation"](#).
- Engine coolant temperature sensor. Refer to [EC-662, "Component Inspection"](#).

OK or NG

- OK >> GO TO 7.
- NG >> Replace malfunctioning component.

7. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, go to [EC-851, "Main 12 Causes of Overheating"](#).

>> **INSPECTION END**

Main 12 Causes of Overheating

INFOID:000000007358743

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	<ul style="list-style-type: none"> • Blocked radiator • Blocked condenser • Blocked radiator grille • Blocked bumper 	• Visual	No blocking	—
	2	• Coolant mixture	• Coolant tester	MA-19, "FOR USA AND CANADA : SAE Viscosity Number"	
	3	• Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	CO-42, "Changing Engine Coolant"
	4	• Reservoir tank cap	• Pressure tester	CO-41, "System Inspection"	
ON*2	5	• Coolant leakage	• Visual	No leakage	CO-41, "System Inspection"
ON*2	6	• Thermostat	• Touch the upper and lower radiator hoses	Both hoses should be hot	CO-54, "Removal and Installation"
ON*1	7	• Cooling fan	• CONSULT	Operating	See trouble diagnosis for DTC P1217 (EC-921, "Diagnosis Procedure").
ON*2	7	• Cooling fan (Crankshaft driven)	• Visual	Operating	See CO-49, "Removal and Installation (Crankshaft Driven Type)" .
OFF	8	• Combustion gas leakage	• Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	• Coolant temperature gauge	• Visual	Gauge less than 3/4 when driving	—
		• Coolant overflow to reservoir tank	• Visual	No overflow during driving and idling	CO-42, "Changing Engine Coolant"
OFF*4	10	• Coolant return from reservoir tank to radiator	• Visual	Should be initial level in reservoir tank	CO-42, "Changing Engine Coolant"
OFF	11	• Cylinder head	• Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	EM-218, "Inspection After Disassembly"
	12	• Cylinder block and pistons	• Visual	No scuffing on cylinder walls or piston	EM-224, "Removal and Installation"

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

*3: Drive at 90 km/h (56 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.

P1217 ENGINE OVER TEMPERATURE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

For more information, refer to [CO-39, "Troubleshooting Chart"](#).

P1225 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

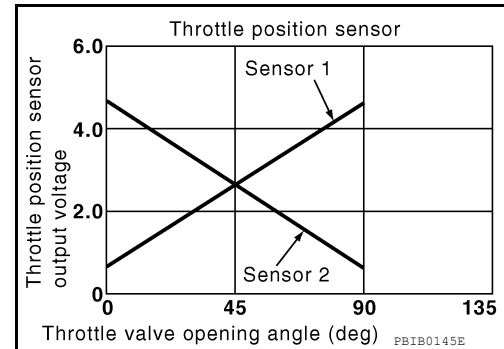
P1225 TP SENSOR

Component Description

INFOID:000000007358744

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve in response to driving conditions via the throttle control motor.



On Board Diagnosis Logic

INFOID:000000007358745

The MIL will not illuminate for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225 1225	Closed throttle position learning performance	Closed throttle position learning value is excessively low.	• Electric throttle control actuator (TP sensor 1 and 2)

DTC Confirmation Procedure

INFOID:000000007358746

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to [EC-853, "Diagnosis Procedure"](#).

Diagnosis Procedure

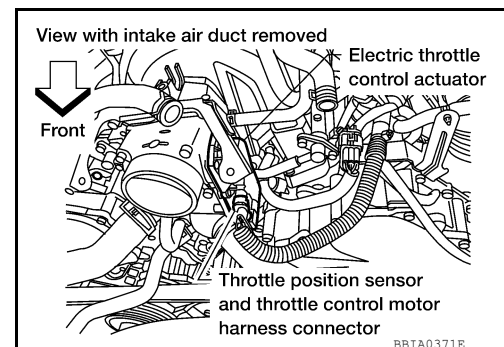
INFOID:000000007358747

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

- OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside. Refer to [EM-165](#).



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

P1225 TP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Replace the electric throttle control actuator. Refer to [EM-165](#).
2. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
3. Perform [EC-597, "Idle Air Volume Learning"](#).

>> INSPECTION END

P1226 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

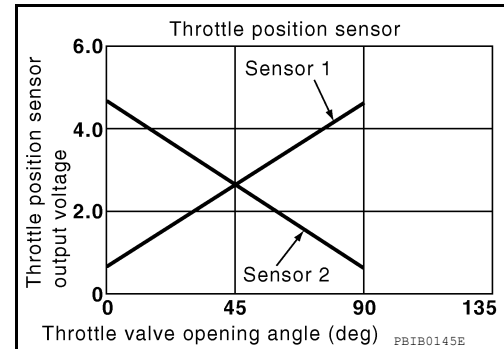
P1226 TP SENSOR

Component Description

INFOID:000000007358748

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve in response to driving conditions via the throttle control motor.



On Board Diagnosis Logic

INFOID:000000007358749

The MIL will not illuminate for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226 1226	Closed throttle position learning performance	Closed throttle position learning is not performed successfully, repeatedly.	• Electric throttle control actuator (TP sensor 1 and 2)

DTC Confirmation Procedure

INFOID:000000007358750

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Repeat steps 2 and 3 for 32 times.
5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to [EC-855, "Diagnosis Procedure"](#).

Diagnosis Procedure

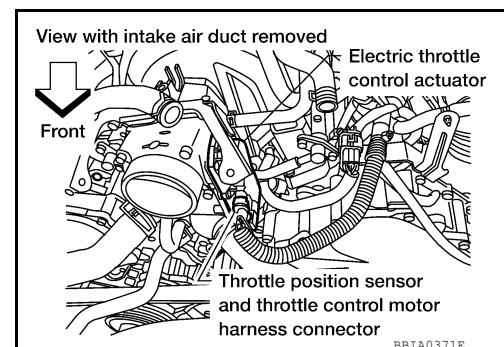
INFOID:000000007358751

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

- OK >> GO TO 2.
- NG >> Remove the foreign matter and clean the electric throttle control actuator inside. Refer to [EM-165](#).



P1226 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator. Refer to [EM-165](#).
2. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
3. Perform [EC-597, "Idle Air Volume Learning"](#).

>> INSPECTION END

P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

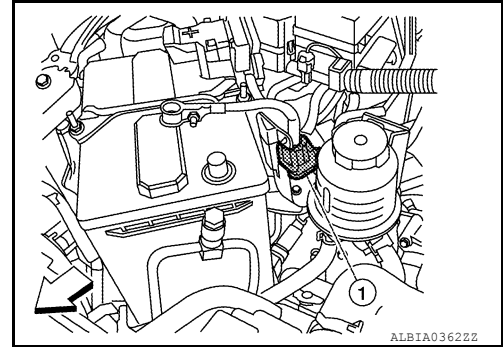
[VK56DE]

P1550 BATTERY CURRENT SENSOR

Component Description

INFOID:000000007358756

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor (1) is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to [CHG-12, "System Description"](#).



↔: Vehicle front

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

On Board Diagnosis Logic

INFOID:000000007358757

The MIL will not illuminate for this self-diagnosis.

NOTE:

If DTC P1550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-836, "DTC Confirmation Procedure"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1550 1550	Battery current sensor circuit range/performance	The output voltage of the battery current sensor remains within the specified range while engine is running.	<ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Battery current sensor

DTC Confirmation Procedure

INFOID:000000007358758

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

1. Start engine and wait at least 10 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-857, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358759

1. CHECK GROUND CONNECTIONS

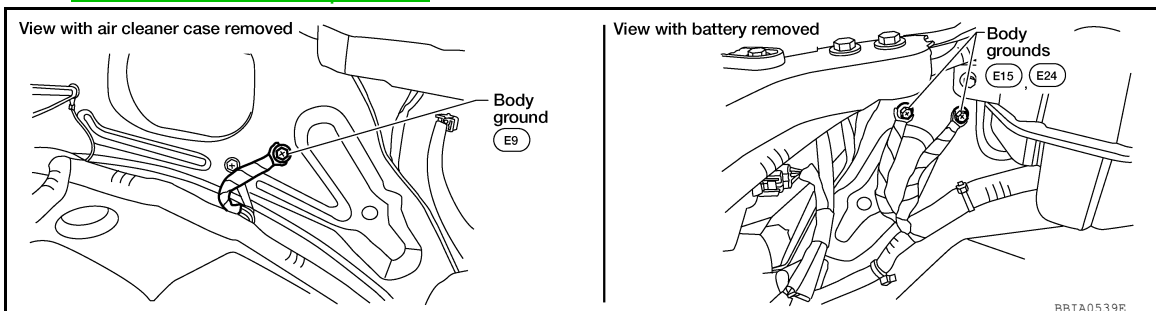
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Refer to [EC-623, "Ground Inspection"](#).

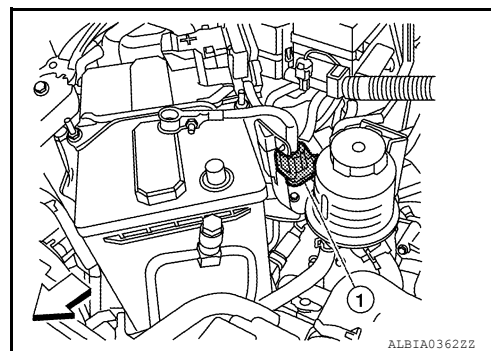


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect battery current sensor (1) harness connector.
2. Turn ignition switch ON.
↔: Vehicle front

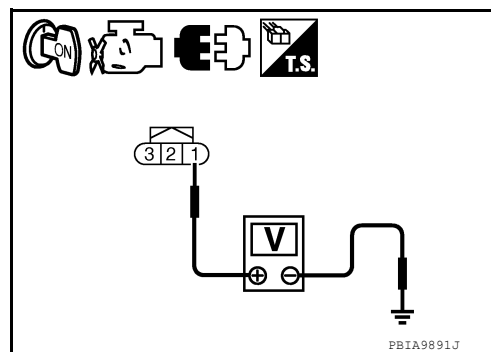


3. Check voltage between battery current sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between battery current sensor terminal 2 and ECM terminal 67.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 6.
- NG >> GO TO 5.

P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between battery current sensor terminal 3 and ECM terminal 71.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK BATTERY CURRENT SENSOR

Refer to [EC-859, "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

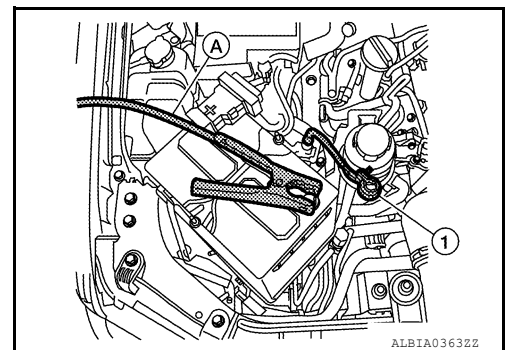
>> **INSPECTION END**

Component Inspection

INFOID:000000007358760

BATTERY CURRENT SENSOR

1. Reconnect harness connectors disconnected.
2. Disconnect battery negative cable (1).
3. Install jumper cable (A) between battery negative terminal and body ground.
4. Turn ignition switch ON.



P1550 BATTERY CURRENT SENSOR

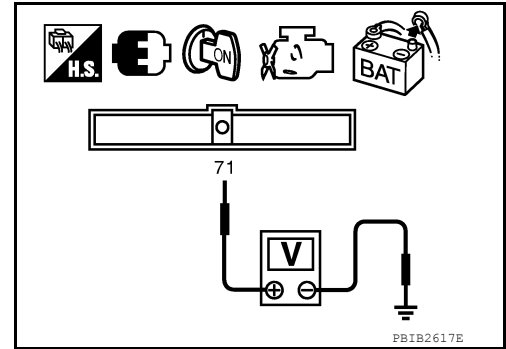
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Check voltage between ECM terminal 71 (battery current sensor signal) and ground.

Voltage: Approximately 2.5 V

6. If NG, replace battery negative cable assembly.



P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

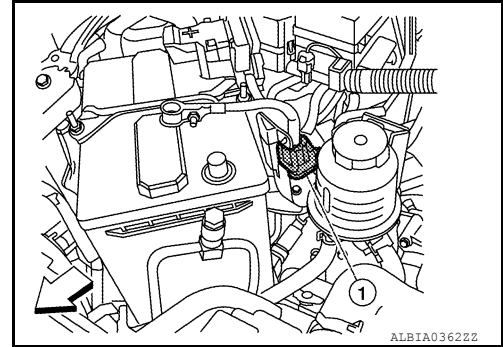
[VK56DE]

P1551, P1552 BATTERY CURRENT SENSOR

Component Description

INFOID:000000007358761

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor (1) is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to [CHG-12, "System Description"](#).



↔: Vehicle front

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

On Board Diagnosis Logic

INFOID:000000007358762

The MIL will not illuminate for these self-diagnoses.

NOTE:

If DTC P1551 or P1552 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-836, "DTC Confirmation Procedure"](#)

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1551 1551	Battery current sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Battery current sensor
P1552 1552	Battery current sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

INFOID:000000007358763

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V with ignition switch ON

1. Turn ignition switch ON.
2. Wait at least 10 seconds.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to [EC-861, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358764

1. CHECK GROUND CONNECTIONS

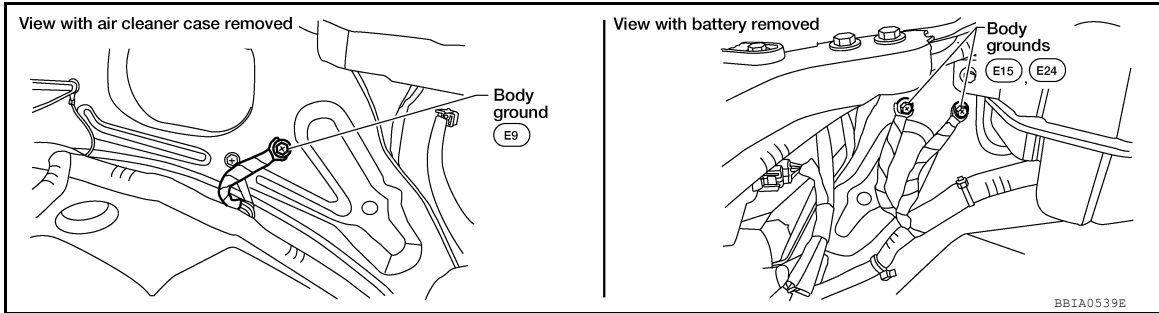
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Refer to [EC-623, "Ground Inspection"](#).

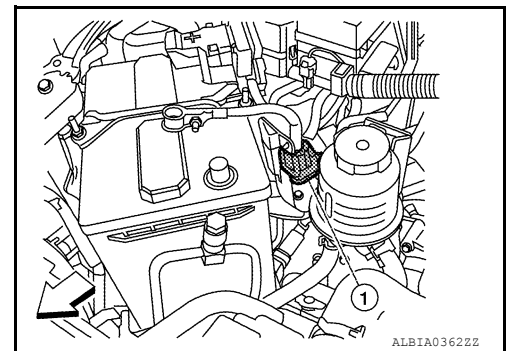


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect battery current sensor (1) harness connector.
2. Turn ignition switch ON.
↔: Vehicle front

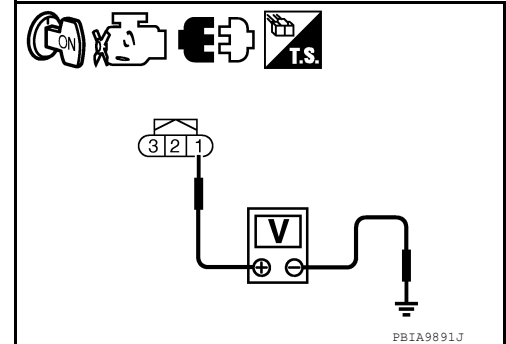


3. Check voltage between battery current sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between battery current sensor terminal 2 and ECM terminal 67.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 6.
- NG >> GO TO 5.

P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between battery current sensor terminal 3 and ECM terminal 71.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.

NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK BATTERY CURRENT SENSOR

Refer to [EC-863, "Component Inspection"](#).

OK or NG

OK >> GO TO 9.

NG >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

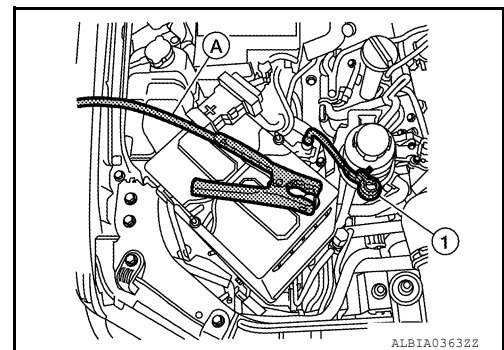
>> **INSPECTION END**

Component Inspection

INFOID:000000007358765

BATTERY CURRENT SENSOR

1. Reconnect harness connectors disconnected.
2. Disconnect battery negative cable (1).
3. Install jumper cable (A) between battery negative terminal and body ground.
4. Turn ignition switch ON.



P1551, P1552 BATTERY CURRENT SENSOR

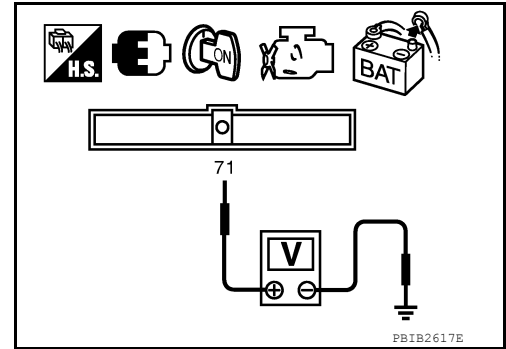
< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

5. Check voltage between ECM terminal 71 (battery current sensor signal) and ground.

Voltage: Approximately 2.5 V

6. If NG, replace battery negative cable assembly.



P1553 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

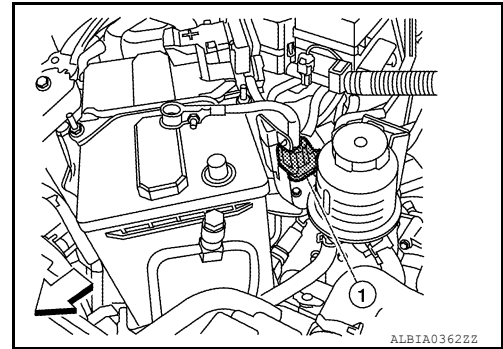
[VK56DE]

P1553 BATTERY CURRENT SENSOR

Component Description

INFOID:000000007358766

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor (1) is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to [CHG-12, "System Description"](#).



↔: Vehicle front

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

On Board Diagnosis Logic

INFOID:000000007358767

The MIL will not illuminate for this self-diagnosis.

NOTE:

If DTC P1553 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-836, "DTC Confirmation Procedure"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1553 1553	Battery current sensor performance	The signal voltage transmitted from the sensor to ECM is higher than the amount of the maximum power generation.	<ul style="list-style-type: none">• Harness or connectors (The sensor circuit is open or shorted.)• Battery current sensor

DTC Confirmation Procedure

INFOID:000000007358768

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

1. Start engine and wait at least 10 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to [EC-865, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358769

1. CHECK GROUND CONNECTIONS

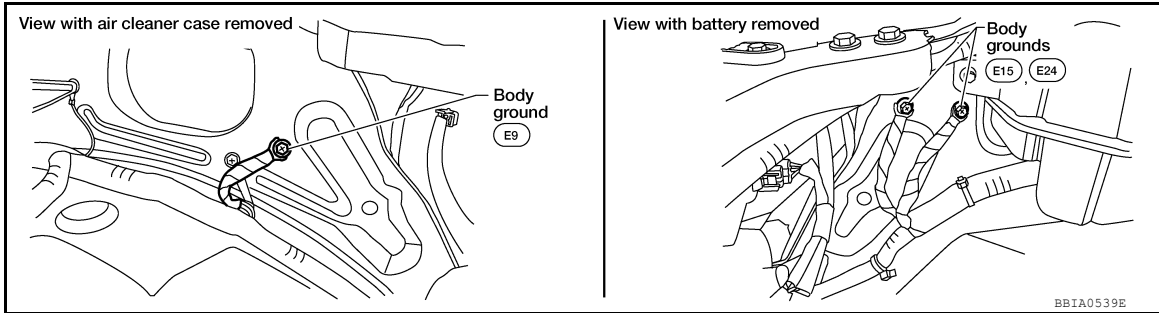
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P1553 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Refer to [EC-623, "Ground Inspection"](#).

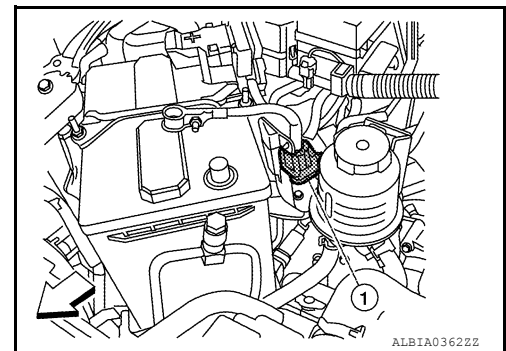


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect battery current sensor (1) harness connector.
2. Turn ignition switch ON.
↔: Vehicle front

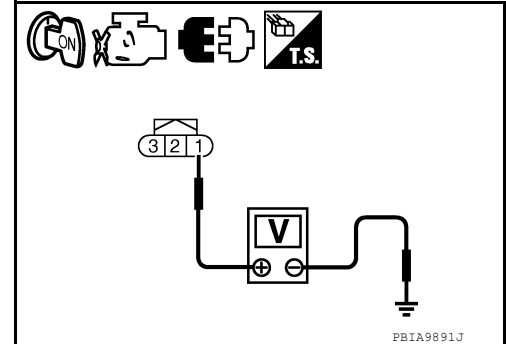


3. Check voltage between battery current sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between battery current sensor terminal 2 and ECM terminal 67.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 6.
- NG >> GO TO 5.

P1553 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between battery current sensor terminal 3 and ECM terminal 71.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.

NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK BATTERY CURRENT SENSOR

Refer to [EC-867, "Component Inspection"](#).

OK or NG

OK >> GO TO 9.

NG >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

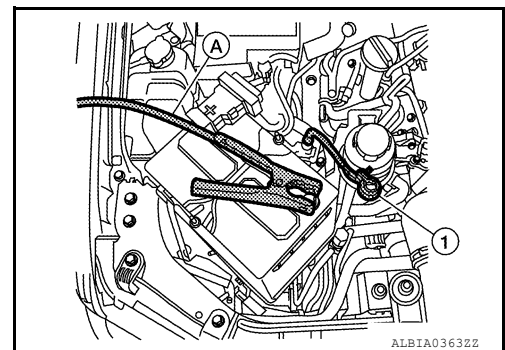
>> **INSPECTION END**

Component Inspection

INFOID:000000007358770

BATTERY CURRENT SENSOR

1. Reconnect harness connectors disconnected.
2. Disconnect battery negative cable (1).
3. Install jumper cable (A) between battery negative terminal and body ground.
4. Turn ignition switch ON.



P1553 BATTERY CURRENT SENSOR

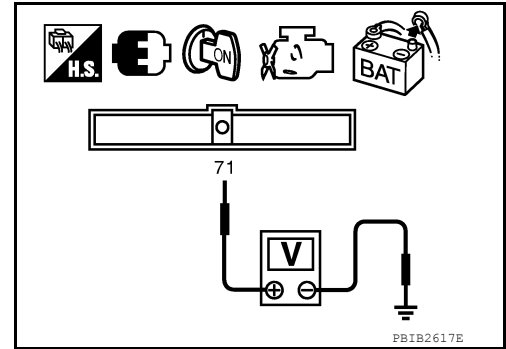
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Check voltage between ECM terminal 71 (battery current sensor signal) and ground.

Voltage: Approximately 2.5 V

6. If NG, replace battery negative cable assembly.



P1554 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

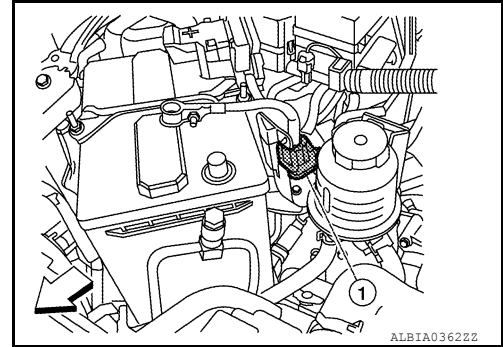
[VK56DE]

P1554 BATTERY CURRENT SENSOR

Component Description

INFOID:000000007358771

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor (1) is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to [CHG-12, "System Description"](#).



↔: Vehicle front

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

On Board Diagnosis Logic

INFOID:000000007358772

The MIL will not illuminate for this self-diagnosis.

NOTE:

If DTC P1554 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-836, "DTC Confirmation Procedure"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1554 1554	Battery current sensor performance	The output voltage of the battery current sensor is lower than the specified value while the battery voltage is high enough.	<ul style="list-style-type: none">• Harness or connectors (The sensor circuit is open or shorted.)• Battery current sensor

Overall Function Check

INFOID:000000007358773

Use this procedure to check the overall function of the battery current sensor circuit. During this check, a 1st trip DTC might not be confirmed.

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is more than 12.8 V at idle.
- Before performing the following procedure, confirm that all load switches and A/C switch are turned OFF.

④ WITH CONSULT

1. Start engine and let it idle.
2. Select "BAT CUR SEN" in "DATA MONITOR" mode with CONSULT.
3. Check "BAT CUR SEN" indication for 10 seconds.
"BAT CUR SEN" should be above 2,300 mV at least once.
4. If NG, go to [EC-870, "Diagnosis Procedure"](#).

④ WITH GST

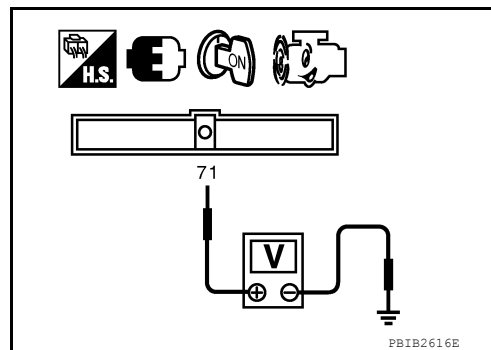
1. Start engine and let it idle.

P1554 BATTERY CURRENT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check voltage between ECM terminal 71 (battery current sensor signal) and ground for 10 seconds.
The voltage should be above 2.3 V at least once.
3. If NG, go to [EC-870. "Diagnosis Procedure"](#).

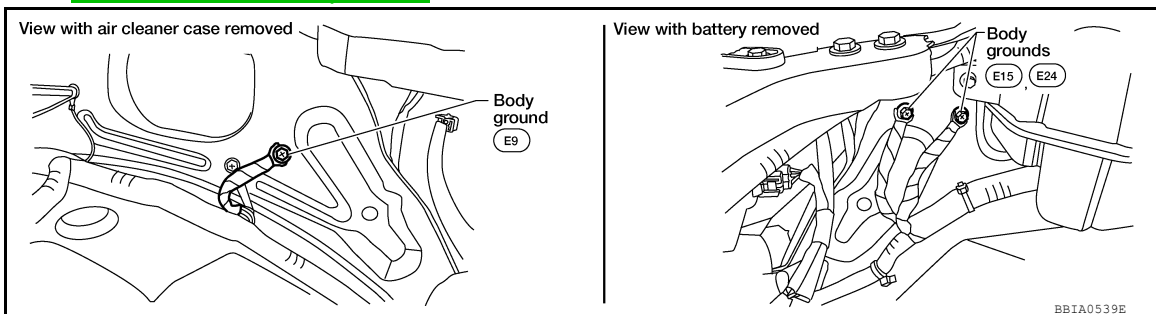


Diagnosis Procedure

INFOID:000000007358774

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623. "Ground Inspection"](#).

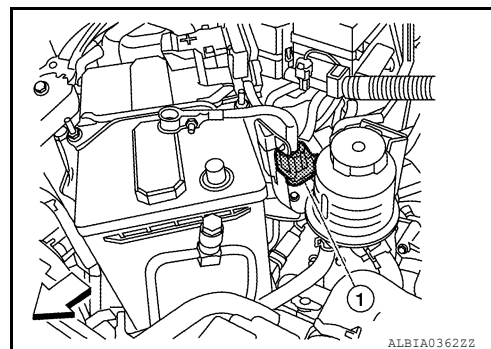


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect battery current sensor (1) harness connector.
2. Turn ignition switch ON.
↔: Vehicle front

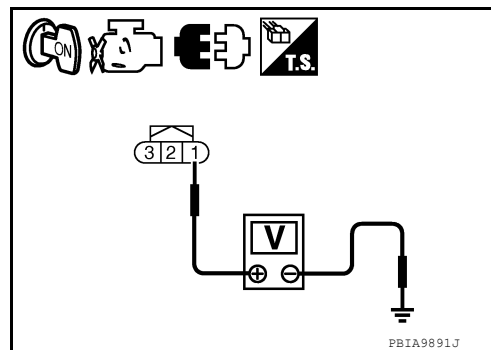


3. Check voltage between battery current sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

P1554 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between battery current sensor terminal 2 and ECM terminal 67.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 6.
- NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between battery current sensor terminal 3 and ECM terminal 71.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK BATTERY CURRENT SENSOR

Refer to [EC-871, "Component Inspection"](#).

OK or NG

- OK >> GO TO 9.
- NG >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

BATTERY CURRENT SENSOR

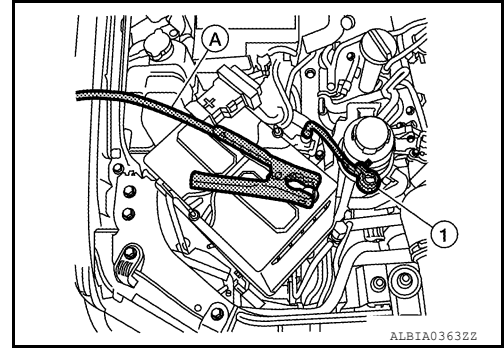
INFOID:000000007358775

P1554 BATTERY CURRENT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

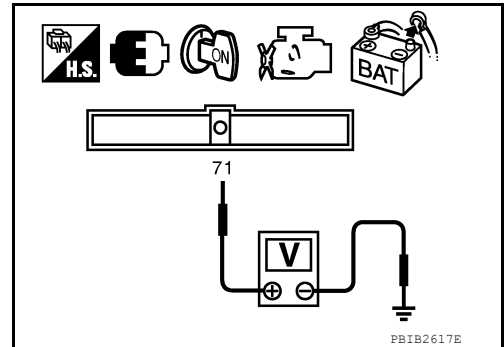
1. Reconnect harness connectors disconnected.
2. Disconnect battery negative cable (1).
3. Install jumper cable (A) between battery negative terminal and body ground.
4. Turn ignition switch ON.



5. Check voltage between ECM terminal 71 (battery current sensor signal) and ground.

Voltage: Approximately 2.5 V

6. If NG, replace battery negative cable assembly.



P1564 ASCD STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

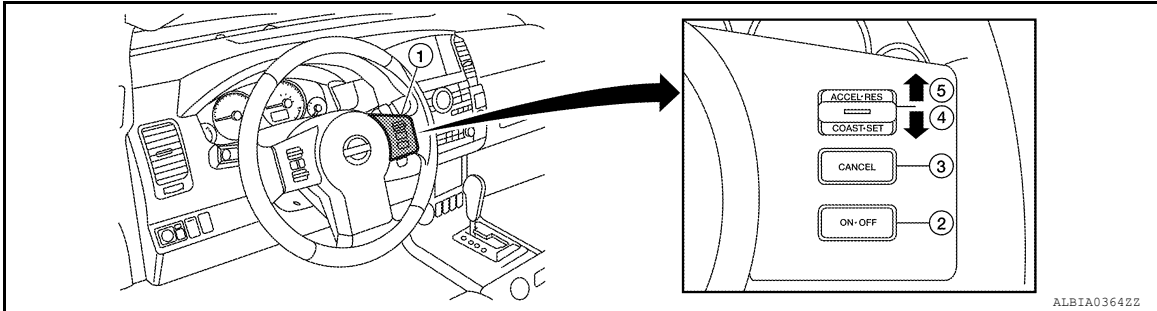
[VK56DE]

P1564 ASCD STEERING SWITCH

Component Description

INFOID:000000007358776

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.



1. ASCD steering switch
2. MAIN switch
3. CANCEL switch
4. SET/COAST switch
5. RESUME/ACCELERATE switch

Refer to [EC-512, "System Description"](#) for the ASCD function.

On Board Diagnosis Logic

INFOID:000000007358777

- This self-diagnosis has the one trip detection logic.
- The MIL will not illuminate for this self-diagnosis.

NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-836, "DTC Confirmation Procedure"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1564 1564	ASCD steering switch	<ul style="list-style-type: none">• An excessively high voltage signal from the ASCD steering switch is sent to ECM.• ECM detects that input signal from the ASCD steering switch is out of the specified range.• ECM detects that the ASCD steering switch is stuck ON.	<ul style="list-style-type: none">• Harness or connectors (The switch circuit is open or shorted.)• ASCD steering switch• Combination switch (spiral cable)• ECM

DTC Confirmation Procedure

INFOID:000000007358778

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON and wait at least 10 seconds.
3. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
4. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
7. Check DTC.
8. If DTC is detected, go to [EC-873, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358779

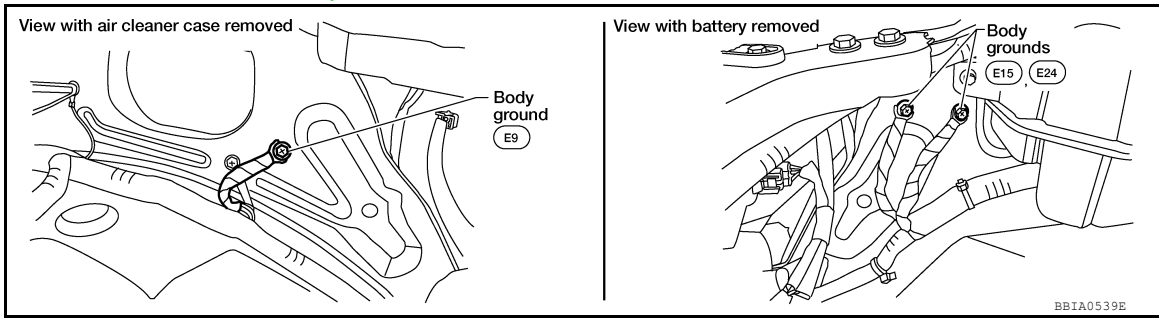
1. CHECK GROUND CONNECTIONS

P1564 ASCD STEERING SWITCH

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623, "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
NG >> Repair or replace ground connections.

2. CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT

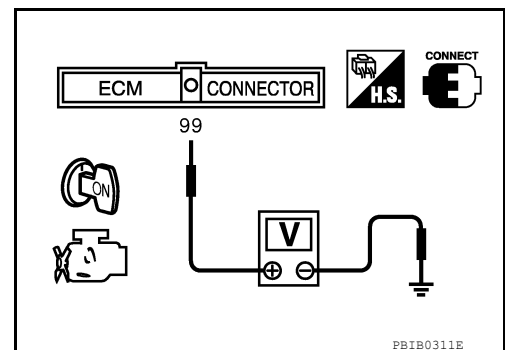
1. Turn ignition switch ON.
2. Select "MAIN SW", "CANCEL SW", "RESUME/ACC SW" and "SET SW" in "DATA MONITOR" mode with CONSULT.
3. Check each item indication under the following conditions.

Switch	Monitor item	Condition	Indication
MAIN switch	MAIN SW	Pressed	ON
		Released	OFF
CANCEL switch	CANCEL SW	Pressed	ON
		Released	OFF
RESUME/ACCELERATE switch	RESUME/ACC SW	Pressed	ON
		Released	OFF
SET/COAST switch	SET SW	Pressed	ON
		Released	OFF

Without CONSULT

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 99 and ground with pressing each button.

Switch	Condition	Voltage (V)
MAIN switch	Pressed	Approx. 0
	Released	Approx. 4
CANCEL switch	Pressed	Approx. 1
	Released	Approx. 4
RESUME/ACCELERATE switch	Pressed	Approx. 3
	Released	Approx. 4
SET/COAST switch	Pressed	Approx. 2
	Released	Approx. 4



OK or NG

- OK >> GO TO 8.
NG >> GO TO 3.

3. CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

P1564 ASCD STEERING SWITCH

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.
2. Disconnect combination switch harness connector M102.
3. Disconnect ECM harness connector.
4. Check harness continuity between combination switch terminal 15 and ECM terminal 67.
Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M31, E152
- Harness connectors E5, F14
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 99 and combination switch terminal 14.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M31, E152
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ASCD STEERING SWITCH

Refer to [EC-875, "Component Inspection"](#).

OK or NG

- OK >> GO TO 8.
NG >> Replace ASCD steering switch. Refer to [ST-17](#).

8. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358780

ASC D STEERING SWITCH

1. Disconnect combination switch (spiral cable) harness connector M102.

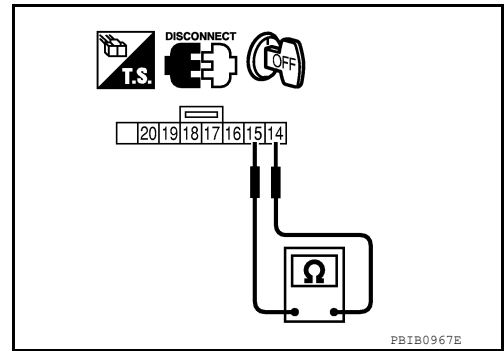
P1564 ASCD STEERING SWITCH

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check continuity between combination switch (spiral cable) terminals 14 and 15 with pushing each switch.

Switch	Condition	Resistance [Ω]
MAIN switch	Pressed	Approx. 0
	Released	Approx. 4,000
CANCEL switch	Pressed	Approx. 250
	Released	Approx. 4,000
RESUME/ACCELERATE switch	Pressed	Approx. 1,480
	Released	Approx. 4,000
SET/COAST switch	Pressed	Approx. 660
	Released	Approx. 4,000



P1572 ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

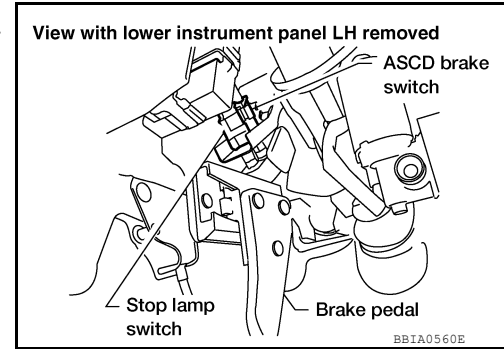
[VK56DE]

P1572 ASCD BRAKE SWITCH

Component Description

INFOID:000000007358781

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by two kinds of input (ON/OFF signal). Refer to [EC-512. "System Description"](#) for the ASCD function.



On Board Diagnosis Logic

INFOID:000000007358782

- This self-diagnosis has the one trip detection logic.
- The MIL will not illuminate for this self-diagnosis.

NOTE:

- If DTC P 1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-833. "DTC Confirmation Procedure"](#).
- This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch is turned OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1572 1572	ASCD brake switch	A)	When the vehicle speed is above 30km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to ECM at the same time.	<ul style="list-style-type: none"> • Harness or connectors (The stop lamp switch circuit is shorted.) • Harness or connectors (The ASCD brake switch circuit is shorted.) • Stop lamp switch • ASCD brake switch • Incorrect stop lamp switch installation • Incorrect ASCD brake switch installation • ECM
		B)	ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven.	

DTC Confirmation Procedure

INFOID:000000007358783

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- Procedure for malfunction B is not described here. It takes extremely long time to complete procedure for malfunction B. By performing procedure for malfunction A, the incident that causes malfunction B can be detected.
- If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
 1. Turn ignition switch OFF and wait at least 10 seconds.
 2. Turn ignition switch ON.
 3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Steps 3 and 5 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

1. Start engine (VDC switch OFF).
2. Press MAIN switch and check that CRUISE indicator illuminates.
3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

P1572 ASCD BRAKE SWITCH

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Vehicle speed	More than 30 km/h (19 MPH)
Selector lever	Suitable position

- Check 1st trip DTC.
If 1st trip DTC is detected, go to [EC-878, "Diagnosis Procedure"](#).
If 1st trip DTC is not detected, go to the following step.
- Drive the vehicle for at least 5 consecutive seconds under the following conditions.

Vehicle speed	More than 30 km/h (19 MPH)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than five seconds so as not to come off from the above-mentioned condition.

- Check 1st trip DTC.
- If 1st trip DTC is detected, go to [EC-878, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358784

1. CHECK OVERALL FUNCTION-I

Ⓟ With CONSULT

- Turn ignition switch ON.
- Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT.
- Check "BRAKE SW1" indication under the following conditions.

CONDITION	INDICATION
Brake pedal: Fully released	ON
Brake pedal: Slightly depressed	OFF

⊗ Without CONSULT

- Turn ignition switch ON.
- Check voltage between ECM terminal 108 and ground under the following conditions.

CONDITION	VOLTAGE
Brake pedal: Fully released	Battery voltage
Brake pedal: Slightly depressed	Approximately 0V

OK or NG

- OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK OVERALL FUNCTION-II

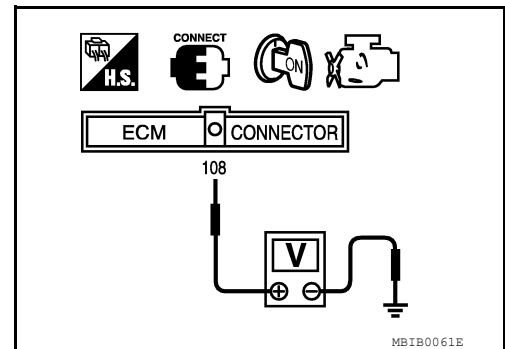
Ⓟ With CONSULT

Check "BRAKE SW2" indication in "DATA MONITOR" mode.

CONDITION	INDICATION
Brake pedal: Fully released	OFF
Brake pedal: Slightly depressed	ON

⊗ Without CONSULT

Check voltage between ECM terminal 101 and ground under the following conditions.



P1572 ASCD BRAKE SWITCH

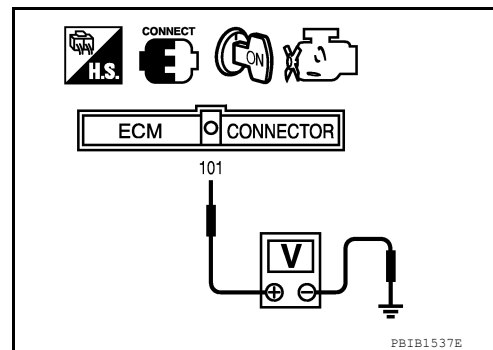
< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

CONDITION	VOLTAGE
Brake pedal: Fully released	Approximately 0V
Brake pedal: Slightly depressed	Battery voltage

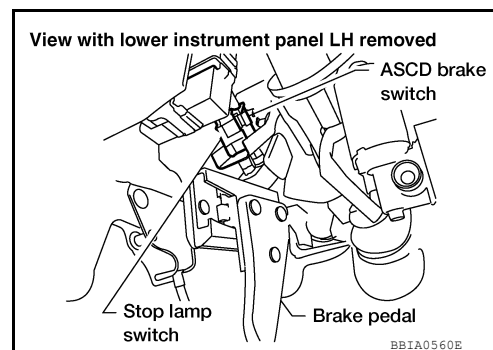
OK or NG

- OK >> GO TO 11.
- NG >> GO TO 7.



3. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.

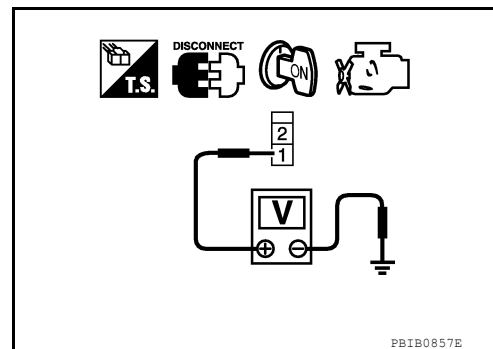


4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E160
- 10 A fuse (No. 12)
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 6.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

P1572 ASCD BRAKE SWITCH

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

6. CHECK ASCD BRAKE SWITCH

Refer to [EC-881, "Component Inspection"](#).

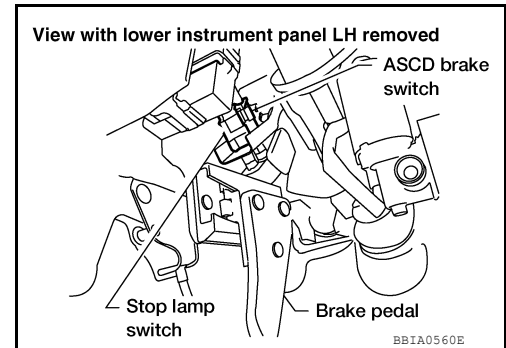
OK or NG

OK >> GO TO 11.

NG >> Replace ASCD brake switch. Refer to [BR-23](#).

7. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.



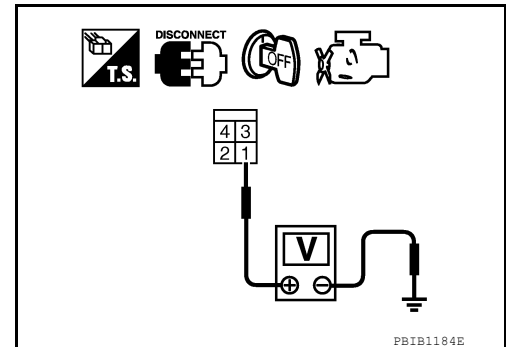
3. Check voltage between stop lamp switch terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 9.

NG >> GO TO 8.



8. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E160
- 10 A fuse (No.20)
- Harness for open or short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK STOP LAMP SWITCH

Refer to [EC-881, "Component Inspection"](#).

OK or NG

OK >> GO TO 11.

NG >> Replace stop lamp switch. Refer to [BR-22](#).

P1572 ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

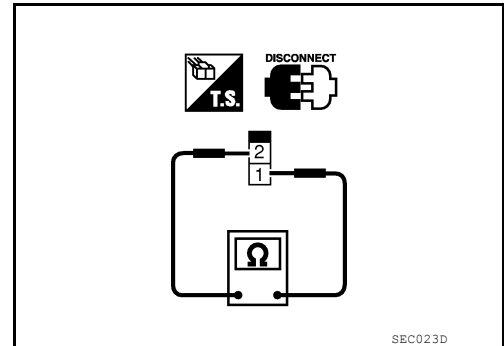
INFOID:000000007358785

ASC D BRAKE SWITCH

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check harness continuity between ASCD brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
Brake pedal: Fully released	Should exist.
Brake pedal: Slightly depressed	Should not exist.

If NG, adjust ASCD brake switch installation, refer to [BR-23. "Removal and Installation"](#), and perform step 3 again.

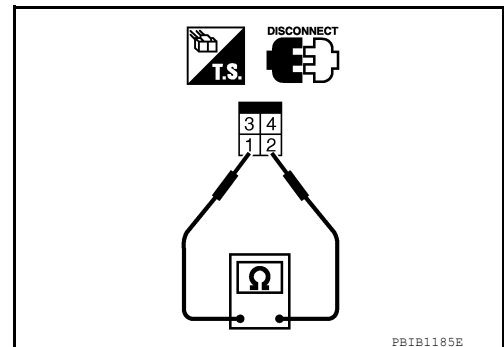


STOP LAMP SWITCH

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check harness continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Condition	Continuity
Brake pedal: Fully released	Should not exist.
Brake pedal: Slightly depressed	Should exist.

If NG, adjust stop lamp switch installation, refer to [BR-23. "Removal and Installation"](#), and perform step 3 again.



P1805 BRAKE SWITCH

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

P1805 BRAKE SWITCH

Description

INFOID:000000007358786

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is being driven.

On Board Diagnosis Logic

INFOID:000000007358787

The MIL will not illuminate for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805 1805	Brake switch	A brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven.	<ul style="list-style-type: none">• Harness or connectors (Stop lamp switch circuit is open or shorted.)• Stop lamp switch

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode.

Engine operating condition in fail-safe mode

ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.

Vehicle condition	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

DTC Confirmation Procedure

INFOID:000000007358788

1. Turn ignition switch ON.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC.
4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to [EC-882. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358789

1.CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Check the stop lamp when depressing and releasing the brake pedal.

Brake pedal	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

OK or NG

- OK >> GO TO 4.
NG >> GO TO 2.

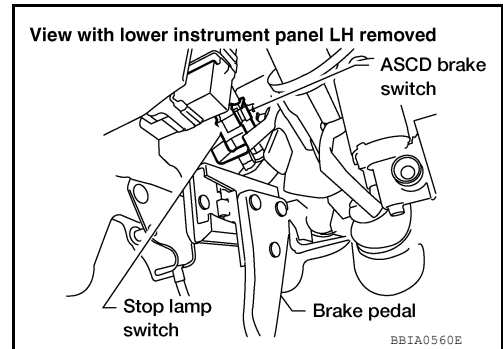
2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

P1805 BRAKE SWITCH

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Disconnect stop lamp switch harness connector.

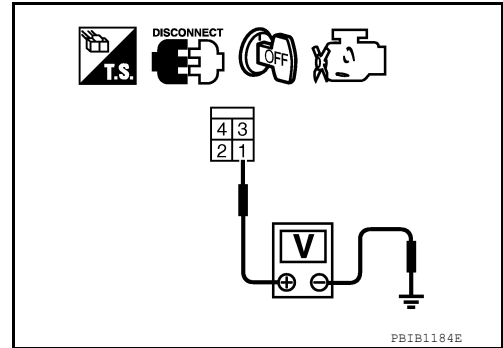


2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E160
- 10 A fuse (No. 20)
- Harness for open and short between stop lamp switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK STOP LAMP SWITCH

Refer to [EC-884, "Component Inspection"](#).

OK or NG

- OK >> GO TO 6.
- NG >> Replace stop lamp switch. Refer to [BR-22](#).

6. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

P1805 BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

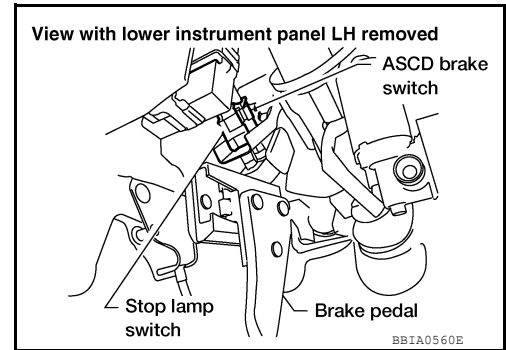
[VK56DE]

Component Inspection

INFOID:000000007358790

STOP LAMP SWITCH

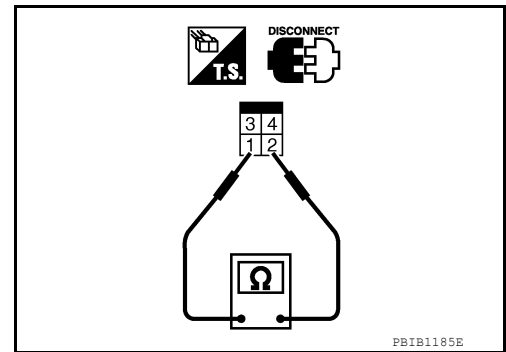
1. Disconnect stop lamp switch harness connector.



2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Conditions	Continuity
Brake pedal: Fully released	Should not exist.
Brake pedal: Slightly depressed	Should exist.

3. If NG, adjust stop lamp switch installation, refer to [BR-23](#), "[Removal and Installation](#)", and perform step 2 again.



P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

Component Description

INFOID:000000007358791

Power supply for the throttle control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is controlled ON/OFF by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

On Board Diagnosis Logic

INFOID:000000007358792

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2100 2100	Throttle control motor relay circuit open	ECM detects that the voltage of power source for throttle control motor is excessively low.	<ul style="list-style-type: none">• Harness or connectors (Throttle control motor relay circuit is open)• Throttle control motor relay
P2103 2103	Throttle control motor relay circuit short	ECM detects that the throttle control motor relay is stuck ON.	<ul style="list-style-type: none">• Harness or connectors (Throttle control motor relay circuit is shorted)• Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode

ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

INFOID:000000007358793

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

PROCEDURE FOR DTC P2100

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.
4. If DTC is detected, go to [EC-885, "Diagnosis Procedure"](#).

PROCEDURE FOR DTC P2103

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V.

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.
3. If DTC is detected, go to [EC-885, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358794

1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

[VK56DE]

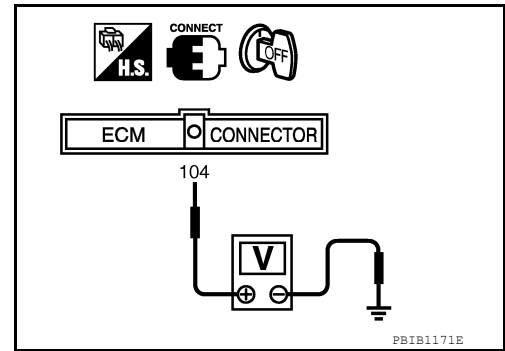
< DTC/CIRCUIT DIAGNOSIS >

- Check voltage between ECM terminal 104 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 2.



2. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

- Disconnect ECM harness connector.
- Disconnect IPDM E/R harness connector E122.
- Check continuity between ECM terminal 104 and IPDM E/R terminal 47. Refer to Wiring Diagram.

Continuity should exist.

- Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 3.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK FUSE

- Disconnect 20A fuse (No. 52).
- Check 20 A fuse for blown.

OK or NG

- OK >> GO TO 7.
- NG >> Replace 20 A fuse.

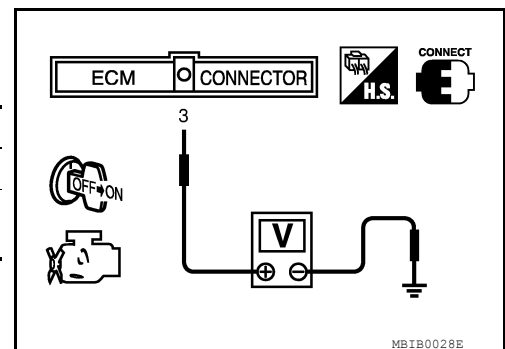
4. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT or tester.

Ignition switch	Voltage
OFF	Approximately 0 V
ON	Battery voltage (11 - 14 V)

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 5.



5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Disconnect IPDM E/R harness connector E119.
- Check continuity between ECM terminal 3 and IPDM E/R terminal 6. Refer to Wiring Diagram.

Continuity should exist.

- Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 6.

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

OK or NG

- OK >> Replace IPDM E/R. Refer to [PCS-29. "Removal and Installation of IPDM E/R"](#).
- NG >> Repair or replace harness or connectors.

A
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P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

Description

INFOID:000000007358795

NOTE:

- If DTC P2101 is displayed with DTC P2100, first perform the trouble diagnosis for DTC P2100. Refer to [EC-885, "DTC Confirmation Procedure"](#).
- If DTC P2101 is displayed with DTC P2119, first perform the trouble diagnosis for DTC P2119. Refer to [EC-894, "DTC Confirmation Procedure"](#).

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

The current opening angle of the throttle valve is detected by the throttle position sensor. The throttle position sensor provides feedback to the ECM, when opens/closes the throttle valve in response to driving conditions via the throttle control motor.

On Board Diagnosis Logic

INFOID:000000007358796

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2101 2101	Electric throttle control performance	Electric throttle control function does not operate properly.	<ul style="list-style-type: none">• Harness or connectors (Throttle control motor circuit is open or shorted)• Electric throttle control actuator

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode

ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

INFOID:000000007358797

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V when engine is running.

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.
4. If DTC is detected, go to [EC-888, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358798

1. CHECK GROUND CONNECTIONS

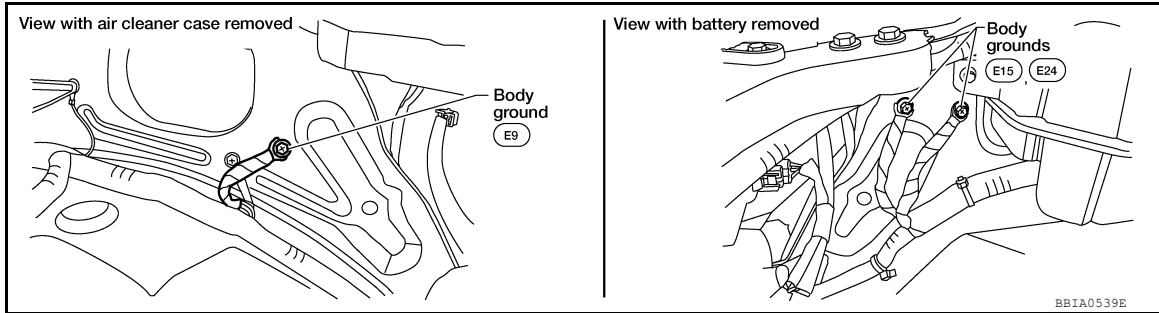
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Refer to [EC-623, "Ground Inspection"](#).



OK or NG

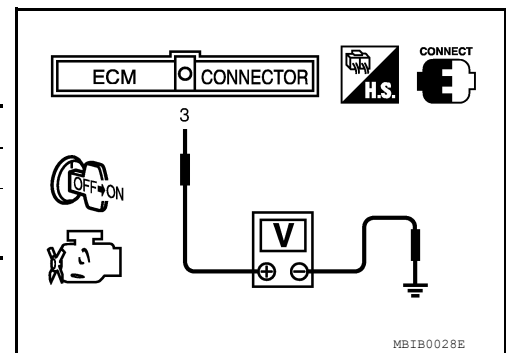
OK >> GO TO 2.

NG >> Repair or replace ground connections.

2. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT or tester.

Ignition switch	Voltage
OFF	Approximately 0 V
ON	Battery voltage (11 - 14 V)



OK or NG

OK >> GO TO 9.

NG >> GO TO 3.

3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

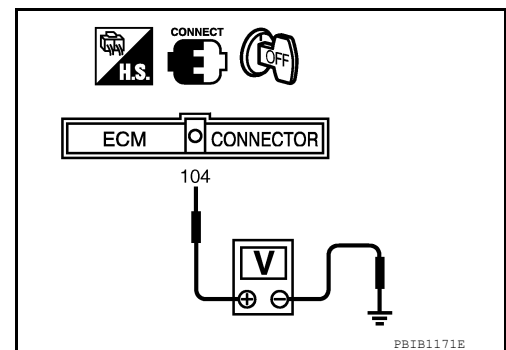
1. Turn ignition switch OFF.
2. Check voltage between ECM terminal 104 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 6.

NG >> GO TO 4.



4. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E122.
3. Check harness continuity between ECM terminal 104 and IPDM E/R terminal 47. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK FUSE

1. Disconnect 20 A fuse (No. 52).
2. Check if 20 A fuse is blown.

OK or NG

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- OK >> GO TO 8.
- NG >> Replace 20 A fuse.

6. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E119.
3. Check harness continuity between ECM terminal 3 and IPDM E/R terminal 6.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

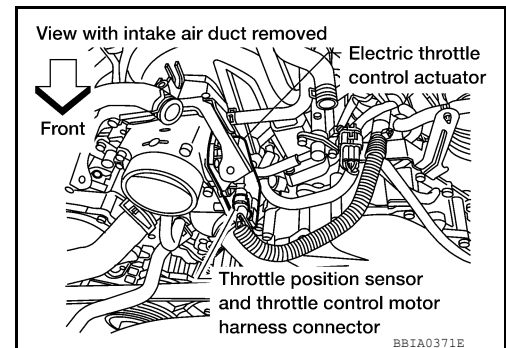
OK or NG

- OK >> Replace IPDM E/R. Refer to [PCS-29. "Removal and Installation of IPDM E/R"](#).
- NG >> Repair or replace harness or connectors.

9. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals.
Refer to Wiring Diagram.

Electric throttle control actuator terminal	ECM terminal	Continuity
5	5	Should not exist
	4	Should exist
6	5	Should exist
	4	Should not exist



5. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 10.
- NG >> Repair or replace malfunctioning part.

10. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

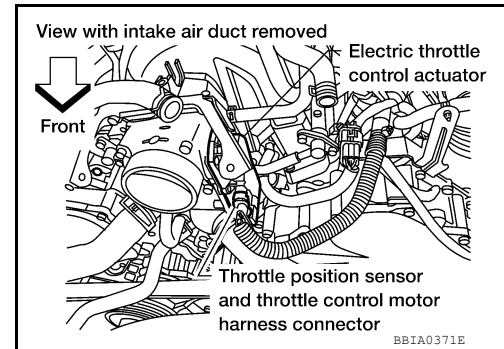
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

- OK >> GO TO 11.
- NG >> Remove the foreign matter and clean the electric throttle control actuator inside. Refer to [EM-165](#).



11. CHECK THROTTLE CONTROL MOTOR

Refer to [EC-891](#), "Component Inspection".

OK or NG

- OK >> GO TO 12.
- NG >> GO TO 13.

12. CHECK INTERMITTENT INCIDENT

Refer to [GI-37](#), "Intermittent Incident".

OK or NG

- OK >> GO TO 13.
- NG >> Repair or replace harness or connectors.

13. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator. Refer to [EM-165](#).
2. Perform [EC-597](#), "Throttle Valve Closed Position Learning".
3. Perform [EC-597](#), "Idle Air Volume Learning".

>> **INSPECTION END**

Component Inspection

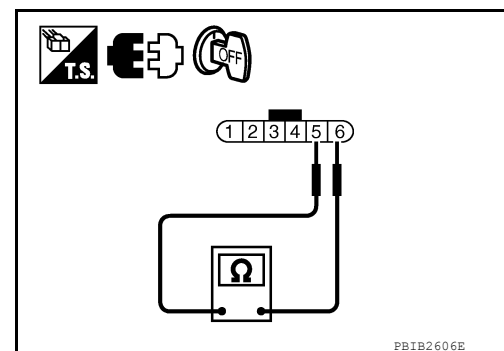
INFOID:000000007358799

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 5 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]

3. If NG, replace electric throttle control actuator and go to next step. Refer to [EM-165](#).
4. Perform [EC-597](#), "Throttle Valve Closed Position Learning".
5. Perform [EC-597](#), "Idle Air Volume Learning".



P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P2118 THROTTLE CONTROL MOTOR

Component Description

INFOID:000000007358800

The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The current opening angle of the throttle valve is detected by the throttle position sensor. The throttle position sensor provides feedback to the ECM, when opens/closes the throttle valve in response to driving conditions via the throttle control motor.

On Board Diagnosis Logic

INFOID:000000007358801

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2118 2118	Throttle control motor circuit short	ECM detects short in both circuits between ECM and throttle control motor.	<ul style="list-style-type: none">• Harness or connectors (Throttle control motor circuit is shorted.)• Electric throttle control actuator (Throttle control motor)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode

ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

INFOID:000000007358802

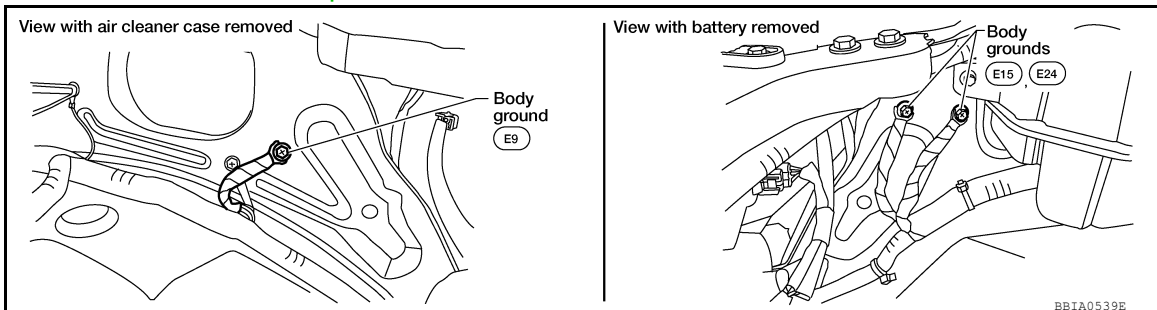
1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
 - a. Turn ignition switch OFF and wait at least 10 seconds.
 - b. Turn ignition switch ON.
 - c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON and wait at least 2 seconds.
3. Start engine and let it idle for 5 seconds.
4. Check DTC.
5. If DTC is detected, go to [EC-892, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358803

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623, "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
NG >> Repair or replace ground connections.

P2118 THROTTLE CONTROL MOTOR

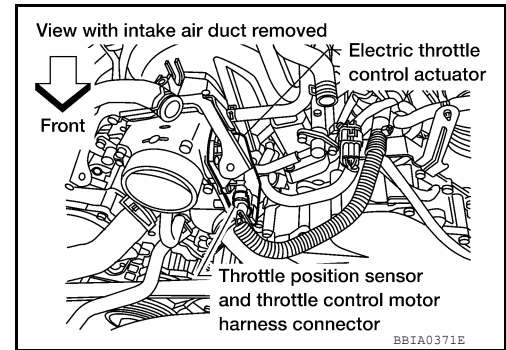
< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Disconnect electric throttle control actuator harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between the following terminals.
Refer to Wiring Diagram.

Electric throttle control actuator terminal	ECM terminal	Continuity
5	5	Should not exist
	4	Should exist
6	5	Should exist
	4	Should not exist



4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 3.
- NG >> Repair or replace malfunctioning part.

3. CHECK THROTTLE CONTROL MOTOR

Refer to [EC-893, "Component Inspection"](#).

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

OK or NG

- OK >> GO TO 5.
- NG >> Repair or replace harness or connectors.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator. Refer to [EM-165](#).
2. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
3. Perform [EC-597, "Idle Air Volume Learning"](#).

>> **INSPECTION END**

Component Inspection

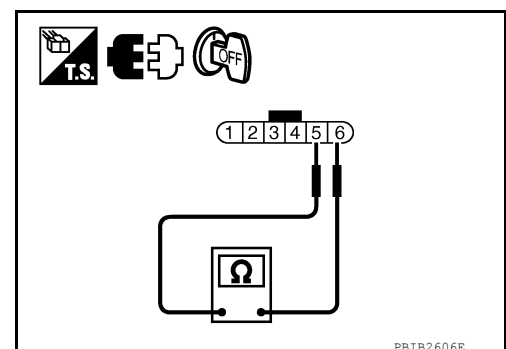
INFOID:000000007358804

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 5 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]

3. If NG, replace electric throttle control actuator and go to next step. Refer to [EM-165](#).
4. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
5. Perform [EC-597, "Idle Air Volume Learning"](#).



P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

Component Description

INFOID:000000007358805

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The current opening angle of the throttle valve is detected by the throttle position sensor. The throttle position sensor provides feedback to the ECM, when opens/closes the throttle valve in response to driving conditions via the throttle control motor.

On Board Diagnosis Logic

INFOID:000000007358806

This self-diagnosis has one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P2119 2119	Electric throttle control actuator	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	• Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detects that the throttle valve is stuck open.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Detected items	Engine operating condition in fail-safe mode
Malfunction A	The ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in the N or P position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

INFOID:000000007358807

NOTE:

- Perform **PROCEDURE FOR MALFUNCTION A AND B** first. If the DTC cannot be confirmed, perform **PROCEDURE FOR MALFUNCTION C**.
- If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
 1. Turn ignition switch OFF and wait at least 10 seconds.
 2. Turn ignition switch ON.
 3. Turn ignition switch OFF and wait at least 10 seconds.

PROCEDURE FOR MALFUNCTION A AND B

1. Turn ignition switch ON and wait at least 1 second.
2. Shift selector lever to the D position and wait at least 3 seconds.
3. Shift selector lever to the P or N position.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON and wait at least 1 second.
6. Shift selector lever to the D position and wait at least 3 seconds.
7. Shift selector lever to the P or N position.
8. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
9. Check DTC.
10. If DTC is detected, go to [EC-895, "Diagnosis Procedure"](#).

PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and wait at least 1 second.

P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Shift selector lever to the D position and wait at least 3 seconds.
3. Shift selector lever to the P position.
4. Start engine and let it idle for 3 seconds.
5. Check DTC.
6. If DTC is detected, go to [EC-895, "Diagnosis Procedure"](#).

Diagnosis Procedure

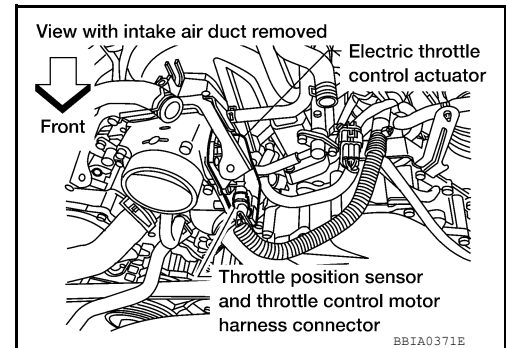
INFOID:000000007358808

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if a foreign matter is caught between the throttle valve and the housing.

OK or NG

- OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside. Refer to [EM-165](#).



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator. Refer to [EM-165](#).
2. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
3. Perform [EC-597, "Idle Air Volume Learning"](#).

>> INSPECTION END

P2122, P2123 APP SENSOR

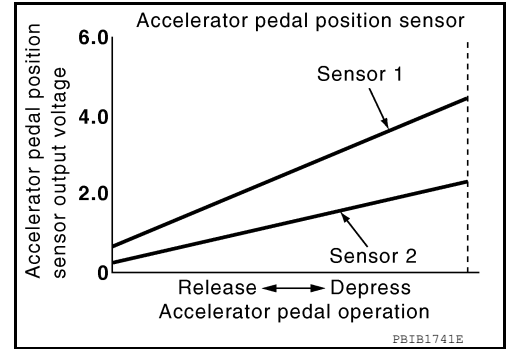
Component Description

INFOID:000000007358809

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle valve in response to driving conditions via the throttle control motor.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



On Board Diagnosis Logic

INFOID:000000007358810

These self-diagnoses have the one trip detection logic.

NOTE:

If DTC P2122 or P2123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-836, "DTC Confirmation Procedure"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2122 2122	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (The APP sensor 1 circuit is open or shorted.) • Accelerator pedal position sensor (Accelerator pedal position sensor 1)
P2123 2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode

The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.

The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:000000007358811

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to [EC-896, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358812

1. CHECK GROUND CONNECTIONS

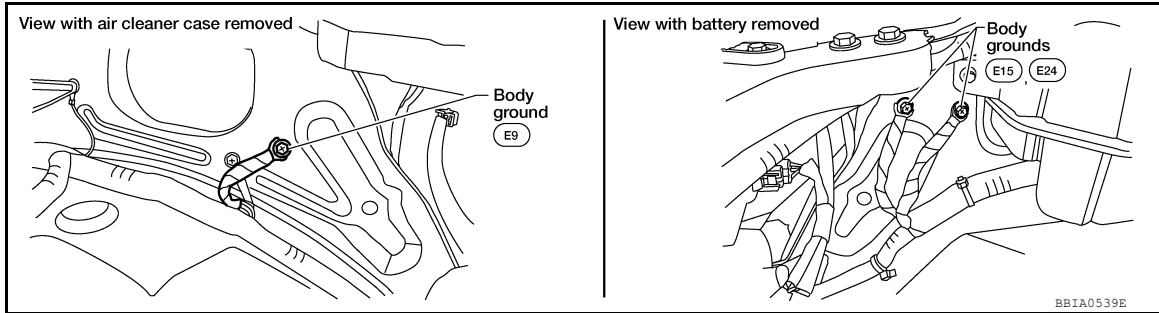
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P2122, P2123 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Refer to [EC-623, "Ground Inspection"](#).



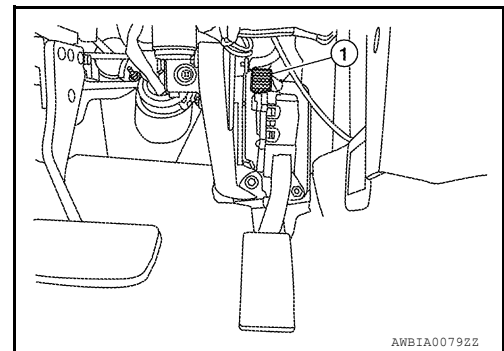
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor (1) harness connector.
2. Turn ignition switch ON.



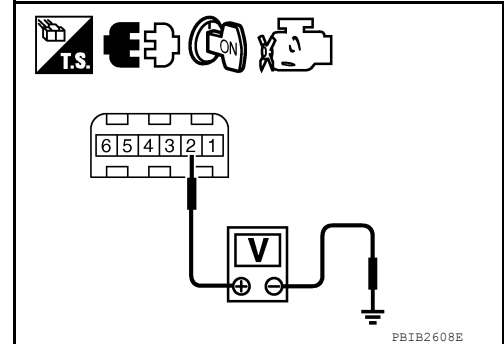
3. Check voltage between APP sensor terminal 2 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 82 and APP sensor terminal 4.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3.
Refer to Wiring Diagram.

Continuity should exist.

P2122, P2123 APP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to [EC-898, "Component Inspection"](#).

OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace the accelerator pedal assembly. Refer to [ACC-4](#).
2. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
3. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
4. Perform [EC-597, "Idle Air Volume Learning"](#).

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

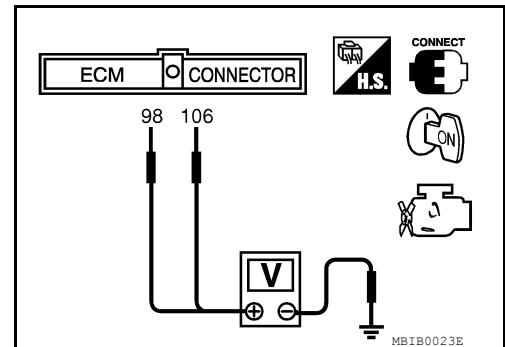
Component Inspection

INFOID:000000007358813

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.65 - 0.87V
	Fully depressed	More than 4.3V
98 (Accelerator pedal position sensor 2)	Fully released	0.28 - 0.48V
	Fully depressed	More than 2.0V



4. If NG, replace accelerator pedal assembly, refer to [ACC-4](#), and go to next step.
5. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
6. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
7. Perform [EC-597, "Idle Air Volume Learning"](#).

P2127, P2128 APP SENSOR

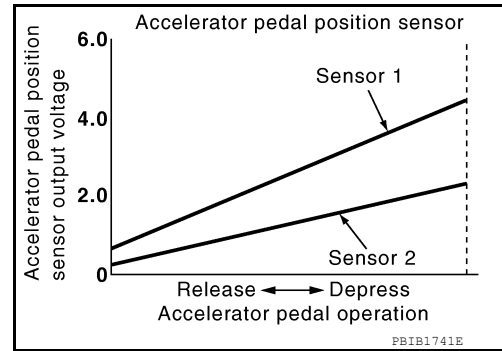
Component Description

INFOID:000000007358814

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle valve in response to driving conditions via the throttle control motor.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



On Board Diagnosis Logic

INFOID:000000007358815

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2127 2127	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (APP sensor 2 circuit is open or shorted.) (TP sensor circuit is shorted.) • Accelerator pedal position sensor (Accelerator pedal position sensor 2) • Electric throttle control actuator (TP sensor)
P2128 2128	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode

- The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
- The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
- So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:000000007358816

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to [EC-899. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358817

1. CHECK GROUND CONNECTIONS

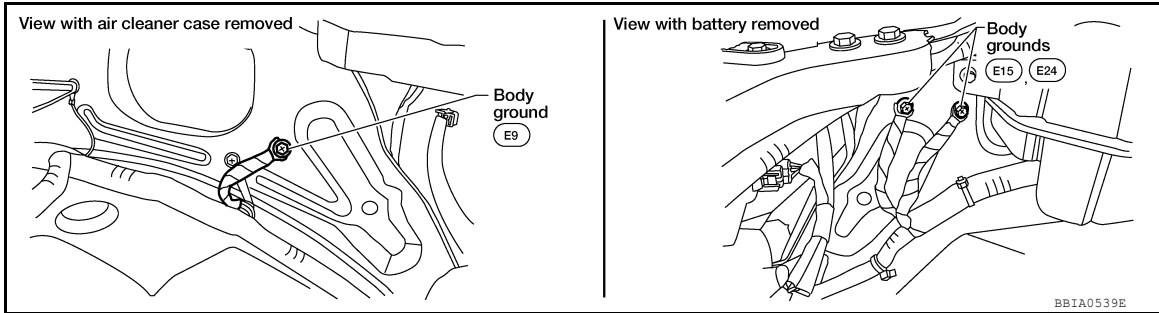
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P2127, P2128 APP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Refer to [EC-623, "Ground Inspection"](#).

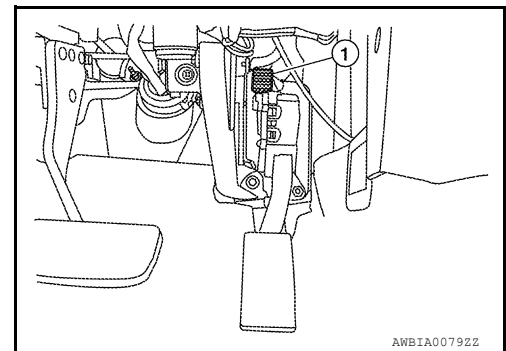


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Disconnect accelerator pedal position (APP) sensor (1) harness connector.
2. Turn ignition switch ON.

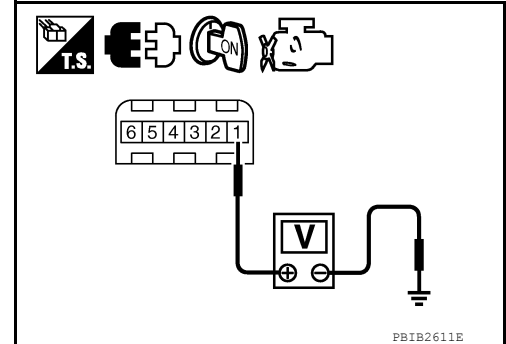


3. Check voltage between APP sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 3.



3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 1 and ECM terminal 91.
Refer to Wiring Diagram.

Continuity should exist.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 2	EC-567, "Wiring Diagram"
91	APP sensor terminal 1	

P2127, P2128 APP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> GO TO 5.
- NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to [EC-906, "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator. Refer to [EM-165](#).
2. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
3. Perform [EC-597, "Idle Air Volume Learning"](#).

>> **INSPECTION END**

7. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 83 and APP sensor terminal 5.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 98 and APP sensor terminal 6.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK APP SENSOR

Refer to [EC-902, "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 10.

10. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace the accelerator pedal assembly. Refer to [EM-165](#).
2. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
3. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
4. Perform [EC-597, "Idle Air Volume Learning"](#).

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

P2127, P2128 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

>> INSPECTION END

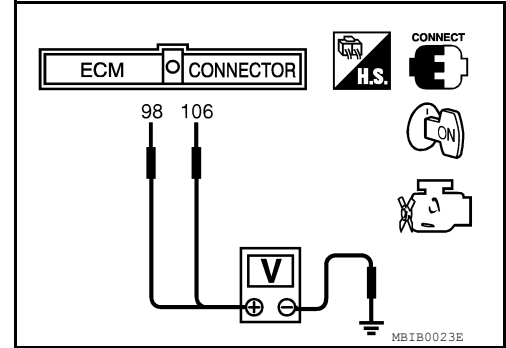
Component Inspection

INFOID:000000007358818

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.65 - 0.87V
	Fully depressed	More than 4.3V
98 (Accelerator pedal position sensor 2)	Fully released	0.28 - 0.48V
	Fully depressed	More than 2.0V



4. If NG, replace accelerator pedal assembly and go to next step. Refer to [ACC-4](#).
5. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
6. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
7. Perform [EC-597, "Idle Air Volume Learning"](#).

P2135 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

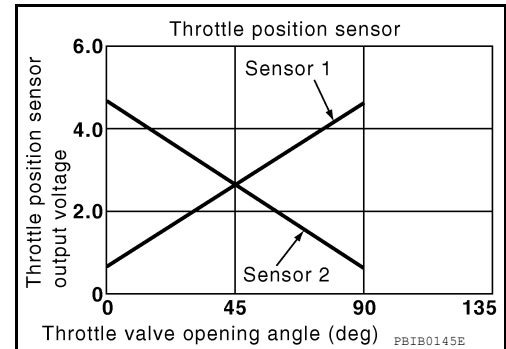
P2135 TP SENSOR

Component Description

INFOID:000000007358819

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has the two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve in response to driving conditions via the throttle control motor.



On Board Diagnosis Logic

INFOID:000000007358820

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2135 2135	Throttle position sensor circuit range/performance	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	<ul style="list-style-type: none">• Harness or connector (TP sensor 1 and 2 circuit is open or shorted.) (APP sensor 2 circuit is shorted.)• Electric throttle control actuator (TP sensor 1 and 2)• Accelerator pedal position sensor (APP sensor 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL illuminates.

Engine operation condition in fail-safe mode

The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.

The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.

So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:000000007358821

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to [EC-903. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358822

1. CHECK GROUND CONNECTIONS

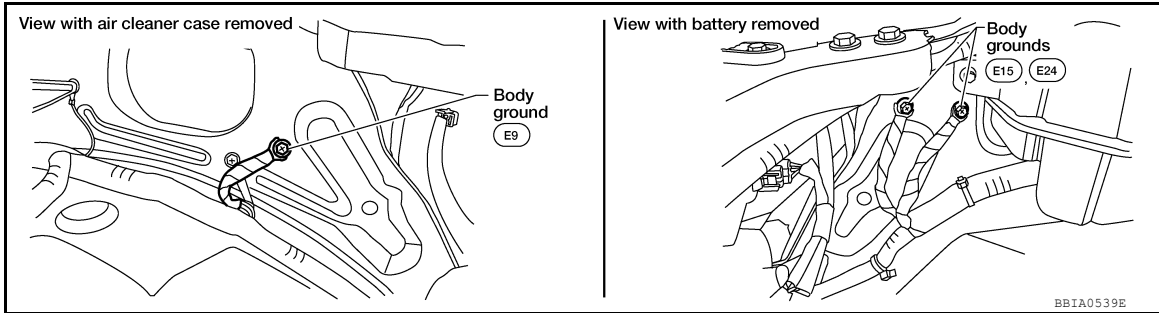
1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.

P2135 TP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Refer to [EC-623, "Ground Inspection"](#).

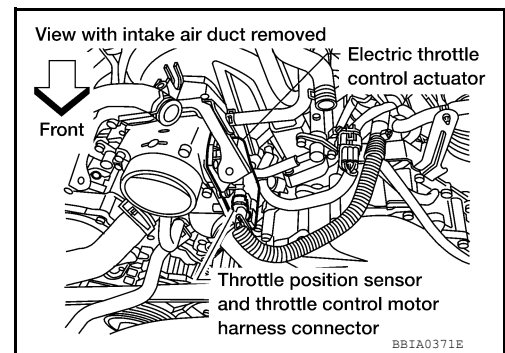


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch ON.

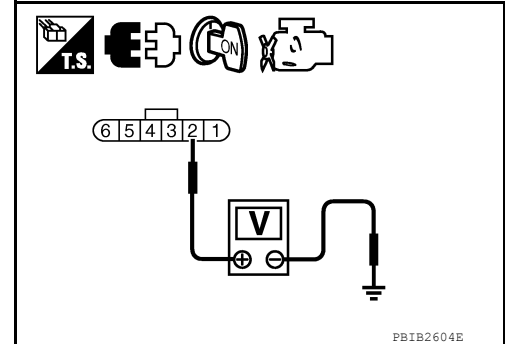


3. Check voltage between electric throttle control actuator terminal 2 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 7.
- NG >> GO TO 3.



3. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 2 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

- OK >> GO TO 4.
- NG >> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 2	EC-567, "Wiring Diagram"
91	APP sensor terminal 1	

P2135 TP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> GO TO 5.
- NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK ACCELERATOR PEDAL POSITION SENSOR

Refer to [EC-910, "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace the accelerator pedal assembly. Refer to [ACC-4](#).
2. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
3. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
4. Perform [EC-597, "Idle Air Volume Learning"](#).

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 4 and ECM terminal 66. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 8.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 50 and electric throttle control actuator terminal 1, ECM terminal 69 and electric throttle control actuator terminal 3. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to [EC-906, "Component Inspection"](#).

OK or NG

- OK >> GO TO 11.
- NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator. Refer to [ACC-4](#).
2. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
3. Perform [EC-597, "Idle Air Volume Learning"](#).

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

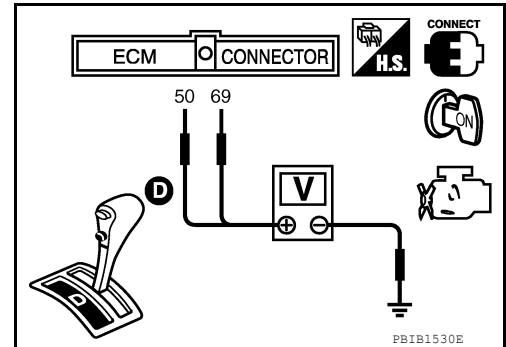
INFOID:000000007358823

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
3. Turn ignition switch ON.
4. Shift selector lever to the D position.
5. Check voltage between ECM terminals 50 (TP sensor 1 signal) and ground, 69 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
69 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V

6. If NG, replace electric throttle control actuator, refer to [EM-165](#), and go to the next step.
7. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
8. Perform [EC-597, "Idle Air Volume Learning"](#).



P2138 APP SENSOR

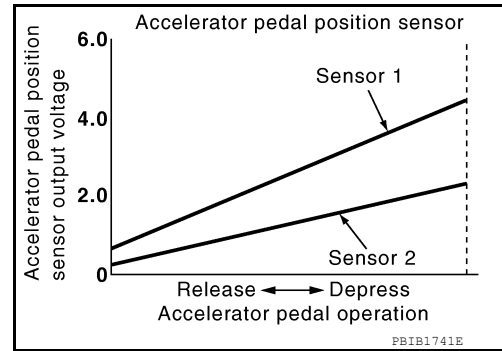
Component Description

INFOID:000000007358824

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle valve in response to driving conditions via the throttle control motor.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



On Board Diagnosis Logic

INFOID:000000007358825

This self-diagnosis has the one trip detection logic.

NOTE:

If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-836, "DTC Confirmation Procedure"](#).

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2138 2138	Accelerator pedal position sensor circuit range/performance	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	<ul style="list-style-type: none"> Harness or connector (APP sensor 1 or 2 circuit is open or shorted.) (TP sensor circuit is shorted.) Accelerator pedal position sensor 1 or 2 Electric throttle control actuator (TP sensor)

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode

- The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
- The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:000000007358826

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

- Start engine and let it idle for 1 second.
- Check DTC.
- If DTC is detected, go to [EC-907, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358827

1. CHECK GROUND CONNECTIONS

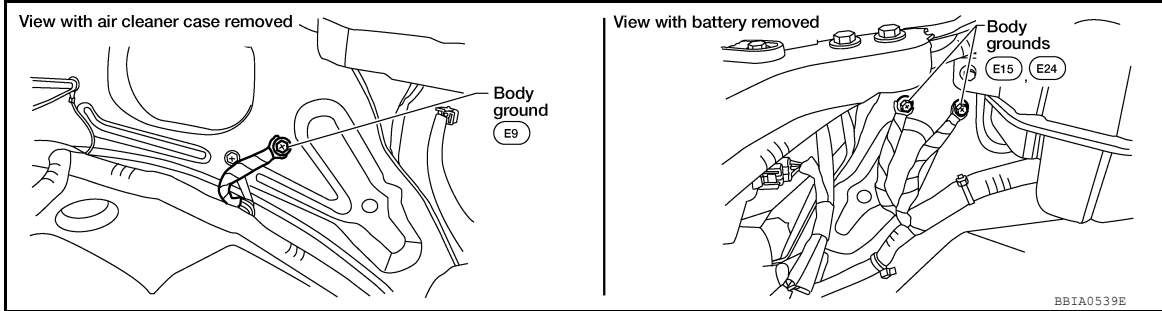
- Turn ignition switch OFF.
- Loosen and retighten ground screws on the body.

P2138 APP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Refer to [EC-623, "Ground Inspection"](#).

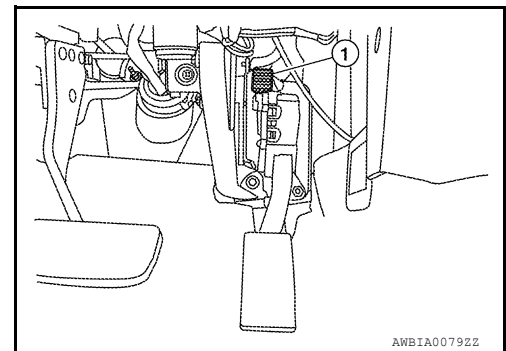


OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor (1) harness connector.
2. Turn ignition switch ON.

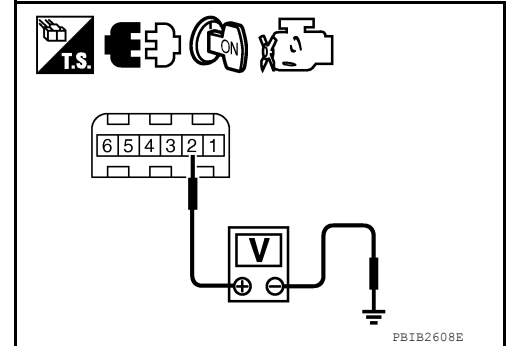


3. Check voltage between APP sensor terminal 2 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

- OK >> GO TO 3.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.



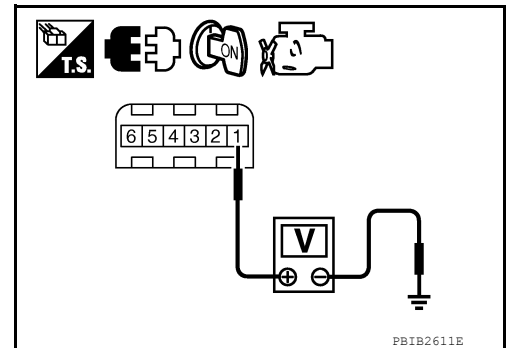
3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.
2. Check voltage between APP sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5V

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 4.



4. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 1 and ECM terminal 91. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

- OK >> GO TO 5.
- NG >> Repair open circuit in harness or connectors.

5.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 2	EC-567. "Wiring Diagram"
91	APP sensor terminal 1	

OK or NG

- OK >> GO TO 6.
- NG >> Repair short to ground or short to power in harness connectors.

6.CHECK THROTTLE POSITION SENSOR

Refer to [EC-906. "Component Inspection"](#).

OK or NG

- OK >> GO TO 12.
- NG >> GO TO 7.

7.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator. Refer to [EM-165](#).
2. Perform [EC-597. "Throttle Valve Closed Position Learning"](#).
3. Perform [EC-597. "Idle Air Volume Learning"](#).

>> INSPECTION END

8.CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 82 and APP sensor terminal 4, ECM terminal 83 and APP sensor terminal 5.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9.CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3, ECM terminal 98 and APP sensor terminal 6.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 10.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10.CHECK ACCELERATOR PEDAL POSITION SENSOR

Refer to [EC-910. "Component Inspection"](#).

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P2138 APP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> GO TO 12.
- NG >> GO TO 11.

11. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace the accelerator pedal assembly. Refer to [ACC-4](#).
2. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
3. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
4. Perform [EC-597, "Idle Air Volume Learning"](#).

>> INSPECTION END

12. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> INSPECTION END

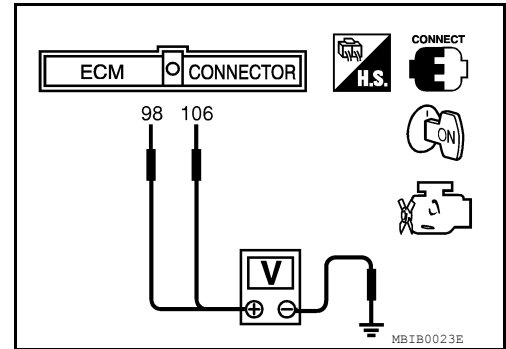
Component Inspection

INFOID:000000007358828

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.65 - 0.87V
	Fully depressed	More than 4.3V
98 (Accelerator pedal position sensor 2)	Fully released	0.28 - 0.48V
	Fully depressed	More than 2.0V



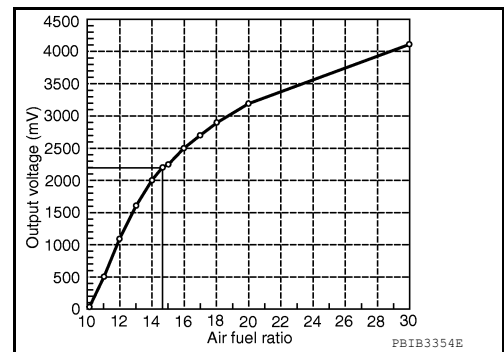
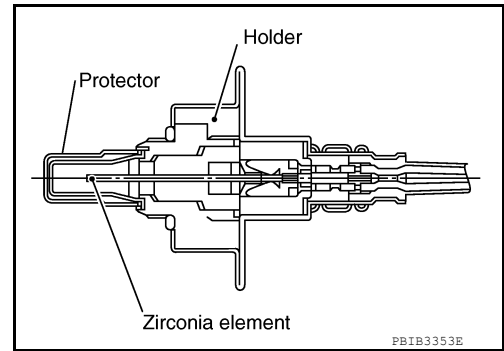
4. If NG, replace accelerator pedal assembly, refer to [ACC-4](#), and go to next step.
5. Perform [EC-597, "Accelerator Pedal Released Position Learning"](#).
6. Perform [EC-597, "Throttle Valve Closed Position Learning"](#).
7. Perform [EC-597, "Idle Air Volume Learning"](#).

P2A00, P2A03 A/F SENSOR 1

Component Description

INFOID:000000007358829

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element. The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich. Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of approximately 800°C (1,472°F).



On Board Diagnosis Logic

INFOID:000000007358830

To judge malfunctions, the A/F signal computed by ECM from the A/F sensor 1 signal is monitored not to be shifted to LEAN side or RICH side.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2A00 2A00 (Bank 1)	Air fuel ratio (A/F) sensor 1 circuit range/performance	<ul style="list-style-type: none"> The output voltage computed by ECM from the A/F sensor 1 signal shifts to the lean side for a specified period. The A/F signal computed by ECM from the A/F sensor 1 signal shifts to the rich side for a specified period. 	<ul style="list-style-type: none"> A/F sensor 1 A/F sensor 1 heater Heated oxygen sensor 2 Fuel pressure Fuel injector Intake air leakage Exhaust gas leaks
P2A03 2A03 (Bank 2)			

DTC Confirmation Procedure

INFOID:000000007358831

NOTE:

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.

P2A00, P2A03 A/F SENSOR 1

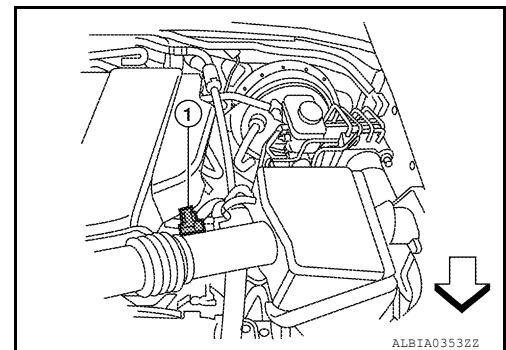
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Turn ignition switch ON and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
6. Clear the self-learning coefficient by touching "CLEAR".
7. Turn ignition switch OFF and wait at least 10 seconds.
8. Turn ignition switch ON.
9. Turn ignition switch OFF and wait at least 10 seconds.
10. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
11. Let engine idle for 1 minute.
12. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
13. Check 1st trip DTC.
14. If 1st trip DTC is detected, go to [EC-912, "Diagnosis Procedure"](#).

Ⓢ WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Disconnect mass air flow sensor (1) harness connector.
 - ↶: Vehicle front
6. Start engine and let it idle for at least 5 seconds.
7. Stop engine and reconnect mass air flow sensor harness connector.
8. Select Service \$03 with GST and check that DTC P0102 is detected.
9. Select Service \$04 with GST and erase the DTC P0102.
10. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
11. Let engine idle for 1 minute.
12. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
13. Select Service \$07 with GST.
 - If 1st trip DTC is detected, go to [EC-912, "Diagnosis Procedure"](#).

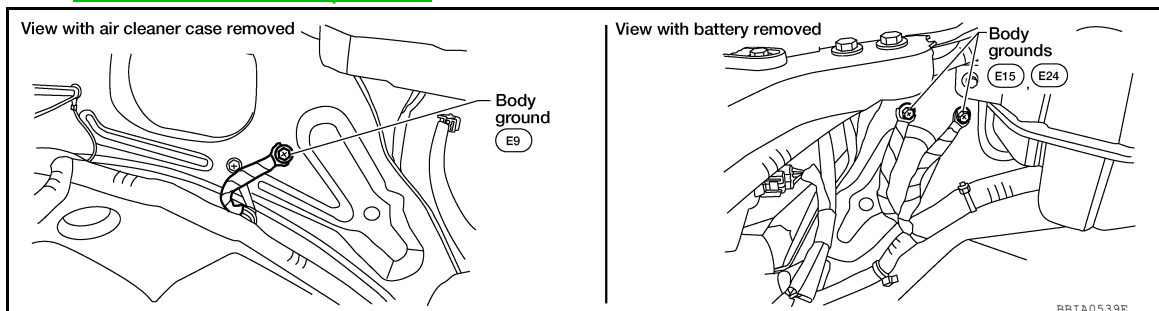


Diagnosis Procedure

INFOID:000000007358832

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to [EC-623, "Ground Inspection"](#).



OK or NG

- OK >> GO TO 2.
- NG >> Repair or replace ground connections.

2. RETIGHTEN AIR FUEL RATIO SENSOR 1 AND HEATED OXYGEN SENSOR 2

Loosen and retighten air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.

Refer to [EM-169. "Removal and Installation"](#).

>> GO TO 3.

3. CHECK FOR EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before the three way catalyst 2.

Is exhaust gas leak detected?

- YES >> Repair or replace.
- NO >> GO TO 4.

4. CHECK FOR INTAKE AIR LEAKAGE

1. Start engine and run it at idle.
2. Listen for an intake air leakage after the mass air flow sensor.

OK or NG

- OK >> GO TO 5.
- NG >> Repair or replace.

5. CLEAR THE SELF-LEARNING DATA

Ⓜ With CONSULT

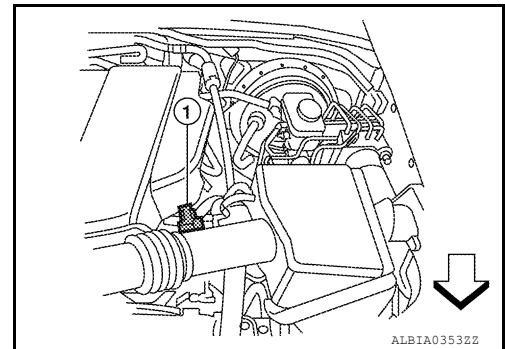
1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.

**Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
Is it difficult to start engine?**

⊗ Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor (1) harness connector.
 - ⇐: Vehicle front
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Check that DTC P0102 is displayed.
7. Erase the DTC memory.
8. Check that DTC P0000 is displayed.
9. Run engine for at least 10 minutes at idle speed.

**Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
Is it difficult to start engine?**



Yes or No

- Yes >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to [EC-716. "Diagnosis Procedure"](#) or [EC-720. "Diagnosis Procedure"](#).
- No >> GO TO 6.

6. CHECK HARNESS CONNECTOR

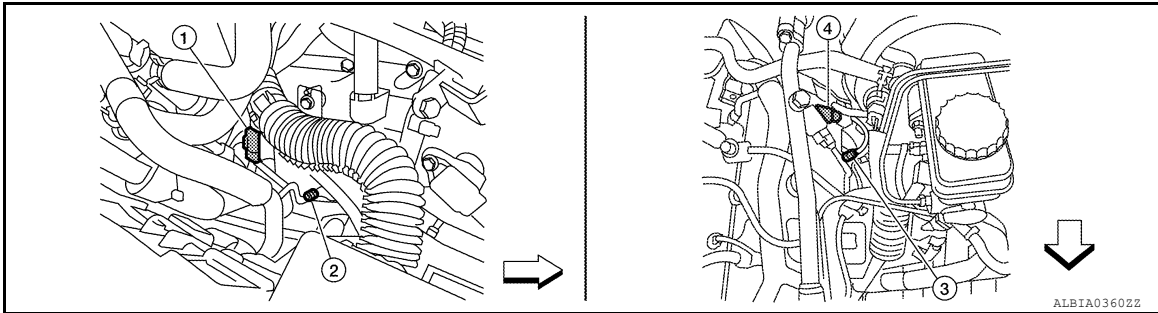
1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.

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P2A00, P2A03 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]



- 1. A/F sensor 1 (bank 2) harness connector
- 2. A/F sensor 1 (bank 2)
- 3. A/F sensor 1 (bank 1)
- 4. A/F sensor 1 (bank 1) harness connector

↶ : Vehicle front

3. Check harness connector for water.

Water should not exit.

OK or NG

- OK >> GO TO 7.
- NG >> Repair or replace harness connector.

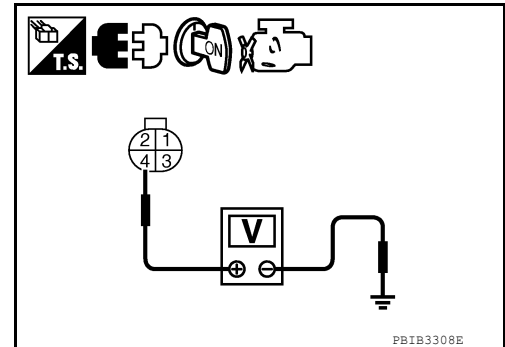
7. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.
2. Check voltage between A/F sensor 1 terminal 4 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 9.
- NG >> GO TO 8.



8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- IPDM E/R harness connector E119
- 15 A fuse (No. 54)
- Harness for open or short between A/F sensor 1 and IPDM E/R

>> Repair or replace harness or connectors.

9. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between A/F sensor 1 terminals and ECM terminals as per the following. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	35
	2	56
Bank 2	1	16
	2	75

Continuity should exist.

4. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	35	1	16
2	56	2	75

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 10.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK A/F SENSOR 1 HEATER

Refer to [EC-635, "Component Inspection"](#).

OK or NG

OK >> GO TO 11.

NG >> GO TO 13.

11. CHECK HEATED OXYGEN SENSOR 2

Check heated oxygen sensor 2. Refer to [EC-711, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace malfunctioning heated oxygen sensor 2.

12. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

OK or NG

OK >> GO TO 13.

NG >> Repair or replace.

13. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to [EM-169](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [Commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (Commercial service tool).

>> GO TO 14.

14. CONFIRM A/F ADJUSTMENT DATA


1. Turn ignition switch OFF and then ON.
2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT.
3. Make sure that "0.000" is displayed on CONSULT screen.

OK or NG

OK >> **INSPECTION END**

NG >> GO TO 15.

15. CLEAR THE SELF-LEARNING DATA

 **With CONSULT**

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P2A00, P2A03 A/F SENSOR 1

[VK56DE]

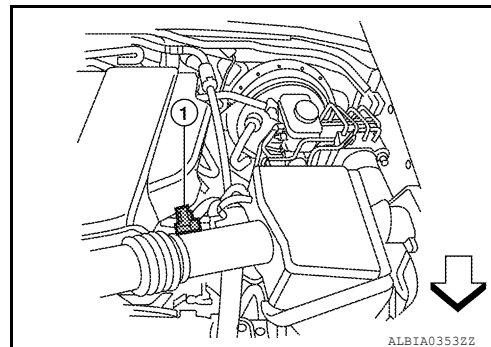
< DTC/CIRCUIT DIAGNOSIS >

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".

⊗ Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor (1) harness connector.
- ⇐: Vehicle front
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Check that DTC P0102 is displayed.
7. Erase the DTC memory.
8. Check that DTC P0000 is displayed.

>> GO TO 16.



16. CONFIRM A/F ADJUSTMENT DATA

1. Turn ignition switch OFF and then ON.
2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT.
3. Check that "0.000" is displayed on CONSULT screen.

>> INSPECTION END

ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

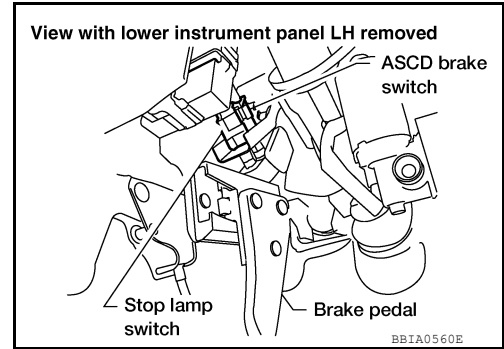
[VK56DE]

ASCD BRAKE SWITCH

Component Description

INFOID:000000007358833

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by two kinds of input (ON/OFF signal). Refer to [EC-512. "System Description"](#) for the ASCD function.



Diagnosis Procedure

INFOID:000000007358834

1. CHECK OVERALL FUNCTION-I

With CONSULT

1. Turn ignition switch ON.
2. Select "BRAKE SW 1" in "DATA MONITOR" mode with CONSULT.
3. Check "BRAKE SW 1" indication under the following conditions.

CONDITION	INDICATION
Brake pedal: Fully released	ON
Brake pedal: Slightly depressed	OFF

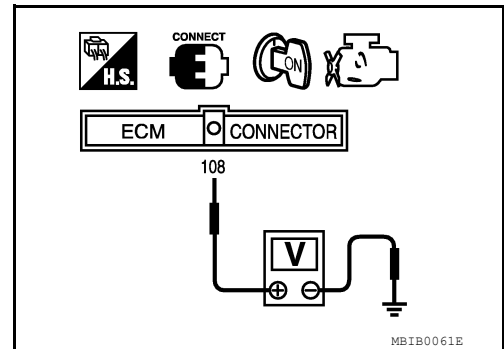
Without CONSULT

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 108 and ground under the following conditions.

CONDITION	VOLTAGE
Brake pedal: Fully released	Battery voltage
Brake pedal: Slightly depressed	Approximately 0 V

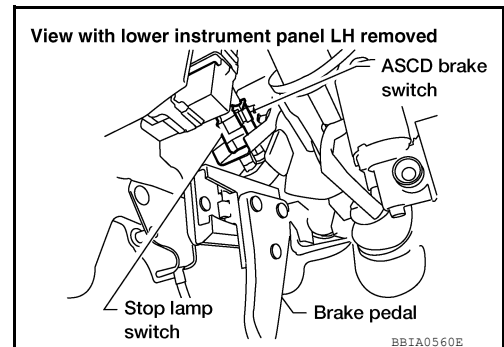
OK or NG

- OK >> INSPECTION END
 NG >> GO TO 2.



2. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.



ASCD BRAKE SWITCH

[VK56DE]

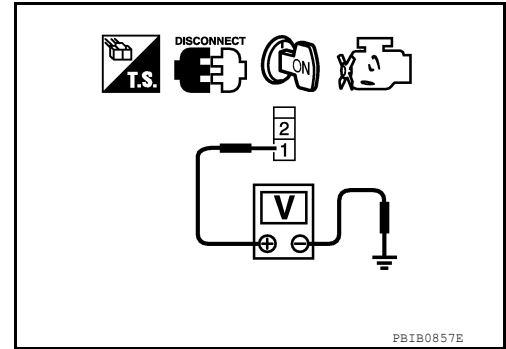
< DTC/CIRCUIT DIAGNOSIS >

4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E160
- 10 A fuse (No. 12)
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 5.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK ASCD BRAKE SWITCH

Refer to [EC-918, "Component Inspection"](#).

OK or NG

- OK >> GO TO 6.
- NG >> Replace ASCD brake switch. Refer to [BR-23](#).

6. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358835

ASCD BRAKE SWITCH

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.

ASCD BRAKE SWITCH

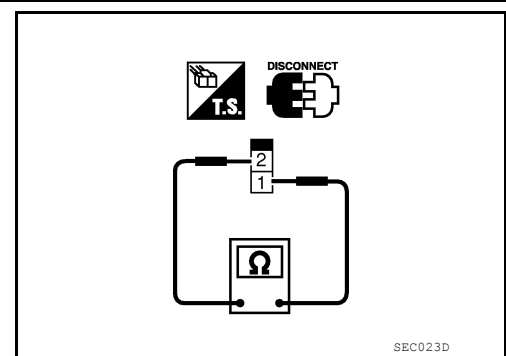
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Check harness continuity between ASCD brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
Brake pedal: Fully released	Should exist.
Brake pedal: Slightly depressed	Should not exist.

If NG, adjust ASCD brake switch installation, refer to [BR-23](#), "[Removal and Installation](#)", and perform step 3 again.



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ASC D INDICATOR

Component Description

INFOID:000000007358836

ASC D indicator lamp illuminates to indicate ASC D operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.

CRUISE indicator illuminates when MAIN switch on ASC D steering switch is turned ON to indicate that ASC D system is ready for operation.

SET indicator illuminates when the following conditions are met.

- CRUISE indicator is illuminated.
- SET/COAST switch on ASC D steering switch is turned ON while vehicle speed is within the range of the ASC D setting.

SET indicator remains lit during ASC D control.

Refer to [EC-512, "System Description"](#) for the ASC D function.

Diagnosis Procedure

INFOID:000000007358837

1. CHECK OVERALL FUNCTION

Check ASC D indicator under the following conditions.

ASC D INDICATOR	CONDITION		SPECIFICATION
CRUISE LAMP	<ul style="list-style-type: none"> • Ignition switch: ON 	<ul style="list-style-type: none"> • MAIN switch: Pressed at the 1st time → at the 2nd time 	ON → OFF
SET LAMP	<ul style="list-style-type: none"> • MAIN switch: ON • When vehicle speed : Between 40 km/h (25 MPH) and 144 km/h (89 MPH) 	<ul style="list-style-type: none"> • ASC D: Operating • ASC D: Not operating 	ON OFF

OK or NG

OK >> **INSPECTION END**

NG >> GO TO 2.

2. CHECK DTC

Check that DTC U0101 or U1001 is not displayed.

OK or NG

OK >> GO TO 3.

NG >> Perform trouble diagnosis for DTC U0101 or U1001. Refer to [EC-624, "DTC Confirmation Procedure"](#) or [EC-625, "DTC Confirmation Procedure"](#).

3. CHECK COMBINATION METER FUNCTION

Refer to [MWI-27, "CONSULT Function \(METER/M&A\)"](#).

OK or NG

OK >> GO TO 4.

NG >> Go to [MWI-4, "Work Flow"](#).

4. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

>> **INSPECTION END**

COOLING FAN

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

COOLING FAN

Description

INFOID:000000007358838

COMPONENT DESCRIPTION

Cooling Fan Motor

The cooling fan operates at each speed when the current flows in the cooling fan motor as per the following.

Cooling fan speed	Cooling fan motor terminals	
	(+)	(-)
Low (LOW)	1	3 and 4
	2	3 and 4
High (HI)	1 and 2	3 and 4

Diagnosis Procedure

INFOID:000000007358839

1. CHECK IPDM E/R POWER SUPPLY AND GROUND CIRCUIT

Refer to [PCS-14, "Diagnosis Procedure"](#).

OK or NG

OK >> GO TO 2.

NG >> Follow the instructions on [PCS-14, "Diagnosis Procedure"](#).

2. CHECK COOLING FAN MOTOR POWER SUPPLY CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector E120.
3. Disconnect cooling fan motor (1) harness connector.
4. Check harness continuity between the following terminals;
cooling fan motor terminal 1 and IPDM E/R terminal 20,
cooling fan motor terminal 2 and IPDM E/R terminal 24.
Refer to Wiring Diagram.

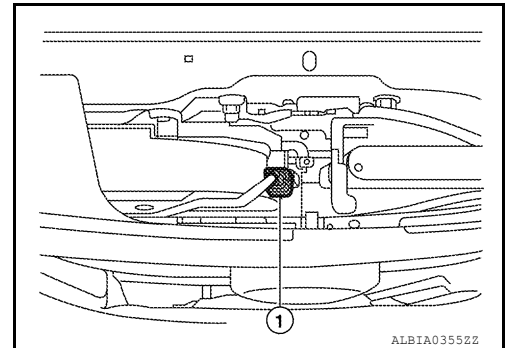
Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK COOLING FAN MOTOR GROUND CIRCUIT FOR OPEN OR SHORT

1. Check harness continuity between the following terminals;
cooling fan motor terminal 3 and ground,
cooling fan motor terminal 4 and ground.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to power in harness or connectors.

4. CHECK COOLING FAN MOTOR

Refer to [EC-922, "Component Inspection"](#).

OK or NG

OK >> GO TO 5.

COOLING FAN

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

NG >> Replace cooling fan motor. Refer to [CO-49, "Exploded View"](#).

5. CHECK INTERMITTENT INCIDENT

Perform [GI-37, "Intermittent Incident"](#).

OK or NG

OK >> INSPETION END

NG >> Repair or replace harness or connector.

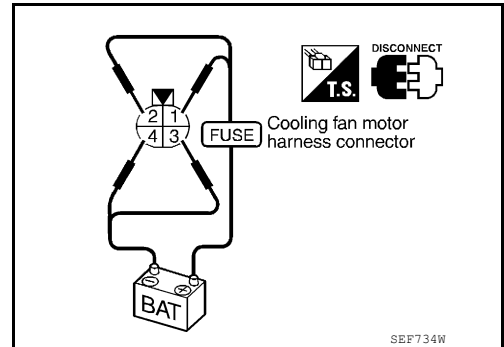
Component Inspection

INFOID:000000007358840

COOLING FAN MOTOR

1. Disconnect cooling fan motor harness connector.
2. Supply cooling fan motor terminals with battery voltage and check operation.

Cooling fan speed	Cooling fan motor terminals	
	(+)	(-)
Low	1	3 and 4
	2	3 and 4
High	1 and 2	3 and 4



Cooling fan motor should operate.

If NG, replace cooling fan motor. Refer to [CO-49, "Exploded View"](#).

ELECTRICAL LOAD SIGNAL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

ELECTRICAL LOAD SIGNAL

Description

INFOID:000000007358841

The electrical load signal (Headlamp switch signal, etc.) is transferred via the CAN communication line.

Diagnosis Procedure

INFOID:000000007358842

1.CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

1. Turn ignition switch ON.
2. Connect CONSULT and select "DATA MONITOR" mode.
3. Select "LOAD SIGNAL" and check indication under the following conditions.

Condition	Indication
Rear window defogger switch: ON	ON
Rear window defogger switch: OFF	OFF

OK or NG

- OK >> GO TO 2.
NG >> GO TO 4.

2.CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Check "LOAD SIGNAL" indication under the following conditions.

Condition	Indication
Lighting switch: ON at 2nd position	ON
Lighting switch: OFF	OFF

OK or NG

- OK >> GO TO 3.
NG >> GO TO 5.

3.CHECK HEATER FAN SIGNAL CIRCUIT OVERALL FUNCTION

Select "HEATER FAN SW" and check indication under the following conditions.

Condition	Indication
Heater fan control switch: ON	ON
Heater fan control switch: OFF	OFF

OK or NG

- OK >> **INSPECTION END**
NG >> GO TO 6.

4.CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to [DEF-3. "Repair Work Flow"](#).

>> **INSPECTION END**

5.CHECK HEADLAMP SYSTEM

Refer to [EXL-4. "Work Flow"](#).

>> **INSPECTION END**

6.CHECK HEATER FAN CONTROL SYSTEM

Refer to [HAC-4. "How to Perform Trouble Diagnosis For Quick And Accurate Repair"](#) or [HAC-128. "How to Perform Trouble Diagnosis For Quick And Accurate Repair"](#).

ELECTRICAL LOAD SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

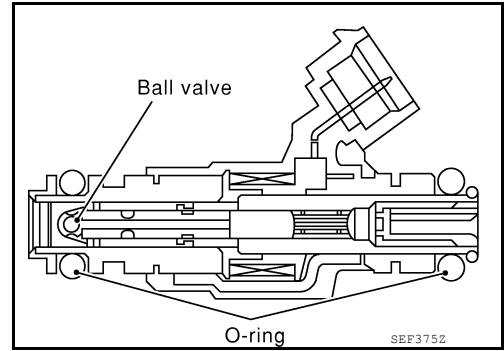
>> INSPECTION END

FUEL INJECTOR

Component Description

INFOID:000000007358843

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the fuel injector circuit, the coil in the fuel injector is energized. The energized coil pulls the ball valve back and allows fuel to flow through the fuel injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the fuel injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



SEF375Z

Diagnosis Procedure

INFOID:000000007358844

1. INSPECTION START

Turn ignition switch to START.

Are any cylinders ignited?

Yes or No

Yes >> GO TO 2.

No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

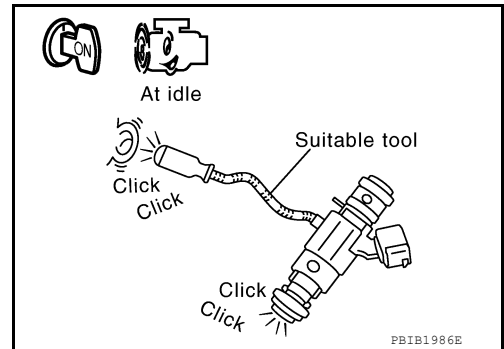
Without CONSULT

1. Start engine.
2. Listen to each fuel injector operating sound.
Clicking noise should be heard.

OK or NG

OK >> **INSPECTION END**

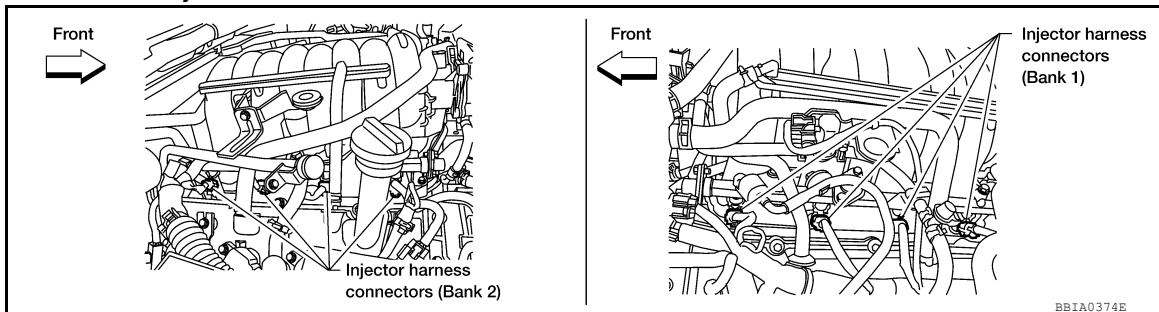
NG >> GO TO 3.



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3. CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.



BBIA0374E

3. Turn ignition switch ON.

FUEL INJECTOR

[VK56DE]

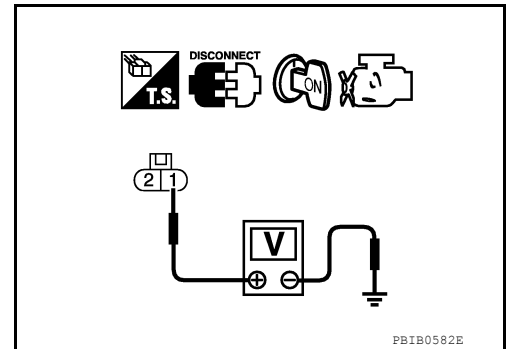
< DTC/CIRCUIT DIAGNOSIS >

4. Check voltage between fuel injector terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R connector E119
- 15 A fuse (No. 55)
- Harness for open or short between fuel injector and fuse

>> Repair harness or connectors.

5. CHECK FUEL INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between fuel injector terminal 2 and ECM terminals 21, 22, 23, 40, 41, 42, 44, 63.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 6.
- NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK FUEL INJECTOR

Refer to [EC-926. "Component Inspection"](#).

OK or NG

- OK >> GO TO 7.
- NG >> Replace malfunctioning fuel injector. Refer to [EM-180](#).

7. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358845

FUEL INJECTOR

1. Disconnect fuel injector harness connector.

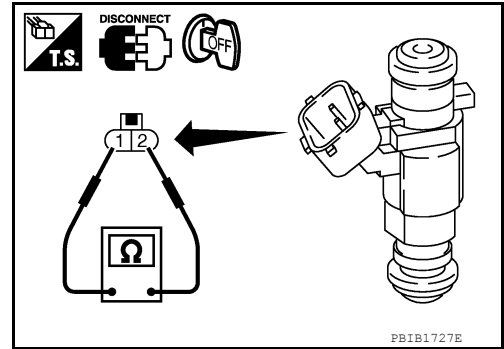
FUEL INJECTOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check resistance between terminals as shown in the figure.

Resistance: 11.1 - 14.5 Ω [at 10 - 60°C (50 - 140°F)]



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FUEL PUMP

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

FUEL PUMP

Description

INFOID:000000007358846

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay
Battery	Battery voltage*		

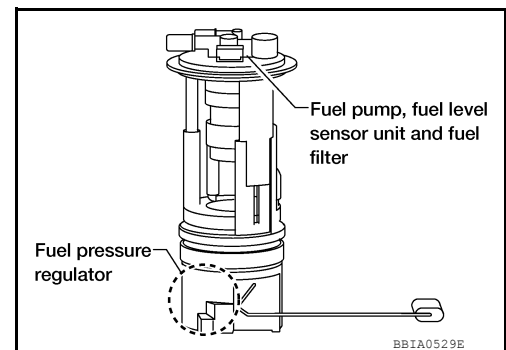
*: ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned ON to improve engine start ability. If the ECM receives a engine speed signal from the camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON	Operates for 1 second.
Engine running and cranking	Operates.
When engine is stopped	Stops in 1.5 seconds.
Except as shown above	Stops.

COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.



Diagnosis Procedure

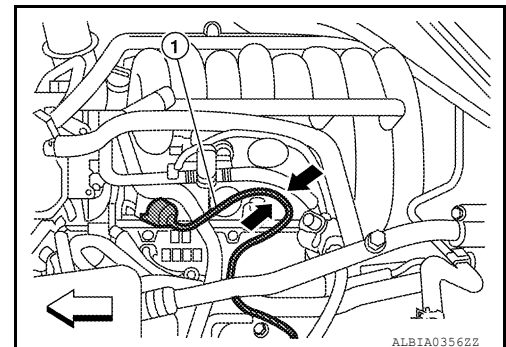
1. CHECK OVERALL FUNCTION

1. Turn ignition switch ON.
2. Pinch fuel feed hose with two fingers.

Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.

OK or NG

- OK >> **INSPECTION END**
NG >> GO TO 2.



2. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Turn ignition switch ON.

FUEL PUMP

[VK56DE]

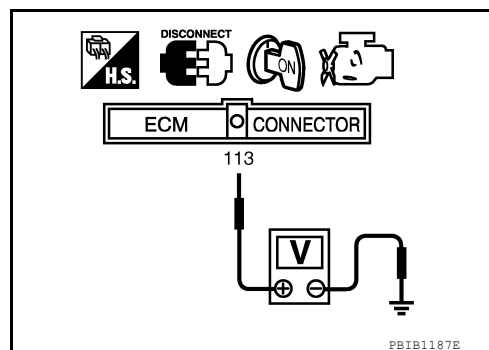
< DTC/CIRCUIT DIAGNOSIS >

4. Check voltage between ECM terminal 113 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 5.
- NG >> GO TO 3.



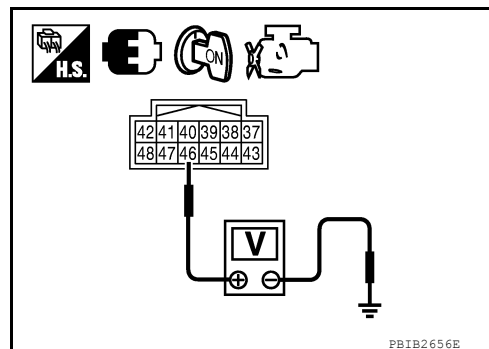
3.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

- Check voltage between IPDM E/R terminal 46 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 4.
- NG >> GO TO 9.



4.DETECT MALFUNCTIONING PART

- Check harness for open or short between IPDM E/R and ECM.

>> Repair harness or connectors.

5.CHECK FUSE

1. Turn ignition switch OFF.
2. Disconnect 15 A fuse (No. 48).
3. Check 15 A fuse.

OK or NG

- OK >> GO TO 6.
- NG >> Replace fuse.

6.CHECK FUEL PUMP POWER SUPPLY AND GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
3. Disconnect IPDM E/R harness connector E119.
4. Check harness continuity between IPDM E/R terminal 13 and "fuel level sensor unit and fuel pump" terminal 1, "fuel level sensor unit and fuel pump" terminal 3 and ground. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

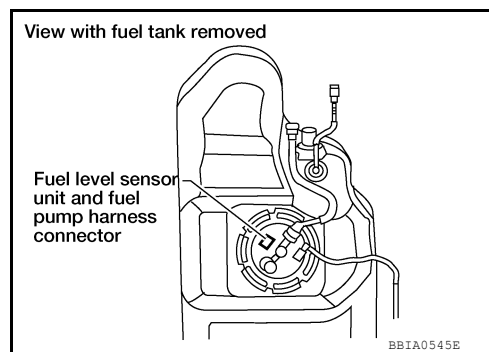
OK or NG

- OK >> GO TO 8.
- NG >> GO TO 7.

7.DETECT MALFUNCTIONING PART

- Check the following.

- Harness connectors E41, C1
- Harness for open or short between fuel pump and IPDM E/R



FUEL PUMP

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Harness for open or short between fuel pump and ground

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK FUEL PUMP

Refer to [EC-930, "Component Inspection"](#).

OK or NG

OK >> GO TO 9.

NG >> Replace "fuel level sensor unit and fuel pump". Refer to [FL-11](#).

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

OK or NG

OK >> Replace IPDM E/R. Refer to [PCS-29](#).

NG >> Repair or replace harness or connectors.

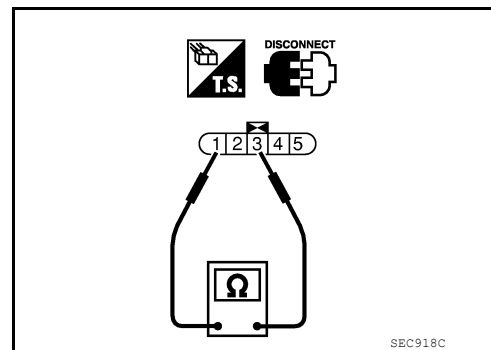
Component Inspection

INFOID:000000007358848

FUEL PUMP

1. Disconnect "fuel level sensor unit and fuel pump" harness connector.
2. Check resistance between fuel level sensor unit and fuel pump terminals 1 and 3.

Resistance: 0.2 - 5.0 Ω [at 25°C (77°F)]



IGNITION SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

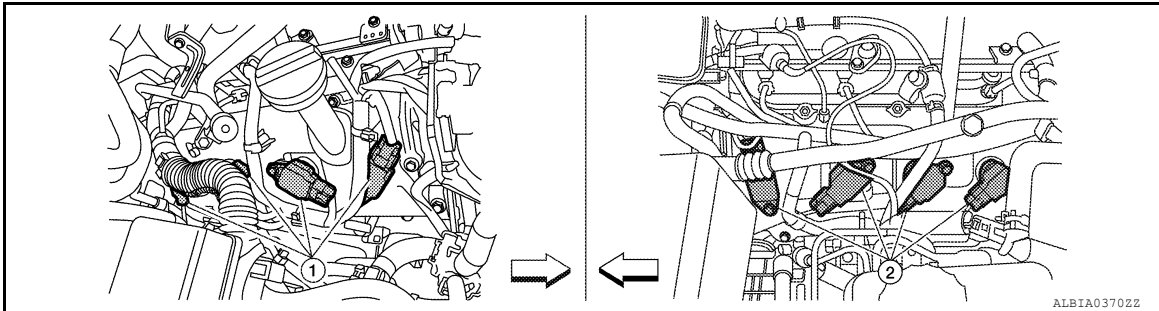
IGNITION SIGNAL

Component Description

INFOID:000000007358849

IGNITION COIL & POWER TRANSISTOR

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns ON and OFF the ignition coil primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.



1. Ignition coils (with power transistor) (bank 2)
2. Ignition coils (with power transistor) (bank 1)

↔ : Vehicle front

Diagnosis Procedure

INFOID:000000007358850

1. CHECK ENGINE START

Turn ignition switch OFF, and restart engine.

Is engine running?

Yes or No

Yes (With CONSULT)>>GO TO 2.

Yes (Without CONSULT)>>GO TO 3.

No >> GO TO 4.

2. CHECK OVERALL FUNCTION

With CONSULT

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
2. Check that each circuit produces a momentary engine speed drop.

OK or NG

OK >> **INSPECTION END**

NG >> GO TO 10.

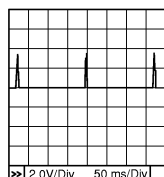
3. CHECK OVERALL FUNCTION

Without CONSULT

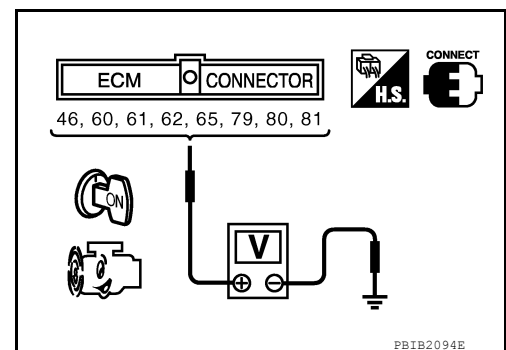
1. Let engine idle.
2. Read the voltage signal between ECM terminals 46, 60, 61, 62, 65, 79, 80, 81 and ground with an oscilloscope.
3. Check that the oscilloscope screen shows the signal wave as shown below.

NOTE:

The pulse cycle changes depending on rpm at idle.



PBIB0044E



PBIB2094E

IGNITION SIGNAL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

OK or NG

- OK >> **INSPECTION END**
- NG >> GO TO 10.

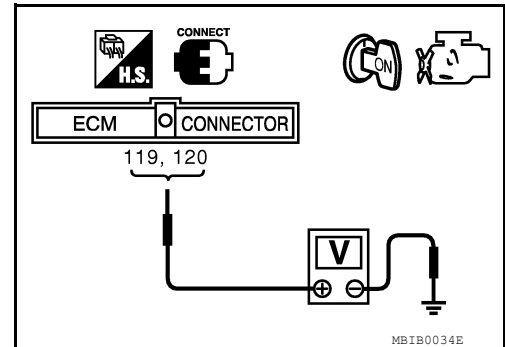
4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.
2. Check voltage between ECM terminals 119, 120 and ground with CONSULT or tester.

Voltage: Battery voltage

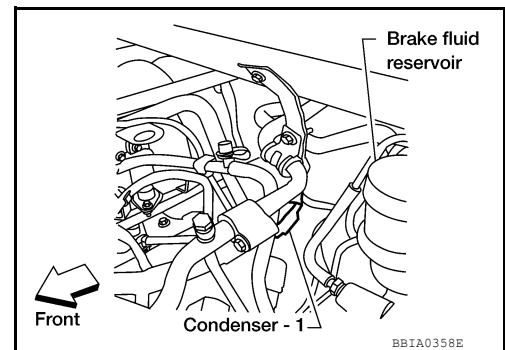
OK or NG

- OK >> GO TO 5.
- NG >> Go to [EC-620, "Diagnosis Procedure"](#).



5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect condenser-1 harness connector.
3. Turn ignition switch ON.

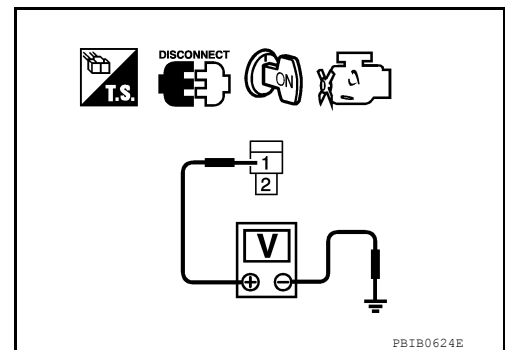


4. Check voltage between condenser-1 terminal 1 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

- OK >> GO TO 8.
- NG >> GO TO 6.



6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R connector E119.
3. Check harness continuity between IPDM E/R terminal 3 and condenser-1 terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

- OK >> Go to [EC-620, "Diagnosis Procedure"](#).
- NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

IGNITION SIGNAL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- Harness for open or short between condenser-1 and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK CONDENSER-1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between condenser-1 terminal 2 and ground.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 9.

NG >> Repair open circuit or short to power in harness or connectors.

9. CHECK CONDENSER-1

Refer to [EC-934. "Component Inspection"](#).

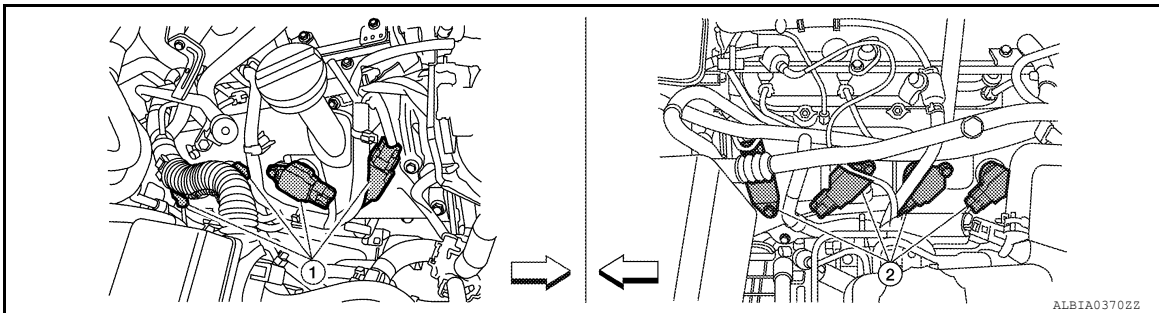
OK or NG

OK >> GO TO 10.

NG >> Replace condenser-1.

10. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.



1. Ignition coils (with power transistor) (bank 2)
2. Ignition coils (with power transistor) (bank 1)

↶ : Vehicle front

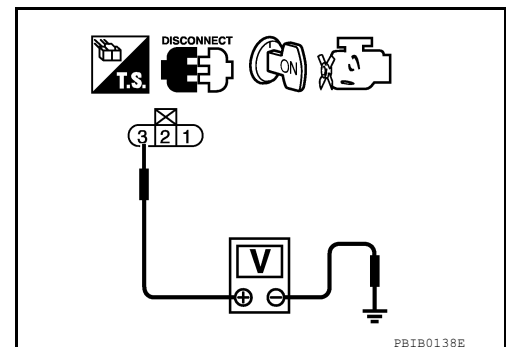
4. Turn ignition switch ON.
5. Check voltage between ignition coil terminal 3 and ground with CONSULT or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 12.

NG >> GO TO 11.



11. DETECT MALFUNCTIONING PART

Check the following.

IGNITION SIGNAL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Harness connectors E2, F32
- Harness for open or short between ignition coil and harness connector F32

>> Repair or replace harness or connectors.

12. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between ignition coil terminal 2 and ground.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 13.

NG >> Repair open circuit or short to power in harness or connectors.

13. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 46, 60, 61, 62, 65, 79, 80, 81 and ignition coil terminal 1.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 14.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to [EC-934. "Component Inspection"](#).

OK or NG

OK >> GO TO 15.

NG >> Replace malfunctioning ignition coil with power transistor.

15. CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

>> **INSPECTION END**

Component Inspection

INFOID:000000007358851

IGNITION COIL WITH POWER TRANSISTOR

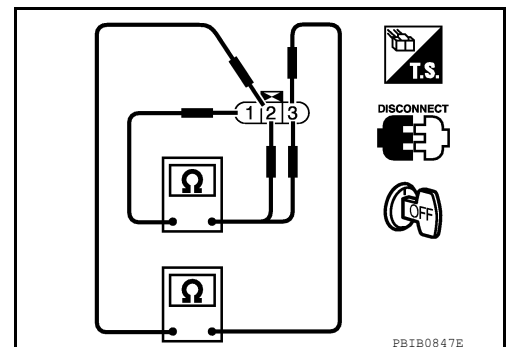
CAUTION:

Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as per the following.

Terminal No. (Polarity)	Resistance [at 25°C (77°F)]
1 and 2	Except 0 or ∞ Ω
1 and 3	Except 0 Ω
2 and 3	

4. If NG, replace ignition coil with power transistor. Refer to [EM-177](#).



IGNITION SIGNAL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

If OK, go to next step.

5. Turn ignition switch OFF.
6. Reconnect all harness connectors disconnected.
7. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

8. Start engine.
9. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
10. Turn ignition switch OFF.
11. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
12. Remove ignition coil and spark plug of the cylinder to be checked. Refer to [EM-177](#).
13. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
14. Connect spark plug and harness connector to ignition coil.
15. Fix ignition coil using a rope etc. with gap of 13 - 17 mm between the edge of the spark plug and grounded metal portion as shown in the figure.
16. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

- Never place the spark plug and the ignition coil within 50 cm each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might damage the ignition coil if the gap of more than 17 mm is made.

NOTE:

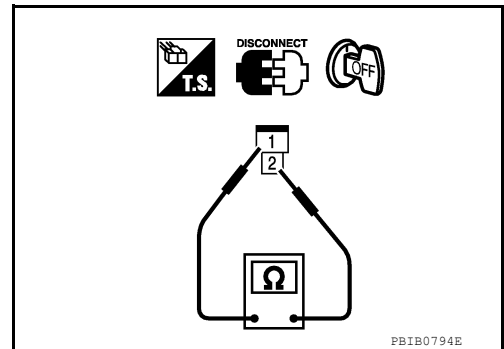
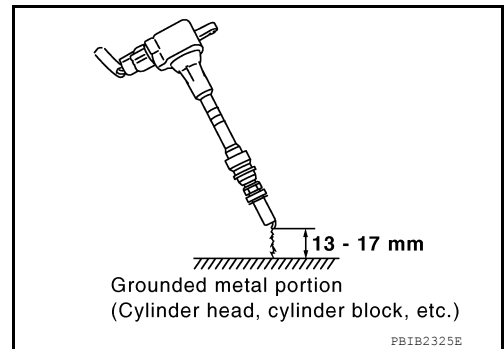
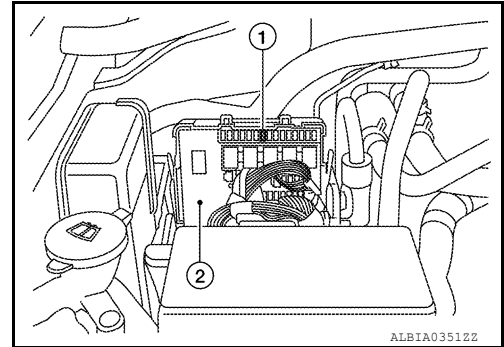
When the gap is less than 13 mm, a spark might be generated even if the coil is malfunctioning.

17. If NG, replace ignition coil with power transistor. Refer to [EM-177](#).

CONDENSER-1

1. Turn ignition switch OFF.
2. Disconnect condenser-1 harness connector.
3. Check resistance between condenser-1 terminals 1 and 2.

Resistance	Above 1 MΩ at 25°C (77°F)
------------	---------------------------



MALFUNCTION INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

MALFUNCTION INDICATOR LAMP

Component Function Check

INFOID:000000007358852

1.CHECK MIL FUNCTION

1. Turn ignition switch ON.
2. Check that MIL illuminates.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-936. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007358853

1.CHECK DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Perform trouble diagnosis for DTC UXXXX.

2.CHECK DTC WITH COMBINATION METER

Refer to [MWI-27. "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Perform trouble diagnosis for DTC indicated.

3.CHECK INTERMITTENT INCIDENT

Refer to [GI-37. "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> Replace combination meter. Refer to [MWI-89. "Removal and Installation"](#).
NO >> Repair or replace malfunctioning part.

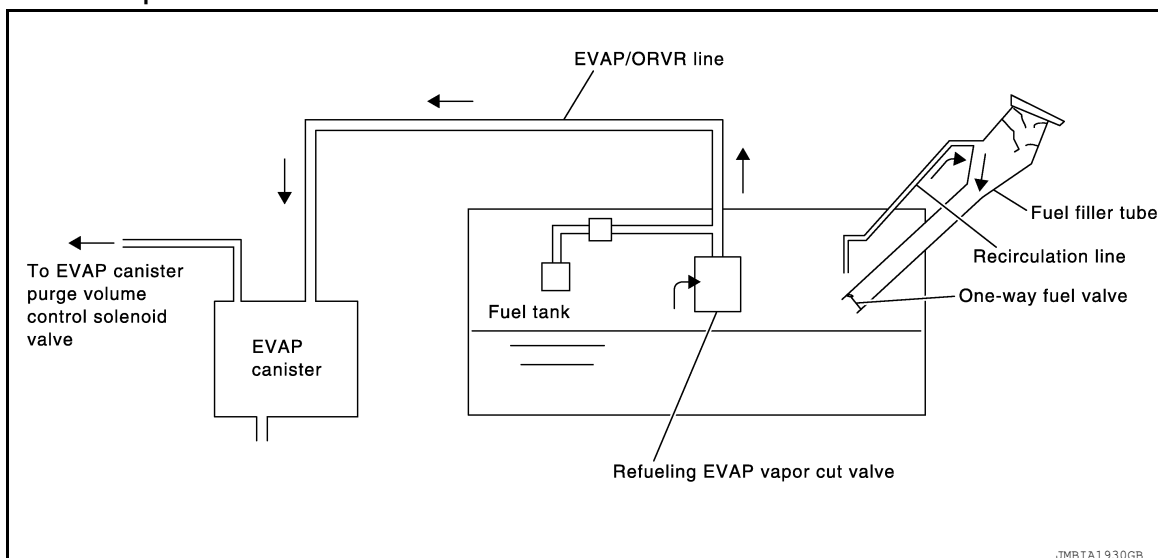
ON BOARD REFUELING VAPOR RECOVERY (ORVR)

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

System Description



From the beginning of refueling, the air and vapor inside the fuel tank go through refueling EVAP vapor cut valve and EVAP/ORVR line to the EVAP canister. The vapor is absorbed by the EVAP canister and the air is released to the atmosphere.

When the refueling has reached the full level of the fuel tank, the refueling EVAP vapor cut valve is closed and refueling is stopped because of auto shut-off. The vapor which was absorbed by the EVAP canister is purged during driving.

WARNING:

When conducting inspections below, always observe the following:

- Put a “CAUTION: FLAMMABLE” sign in workshop.
- Never smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Always furnish the workshop with a CO₂ fire extinguisher.

CAUTION:

- Before removing fuel line parts, carry out the following procedures:
 - Put drained fuel in an explosion-proof container and put lid on securely.
 - Release fuel pressure from fuel line. Refer to [EC-952, "Fuel Pressure Check"](#).
 - Disconnect battery ground cable.
- Always replace O-ring when the fuel gauge retainer is removed.
- Never kink or twist hose and tube when they are installed.
- Never tighten hose and clamps excessively to avoid damaging hoses.
- After installation, run engine and check for fuel leakage at connection.
- Never attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.

Diagnosis Procedure

INFOID:000000007358855

SYMPTOM: FUEL ODOR FROM EVAP CANISTER IS STRONG.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16, "Removal and Installation"](#).
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

- OK >> GO TO 2.
- NG >> GO TO 3.

2. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

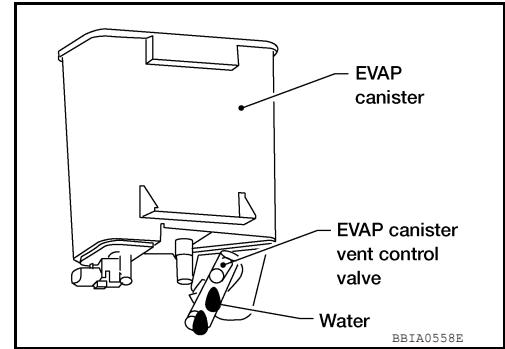
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Does water drain from the EVAP canister?

Yes or No

- Yes >> GO TO 3.
- No >> GO TO 6.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to [FL-16, "Removal and Installation"](#).

>> GO TO 4.

4. CHECK DRAIN FILTER

Refer to [EC-940, "Component Inspection"](#).

OK or NG

- OK >> GO TO 5.
- NG >> Replace drain filter.

5. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and drain filter for clogging or poor connection.

>> Repair or replace EVAP hose. Refer to [EM-165](#).

6. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to [EC-940, "Component Inspection"](#).

OK or NG

- OK >> **INSPECTION END**
- NG >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-16, "Removal and Installation"](#).

SYMPTOM: CANNOT REFUEL/FUEL ODOR FROM THE FUEL FILLER OPENING IS STRONG WHILE REFUELING.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-16, "Removal and Installation"](#).
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

- OK >> GO TO 2.
- NG >> GO TO 3.

2. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

[VK56DE]

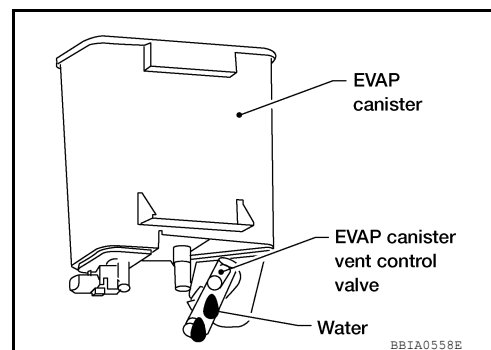
< DTC/CIRCUIT DIAGNOSIS >

Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 3.

No >> GO TO 6.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to [FL-16, "Removal and Installation"](#).

>> GO TO 4.

4. CHECK DRAIN FILTER

Refer to [EC-940, "Component Inspection"](#).

OK or NG

OK >> GO TO 5.

NG >> Replace drain filter. Refer to [EC-516](#).

5. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and drain filter for clogging or poor connection.

>> Repair or replace EVAP hose. Refer to [EM-165](#).

6. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling EVAP vapor cut valve for clogging, kinks, looseness and improper connection.

OK or NG

OK >> GO TO 7.

NG >> Repair or replace hoses and tubes.

7. CHECK FILLER RECIRCULATION LINE

Check recirculation line for clogging, dents and cracks.

OK or NG

OK >> GO TO 8.

NG >> Replace filler filler tube.

8. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to [EC-940, "Component Inspection"](#).

OK or NG

OK >> GO TO 9.

NG >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-16, "Removal and Installation"](#).

9. CHECK FUEL FILLER TUBE

Check filler filler tube and hose connected to the fuel tank for clogging, dents and cracks.

OK or NG

OK >> GO TO 10.

NG >> Replace fuel filler tube.

10. CHECK ONE-WAY FUEL VALVE-I

Check one-way valve for clogging.

OK or NG

OK >> GO TO 11.

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

NG >> Repair or replace one-way fuel valve with fuel tank. Refer to [FL-6. "Removal and Installation"](#).

11. CHECK ONE-WAY FUEL VALVE-II

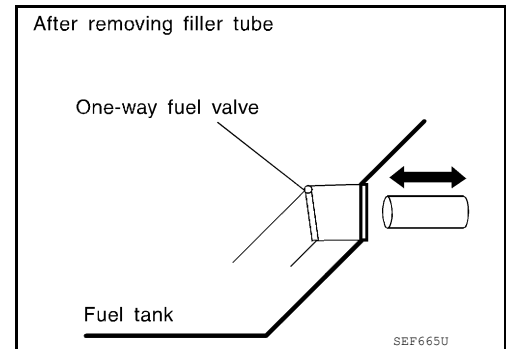
1. Check that fuel is drained from the tank.
2. Remove fuel filler tube and hose.
3. Check one-way fuel valve for operation as per the following.
When a stick is inserted, the valve should open, when removing stick it should close.

Never drop any material into the tank.

OK or NG

OK >> **INSPECTION END**

NG >> Replace fuel filler tube or replace one-way fuel valve with fuel tank. Refer to [FL-6](#).



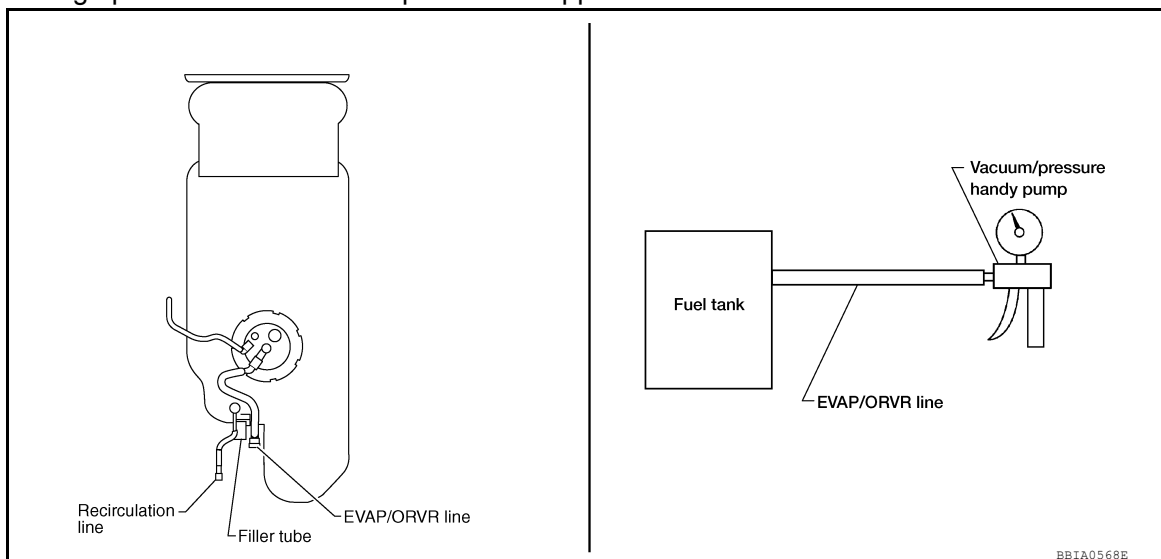
INFOID:000000007358856

Component Inspection

REFUELING EVAP VAPOR CUT VALVE

Ⓟ With CONSULT

1. Remove fuel tank. Refer to [FL-6. "Removal and Installation"](#).
2. Drain fuel from the tank as per the following:
 - a. Remove fuel feed hose located on the fuel gauge retainer.
 - b. Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
 - c. Drain fuel using "FUEL PUMP RELAY" in "ACTIVE TEST" mode with CONSULT.
3. Check refueling EVAP vapor cut valve for being stuck to close as per the following.
Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
4. Check refueling EVAP vapor cut valve for being stuck to open as per the following.
 - a. Connect vacuum pump to hose end.
 - b. Remove fuel gauge retainer with fuel gauge unit.
Always replace O-ring with new one.
 - c. Turn fuel tank upside down.
- d. Apply vacuum pressure to hose end [-13.3 kPa (-0.136 kg/cm², -.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



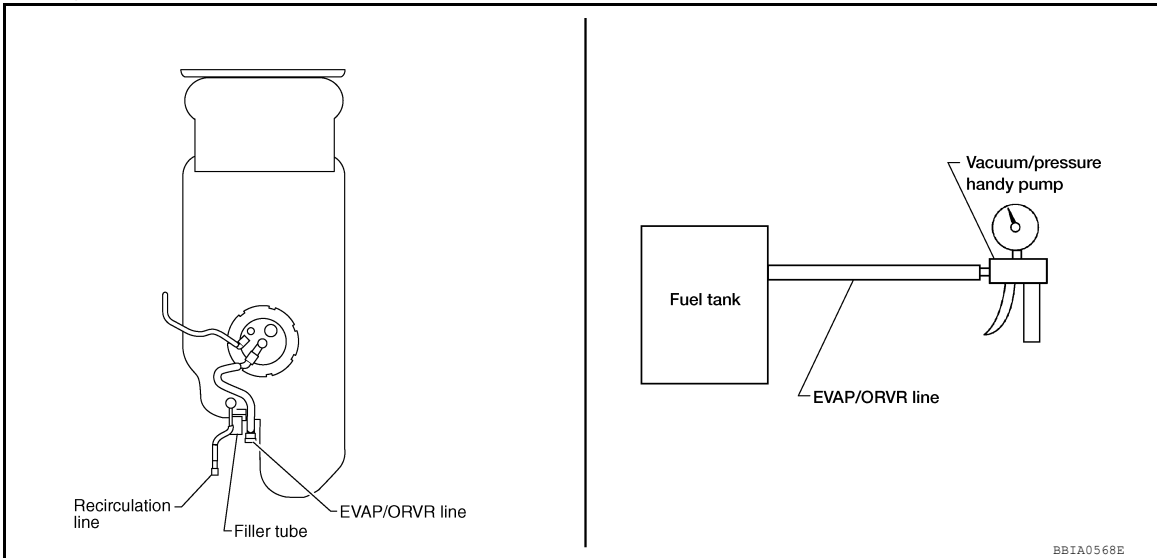
ⓧ Without CONSULT

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

< DTC/CIRCUIT DIAGNOSIS >

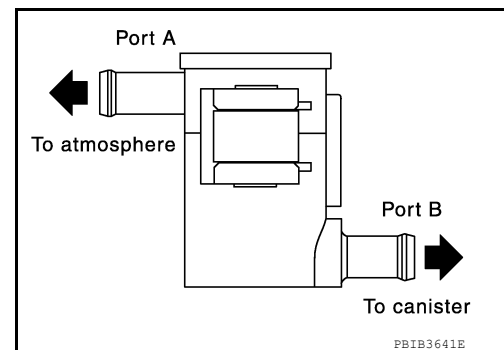
[VK56DE]

1. Remove fuel tank. Refer to [FL-6. "Removal and Installation"](#).
2. Drain fuel from the tank as per the following:
 - a. Remove fuel gauge retainer.
 - b. Drain fuel from the tank using a handy pump into a fuel container.
3. Check refueling EVAP vapor cut valve for being stuck to close as per the following. Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
4. Check refueling EVAP vapor cut valve for being stuck to open as per the following.
 - a. Connect vacuum pump to hose end.
 - b. Remove fuel gauge retainer with fuel gauge unit.
Always replace O-ring with new one.
 - c. Turn fuel tank upside down.
 - d. Apply vacuum pressure to hose end [-13.3 kPa (-0.136 kg/cm², -.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.
7. If NG, replace drain filter. Refer to [EC-516](#).



POSITIVE CRANKCASE VENTILATION

< DTC/CIRCUIT DIAGNOSIS >

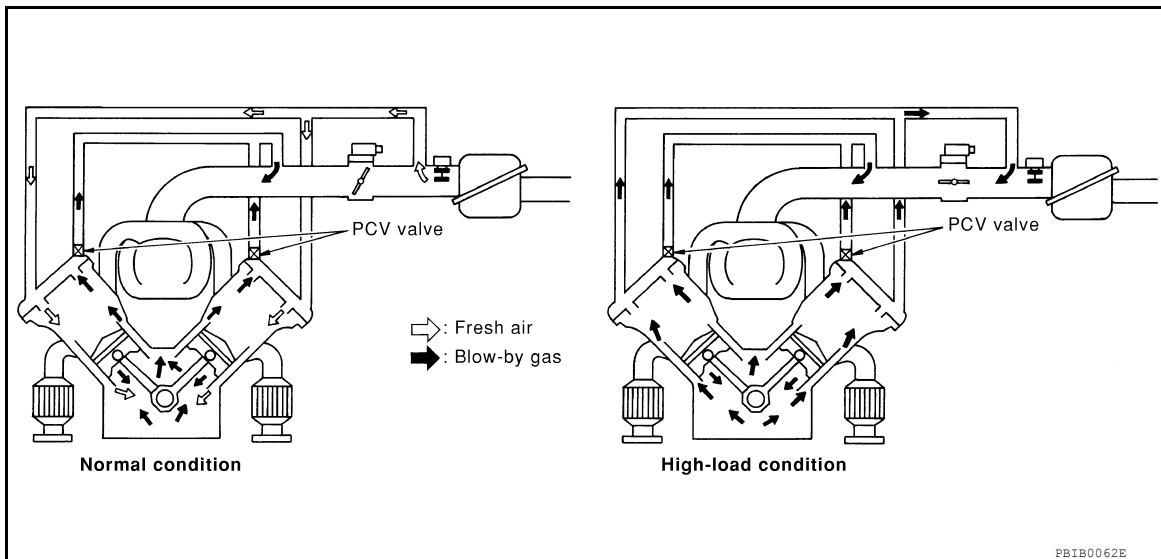
[VK56DE]

POSITIVE CRANKCASE VENTILATION

Description

INFOID:000000007358857

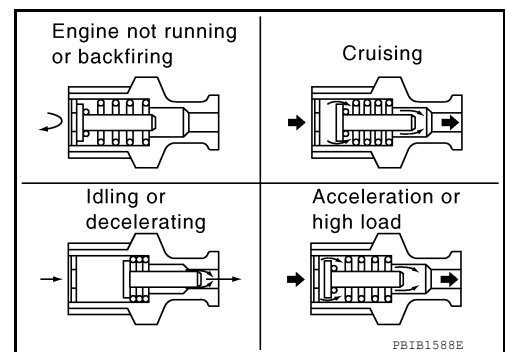
SYSTEM DESCRIPTION



This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover. Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.

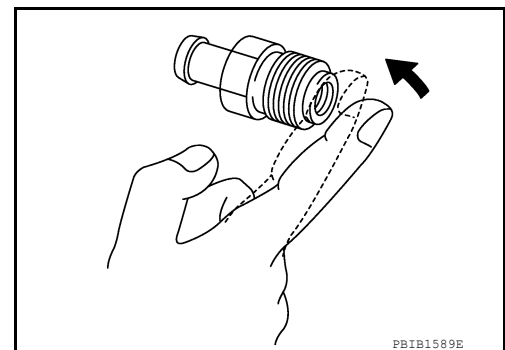


Component Inspection

INFOID:000000007358858

PCV (POSITIVE CRANKCASE VENTILATION) VALVE

With engine running at idle, remove PCV valve from rocker cover. Refer to [EM-178](#). A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



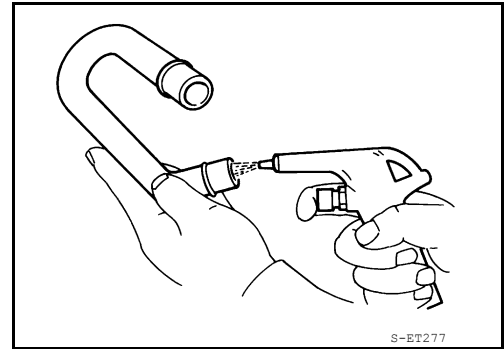
PCV VALVE VENTILATION HOSE

POSITIVE CRANKCASE VENTILATION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

1. Check hoses and hose connections for leakage.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



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REFRIGERANT PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

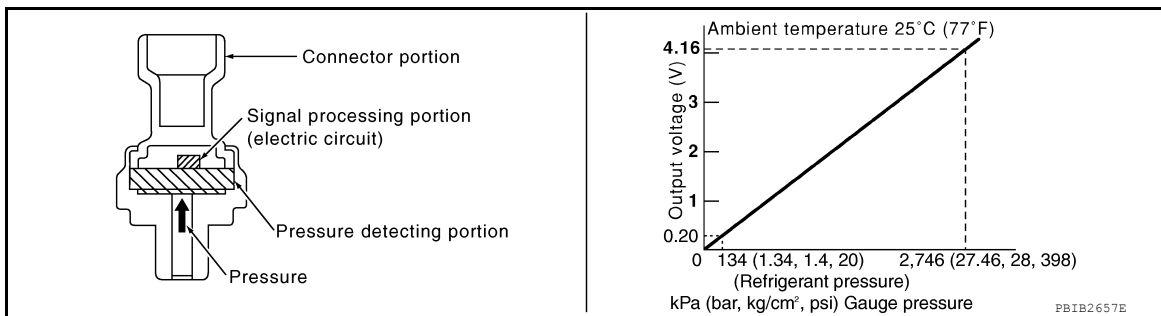
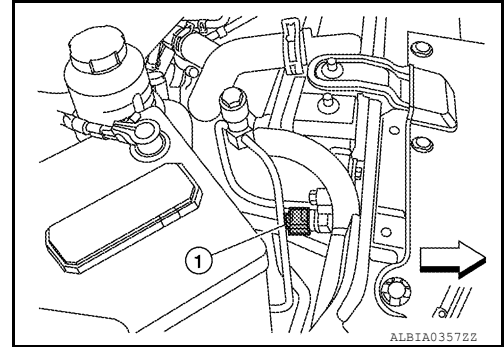
[VK56DE]

REFRIGERANT PRESSURE SENSOR

Component Description

INFOID:000000007358859

The refrigerant pressure sensor (1) is installed at the condenser of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.



Diagnosis Procedure

INFOID:000000007358860

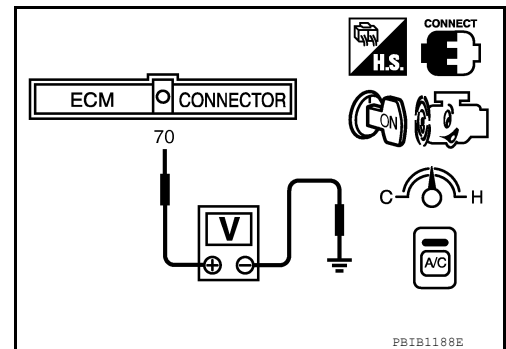
1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower fan switch ON.
3. Check voltage between ECM terminal 70 and ground with CONSULT or tester.

Voltage: 1.0 - 4.0 V

OK or NG

- OK >> **INSPECTION END**
- NG >> GO TO 2.



2. CHECK GROUND CONNECTIONS

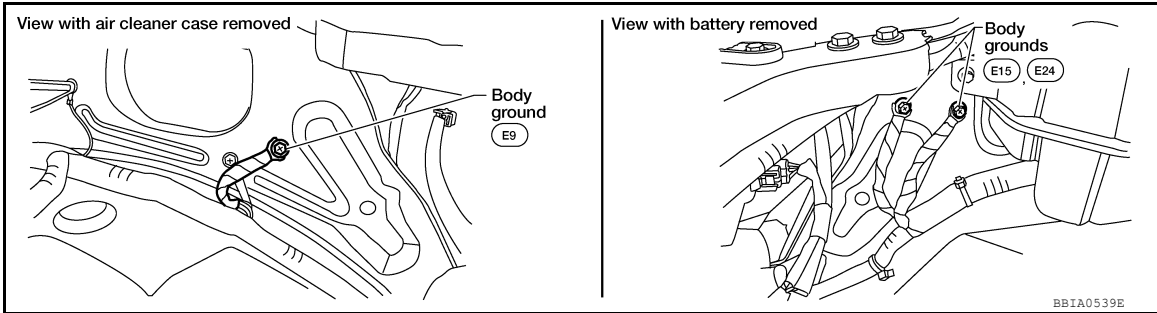
1. Turn A/C switch and blower fan switch OFF.
2. Turn ignition switch OFF.
3. Loosen and retighten ground screws on the body.

REFRIGERANT PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Refer to [EC-623, "Ground Inspection"](#).



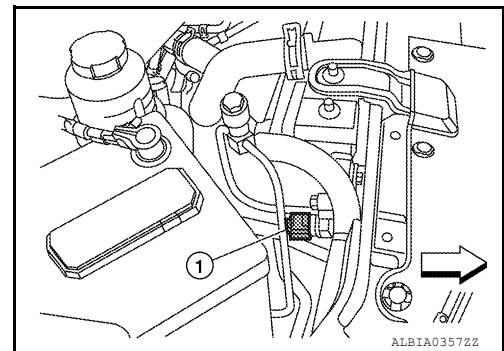
OK or NG

OK >> GO TO 3.

NG >> Repair or replace ground connections.

3. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect refrigerant pressure sensor (1) harness connector.
2. Turn ignition switch ON.



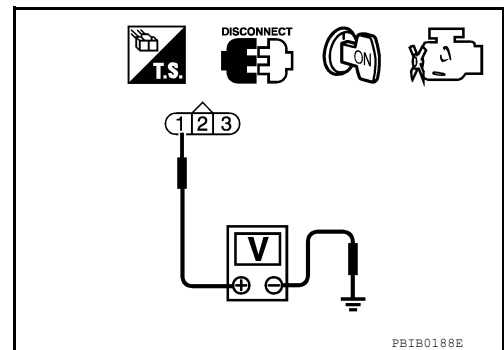
3. Check voltage between refrigerant pressure sensor terminal 1 and ground with CONSULT or tester.

Voltage: Approximately 5 V

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair harness or connectors.

5. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between refrigerant pressure sensor terminal 3 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.

NG >> GO TO 6.

REFRIGERANT PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 70 and refrigerant pressure sensor terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

- OK >> GO TO 9.
- NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E5, F14
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK INTERMITTENT INCIDENT

Refer to [GI-37, "Intermittent Incident"](#).

OK or NG

- OK >> Replace refrigerant pressure sensor. Refer to [HA-54](#).
- NG >> Repair or replace malfunctioning part.

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VK56DE]

SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Matrix Chart

INFOID:000000007358861

SYSTEM — BASIC ENGINE CONTROL SYSTEM

		SYMPTOM												Refer- ence page	
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION		BATTERY DEAD (UNDER CHARGE)
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-928
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-952
	Fuel injector circuit	1	1	2	3	2		2	2			2			EC-925
	Evaporative emission system	3	3	4	4	4	4	4	4	4	4	4			EC-516
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-942
	Incorrect idle speed adjustment						1	1	1	1		1			EC-592
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-885 EC-888 EC-892 EC-894
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-592
	Ignition circuit	1	1	2	2	2		2	2			2			EC-931
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-620

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VK56DE]

	SYMPTOM												Refer- ence page	
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION		BATTERY DEAD (UNDER CHARGE)
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Mass air flow sensor circuit	1			2										EC-643 EC-647
Engine coolant temperature sensor circuit							3			3				EC-657 EC-661
Air fuel ratio (A/F) sensor 1 circuit		1	2	3	2		2	2			2			EC-676 EC-680 EC-684 EC-688 EC-911
Throttle position sensor circuit						2			2					EC-664 EC-731 EC-853 EC-855 EC-903
Accelerator pedal position sensor circuit			3	2	1									EC-836 EC-896 EC-899 EC-907
Knock sensor circuit			2								3			EC-742
Crankshaft position sensor (POS) circuit	2	2												EC-745
Camshaft position sensor (PHASE) circuit	3	2												EC-749
Vehicle speed signal circuit		2	3		3						3			EC-820
Power steering pressure sensor circuit		2						3	3					EC-828
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-831 EC-833 EC-835
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-640
Park/neutral position (PNP) signal circuit			3		3		3	3			3			EC-839
Refrigerant pressure sensor circuit		2				3			3		4			EC-944
Electrical load signal circuit							3							EC-923
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	HAC-4 or HAC-128
ABS actuator and electric unit (control unit)			4											EC-848

1 - 6: The numbers refer to the order of inspection.

(continued on next table)

SYSTEM — ENGINE MECHANICAL & OTHER

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VK56DE]

		SYMPTOM												Reference page		
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATSWATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION		BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA		
Fuel	Fuel tank	5	5												FL-6	
	Fuel piping			5	5	5		5	5			5			FL-5	
	Vapor lock															—
	Valve deposit															—
	Poor fuel (Heavy weight gasoline, Low octane)	5			5	5	5		5	5			5			—
Air	Air duct		5												EM-164	
	Air cleaner														EM-164	
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)	5		5	5	5		5	5				5		EM-164	
	Electric throttle control actuator				5		5				5				EM-165	
	Air leakage from intake manifold/Collector/Gasket															EM-165
Cranking	Battery	1	1	1		1		1	1					1	PG-5	
	Generator circuit														CHG-5, CHG-8	
	Starter circuit	3										1		STR-5, STR-9		
	Signal plate	6													EM-199	
	Park/neutral position (PNP) signal	4													TM-51	
Engine	Cylinder head	5	5	5	5	5		5	5			5	3		EM-214	
	Cylinder head gasket														4	
	Cylinder block	6	6	6	6	6		6	6			6			EM-228	
	Piston														4	
	Piston ring															
	Connecting rod															
	Bearing															
	Crankshaft															

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ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VK56DE]

		SYMPTOM												Reference page	
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION		BATTERY DEAD (UNDER CHARGE)
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Valve mechanism	Timing chain														EM-194
	Camshaft														EM-199
	Intake valve timing control	5	5	5	5	5		5	5			5			EM-194
	Intake valve												3		EM-214
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5		5	5			5			EM-169
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			LU-29 LU-30 LU-32 LU-34
	Oil level (Low)/Filthy oil														LU-26
Cooling	Radiator/Hose/Radiator filler cap														CO-41
	Thermostat									5					CO-54
	Water pump														CO-52
	Water gallery	5	5	5	5	5		5	5		4	5			CO-37
	Cooling fan									5					CO-49 CO-50
	Coolant level (Low)/Contaminated coolant									5					CO-41
NVIS (NISSAN Vehicle Immobilizer System — NATS)		1	1												SEC-5 or SEC-116

1 - 6: The numbers refer to the order of inspection.

NORMAL OPERATING CONDITION

< SYMPTOM DIAGNOSIS >

[VK56DE]

NORMAL OPERATING CONDITION

Fuel Cut Control (at No Load and High Engine Speed)

INFOID:000000007358862

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Accelerator pedal position sensor	Accelerator pedal position	Fuel cut control	Fuel injector
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Unified meter control unit	Neutral position		
	Vehicle speed*		

*: This signal is sent to the ECM via the CAN communication line.

SYSTEM DESCRIPTION

If the engine speed is above 2,400 rpm under no load (for example, the selector lever position is neutral and engine speed over is 2,400 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

Fuel cut will be operated until the engine speed reaches 1,000 rpm, then fuel cut will be cancelled.

NOTE:

This function is different from deceleration control listed under [EC-507, "System Description"](#).

PERIODIC MAINTENANCE

FUEL PRESSURE

Fuel Pressure Check

INFOID:000000007358863

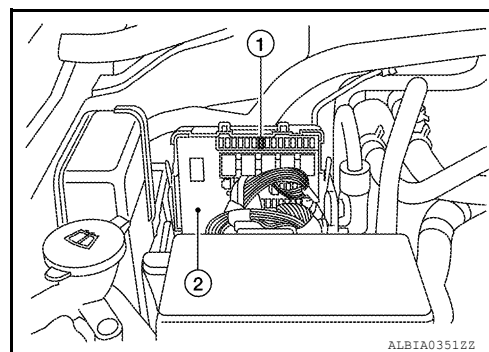
FUEL PRESSURE RELEASE

④ With CONSULT

1. Turn ignition switch ON.
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.
3. Start engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.

⊗ Without CONSULT

1. Remove fuel pump fuse (1) located in IPDM E/R (2).
2. Start engine.
3. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
4. Turn ignition switch OFF.
5. Reinstall fuel pump fuse after servicing fuel system.



FUEL PRESSURE CHECK

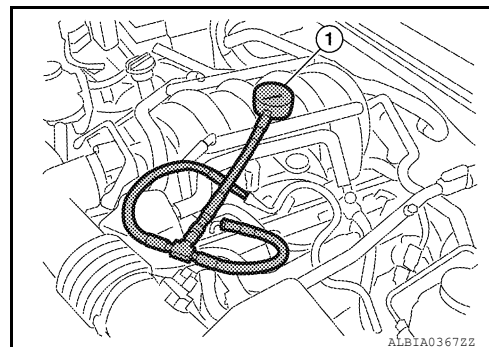
CAUTION:

- Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.
- Be careful not to scratch or get the fuel hose connection area dirty when servicing, so that the quick connector o-ring maintains seal ability.
- Use Fuel Pressure Gauge Kit [SST (J-44321)] and Fuel Pressure Adapter [SST (J-44321-6)] to check fuel pressure.
- Never perform fuel pressure check with electrical system operating (i.e. lights, rear window defogger, A/C, etc.). Fuel pressure gauge may indicate false readings due to varying engine loads and changes in manifold vacuum.

NOTE:

Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because R51 models do not have fuel return system.

1. Release fuel pressure to zero. Refer to "FUEL PRESSURE RELEASE".
2. Remove engine cover.
3. Remove fuel hose using Quick Connector Release [SST (J-45488)]. Refer to [EM-180. "Exploded View"](#).
 - Never twist or kink fuel hose because it is plastic hose.
 - Never remove fuel hose from quick connector.
 - Keep fuel hose connections clean.
4. Install Fuel Pressure Adapter [SST (J-44321-6)] and Fuel Pressure Gauge [SST (J-44321)] (1) as shown in the figure.
 - Never distort or bend fuel rail tube when installing fuel pressure gauge adapter.
 - When reconnecting fuel hose, check the original fuel hose for damage and abnormality.
5. Turn ignition switch ON (reactivate fuel pump), and check for fuel leakage.
6. Start engine and check for fuel leakage.
7. Read the indication of fuel pressure gauge.



FUEL PRESSURE

< PERIODIC MAINTENANCE >

[VK56DE]

- During fuel pressure check, check for fuel leakage from fuel connection every 3 minutes.

At idling: Approximately 350 kPa (3.57 kg/cm², 51 psi)

8. If result is unsatisfactory, go to next step.
9. Check the following.
 - Fuel hoses and fuel tubes for clogging
 - Fuel filter for clogging
 - Fuel pump
 - Fuel pressure regulator for cloggingIf OK, replace fuel pressure regulator. Refer to [FL-11](#).
If NG, repair or replace malfunctioning part.
10. Before disconnecting Fuel Pressure Gauge and Fuel Pressure Adapter [SST (J-44321-6)], release fuel pressure to zero. Refer to "FUEL PRESSURE RELEASE".

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EVAP LEAK CHECK

< PERIODIC MAINTENANCE >

[VK56DE]

EVAP LEAK CHECK

How to Detect EVAP Leakage

INFOID:000000007358864

CAUTION:

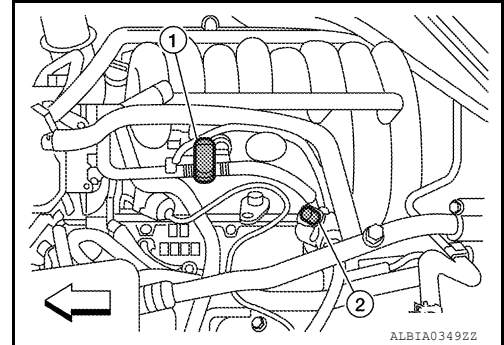
- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in EVAP system.

NOTE:

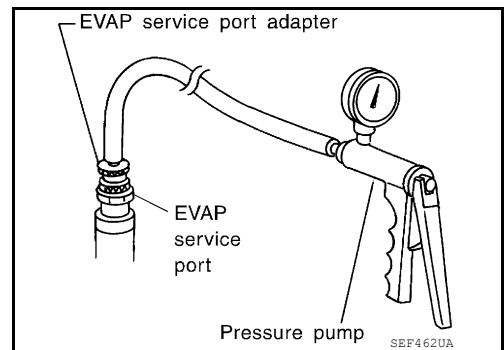
- Never start engine.
- Improper installation of EVAP service port adapter (commercial service tool) to the EVAP service port may cause a leak.

Ⓟ WITH CONSULT

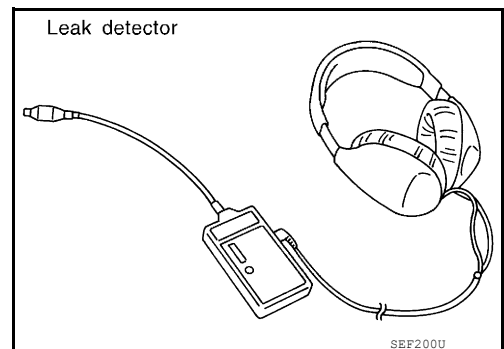
1. Attach the EVAP service port adapter (commercial service tool) securely to the EVAP service port.
 - EVAP canister purge volume control solenoid valve (1)
 - ↶: Vehicle front



2. Also attach the pressure pump and hose to the EVAP service port adapter (commercial service tool).
3. Turn ignition switch ON.
4. Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT MODE" with CONSULT.
5. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
6. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
7. Remove EVAP service port adapter (commercial service tool) and hose with pressure pump. Refer to [FL-16, "Removal and Installation"](#).



8. Locate the leak using a leak detector (commercial service tool). Refer to [EC-516, "Description"](#).



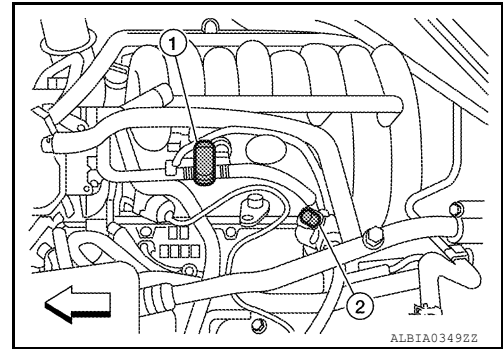
ⓧ WITHOUT CONSULT

EVAP LEAK CHECK

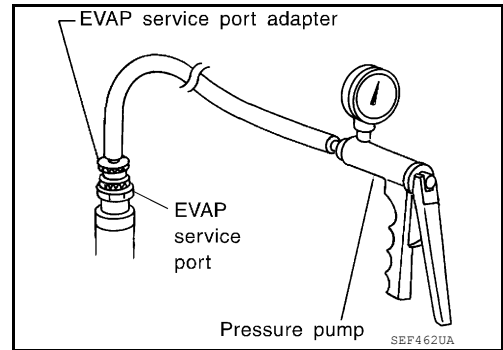
[VK56DE]

< PERIODIC MAINTENANCE >

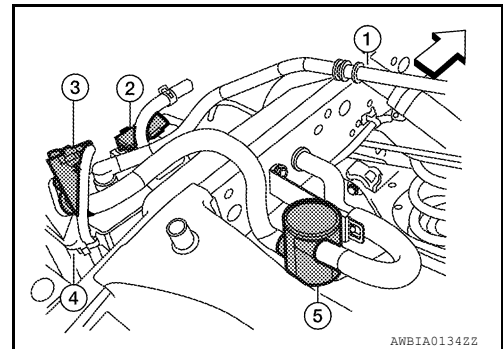
1. Attach the EVAP service port adapter (commercial service tool) securely to the EVAP service port (2).
 - EVAP canister purge volume control solenoid valve (1)
 - ⇐: Vehicle front



2. Also attach the pressure pump with pressure gauge to the EVAP service port adapter (commercial service tool).



3. Apply battery voltage between the terminals of EVAP canister vent control valve (3) to make a closed EVAP system.
 - Fuel filler pipe (top of frame view) (1)
 - EVAP control system pressure sensor (2)
 - EVAP canister (4)
 - Drain filter (5)
 - ⇐: Vehicle front
4. To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm², 0.2 to 0.4 psi).



5. Remove EVAP service port adapter (commercial service tool) and hose with pressure pump. Refer to [FL-16, "Removal and Installation"](#).
6. Locate the leak using a leak detector (commercial service tool). Refer to [EC-516, "Description"](#).

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VK56DE]

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Fuel Pressure

INFOID:000000007358865

Fuel pressure at idling kPa (kg/cm ² , psi)	Approximately 350 (3.57, 51)
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Idle Speed and Ignition Timing

INFOID:000000007358866

Target idle speed	No-load* (in the P or N position)	650 ± 50 rpm
Air conditioner: ON	In the P or N position	700 rpm or more
Ignition timing	In the P or N position	15° ± 5°BTDC

*: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, rear window defogger and heater fan)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

INFOID:000000007358867

Condition	Calculated load value (%) (Using CONSULT or GST)
At idle	14.0 - 33.0
At 2,500 rpm	12.0 - 25.0

Mass Air Flow Sensor

INFOID:000000007358868

Supply voltage	Battery voltage (11 - 14 V)
Output voltage at idle	1.0 - 1.3 V*
Mass air flow (Using CONSULT or GST)	3.0 - 9.0 g/s at idle* 9.0 - 28.0 g/s at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no load.

Intake Air Temperature Sensor

INFOID:000000007358869

Temperature [°C (°F)]	Resistance (kΩ)
25 (77)	1.800 - 2.200

Engine Coolant Temperature Sensor

INFOID:000000007358870

Temperature [°C (°F)]	Resistance (kΩ)
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

A/F Sensor 1 Heater

INFOID:000000007358871

Resistance [at 25°C (77°F)]	1.98 - 2.66 Ω
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SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VK56DE]

Heated Oxygen sensor 2 Heater

INFOID:000000007358872

A

Resistance [at 25°C (77°F)]	8 - 10 Ω
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Crankshaft Position Sensor (POS)

INFOID:000000007358873

EC

Refer to [EC-747, "Component Inspection"](#).

Camshaft Position Sensor (PHASE)

INFOID:000000007358874

C

Refer to [EC-751, "Component Inspection"](#).

Throttle Control Motor

INFOID:000000007358875

D

Resistance [at 25°C (77°F)]	Approximately 1 - 15 Ω
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E

Fuel Injector

INFOID:000000007358876

F

Resistance [at 10 - 60°C (50 - 140°F)]	11.1 - 14.5 Ω
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Fuel Pump

INFOID:000000007358877

G

Resistance [at 25°C (77°F)]	0.2 - 5.0 Ω
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