

A

# SECTION STR

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## STARTING SYSTEM

C

### CONTENTS

D

<b>PRECAUTION</b> .....	<b>DIAGNOSIS AND REPAIR WORK FLOW</b> .....	F
<b>PRECAUTIONS</b> .....	Work Flow (With GR8-1200 NI) .....	
Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" .....	Work Flow (Without GR8-1200 NI) .....	
Precaution for Procedure without Cowl Top Cover.....	<b>DTC/CIRCUIT DIAGNOSIS</b> .....	G
Precautions for Removing Battery Terminal .....	<b>B TERMINAL CIRCUIT</b> .....	H
<b>PREPARATION</b> .....	Description .....	
<b>PREPARATION</b> .....	Diagnosis Procedure .....	
Special Service Tools .....	<b>S CONNECTOR CIRCUIT</b> .....	I
Commercial Service Tools .....	Description .....	
<b>SYSTEM DESCRIPTION</b> .....	Diagnosis Procedure .....	
<b>COMPONENT PARTS</b> .....	<b>SYMPTOM DIAGNOSIS</b> .....	J
<b>VQ37VHR</b> .....	<b>STARTING SYSTEM</b> .....	
VQ37VHR : Component Parts Location .....	Symptom Table .....	K
VQ37VHR : Component Description .....	<b>REMOVAL AND INSTALLATION</b> .....	
<b>VK56VD</b> .....	<b>STARTER MOTOR</b> .....	L
VK56VD : Component Parts Location .....	<b>VQ37VHR</b> .....	
VK56VD : Component Description .....	VQ37VHR : Exploded View .....	M
<b>SYSTEM</b> .....	VQ37VHR : Removal and Installation (2WD) .....	
System Diagram .....	VQ37VHR : Removal and Installation (AWD) .....	
System Description .....	<b>VK56VD</b> .....	N
<b>WIRING DIAGRAM</b> .....	VK56VD : Exploded View .....	
<b>STARTING SYSTEM</b> .....	VK56VD : Removal and Installation .....	
Wiring Diagram .....	<b>SERVICE DATA AND SPECIFICATIONS (SDS)</b> .....	O
<b>BASIC INSPECTION</b> .....	<b>SERVICE DATA AND SPECIFICATIONS (SDS)</b> .....	P
	Starter Motor .....	

# PRECAUTIONS

< PRECAUTION >

## PRECAUTION

### PRECAUTIONS

#### Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:000000012351342

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 "SRS AIR BAG" and "SEAT BELT" of this Service Manual.

#### **WARNING:**

Always observe the following items for preventing accidental activation.

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that 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 "SRS AIR BAG".
- Never 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:**

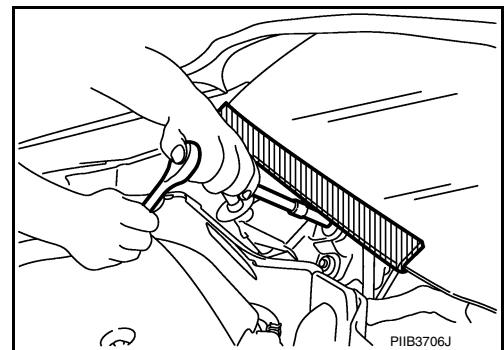
Always observe the following items for preventing accidental activation.

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never 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 for Procedure without Cowl Top Cover

INFOID:000000012351343

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.



# PRECAUTIONS

< PRECAUTION >

## Precautions for Removing Battery Terminal

INFOID:000000012351344

- When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.

**NOTE:**

ECU may be active for several tens of seconds after the ignition switch is turned OFF. If the battery terminal is removed before ECU stops, then a DTC detection error or ECU data corruption may occur.

- For vehicles with the 2-batteries, be sure to connect the main battery and the sub battery before turning ON the ignition switch.

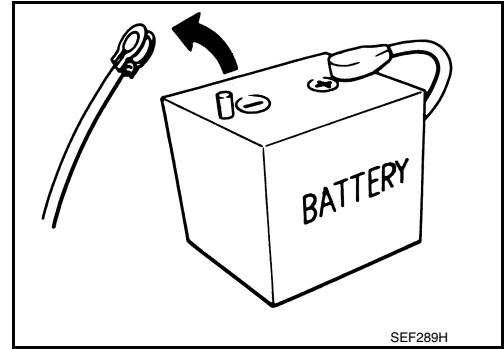
**NOTE:**

If the ignition switch is turned ON with any one of the terminals of main battery and sub battery disconnected, then DTC may be detected.

- After installing the 12V battery, always check "Self Diagnosis Result" of all ECUs and erase DTC.

**NOTE:**

The removal of 12V battery may cause a DTC detection error.



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# PREPARATION


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## PREPARATION

### PREPARATION

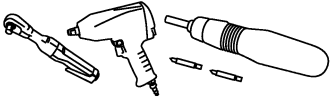
#### Special Service Tools

INFOID:000000012351345

Tool number (TechMate No.) Tool name	Description
<p>— (—) Model GR8-1200 NI Multitasking battery and electrical diagnostic station</p>  <p style="text-align: right; font-size: small;">AWIA1239ZZ</p>	<p>Tests batteries, starting and charging systems and charges batteries. For operating instructions, refer to diagnostic station instruction manual.</p>

#### Commercial Service Tools

INFOID:000000012351346

Tool name	Description
<p>Power tool</p>  <p style="text-align: right; font-size: small;">PIIB1407E</p>	<p>Loosening bolts, nuts and screws</p>

# COMPONENT PARTS

< SYSTEM DESCRIPTION >

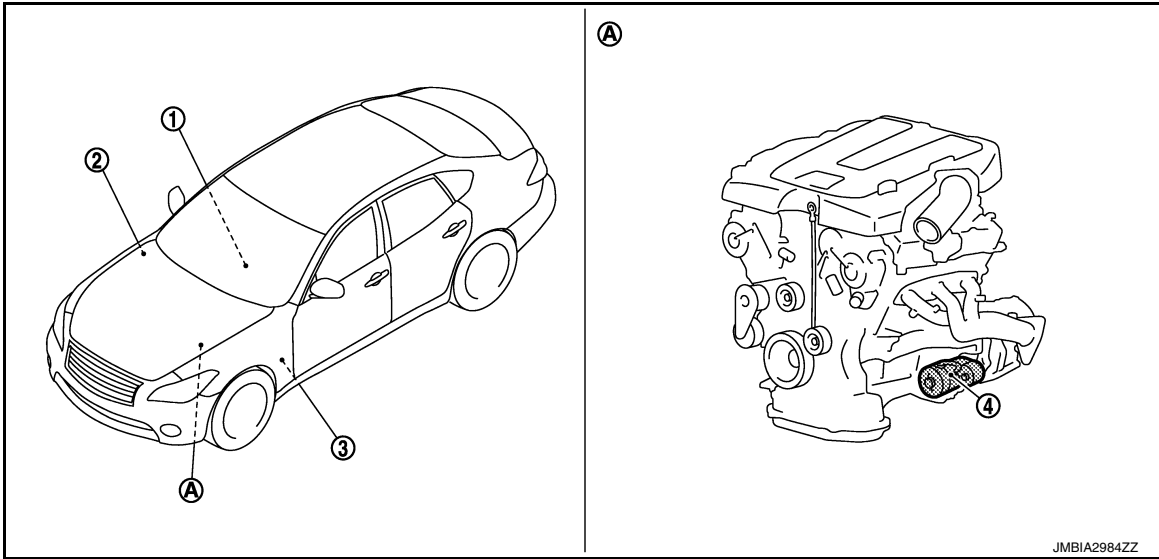
## SYSTEM DESCRIPTION

### COMPONENT PARTS

VQ37VHR

VQ37VHR : Component Parts Location

INFOID:000000012351347



- 1. TCM  
Refer to [TM-11, "A/T CONTROL SYSTEM : Component Parts Location"](#).
- 2. IPDM E/R  
Refer to [PCS-5, "IPDM E/R : Component Parts Location"](#).
- 3. BCM  
Refer to [BCS-5, "BODY CONTROL SYSTEM : Component Parts Location"](#).
- 4. Starter motor
- A. Engine

VQ37VHR : Component Description

INFOID:000000012351348

Component part	Description
TCM	TCM supplies power to the starter relay and starter control relay inside IPDM E/R when the selector lever is shifted to the "P" or "N" position.
BCM	BCM controls the starter relay inside IPDM E/R.
IPDM E/R	CPU inside IPDM E/R controls the starter control relay.
Starter motor	The starter motor plunger closes and the motor is supplied with battery power, which in turn cranks the engine, when the "S" terminal is supplied with electric power.

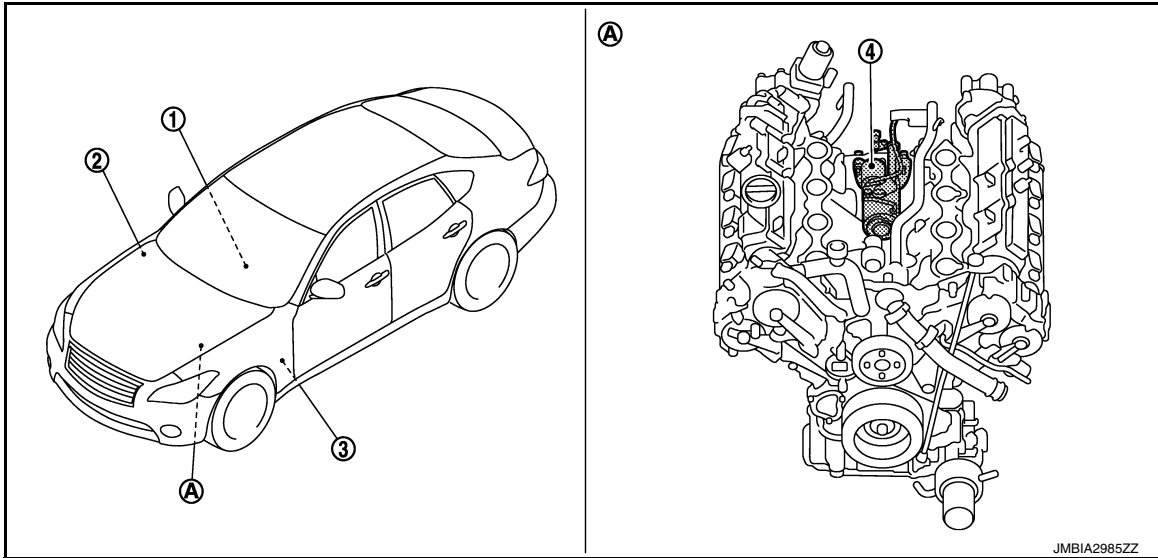
VK56VD

# COMPONENT PARTS

< SYSTEM DESCRIPTION >

## VK56VD : Component Parts Location

INFOID:000000012351349



- 1. TCM  
Refer to [TM-11. "A/T CONTROL SYSTEM : Component Parts Location"](#).
- 2. IPDM E/R  
Refer to [PCS-5. "IPDM E/R : Component Parts Location"](#).
- 3. BCM  
Refer to [BCS-5. "BODY CONTROL SYSTEM : Component Parts Location"](#).
- 4. Starter motor
- A. Engine

## VK56VD : Component Description

INFOID:000000012351350

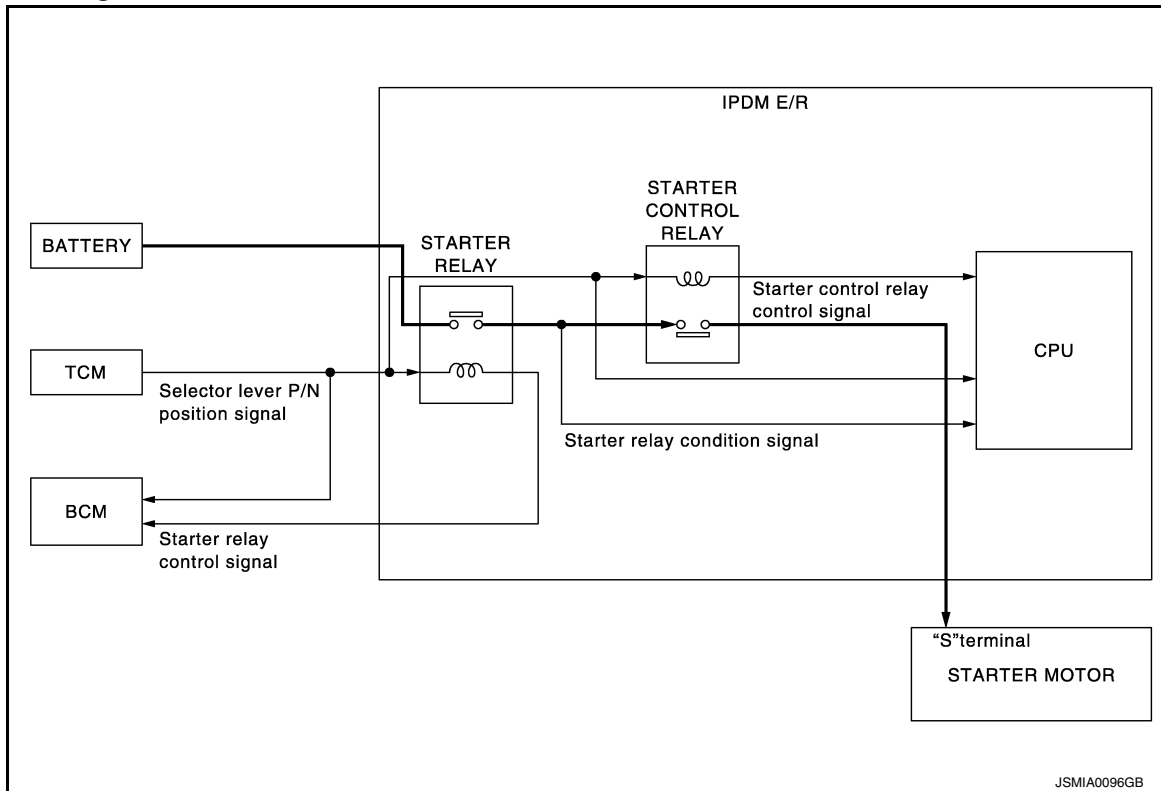
Component part	Description
TCM	TCM supplies power to the starter relay and starter control relay inside IPDM E/R when the selector lever is shifted to the "P" or "N" position.
BCM	BCM controls the starter relay inside IPDM E/R.
IPDM E/R	CPU inside IPDM E/R controls the starter control relay.
Starter motor	The starter motor plunger closes and the motor is supplied with battery power, which in turn cranks the engine, when the "S" terminal is supplied with electric power.

# SYSTEM

< SYSTEM DESCRIPTION >

## SYSTEM

### System Diagram



### System Description

INFOID:000000012351352

- When selector lever is "P" or "N", power is supplied to starter relay and starter control relay by TCM. And BCM and IPDM E/R (CPU) detect selector lever P/N condition by the inputted signal.
- When starter operating condition is satisfied, IPDM E/R turns starter control relay ON by starter control relay control signal.
- When engine cranking condition is satisfied, BCM turns starter relay ON by starter relay control signal.
- Then battery power is supplied to starter motor ("S" terminal) through starter control relay and starter relay. And IPDM E/R (CPU) detect starter relay condition by the inputted signal.

# STARTING SYSTEM

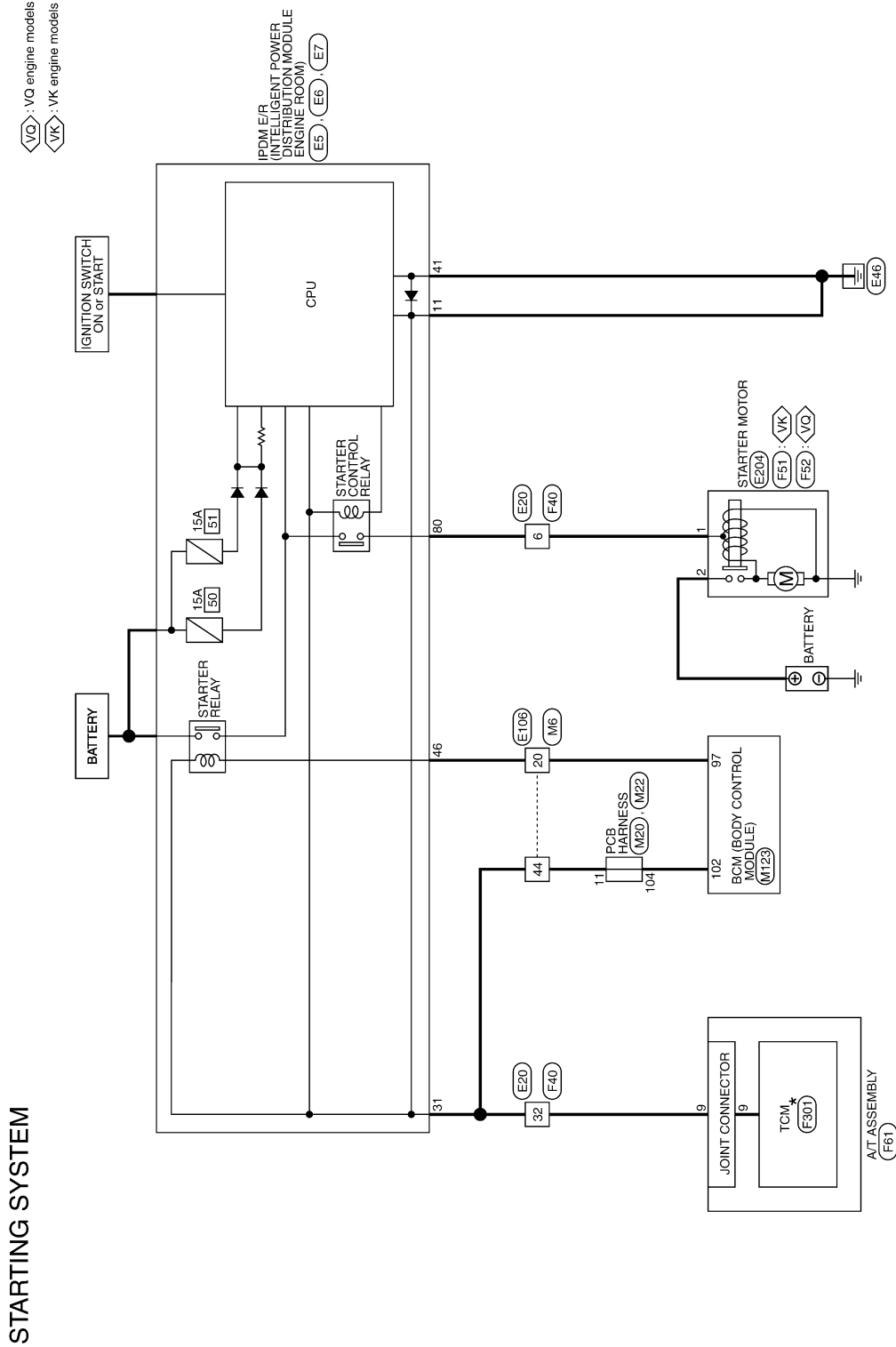
< WIRING DIAGRAM >

## WIRING DIAGRAM

### STARTING SYSTEM

Wiring Diagram

INFOID:000000012351353



\*: This connector is not shown in "Harness Layout".

2015/09/02

JRBWD7331GB



# STARTING SYSTEM

< WIRING DIAGRAM >

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## STARTING SYSTEM

Connector No.	E5
Connector Name	POWER INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM
Connector Type	TH8BFW-CS12-M4-TV



Terminal No.	Color Of Wire	Signal Name [Specification]
4	W	ENG_SOL
5	P	IGN_COIL
6	R	ECM_M8 [With VQ37 engine]
6	SR	ECM_M8 [With V56 engine]
7	R	ETC [With V56 engine]
7	Y	ETC [With VQ37 engine]
8	L/Y	A/C_COMP [With V56 engine]
8	P	A/C_COMP [With VQ37 engine]
10	V	ECM_BAT
11	B	P-GRND
12	G	AUS_ECU
13	GR	FUEL_PUMP [With VQ37 engine]
13	W	FUEL_PUMP [With V56 engine]
15	V	WIPER_AUTOSTOP
16	W	IGN_SIGNAL
22	BR	ALL-FC
22	O	GRD_SW
23	O	MODE_SW
24	O	SUB_ECU
25	LG	PUSH_START_SW
30	BR	NP_SW [With V56 engine]
31	W	NP_SW [With VQ37 engine]
31	W	F/L_IGN_SW
36	GR	

Connector No.	E6
Connector Name	POWER INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM
Connector Type	TH8BFW-AH



Terminal No.	Color Of Wire	Signal Name [Specification]
39	P	CAN-L
40	L	CAN-H
41	B	S-GRD
42	V	MOTOR_FAN_RLY_CONT [With V56 engine]
42	Y	MOTOR_FAN_RLY_CONT [With VQ37 engine]
43	SR	DETENT_SW
44	GR	HORN_RLY [With V56 engine]
44	LG	HORN_RLY [With VQ37 engine]
45	G	HORN_SW
46	BR	START_CONT

Connector No.	E7
Connector Name	POWER INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM
Connector Type	TH8BFW-CS12-M4



Terminal No.	Color Of Wire	Signal Name [Specification]
48	P	DTRL_DECER
51	O	WASH_MTR
52	G	INJECTOR_#1
53	L	FR_WIPER_HI
54	P	FR_WIPER_LO
55	R	TAIL/LUMI
56	GR	O2_SENS_#1
57	V	O2_SENS_#2
58	BR	AT_ECU

Terminal No.	Color Of Wire	Signal Name [Specification]
30	B	
31	LG	
32	W	
32	W	
33	Y	
34	Y	
35	Y	
37	SHIELD	
38	G	
39	Y	
40	R	
41	W	
42	L	
43	B	
46	SHIELD	
47	R	
48	L	
49	G	
50	B	
51	Y	
52	W	



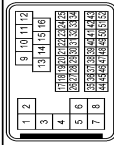
Connector No.	E106
Connector Name	WIRE TO WIRE
Connector Type	TH8BFW-CS16-TM4



Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	
2	W	
3	SR	
4	LG	
5	O	
6	W	
7	GR	
8	G	
9	Y	
10	BR	
11	SR	
12	L	
13	GR	
14	GR	
15	SR	
16	GR	
19	W	
20	BR	
21	G	
22	O	
23	L	
24	GR	
25	Y	
28	V	
29	Y	

Terminal No.	Color Of Wire	Signal Name [Specification]
70	LG	
71	O	SSOFF
72	G	MOTOR
73	G	START
74	Y	START
75	Y	START
76	Y	START
77	B	SHIELD
78	W	STARTER_MOTOR

Connector No.	E20
Connector Name	WIRE TO WIRE
Connector Type	SAA38AMB-RCS-SH28



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/W	
2	SHIELD	
3	L/B	
4	SHIELD	
5	L/W	
6	W	
6	L/B	
7	G	
8	G	
11	Y	[With V56 engine]
11	Y	[With VQ37 engine]
12	V	
13	L	
14	LG	
14	V	[With V56 engine]
14	V	[With VQ37 engine]
15	SR	
16	GR	
19	W	
20	BR	
21	G	
22	O	
23	L	
24	GR	
25	Y	
28	V	
29	Y	

# STARTING SYSTEM

< WIRING DIAGRAM >

## STARTING SYSTEM

13	V	-	-
14	V	-	-
15	V	-	-
16	GR	-	-
17	GR	-	-
18	BR	-	-
19	BR	-	-
20	BR	-	-
21	P	-	-
22	L	-	-
23	P	-	-
24	SHIELD	-	-
25	L/O	-	-
26	W/L	-	-
27	BR	-	-
28	G	-	-
29	O	-	-
30	Y	-	-
31	G	-	-
32	G	-	-
33	O	-	-
34	Y	-	-
35	G	-	-
36	G	-	-
37	V	-	-
38	BR	-	-
39	BR	-	-
40	Y	-	-
41	BR	-	-
42	W	-	-
43	L	-	-
44	GR	-	-
45	GR	-	-
46	GR	-	-
47	V	-	-
48	G	-	-
49	O	-	-
50	LG	-	-
51	R	-	-
52	B	-	-
53	W	-	-
54	R	-	-
55	B	-	-
56	W	-	-
57	Y	-	-
58	BR	-	-
59	BR	-	-
60	Y	-	-
61	G	-	-
62	R	-	-
63	R	-	-
64	Y	-	-
65	Y	-	-
66	R	-	-
67	SR	-	-
68	G	-	-
69	SHIELD	-	-
70	W	-	-
71	W	-	-
72	R	-	-
73	G	-	-
74	Y	-	-
75	B	-	-
76	SHIELD	-	-
77	O	-	-
78	SR	-	-
79	V	-	-
80	V	-	-
81	GR	-	-
82	SR	-	-
83	GR	-	-
84	Y	-	-

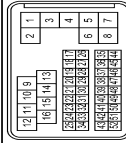
85	Y	-	-
86	L	-	-
87	V	-	-
88	V	-	-
89	BR	-	-
90	BR	-	-
91	LG	-	-
92	W	-	-
93	W	-	-
94	P	-	-
95	LG	-	-
96	BR	-	-
97	W	-	-
98	R	-	-
99	V	-	-
100	V	-	-

Connector No.	E204
Connector Name	STARTER MOTOR
Connector Type	24348_31161



Terminal No.	2
Color Of Wire	BY
Signal Name [Specification]	-

Connector No.	F40
Connector Name	WIRE TO WIRE
Connector Type	SAABFF-RSS-SHZ8



Terminal No.	Color Of Wire	Signal Name [Specification]
1	SHIELD	-
2	L/S	-
3	L/S	-
4	SHIELD	-
5	L/W	-
6	R	-
7	W	-
8	W	-
9	W	-
10	G	-
11	G	-
12	W	-
13	P	-
14	V	-
15	R	-
16	O	-
17	Y	-
18	L	-
19	L	-
20	GR	-
21	G	-
22	W	-
23	L	-
24	Y	-
25	LG	-
26	R	-
27	R	-
28	Y	-
29	Y	-
30	BR	-
31	BR	-
32	LG	-
33	P	-
34	Y	-
35	O	-
36	SHIELD	-
37	L/G	-
38	O/L	-
39	L/Y	-
40	P	-
41	W/L	-
42	O/L	-
43	W	-
44	LG	-
45	O	-
46	SHIELD	-
47	L/G	-

47	W	-	[With VG37 engine]
48	BR	-	[With VG37 engine]
49	L	-	[With V56 engine]
50	O/L	-	[With VG37 engine]
51	W/L	-	[With V56 engine]
52	O/L	-	[With VG37 engine]
53	W/L	-	[With V56 engine]
54	O	-	[With VG37 engine]
55	O	-	[With V56 engine]
56	O	-	[With VG37 engine]
57	W	-	[With V56 engine]

Connector No.	F51
Connector Name	STARTER MOTOR
Connector Type	X01FGY



Terminal No.	1
Color Of Wire	R
Signal Name [Specification]	-

Connector No.	F52
Connector Name	STARTER MOTOR
Connector Type	X01MGY



Terminal No.	1
Color Of Wire	W
Signal Name [Specification]	-

# STARTING SYSTEM

< WIRING DIAGRAM >

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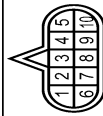
## STARTING SYSTEM

Connector No.	F31
Connector Name	A/T ASSEMBLY
Connector Type	PKUPG-D57



Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	POWER SUPPLY (BACK UP)
2	R	POWER SUPPLY (BACK UP)
3	L	CAN-H
4	V	K-LINE
5	B	GND
6	G	POWER SUPPLY (IGN)
7	SB	BACK-UP LAMP RELAY
8	P	CAN-L
9	BR	P/W SIGNAL
10	B	GROUND

Connector No.	F301
Connector Name	TCM
Connector Type	SPURFG



Terminal No.	Color Of Wire	Signal Name [Specification]
1	-	VIGN
2	-	BATT
3	-	CAN-H
4	-	K-LINE
5	-	GND
6	-	VIGN
7	-	REV LAMP RLY
8	-	CAN-L
9	-	START RLY
10	-	GND

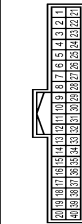
Connector No.	M6
Connector Name	WIRE TO WIRE
Connector Type	TH80MIV-C3.5E-TM4



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	W	-
3	SB	SHIELD
4	LG	B
5	W	-
6	W	-
7	BG	-
8	G	-
9	Y	-
10	W	-
11	R	-
12	V	-
13	LG	-
14	L	-
15	V	-
16	B	-
17	GR	-
18	GR	-
19	SB	-
20	SB	-
21	BR	-
22	L	-
23	P	-
27	SHIELD	-
28	V	-
29	SB	-
31	BG	-
32	P	-
33	R	-
34	BG	-
36	V	-
37	G	-
41	BR	-
44	BR	-
45	Y	-
46	BG	-
47	V	-

Terminal No.	Color Of Wire	Signal Name [Specification]
48	G	-
49	BG	-
50	W	-
51	W	-
52	G	-
53	GR	-
61	BR	-
62	LG	-
63	BR	-
64	L	- [Without LCC]
64	SB	- [Without LCC]
65	R	- [Without LCC]
66	P	- [Without LCC]
67	L	-
68	R	-
69	SHIELD	-
70	B	-
71	W	-
72	R	-
73	G	-
74	Y	-
75	B	-
76	SHIELD	-
77	B	-
78	V	-
80	G	-
82	B	-
83	BG	-
84	SB	-
85	L	-
86	L	-
87	Y	-
88	V	-
89	LG	-
90	BG	-
91	W	-
92	BG	-
93	G	-
94	Y	-
95	W	-
97	SB	-
98	R	-
99	W	-
100	L	-

Connector No.	M20
Connector Name	PCB HARNESS
Connector Type	TH40P8-AM



Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	-
2	B	-
3	Y	-
4	G	-
5	R	-
6	W	-
11	BR	-
12	R	-
15	B	-
16	SHIELD	-
17	R	-
18	P	-
19	W	-
21	B	-
22	R	- [With LCC]
22	Y	- [Without LCC]
33	Y	- [With LCC]
33	SB	- [Without LCC]
34	SB	-
37	P	-
38	V	-
35	L	-
36	P	-
38	L	-
40	Y	-

# STARTING SYSTEM

< WIRING DIAGRAM >

## STARTING SYSTEM

Connector No.	M22
Connector Name	PCB HARNESS
Connector Type	TH40FB-NH



Terminal No.	Color Of Wire	Signal Name [Specification]
81	L	-
82	P	-
83	B	-
84	B	-
85	B	-
86	B	-
87	B	-
88	B	-
89	Y	-
91	V	-
92	V	-
93	B	-
94	B	-
95	LG	-
96	BR	-
97	G	-
98	G	-
100	LG	-
101	L	-
102	P	-
103	B	-
104	BR	-
105	R	-
107	Y	-
108	Y	-
109	BR	-
110	Y	-
112	B	-
113	P	-
114	L	-
116	B	-
117	B	- [With VK55 engine]
117	BG	- [With VK37 engine]
118	B	-
119	LG	-

120	V	-
-----	---	---

Connector No.	M23
Connector Name	ECM [BODY CONTROL MODULE]
Connector Type	TH40FW-NH



Terminal No.	Color Of Wire	Signal Name [Specification]
71	BR	KYLS ENT RECEIVER COMM
72	B	OUTS HD LAMP OUTPUT
73	V	ON IND
75	G	DR DOOR REQ SW
76	BR	PUSH SW
78	BR	DRIVER DOOR ANT+
79	SB	DRIVER DOOR ANT-
80	LG	PASSENGER DOOR ANT+
81	V	PASSENGER DOOR ANT-
82	V	REAR BUMP ANT+
83	SB	REAR BUMP ANT-
84	BR	ROOM ANT+
85	R	ROOM ANT-
86	C	ROOM ANT2-
87	G	TRUNK ROOM ANT+
88	V	TRUNK ROOM ANT-
89	SB	TRUNK ROOM ANT-
90	R	PUSH BTN IGN SW ILL PMW
91	GR	LOCK IND
92	B	PUSH BTN IGN SW ILL GND
93	V	HAET WARN BUZZER
96	SB	ACC RELAY CONT
97	SB	STARTER RELAY CONT
98	B	IGN RELAY (F/R) CONT
99	R	IGN RELAY (F/R) CONT
100	SB	PASS DOOR REQ SW
102	BR	P/N POSITION
104	GR	ANT SHIFT SELECT PMW SPY
105	R	STOP LAMP SW 2
106	B	BLWR RELAY CONT
109	Y	ACC IND
110	R	RECEIVER PMW SPY

JRBWD7335GB

# DIAGNOSIS AND REPAIR WORK FLOW

< BASIC INSPECTION >

## BASIC INSPECTION

### DIAGNOSIS AND REPAIR WORK FLOW

Work Flow (With GR8-1200 NI)

INFOID:0000000012351354

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#### STARTING SYSTEM DIAGNOSIS WITH GR8-1200 NI

To test the starting system, use the following special service tool:

- GR8-1200 NI Multitasking battery and electrical diagnostic station

**NOTE:**

Refer to the diagnostic station Instruction Manual for proper starting system diagnosis procedures.

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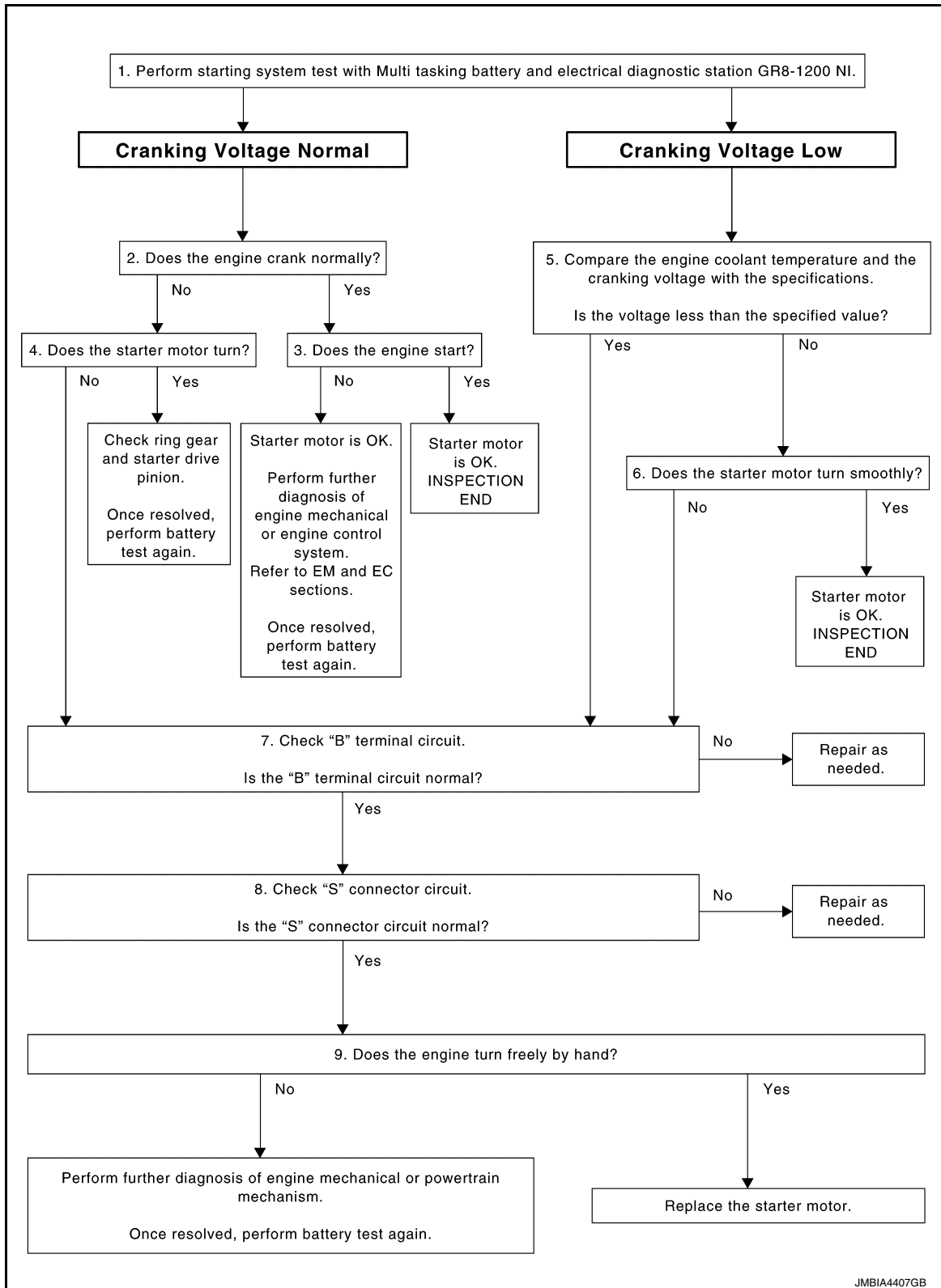
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# DIAGNOSIS AND REPAIR WORK FLOW

< BASIC INSPECTION >

## OVERALL SEQUENCE



## DETAILED FLOW

### NOTE:

To ensure a complete and thorough diagnosis, the battery, starter motor and alternator test segments must be done as a set from start to finish.

1. DIAGNOSIS WITH MULTITASKING BATTERY AND ELECTRICAL DIAGNOSTIC STATION GR8-1200 NI

# DIAGNOSIS AND REPAIR WORK FLOW

## < BASIC INSPECTION >

Perform the starting system test with Multitasking battery and electrical diagnostic station GR8-1200 NI. For details and operating instructions, refer to diagnostic station Instruction Manual.

### Test result

CRANKING VOLTAGE NORMAL>>GO TO 2.

CRANKING VOLTAGE LOW>>GO TO 5.

CHARGE BATTERY>>Perform the slow battery charging procedure. (Initial rate of charge is 10A for 12 hours.) Perform battery test again. Refer to diagnostic station instruction manual.

REPLACE BATTERY>>Before replacing battery, clean the battery cable clamps and battery posts. Perform battery test again. Refer to diagnostic station instruction manual. If second test result is "REPLACE BATTERY", then do so. Perform battery test again to confirm repair.

## 2. CRANKING CHECK

Check that the starter motor operates correctly.

### Does the engine crank normally?

YES >> GO TO 3.

NO >> GO TO 4.

## 3. ENGINE START CHECK

Check that the engine starts.

### Does the engine start?

YES >> Starter motor is OK. INSPECTION END

NO >> Perform further diagnosis of engine mechanical or engine control system. Refer EM and EC sections. Once resolved, perform battery test again.

## 4. STARTER MOTOR ACTIVATION

Check that the starter motor operates.

### Does the starter motor turn?

YES >> Check ring gear and starter motor drive pinion. Once resolved, perform battery test again.

NO >> GO TO 7.

## 5. COMPARISON BETWEEN ENGINE COOLANT AND CRANKING VOLTAGE

Compare the engine coolant temperature and the cranking voltage with the specifications.

### Minimum Specification of Cranking Voltage Referencing Coolant Temperature

Engine coolant temperature [°C (°F)]	Voltage [V]
-30 to -20 (-22 to -4)	8.6
-19 to -10 (-2 to 14)	9.1
-9 to 0 (16 to 32)	9.5
More than 1 (More than 34)	9.9

### Is the voltage less than the specified value?

YES >> GO TO 7.

NO >> GO TO 6.

## 6. STARTER OPERATION

Check the starter operation status.

### Does the starter motor turn smoothly?

YES >> Starter motor is OK. INSPECTION END

NO >> GO TO 7.

## 7. "B" TERMINAL CIRCUIT INSPECTION

Check "B" terminal circuit. Refer to [STR-18, "Diagnosis Procedure"](#).

### Is "B" terminal circuit normal?

YES >> GO TO 8.

NO >> Repair as needed.

## 8. "S" CONNECTOR CIRCUIT INSPECTION

Check "S" connector circuit. Refer to [STR-19, "Diagnosis Procedure"](#).

# DIAGNOSIS AND REPAIR WORK FLOW

## < BASIC INSPECTION >

### Is "S" connector circuit normal?

- YES >> GO TO 9.
- NO >> Repair as needed.

## 9. ENGINE ROTATION STATUS

Check that the engine can be rotated by hand.

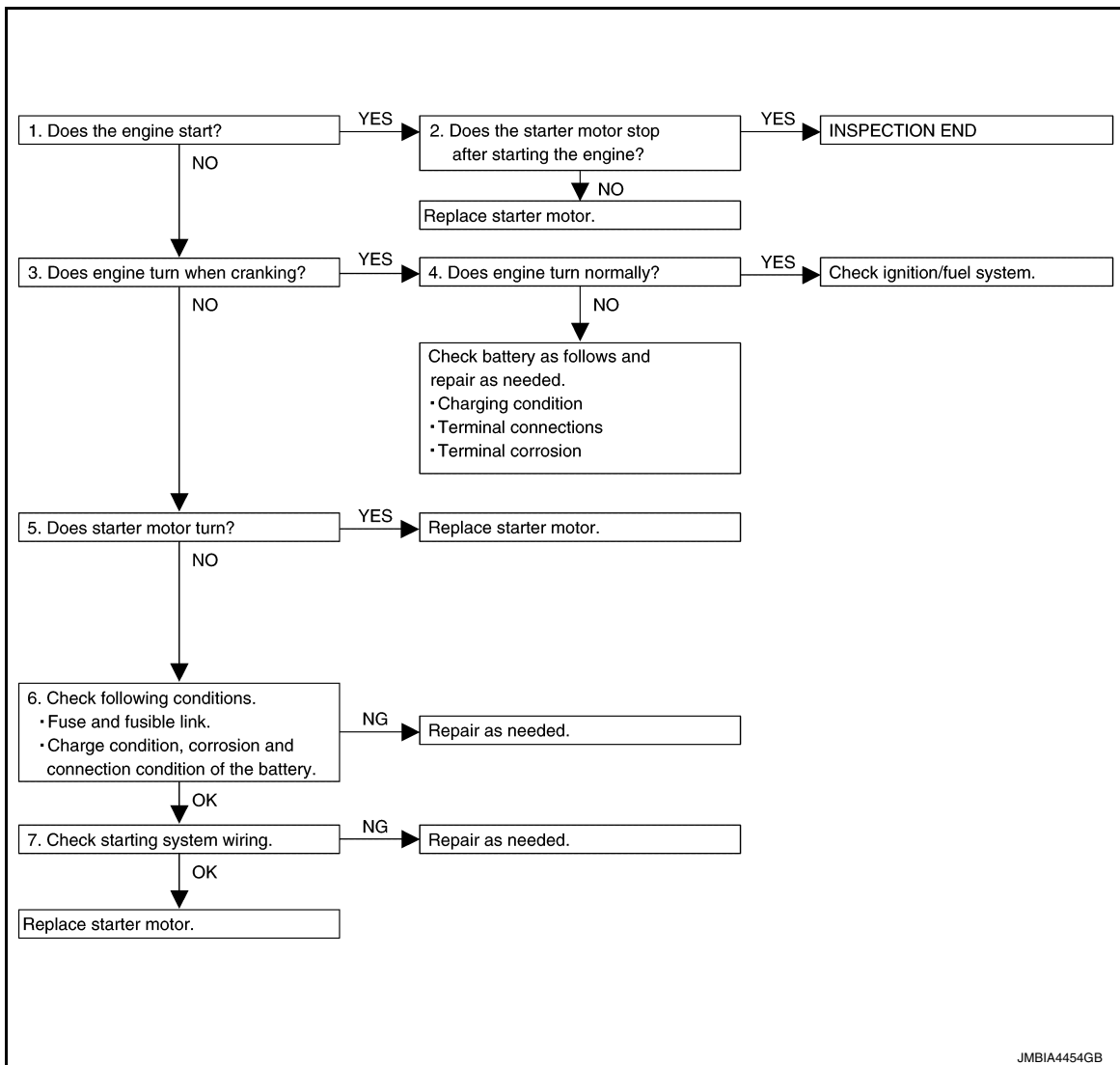
### Does the engine turn freely by hand?

- YES >> Replace starter motor. Refer to [STR-22. "VQ37VHR : Removal and Installation \(2WD\)"](#) (VQ37VHR[2WD]), [STR-23. "VQ37VHR : Removal and Installation \(AWD\)"](#) (VQ37VHR[AWD]) or [STR-26. "VK56VD : Removal and Installation"](#) (VK56VD).
- NO >> Perform further diagnosis of engine mechanical or powertrain mechanism. Once resolved, perform battery test again using Multitasking battery and electrical diagnostic station GR8-1200 NI. Refer to the diagnostic station Instruction Manual for proper testing procedures.

## Work Flow (Without GR8-1200 NI)

INFOID:000000012351355

## OVERALL SEQUENCE



## DETAILED FLOW

### NOTE:

If any malfunction is found, immediately disconnect the battery cable from the negative terminal.

## 1. CHECK ENGINE START

Crank the engine and check that the engine starts.



# DIAGNOSIS AND REPAIR WORK FLOW

## < BASIC INSPECTION >

### Does the engine start?

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

## 2.CHECK THAT THE STARTER MOTOR STOPS

Check that the starter motor stops after starting the engine.

### Does the starter motor stop?

- YES >> INSPECTION END  
NO >> Replace starter motor. Refer to [STR-22. "VQ37VHR : Removal and Installation \(2WD\)"](#) (VQ37VHR[2WD]), [STR-23. "VQ37VHR : Removal and Installation \(AWD\)"](#) (VQ37VHR[AWD]) or [STR-26. "VK56VD : Removal and Installation"](#) (VK56VD).

## 3.CHECK THAT THE ENGINE TURNS WHEN CRANKING

Check that the engine turns when cranking.

### Does engine turn when cranking?

- YES >> GO TO 4.  
NO >> GO TO 5.

## 4.CHECK THE ENGINE SPEED WHEN CRANKING

Check that the engine speed is not low when cranking.

### Does engine turn normally?

- YES >> Check ignition/fuel system.  
NO >> Check charge condition, corrosion and connection condition of the battery. Refer to [PG-157. "Work Flow"](#).

## 5.CHECK STARTER MOTOR ACTIVATION

Check that the starter motor runs at cranking.

### Does starter motor turn?

- YES >> Replace starter motor. Refer to [STR-22. "VQ37VHR : Removal and Installation \(2WD\)"](#) (VQ37VHR[2WD]), [STR-23. "VQ37VHR : Removal and Installation \(AWD\)"](#) (VQ37VHR[AWD]) or [STR-26. "VK56VD : Removal and Installation"](#) (VK56VD).  
NO >> GO TO 6.

## 6.CHECK POWER SUPPLY CIRCUIT

Check the following conditions.

- Fuse and fusible link
- Charge condition, corrosion and connection condition of the battery. Refer to [PG-157. "Work Flow"](#).

### Are these inspection results normal?

- YES >> GO TO 7.  
NO >> Repair as needed.

## 7.CHECK STARTING SYSTEM WIRING

Check the following.

- "B" terminal circuit. Refer to [STR-18. "Diagnosis Procedure"](#).
- "S" connector circuit. Refer to [STR-19. "Diagnosis Procedure"](#).

### Are these inspection results normal?

- YES >> Replace starter motor. Refer to [STR-22. "VQ37VHR : Removal and Installation \(2WD\)"](#) (VQ37VHR[2WD]), [STR-23. "VQ37VHR : Removal and Installation \(AWD\)"](#) (VQ37VHR[AWD]) or [STR-26. "VK56VD : Removal and Installation"](#) (VK56VD).  
NO >> Repair as needed.

# B TERMINAL CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

## DTC/CIRCUIT DIAGNOSIS

### B TERMINAL CIRCUIT

#### Description

INFOID:0000000012351356

The "B" terminal is constantly supplied with battery power.

#### Diagnosis Procedure

INFOID:0000000012351357

#### CAUTION:

Perform diagnosis under the condition that engine cannot start by the following procedure.

1. Remove fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.

#### 1. CHECK "B" TERMINAL CIRCUIT

1. Turn ignition switch OFF.
2. Check that starter motor "B" terminal connection is clean and tight.
3. Check voltage between starter motor "B" terminal and ground.

Terminals		Voltage (Approx.)
(+)	(-)	
Starter motor "B" terminal	Terminal	Battery voltage
E204	2	
	Ground	

Is the inspection result normal?

- YES >> GO TO 2.  
NO >> Check harness between battery and starter motor for open circuit.

#### 2. CHECK BATTERY CABLE CONNECTION STATUS (VOLTAGE DROP TEST)

1. Shift A/T selector lever to "P" or "N" position.
2. Check voltage between battery positive terminal and starter motor "B" terminal.

Terminals		Condition	Voltage (Approx.)
(+)	(-)		
	Starter motor "B" terminal	When the ignition switch is in START position	Less than 0.5 V
	Terminal		
Battery positive terminal	E204		
	2		

Is the inspection result normal?

- YES >> GO TO 3.  
NO >> Check harness between the battery and the starter motor for poor continuity.

#### 3. CHECK GROUND CIRCUIT STATUS (VOLTAGE DROP TEST)

1. Shift A/T selector lever to "P" or "N" position.
2. Check voltage between starter motor case and battery negative terminal.

Terminals		Condition	Voltage (Approx.)
(+)	(-)		
Starter motor case	Battery negative terminal	When the ignition switch is in START position	Less than 0.2 V

Is the inspection result normal?

- YES >> "B" terminal circuit is OK. Further inspection is necessary. Refer to [STR-13, "Work Flow \(With GR8-1200 NI\)"](#) or [STR-16, "Work Flow \(Without GR8-1200 NI\)"](#).  
NO >> Check the starter motor case and ground for poor continuity.

# S CONNECTOR CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

## S CONNECTOR CIRCUIT

### Description

INFOID:000000012351358

The starter motor magnetic switch is supplied with power when the ignition switch is turned to the START position while the selector lever is in the "P" or "N" position.

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### Diagnosis Procedure

INFOID:000000012351359

#### CAUTION:

Perform diagnosis under the condition that engine cannot start by the following procedure.

1. Remove fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.

#### 1. CHECK "S" CONNECTOR CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect starter motor connector.
3. Shift A/T selector lever to "P" or "N" position.
4. Check voltage between starter motor harness connector and ground.

Terminals		Condition	Voltage (Approx.)
(+)	(-)		
Starter motor harness connector	Terminal		
F51 (VK56VD) F52 (VQ37VHR)	1	When the ignition switch is in START position	Battery voltage

#### Is the inspection result normal?

YES >> "S" connector circuit is OK. Further inspection is necessary. Refer to [STR-13. "Work Flow \(With GR8-1200 NI\)"](#) or [STR-16. "Work Flow \(Without GR8-1200 NI\)"](#).

NO >> GO TO 2.

#### 2. CHECK HARNESS CONTINUITY (OPEN CIRCUIT)

1. Disconnect IPDM E/R connector.
2. Check continuity between starter motor harness connector and IPDM E/R harness connector.

Starter motor harness connector		IPDM E/R harness connector		Continuity
Connector No.	Terminal No.	Connector No.	Terminal No.	
F51 (VK56VD) F52 (VQ37VHR)	1	E7	80	Existed

#### Is the inspection result normal?

YES >> Further inspection is necessary. Refer to [SEC-50. "Work Flow"](#).

NO >> Repair the harness.

# STARTING SYSTEM

< SYMPTOM DIAGNOSIS >

## SYMPTOM DIAGNOSIS

### STARTING SYSTEM

#### Symptom Table

INFOID:0000000012351360

Symptom	Reference
No normal cranking	Refer to <a href="#">STR-13, "Work Flow (With GR8-1200 NI)"</a> or <a href="#">STR-16, "Work Flow (Without GR8-1200 NI)"</a> .
Starter motor does not rotate	

# STARTER MOTOR

< REMOVAL AND INSTALLATION >

## REMOVAL AND INSTALLATION

### STARTER MOTOR

VQ37VHR

VQ37VHR : Exploded View

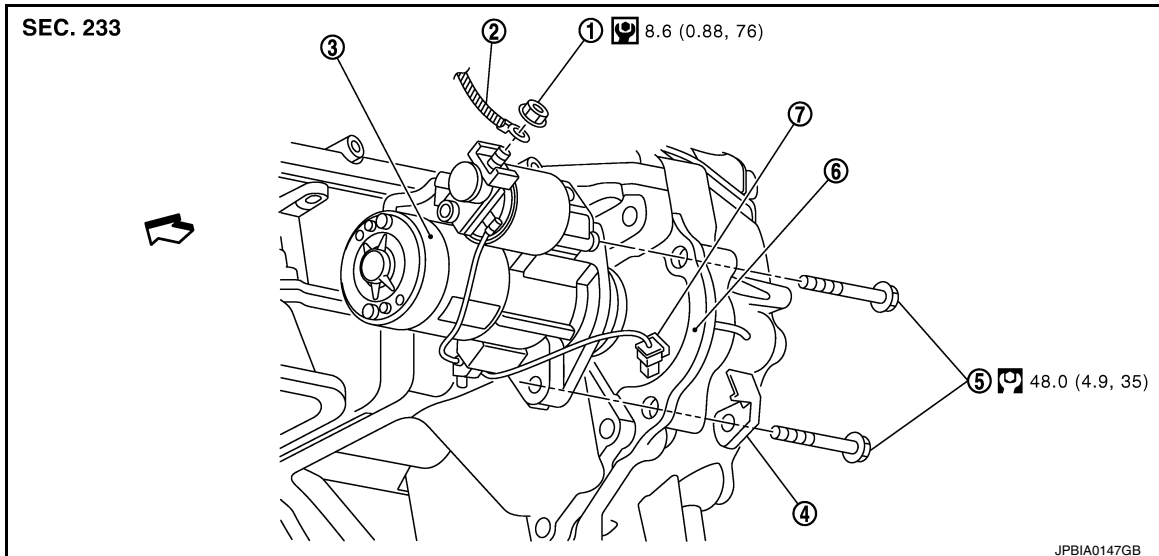
INFOID:000000012351361

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### REMOVAL

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|-------------------------|--------------------------------|----------------------|
| 1. "B" terminal nut     | 2. "B" terminal harness        | 3. Starter motor     |
| 4. Harness clip bracket | 5. Starter motor mounting bolt | 6. Converter housing |
| 7. "S" connector        |                                |                      |

⇐ : Engine front

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

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### DISASSEMBLY

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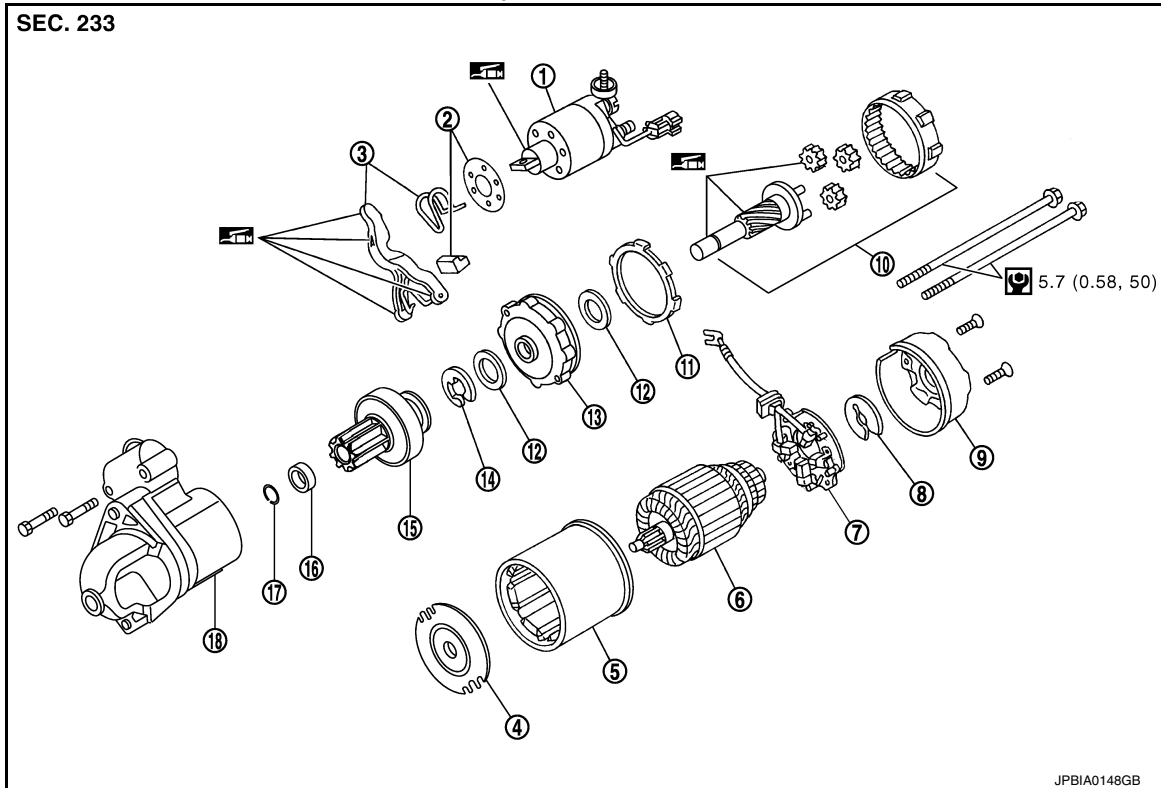
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# STARTER MOTOR


< REMOVAL AND INSTALLATION >

Type: S114-932



- |                             |                         |                        |
|-----------------------------|-------------------------|------------------------|
| 1. Magnetic switch assembly | 2. Dust cover kit       | 3. Shift lever set     |
| 4. Center bracket (A)       | 5. Yoke assembly        | 6. Armature assembly   |
| 7. Brush holder assembly    | 8. Thrust washer        | 9. Rear cover assembly |
| 10. Shaft gear assembly     | 11. Packing             | 12. Thrust washer      |
| 13. Center bracket (P)      | 14. E-ring              | 15. Pinion assembly    |
| 16. Pinion stopper          | 17. Pinion stopper clip | 18. Gear case assembly |

 : High-temperature grease point

 : N·m (kg·m, in·lb)

## NOTE:

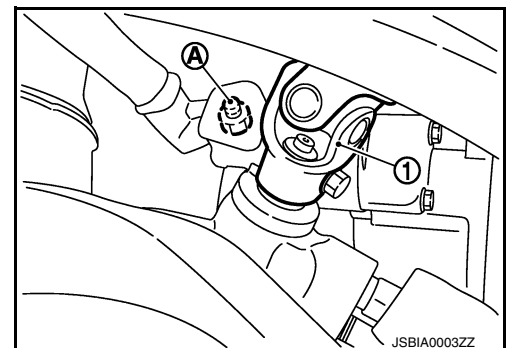
Apply high-temperature grease to lubricate the bearing, gears and frictional surface when assembling the starter.

## VQ37VHR : Removal and Installation (2WD)

INFOID:000000012351362

### Removal

1. Disconnect the battery cable from the negative terminal. Refer to [PG-164, "Removal and Installation"](#).
2. Remove front undercover. Refer to [EXT-32, "FRONT UNDER COVER : Removal and Installation"](#).
3. Remove road wheel and tire (Front LH). Refer to [WT-64, "Removal and Installation"](#).
4. Disconnect steering lower joint (1), then remove it. Refer to [ST-38, "Removal and Installation"](#).
5. Remove "B" terminal nut (A).



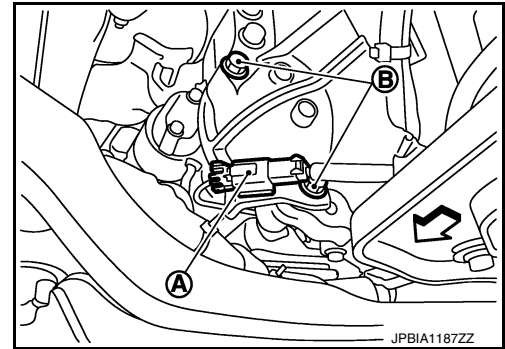
# STARTER MOTOR

## < REMOVAL AND INSTALLATION >

6. Disconnect "S" connector (A).

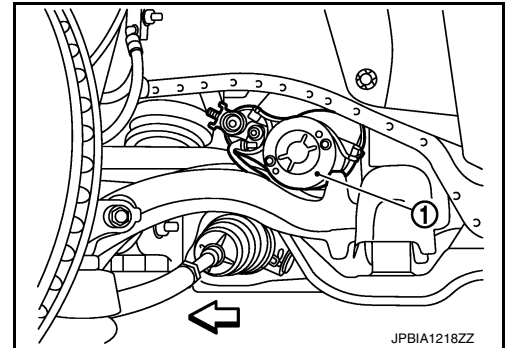
↔ : Vehicle front

7. Remove starter motor mounting bolts (B), using power tools.



8. Remove starter motor (1) from the side of the vehicle.

↔ : Vehicle front



## INSTALLATION

Note the following item, and install in the reverse order of removal.

### **CAUTION:**

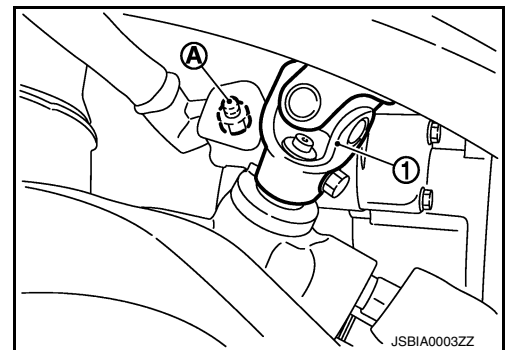
**Be careful to tighten "B" terminal nut carefully.**

## VQ37VHR : Removal and Installation (AWD)

INFOID:000000012351363

### Removal

1. Disconnect the battery cable from the negative terminal. Refer to [PG-164, "Removal and Installation"](#).
2. Remove front undercover. Refer to [EXT-32, "FRONT UNDER COVER : Removal and Installation"](#).
3. Remove road wheel and tire (front LH). Refer to [WT-64, "Removal and Installation"](#).
4. Disconnect steering lower joint (1), and then remove it. Refer to [ST-38, "Removal and Installation"](#).
5. Remove "B" terminal nut (A).



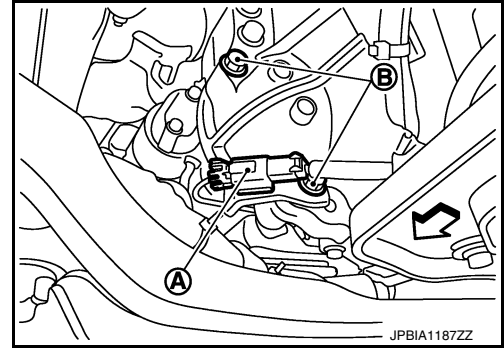
# STARTER MOTOR

## < REMOVAL AND INSTALLATION >

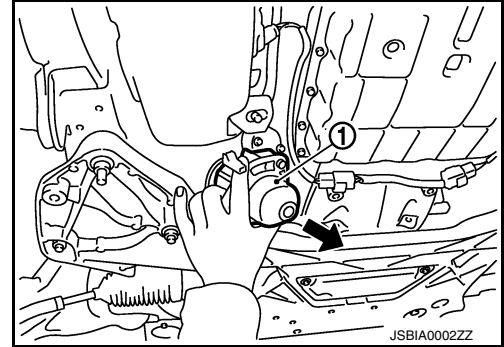
6. Disconnect "S" connector (A).

↔ : Vehicle front

7. Remove starter motor mounting bolts (B), using power tools.



8. Remove exhaust mounting bracket. Refer to [EX-5. "VQ37VHR : Exploded View"](#).
9. Remove starter motor (1) downward from the vehicle.



## INSTALLATION

Note the following item, and then install in the reverse order of removal.

### **CAUTION:**

**Be careful to tighten "B" terminal nut carefully.**

VK56VD

VK56VD : Exploded View

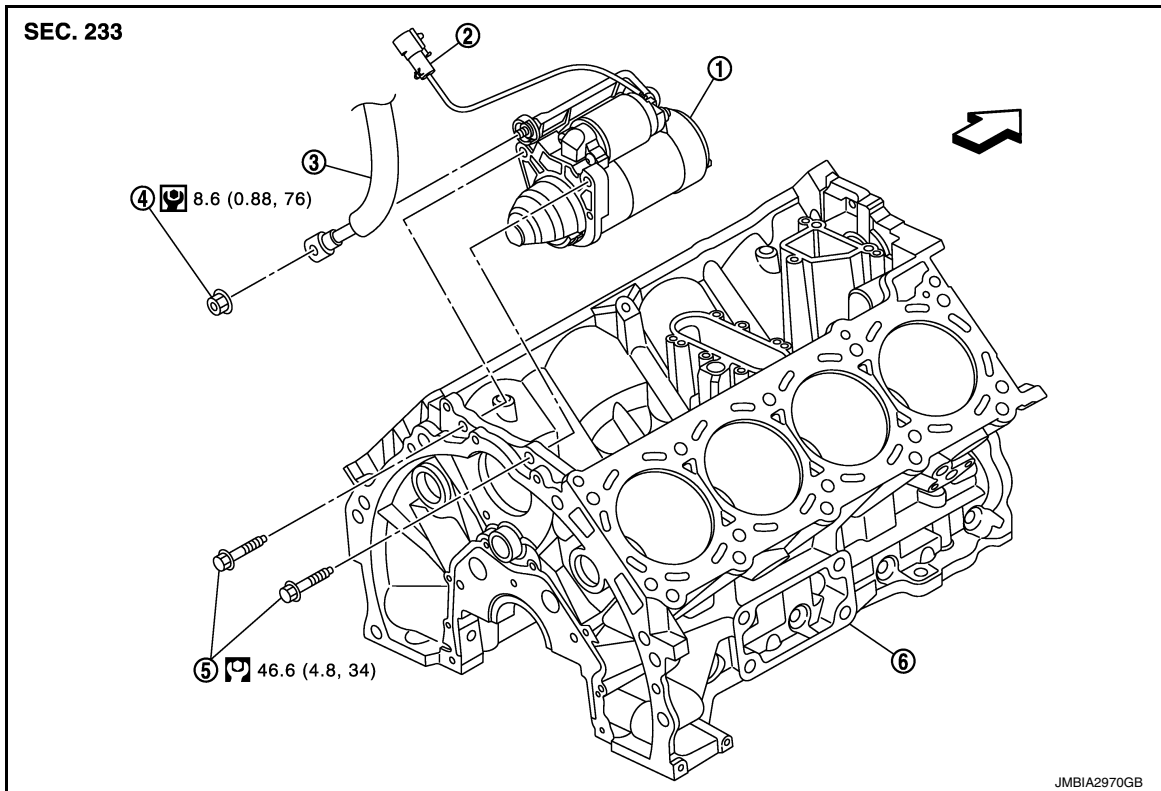
INFOID:000000012351364

## REMOVAL



# STARTER MOTOR

## < REMOVAL AND INSTALLATION >



- |                     |                                |                         |
|---------------------|--------------------------------|-------------------------|
| 1. Starter motor    | 2. "S" connector               | 3. "B" terminal harness |
| 4. "B" terminal nut | 5. Starter motor mounting bolt | 6. Cylinder block       |

← : Engine front

: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

### DISASSEMBLY

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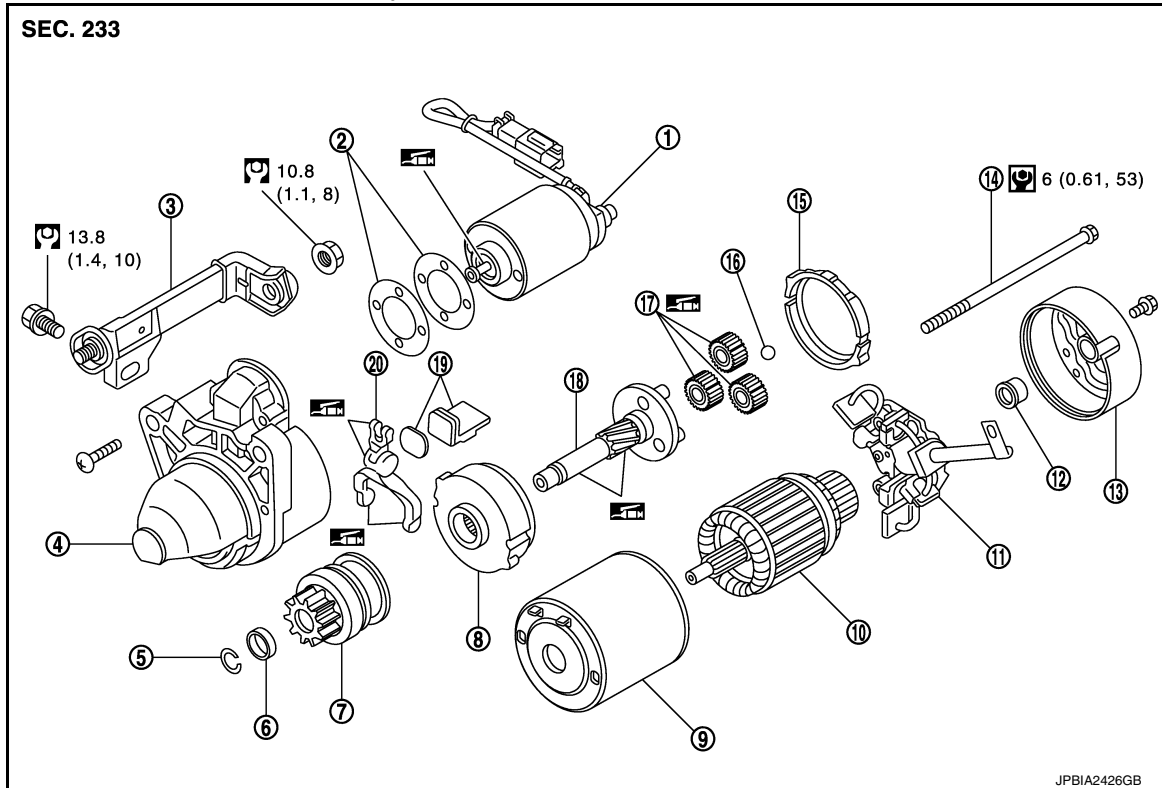
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# STARTER MOTOR


< REMOVAL AND INSTALLATION >


Type: M001T30671/M001T30672



- |                             |                           |                           |
|-----------------------------|---------------------------|---------------------------|
| 1. Magnetic switch assembly | 2. Adjusting plate        | 3. "B" terminal extension |
| 4. Gear case assembly       | 5. Stopper ring           | 6. Stopper                |
| 7. Pinion assembly          | 8. Internal gear          | 9. Yoke assembly          |
| 10. Armature assembly       | 11. Brush holder assembly | 12. Metal RR              |
| 13. Rear cover              | 14. Through bolt          | 15. Packing               |
| 16. Ball                    | 17. Planetary gear        | 18. Gear shaft            |
| 19. Dust cover kit          | 20. Shift lever           |                           |

 : High-temperature grease point

 : N·m (kg-m, ft-lb)

 : N·m (kg-m, in-lb)

## NOTE:

Apply high-temperature grease to lubricate the bearing, gears and frictional surface when assembling the starter.

## VK56VD : Removal and Installation

INFOID:000000012351365

### REMOVAL

1. Disconnect the battery cable from the negative terminal. Refer to [PG-164. "Removal and Installation"](#).
2. Remove engine cover. Refer to [EM-189. "Removal and Installation"](#).
3. Remove intake manifold. Refer to [EM-199. "Removal and Installation"](#).
4. Remove "B" terminal nut, and disconnect "B" terminal harness.
5. Disconnect "S" connector.
6. Remove starter motor mounting bolts.
7. Remove starter motor upward from the vehicle.

### INSTALLATION

Note the following item, and then install in the reverse order of removal.

### CAUTION:

# STARTER MOTOR

< REMOVAL AND INSTALLATION >

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**Be careful to tighten "B" terminal nut carefully.**

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# SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

## SERVICE DATA AND SPECIFICATIONS (SDS)

### SERVICE DATA AND SPECIFICATIONS (SDS)

#### Starter Motor

INFOID:0000000012351366

Applied model		VQ37VHR	VK56VD
Type	S114-932		M001T30671 M001T30672
	HITACHI make		mitsubishi make
	Reduction gear type		
System voltage [V]		12	
No-load	Terminal voltage [V]	11	
	Current [A]	Less than 110	Less than 120
	Revolution [rpm]	More than 2,700	More than 3,220