SECTION STR
STARTING SYSTEM

CONTENTS

PRECAUTION

PRECAUTIONS

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

INFOID:0000000013440310

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, it is recommended that all maintenance and repair be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper repair, 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.

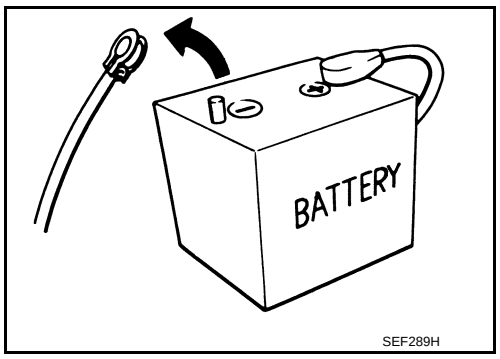
- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery or batteries, and wait at least 3 minutes before performing any service.**

Precautions for Removing Battery Terminal

INFOID:0000000013440311

When disconnecting the battery terminal, pay attention to the following.

- Always use a 12V battery as power source.
- Never disconnect battery terminal while engine is running.
- When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.
- For vehicles with the engine listed below, remove the battery terminal after a lapse of the specified time:



BR08DE	: 4 minutes	V9X engine	: 4 minutes
D4D engine	: 20 minutes	YD25DDTi	: 2 minutes
HR09DET	: 12 minutes	YS23DDT	: 4 minutes
HRA2DDT	: 12 minutes	YS23DDTT	: 4 minutes
K9K engine	: 4 minutes	ZD30DDTi	: 60 seconds
M9R engine	: 4 minutes	ZD30DDTT	: 60 seconds
R9M engine	: 4 minutes		

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.

- After high-load driving, if the vehicle is equipped with the V9X engine, turn the ignition switch OFF and wait for at least 15 minutes to remove the battery terminal.

NOTE:

- Turbocharger cooling pump may operate in a few minutes after the ignition switch is turned OFF.
- Example of high-load driving
  - Driving for 30 minutes or more at 140 km/h (86 MPH) or more.
  - Driving for 30 minutes or more on a steep slope.

- 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.

PREPARATION

PREPARATION

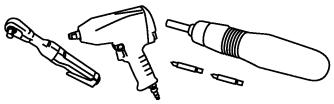
Special Service Tools

INFOID:0000000012793100

Tool number (Kent-Moore No.) Tool name	Description
— (—) Model GR8-1200 NI Multitasking battery and electrical diagnostic station  AWIIA1239ZZ	Tests batteries, starting and charging systems and charges batteries. For operating instructions, refer to diagnostic station instruction manual.

Commercial Service Tools

INFOID:0000000012793101

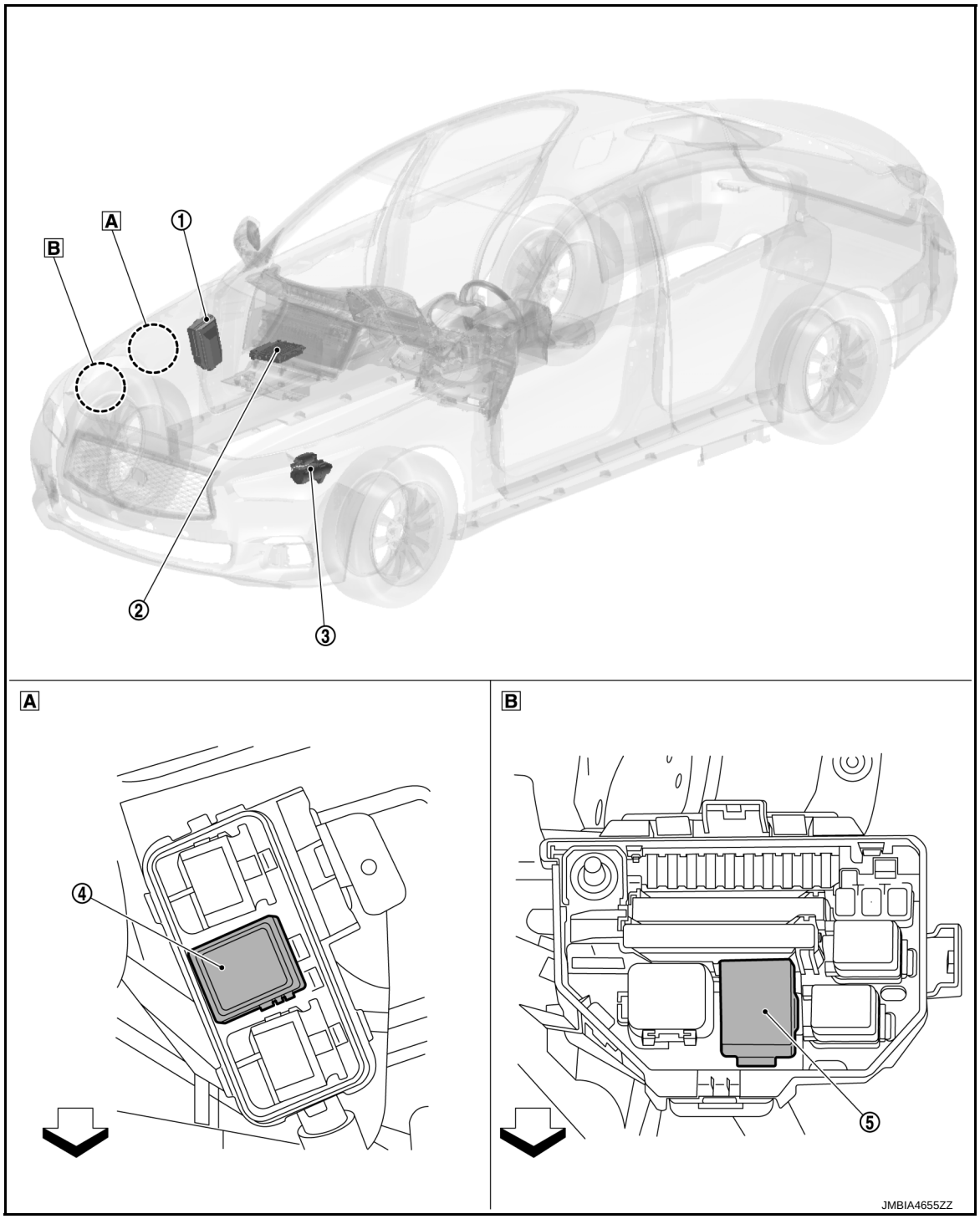
Tool name	Description
Power tool  PIIB1407E	Loosening bolts, nuts and screws

SYSTEM DESCRIPTION

COMPONENT PARTS

Component Parts Location

INFOID:0000000012793102



A Right side of engine room

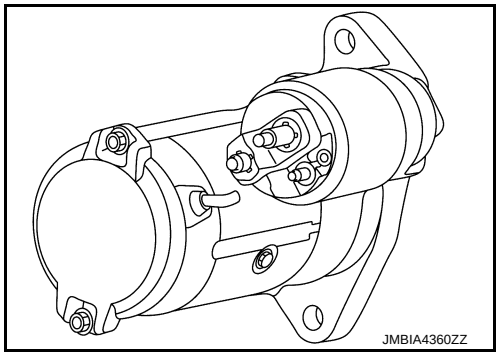
B Front right side of engine room

No.	Component	Function
①	IPDM E/R	IPDM E/R controls ignition No.2 relay. Refer to PCS-5, "Component Parts Location" for detailed installation location.
②	ECM	ECM controls starter relay. Refer to EC4-25, "ENGINE CONTROL SYSTEM : Component Parts Location" for detailed installation location.
③	Starter motor	Refer to STR-7, "Starter motor".
④	Starter relay	Starter relay is turned ON by ECM when starter operating condition is satisfied.
⑤	Ignition No.2 relay	Ignition No.2 relay is turned ON by IPDM E/R when ignition switch is ON or START.

Starter motor

INFOID:0000000012793103

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.
- “B” terminal: The “B” terminal is constantly supplied with battery power.
- “S” terminal: The starter motor magnetic switch (“S” terminal) is supplied with power when the cranking condition is satisfied.

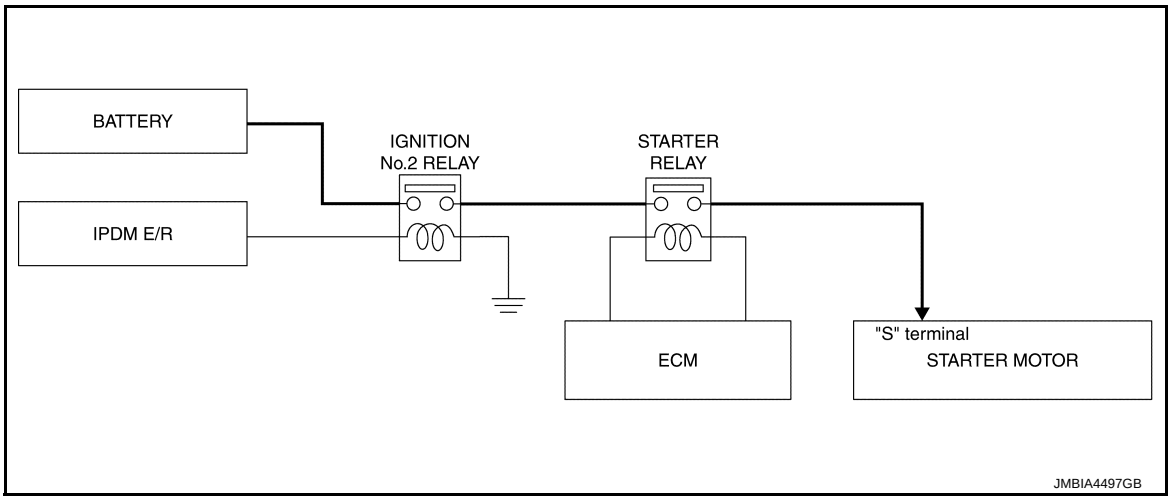


SYSTEM

System Description

INFOID:0000000012793104

SYSTEM DIAGRAM



SYSTEM DESCRIPTION

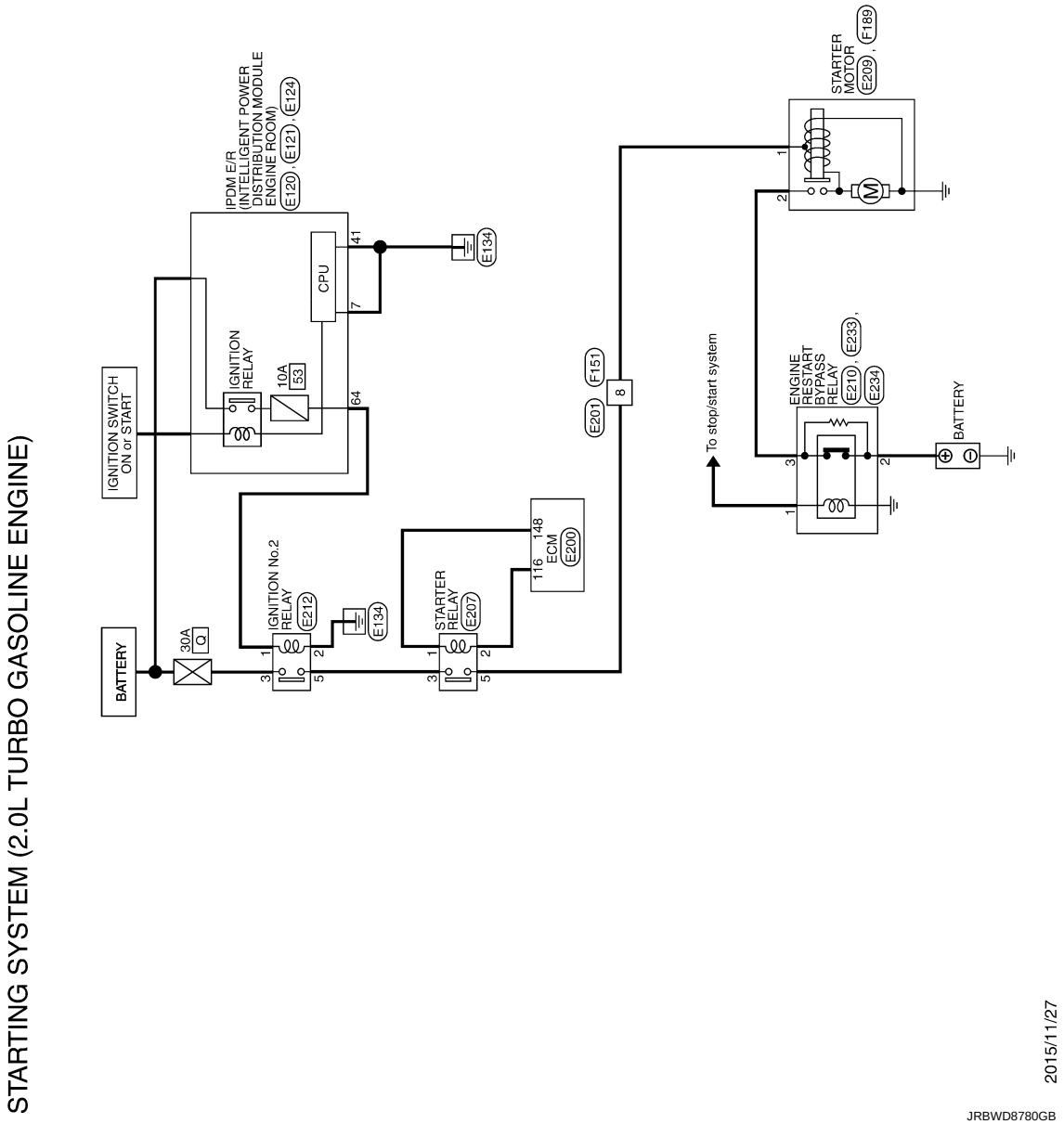
- When ignition switch is ON or START, IPDM E/R turns ignition No.2 relay ON.
- When starter operating condition is satisfied, ECM turns starter relay ON.
- Then battery power is supplied to starter motor (“S” terminal) through ignition No.2 relay and starter relay.

WIRING DIAGRAM

STARTING SYSTEM

Wiring Diagram

INFOID:0000000012793105



STARTING SYSTEM (2.0L TURBO GASOLINE ENGINE)

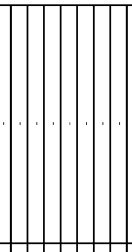
Connector No.	E120
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS12FW-CS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
7	B/W	-
9	P	-
10	LG	-
11	V	-
13	BG	-
14	SB	-
15	BR	-
17	GR	-
18	L	-

Connector No.	E121
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH32FW-NH

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
19	L	- [With 2.0L turbo gasoline engine]
19	P	- [With VR30 engine]
22	BG	-
23	GR	- [With VR30 engine]
23	LG	- [With 2.0L turbo gasoline engine and without Anti theft diode]
23	P	- [With 2.0L turbo gasoline engine and with Anti theft diode]
27	GR	-
28	P	-
29	L	-
31	G	-
32	SB	-
33	SB	-
34	Y	-
35	G	-
36	SB	- [With VR30 engine]
36	W	- [With 2.0L turbo gasoline engine]
37	GR	-
38	BR	-
41	GR	-
43	V	-

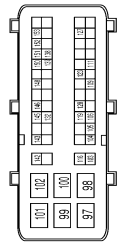
Connector No.	E124
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH12FW-NH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
62	G	-
64	SB	-
65	V	-
69	G	-
71	W	-
72	Y	-

Connector No.	E200
Connector Name	ECM
Connector Type	ADA52FB-AH26

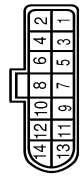
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
97	G	POWER SUPPLY (MAIN)
98	B	ECM GROUND
99	G	POWER SUPPLY (MAIN)
100	B	ECM GROUND
101	G	POWER SUPPLY (MAIN)
102	B	ECM GROUND
103	V	COOLING FAN CONTROL SIGNAL (PWM)
104	Y	SENSOR POWER SUPPLY
105	R	SENSOR POWER SUPPLY
106	W	SENSOR GROUND
109	P	ENGINE SPEED SIGNAL
111	G	POWER SUPPLY
116	LG	STARTER RELAY-L
119	BR	SENSOR GROUND
120	BG	SENSOR GROUND
123	BR	MAIN RELAY CONTROL SIGNAL
127	V	FUEL PUMP ON SIGNAL
132	G	ACCELERATOR PEDAL POSITION SENSOR 1
137	L	CAN-H
138	L	DRIVETRAIN CAN-H
142	GR	BACK-UP LAMP SWITCH
143	LG	REFRIGERANT PRESSURE SENSOR
145	L	ACCELERATOR PEDAL POSITION SENSOR 2
146	L	FUEL TANK PRESSURE SENSOR
148	L	STARTER RELAY-H
150	P	CAN-L
151	P	DRIVETRAIN CAN-L
152	B	EVAP CANISTER VENT CONTROL VALVE
153	G	EVAP PURGE CONTROL VALVE

Connector No.	E201
Connector Name	WIRE TO WIRE
Connector Type	Delphi_33104047

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	-
2	R	-
5	G	-
6	L	-
7	R	-
8	W	-
9	B	-
13	L	-

Connector No.	E207
Connector Name	STARTER RELAY
Connector Type	24347_9F900

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	LG	-
3	R	-
5	W	-

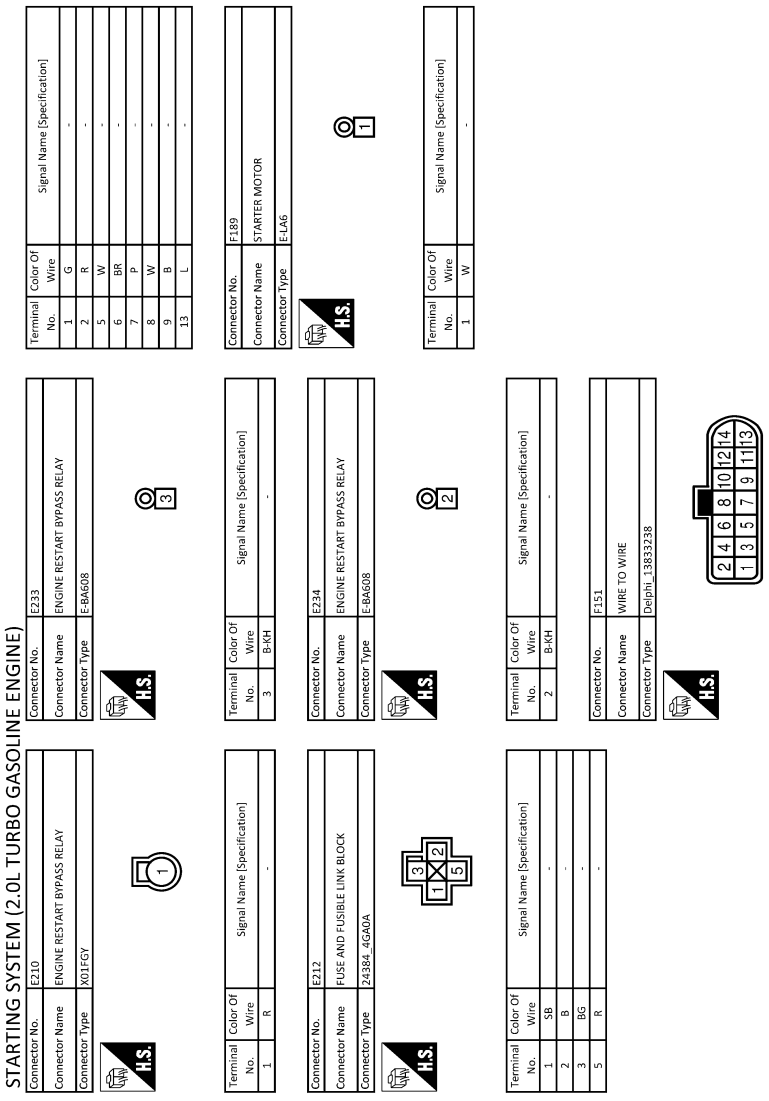
Connector No.	E209
Connector Name	STARTER MOTOR
Connector Type	24343_4GD0C

H.S.

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

JRBWD9569GB

STARTING SYSTEM (2.0L TURBO GASOLINE ENGINE)



JRBWD9570GB

BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow (With GR8-1200 NI)

INFOID:0000000012793106

STARTING SYSTEM DIAGNOSIS WITH GR8-1200 NI

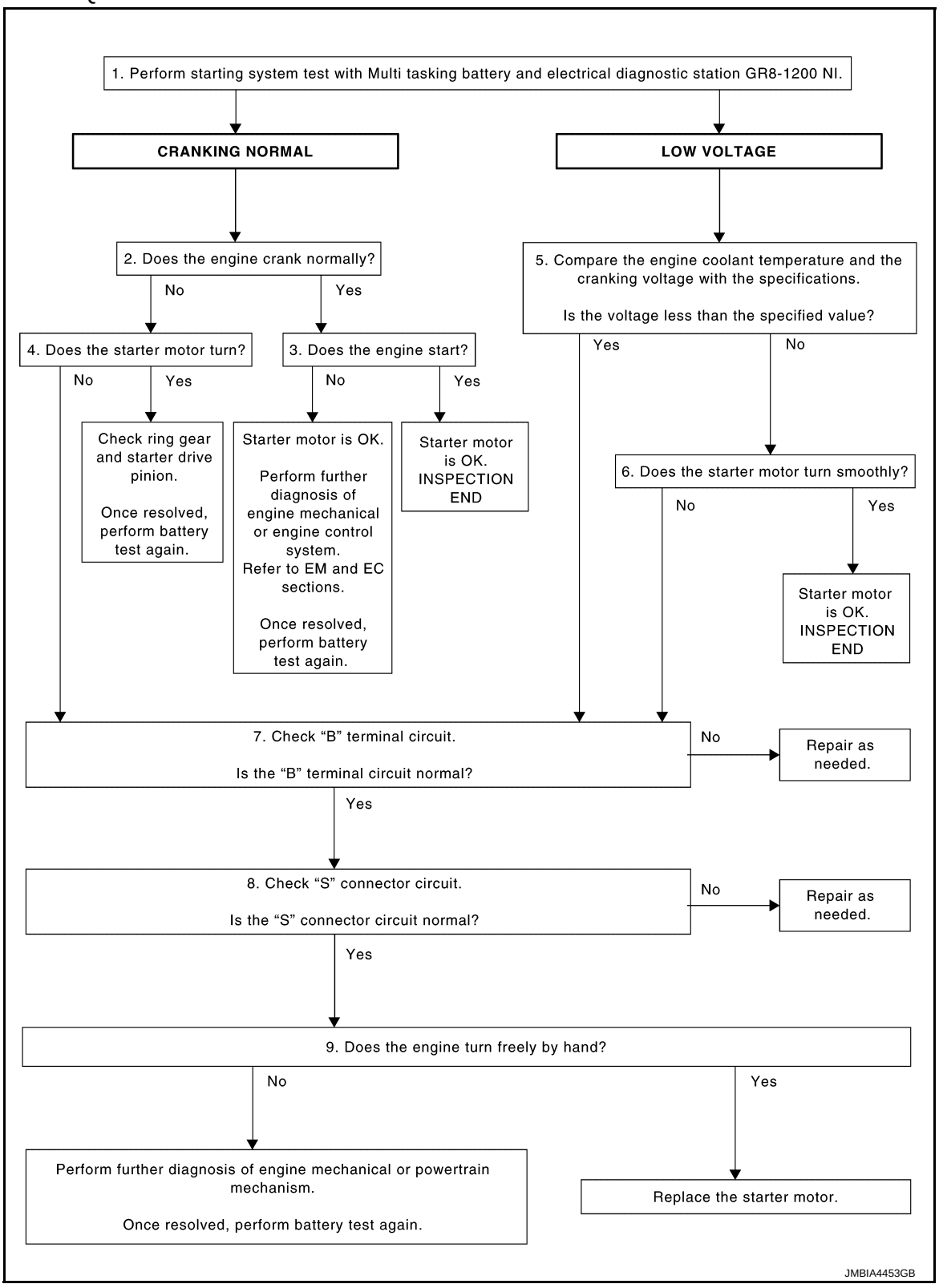
To test the starting system, use the following special service tool:

- GR8-1200 NI Multitasking battery and electrical diagnostic station

NOTE:

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

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

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 NORMAL>>GO TO 2.
LOW VOLTAGE>>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-17, "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".

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.

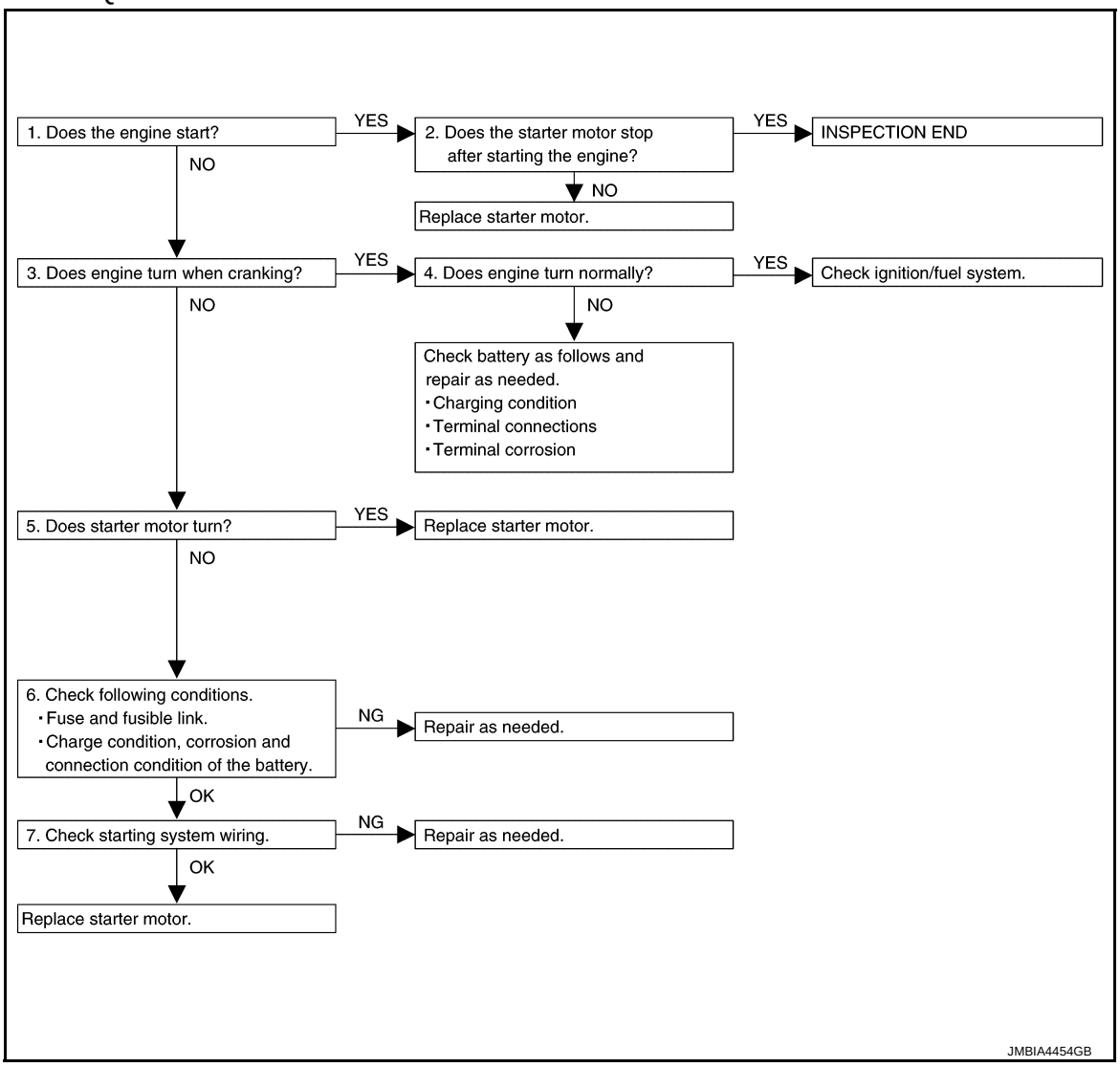
Does the engine turn freely by hand?

YES >> Replace starter motor. Refer to STR-23, "2.0L TURBO GASOLINE ENGINE : Removal and Installation".
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:0000000012793107

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.

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-23, "2.0L TURBO GASOLINE ENGINE : Removal and Installation".

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-249, "2.0L TURBO GASOLINE ENGINE : 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-23, "2.0L TURBO GASOLINE ENGINE : Removal and Installation".
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-249, "2.0L TURBO GASOLINE ENGINE : 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-17, "Diagnosis Procedure".
- “S” connector circuit. Refer to STR-19, "Diagnosis Procedure".

Are these inspection results normal?

YES >> Replace starter motor. Refer to STR-23, "2.0L TURBO GASOLINE ENGINE : Removal and Installation".
NO >> Repair as needed.

DTC/CIRCUIT DIAGNOSIS

B TERMINAL CIRCUIT

Diagnosis Procedure

INFOID:0000000012793109

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.

(+)		(–)	Voltage (Approx.)
Starter motor			
Connector	Terminal		
E209	2	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> GO TO 4.

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.

(+)	(–)		Condition	Voltage (Approx.)
	Starter motor			
	Connector	Terminal		
Battery positive terminal	E209	2	When the ignition switch is in START position	Less than 0.5

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

Is the inspection result normal?

YES >> “B” terminal circuit is OK. Further inspection is necessary. Refer toSTR-12, "Work Flow (With GR8-1200 NI)" (with GR8-1200NI) or STR-15, "Work Flow (Without GR8-1200 NI)" (without GR8-1200NI).
NO >> Check the starter motor case and ground for poor continuity.

4.CHECK ENGINE RESTART BYPASS RELAY CIRCUIT

Check voltage between engine restart bypass relay connector and ground.

(+)		(–)	Voltage (Approx.)
Engine restart bypass relay			
Connector	Terminal		
E234	2	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.
NO >> Check harness between battery and engine restart bypass relay for open circuit.

5. CHECK “B” TERMINAL CIRCUIT 2

1. Disconnect engine restart bypass relay connector and starter motor connector.
2. Check continuity between starter motor connector and engine restart bypass relay connector.

Starter motor		Engine restart bypass relay		Continuity
Connector	Terminal	Connector	Terminal	
E209	2	E233	3	Existed

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-45, "Intermittent Incident".
NO >> Repair or replace harness.

S CONNECTOR CIRCUIT

Diagnosis Procedure

INFOID:0000000012793111

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.

(+)		(–)	Condition	Voltage
Starter motor				
Connector	Terminal			
F189	1	Ground	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-12, "Work Flow (With GR8-1200 NI)" (with GR8-1200 NI) or STR-15, "Work Flow (Without GR8-1200 NI)" (without GR8-1200 NI).

NO >> GO TO 2.

2.CHECK FUSIBLE LINK

1. Turn ignition switch OFF.
2. Check that the following fusible link is not fusing.

Fusible link No.	Capacity
Q	30 A

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace the fusible link after repairing the applicable circuit.

3.CHECK IGNITION NO.2 RELAY CIRCUIT 1

1. Remove ignition No.2 relay.
2. Check voltage between ignition No.2 relay harness connector and ground.

(+)		(–)	Voltage
Ignition No.2 relay			
Connector	Terminal		
E212	3	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace harness.

4.CHECK IGNITION NO.2 RELAY CIRCUIT 2

1. Disconnect IPDM E/R connector.
2. Check continuity between ignition No.2 relay harness connector and IPDM E/R harness connector.

Ignition No.2 relay		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E212	1	E124	64	Existed

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace harness.

5.CHECK IGNITION NO.2 RELAY CIRCUIT 3

Check continuity between ignition No.2 relay harness connector and ground.

Ignition No.2 relay		—	Continuity
Connector	Terminal		
E212	2	Ground	Existed

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace harness.

6.CHECK IGNITION NO.2 RELAY

Check ignition No.2 relay. Refer to STR-20, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace ignition No.2 relay.

7.CHECK STARTER RELAY CIRCUIT 1

1. Remove starter relay.
2. Check continuity between starter relay harness connector and ignition No.2 relay harness connector.

Starter relay		Ignition No.2 relay		Continuity
Connector	Terminal	Connector	Terminal	
E207	3	E212	5	Existed

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace harness.

8.CHECK STARTER RELAY CIRCUIT 2

Check continuity between starter motor harness connector and starter relay harness connector.

Starter motor		Starter relay		Continuity
Connector	Terminal	Connector	Terminal	
F189	2	E207	5	Existed

Is the inspection result normal?

YES >> Further inspection is necessary. Check ECM or security control system.
NO >> Repair or replace harness.

Component Inspection

INFOID:0000000013469629

1.CHECK IGNITION NO.2 RELAY

1. Turn ignition switch OFF.
2. Remove ignition No.2 relay.
3. Apply battery voltage to ignition No.2 relay between terminals 1 and 2.
4. Check continuity of headlamp washer relay.

Ignition No.2 relay		Condition		Continuity
Terminal				
3	5	Voltage	Apply	Existed
			Not Apply	Not existed

Is the inspection result normal?

YES >> Ignition No.2 relay is normal.
NO >> Replace Ignition No.2 relay.

SYMPTOM DIAGNOSIS

STARTING SYSTEM

Symptom Table

INFOID:0000000012793112

Symptom	Reference
No normal cranking	Refer to STR-12, "Work Flow (With GR8-1200 NI)" or STR-15, "Work Flow (Without GR8-1200 NI)".
Starter motor does not rotate	

REMOVAL AND INSTALLATION

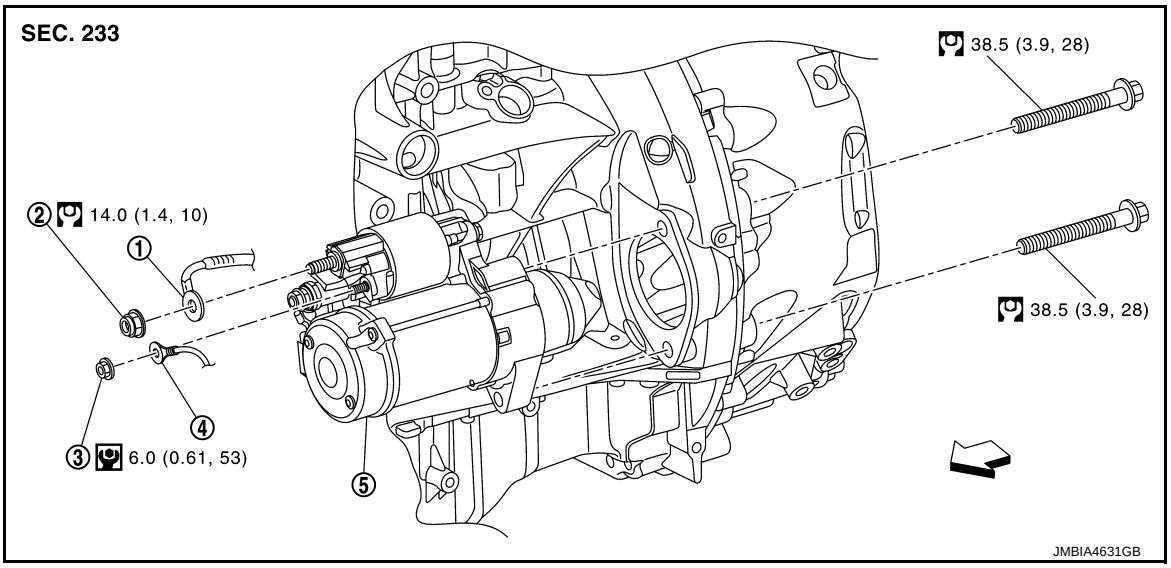
STARTER MOTOR

2.0L TURBO GASOLINE ENGINE

2.0L TURBO GASOLINE ENGINE : Exploded View

INFOID:0000000013437580

REMOVAL



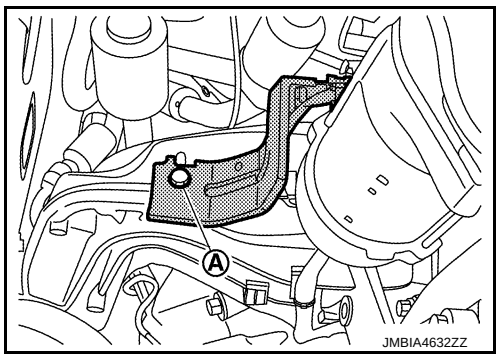
① “B” terminal harness
② “B” terminal nut
③ “S” terminal nut
④ “S” terminal harness
⑤ Starter motor
⇦ Vehicle front
: N·m (kg-m, in-lb)
: N·m (kg-m, ft-lb)

2.0L TURBO GASOLINE ENGINE : Removal and Installation

INFOID:0000000013437581

Removal

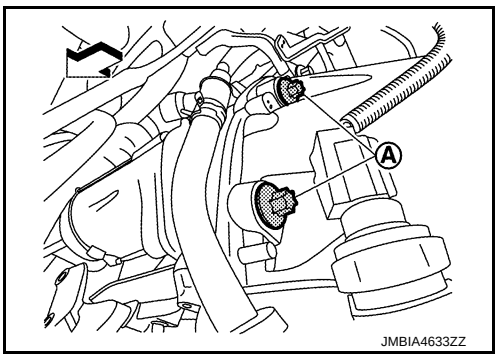
1. Disconnect the battery cable from the negative terminal. Refer to PG-261, "2.0L TURBO GASOLINE ENGINE : Removal and Installation".
2. Remove rear engine cover. Refer to EXT-35, "FRONT UNDER COVER : Removal and Installation".
3. Remove engine restart bypass relay. Refer to EC4-971, "Removal and Installation".
4. Remove cable bracket mounting bolt Ⓐ, and then move cable bracket to a location where it does not inhibit work.



5. Remove “B” terminal nut and disconnect “B” terminal harness.
6. Remove “S” terminal nut and disconnect “S” terminal harness.

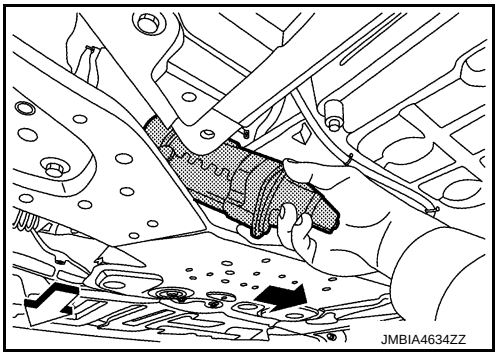
7. Remove starter motor mounting bolts Ⓐ.

⇦ : Vehicle front



8. Remove starter motor downward from the vehicle.

⇦ : Vehicle front



INSTALLATION

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

CAUTION:

- **Be careful to tighten “B” terminal nut to the specified torque.**
- **Erase the starter operation counter when the starter motor for models with stop/start system is replaced. Refer to EC4-218, "Description".**
- **Replace the starter relay when the starter motor for models with stop/start system is replaced.**

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Starter Motor

INFOID:0000000013437585

Applied model		2.0L turbo gasoline engine
Type		428000-9210
		DENSO make
		Reduction gear type
System voltage	[V]	12

PRECAUTION

PRECAUTIONS

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

INFOID:0000000013599983

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, it is recommended that all maintenance and repair be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper repair, 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.

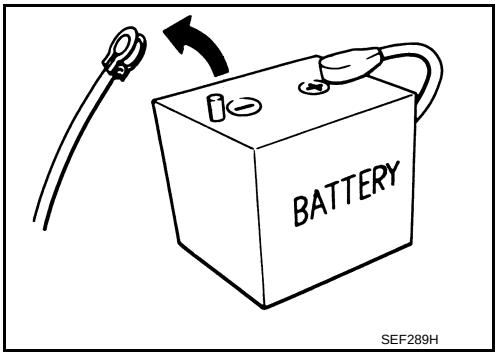
- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery or batteries, and wait at least 3 minutes before performing any service.**

Precautions for Removing Battery Terminal

INFOID:0000000013599984

When disconnecting the battery terminal, pay attention to the following.

- Always use a 12V battery as power source.
- Never disconnect battery terminal while engine is running.
- When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.
- For vehicles with the engine listed below, remove the battery terminal after a lapse of the specified time:



BR08DE	: 4 minutes	V9X engine	: 4 minutes
D4D engine	: 20 minutes	YD25DDTi	: 2 minutes
HR09DET	: 12 minutes	YS23DDT	: 4 minutes
HRA2DDT	: 12 minutes	YS23DDTT	: 4 minutes
K9K engine	: 4 minutes	ZD30DDTi	: 60 seconds
M9R engine	: 4 minutes	ZD30DDTT	: 60 seconds
R9M engine	: 4 minutes		

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.

- After high-load driving, if the vehicle is equipped with the V9X engine, turn the ignition switch OFF and wait for at least 15 minutes to remove the battery terminal.

NOTE:

- Turbocharger cooling pump may operate in a few minutes after the ignition switch is turned OFF.
- Example of high-load driving
  - Driving for 30 minutes or more at 140 km/h (86 MPH) or more.
  - Driving for 30 minutes or more on a steep slope.

- 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.

PREPARATION

PREPARATION

Special Service Tools

INFOID:0000000013599899

Tool number (Kent-Moore No.) Tool name	Description
— (—) Model GR8-1200 NI Multitasking battery and electrical diagnostic station  AWIIA1239ZZ	Tests batteries, starting and charging systems and charges batteries. For operating instructions, refer to diagnostic station instruction manual.

Commercial Service Tools

INFOID:0000000013599900

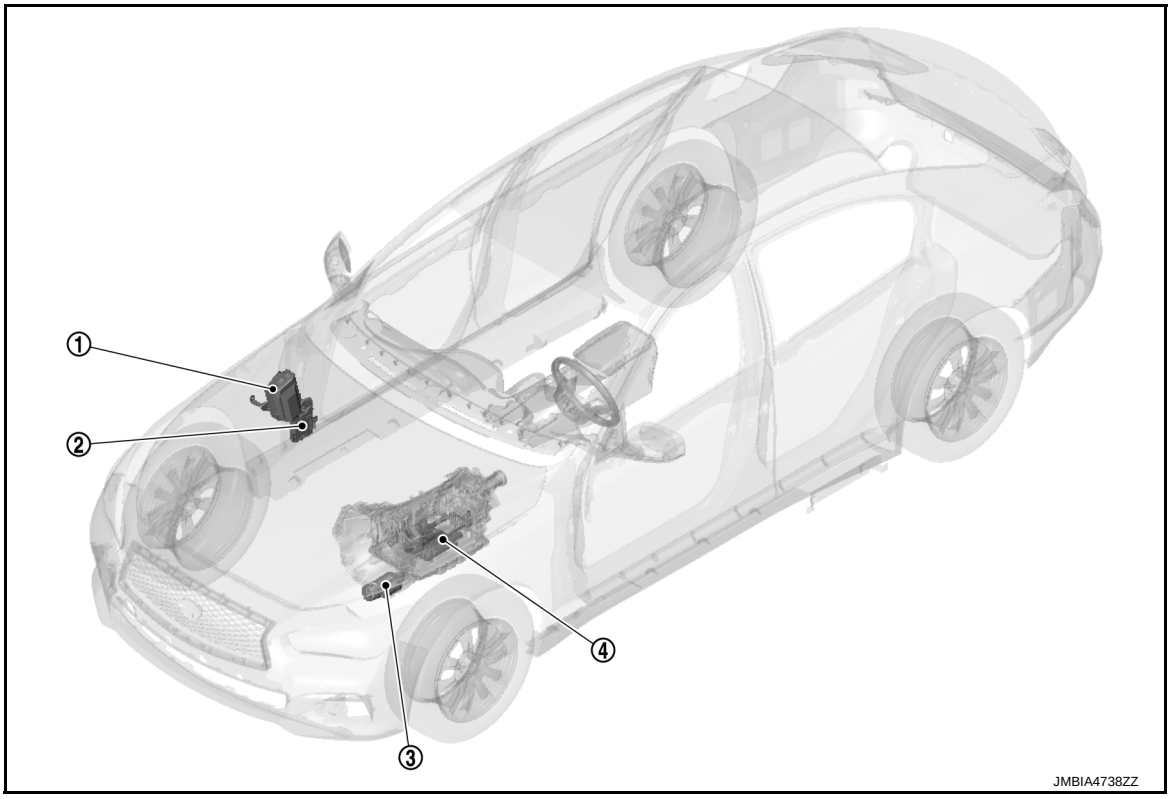
Tool name	Description
Power tool  PIIB1407E	Loosening bolts, nuts and screws

SYSTEM DESCRIPTION

COMPONENT PARTS

Component Parts Location

INFOID:0000000013599901



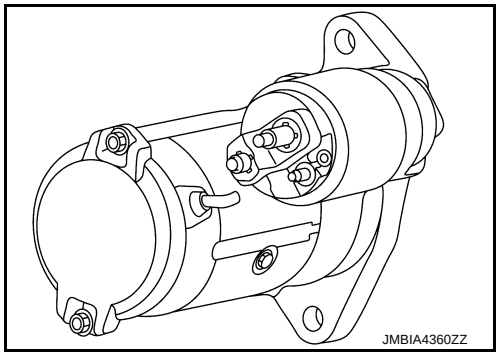
No.	Component	Function
①	IPDM E/R	CPU inside IPDM E/R controls starter control relay. Refer to PCS-5, "Component Parts Location" for detailed installation location.
②	BCM	BCM controls starter relay. Refer to BCS-5, "BODY CONTROL SYSTEM : Component Parts Location" for detailed installation location.
③	Starter motor	Refer to STR-29, "Starter motor".
④	TCM	TCM supplies power to starter relay and starter control relay when the selector lever is shifted to the P or N position. Refer to TM-13, "A/T CONTROL SYSTEM : Component Parts Location" for detailed installation location.

Starter motor

INFOID:0000000013599902

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.

- “B” terminal: The “B” terminal is constantly supplied with battery power.
- “S” terminal: The starter motor magnetic switch (“S” terminal) is supplied with power when the cranking condition is satisfied.

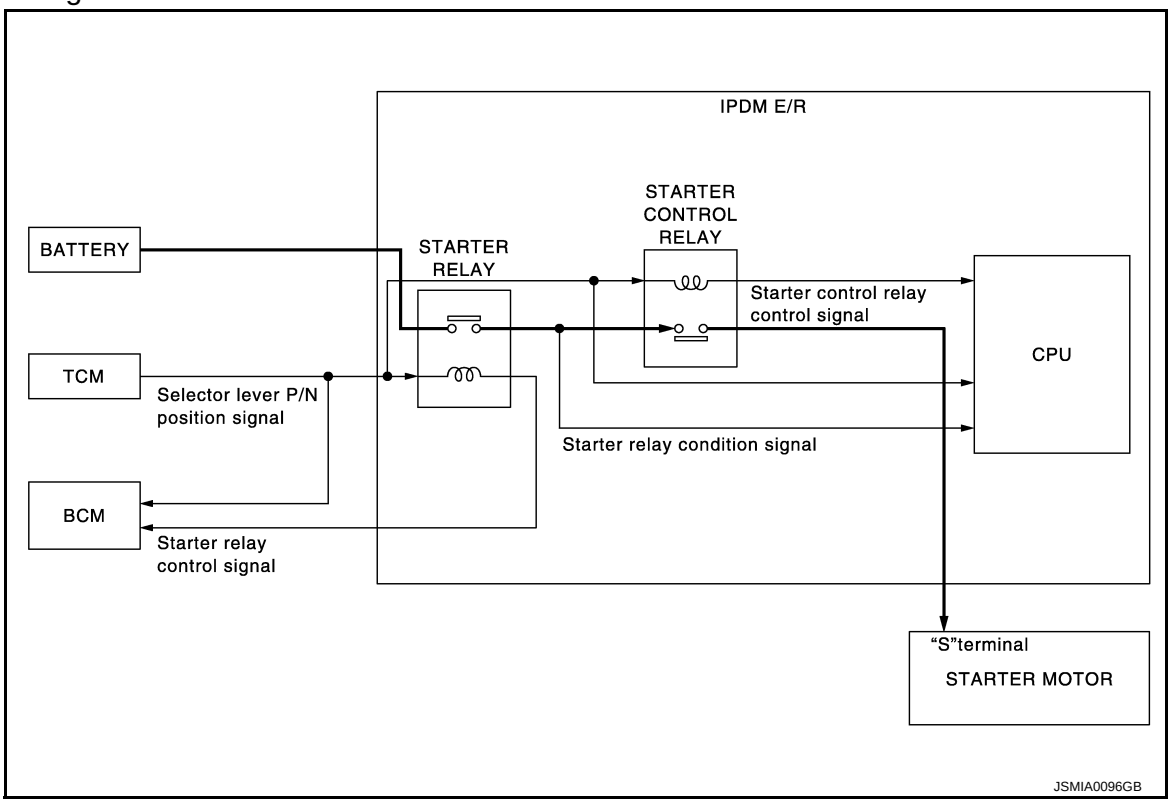


SYSTEM

System Description

INFOID:0000000013599903

System Diagram



System Description

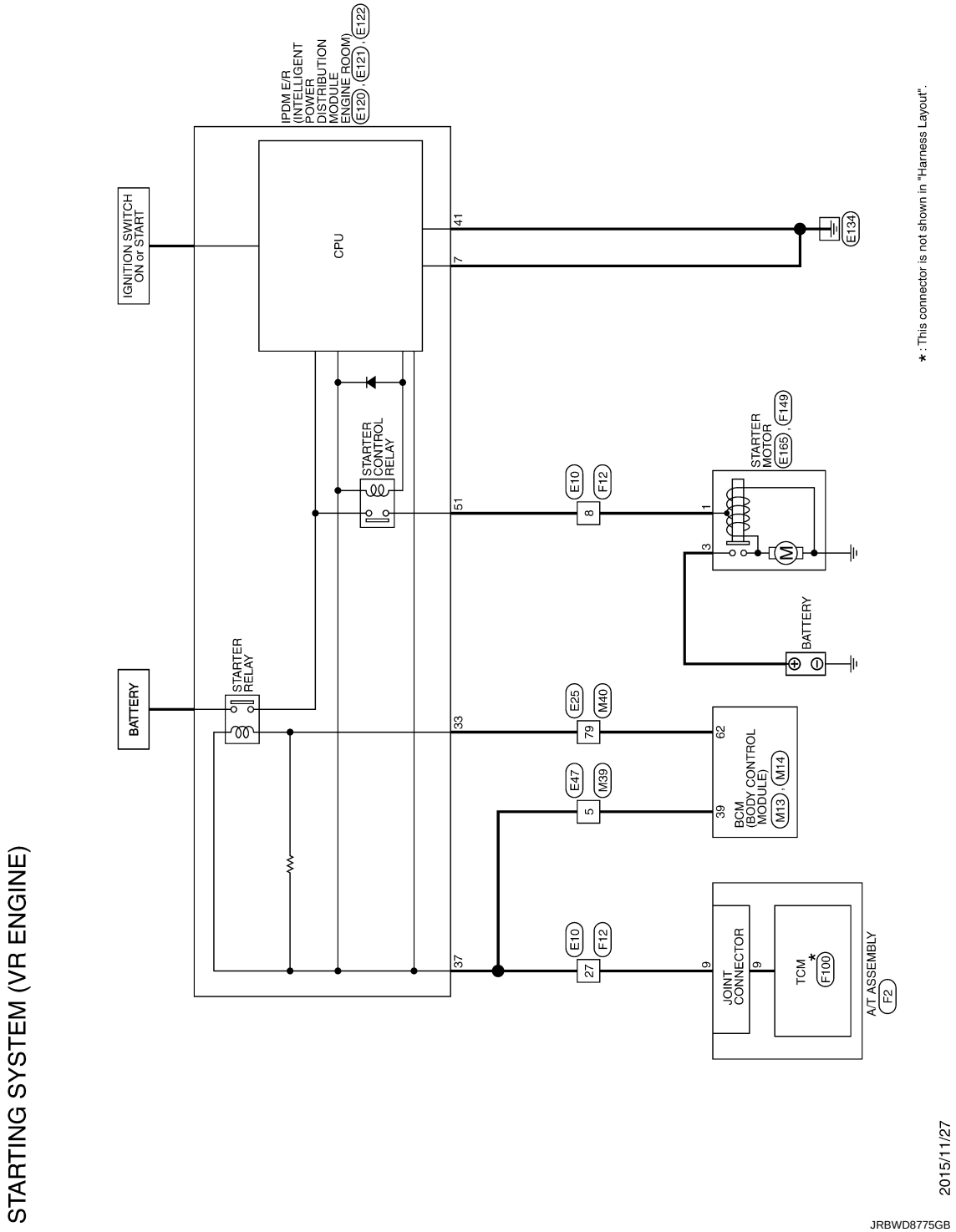
- When selector lever is P or N, power is supplied to starter relay and starter control relay by TCM. And BCM and IPDM E/R (CPU) detect selector lever P/N condition by the inputted signal.
- When starter operating condition is satisfied, IPDM E/R turns starter control relay ON by starter control relay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

WIRING DIAGRAM

STARTING SYSTEM

Wiring Diagram

INFOID:0000000013599904



STARTING SYSTEM (VR ENGINE)

Connector No.	E10
Connector Name	WIRE TO WIRE
Connector Type	SAA36MB-RS8-SH28

H.S.

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

Connector No.	E25
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	BG	-
6	V	-
7	L	-
8	BG	- [With VR30 engine]
8	BR	- [With 2.0L turbo gasoline engine]
9	B	- [With 2.0L turbo gasoline engine]
9	GR	- [With VR30 engine] [Color of wire differs depending on production]
9	LG	- [With VR30 engine] [Color of wire differs depending on production]
10	BR	-
11	L	-
12	GR	- [With VR30 engine]
12	P	- [With 2.0L turbo gasoline engine]
13	SHIELD	- [With 2.0L turbo gasoline engine]
13	W	- [With VR30 engine]
14	B	-
15	GR	- [With 2.0L turbo gasoline engine]
15	SB	- [With VR30 engine]
16	BR	- [With 2.0L turbo gasoline engine]
16	Y	- [With VR30 engine]
17	BR	- [With VR30 engine]
17	GR	- [With 2.0L turbo gasoline engine]
18	G	- [With 2.0L turbo gasoline engine]
18	P	- [With VR30 engine]
19	Y	-
31	W	- [With 2.0L turbo gasoline engine]
31	Y	- [With VR30 engine]
32	G	- [With 2.0L turbo gasoline engine]
32	GR	- [With VR30 engine]
33	L	- [With VR30 engine]
33	Y	- [With 2.0L turbo gasoline engine]
34	P	-
35	GR	-
36	R	-
37	V	- [With VR30 engine]
38	L	- [With VR30 engine]
38	P	- [With 2.0L turbo gasoline engine and without gateway]
38	R	- [With 2.0L turbo gasoline engine and with gateway]
39	BR	- [With 2.0L turbo gasoline engine]
39	Y	- [With VR30 engine]
40	SB	-
41	LG	-
44	Y	-
45	L	- [With 2.0L turbo gasoline engine]
45	W	- [With VR30 engine]
46	B	- [With VR30 engine]
46	Y	- [With 2.0L turbo gasoline engine]
47	G	-
48	SHIELD	-
49	R	-
50	BR	- [With VR30 engine]
50	GR	- [With 2.0L turbo gasoline engine]
51	L	-
52	W	-
53	V	-
54	P	- [With VR30 engine]
54	W	- [With 2.0L turbo gasoline engine]
55	B	- [With 2.0L turbo gasoline engine]
55	W	- [With VR30 engine]
56	BG	- [With 2.0L turbo gasoline engine]
56	SB	- [With VR30 engine]
57	BG	- [With VR30 engine]
57	W	- [With 2.0L turbo gasoline engine]
58	B	- [Color of wire differs depending on production]
58	B/W	- [Color of wire differs depending on production]
59	W	-
61	R	-
64	Y	-
65	BR	- [Color of wire differs depending on production]
65	GR	- [Color of wire differs depending on production]
66	GR	-
67	LG	-
68	BG	-
69	L	-
70	R	-
71	G	- [With 2.0L turbo gasoline engine]
71	LG	- [With VR30 engine]
72	L	- [With 2.0L turbo gasoline engine]
72	V	- [With VR30 engine]
73	G	- [With VR30 engine]
73	W	- [With 2.0L turbo gasoline engine]
74	BR	- [With VR30 engine]
74	L	- [With 2.0L turbo gasoline engine]
75	P	- [With 2.0L turbo gasoline engine and without gateway]
75	R	- [With 2.0L turbo gasoline engine and with gateway]
75	V	- [With VR30 engine]
76	G	-
77	Y	-
78	LG	- [With 2.0L turbo gasoline engine and with ADAS]
78	P	- [With VR30 engine]
78	V	- [With 2.0L turbo gasoline engine and without ADAS]
79	SB	-
80	G	-
81	R	-
82	V	-
83	BR	- [With 2.0L turbo gasoline engine]
83	R	- [With VR30 engine]
84	LG	-
86	BG	-
87	G	-
89	LG	-
90	G	- [With VR30 engine]
90	GR	- [With 2.0L turbo gasoline engine]
91	G	-
93	BG	-
94	GR	- [With VR30 engine]
94	L	- [With 2.0L turbo gasoline engine]
95	BG	- [With VR30 engine]
95	P	- [With 2.0L turbo gasoline engine and without gateway]
95	R	- [With 2.0L turbo gasoline engine and with gateway]
96	W	-
97	LG	-
98	L	-
99	LG	- [With 2.0L turbo gasoline engine]
99	P	- [With VR30 engine]

JRBWD9565GB

STARTING SYSTEM (VR ENGINE)

100	SHIELD	-

Connector No.	E47
Connector Name	WIRE TO WIRE
Connector Type	TH32MW-NH

H.S.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	- [Color of wire differs depending on production]
1	Y	- [Color of wire differs depending on production]
2	V	-
3	L	-
4	P	- [Without Gateway]
4	R	- [With Gateway]
5	W	-
6	SB	-
7	BR	- [Color of wire differs depending on production]
7	L	- [Color of wire differs depending on production]
8	W	-
9	BG	- [Without BOSE system]
9	V	- [With BOSE system]
10	V	-
11	SB	-
12	G	-
13	G	-
15	BR	-
16	P	-
17	SHIELD	-
18	L	-
19	Y	-
20	W	-
21	G	-
22	R	-
23	BR	-
24	R	-
25	L	-
26	BG	-
27	LG	-
28	BR	-
29	W	-
30	Y	-

31	G	-
32	GR	-

Connector No.	E120
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS12FW-CS

H.S.

7 9 10 11
13 14 15 17 18

Terminal No.	Color Of Wire	Signal Name [Specification]
7	B/W	-
9	P	-
10	LG	-
11	V	-
13	BG	-
14	SB	-
15	BR	-
17	GR	-
18	L	-

Connector No.	E121
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH32FW-NH

H.S.

19 22 23 27 28 29 31 32 33 34
35 36 37 38 41 43

Terminal No.	Color Of Wire	Signal Name [Specification]
19	L	- [With 2.0L turbo gasoline engine]
19	P	- [With VR30 engine]
22	BG	-
23	GR	- [With VR30 engine]
23	LG	- [With 2.0L turbo gasoline engine and without Anti-theft diode]
23	P	- [With 2.0L turbo gasoline engine and with Anti-theft diode]
27	GR	-

28	P	-
29	L	-
31	G	-
32	SB	-
33	SB	-
34	Y	-
35	G	-
36	SB	- [With VR30 engine]
36	W	- [With 2.0L turbo gasoline engine]
37	GR	-
38	BR	-
41	GR	-
43	V	-

Connector No.	E122
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	M01FB-LC

H.S.

51

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

Connector No.	E165
Connector Name	STARTER MOTOR
Connector Type	24340_4GB0A

H.S.

3

Terminal No.	Color Of Wire	Signal Name [Specification]
3	B-KH	-

Connector No.	F2
Connector Name	A/T ASSEMBLY
Connector Type	RK10FG-DGY

H.S.

5 4 3 2 1
10 9 8 7 6

Terminal No.	Color Of Wire	Signal Name [Specification]
1	GR	IGNITION POWER SUPPLY [With 2.0L turbo gasoline engine]
1	L	IGNITION POWER SUPPLY [With VR30 engine]
2	P	BATTERY POWER SUPPLY [MEMORY BACK-UP]
3	L	CAN-H
4	R	K-LINE
5	B	GROUND [With 2.0L turbo gasoline engine]
5	BR	GROUND [With VR30 engine]
6	GR	IGNITION POWER SUPPLY
7	BG	BACK-UP LAMP RELAY
8	P	CAN-L
9	V	STARTER RELAY
10	B	GROUND

Connector No.	F12
Connector Name	WIRE TO WIRE
Connector Type	SAA36FB-RS8-SHZ8

H.S.

12 11 10 9 2 1
18 15 14 13 3 4
24 23 22 21 20 19 6 5
30 29 28 27 26 25 8 7
36 35 34 33 32 31 44 43 42 41 40 39

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	GR	-
3	BG	-
4	R	-
5	G	-
7	L	-
8	W	-
9	W	-

JRBWD9566GB

STARTING SYSTEM (VR ENGINE)

10	BG	-
11	R	-
12	LG	-
13	L	-
14	Y	-
15	LG	-
16	Y	-
17	L	-
18	P	-
19	GR	-
20	BG	-
21	GR	-
22	W	-
23	G	-
24	SB	-
25	V	-
26	W	-
27	V	-
28	W	-
29	Y	-
30	R	-
31	P	-
32	R	-
33	P	-
34	BG	-
35	LG	-
36	SB	-
37	V	-
38	BR	-
39	GR	-
40	SHIELD	-
41	B	-
42	R	-
43	Y	-
45	Y	-
46	P	-
47	L	-
48	LG	-
49	BG	-
50	SHIELD	-
51	W	-
52	G	-

Connector No.	F100
Connector Name	TCM
Connector Type	SP10FG

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	-	IGNITION POWER SUPPLY
2	-	BATTERY POWER SUPPLY (MEMORY BACK-UP)
3	-	CAN-H
4	-	K-LINE
5	-	GROUND
6	-	IGNITION POWER SUPPLY
7	-	BACK-UP LAMP RELAY
8	-	CAN-L
9	-	STARTER RELAY
10	-	GROUND

Connector No.	F149
Connector Name	STARTER MOTOR
Connector Type	XO1MGY

H.S.

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

Connector No.	M13
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	TH40FG-NH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	PUSH-SW
3	Y	SENS PWR SPLY
4	BG	OPTICAL SENSOR
5	LG	-
10	W	COMBI SW OUTPUT 5
11	SB	COMBI SW OUTPUT 4
12	L	COMBI SW OUTPUT 3
13	G	COMBI SW OUTPUT 2
14	P	COMBI SW OUTPUT 1
15	G	ONE TOUCH UNLK SENS (DR)
16	G	ONE TOUCH UNLK SENS (PASS)
17	P	RECEIVER/SENSOR GND
18	L	SECURITY IND LAMP CONT
20	R	DETENT SW
21	SB	STEP LAMP CONT
25	R	STOP LAMP SW2
26	R	EXTENDED STORAGE FUSE SW
27	P	STOP LAMP SW
30	W	DR DOOR UNLK SENS
33	V	TR LID OP CANCEL SW
36	G	HAZARD SW
39	BR	P/N POSITION

Connector No.	M14
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	TH40FB-NH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
48	R	PUSH-BTN IGN SW ILL PWR
52	G	DONGLE LINK
54	V	COMM LINE
55	R	RAIN SENSOR
59	P	CAN-L
60	L	CAN-H
61	G	REAR WINDOW DEF RLY CONT
62	R	STARTER RLY CONT
64	V	I-KEY WARN BUZZER
65	B	OUTS HD LAMP CONT
66	B	BLOWER FAN RLY CONT [With VR30 engine]
66	Y	BLOWER FAN RLY CONT [With 2.0L turbo gasoline engine]
67	W/B	IGN RLYAY (F/B) CONT
68	R	DIMMER
69	GR	A/T SHIFT SELECT PWR SPLY
70	B	IGN RLYAY (IPDM E/R) CONT
71	G	DR DOOR REQ SW
72	SB	PASS DOOR REQ SW
75	BR	COMBI SW INPUT 5
76	BG	COMBI SW INPUT 4
77	V	COMBI SW INPUT 3
78	Y	COMBI SW INPUT 2
79	LG	COMBI SW INPUT 1
80	L	TR LID OPNR SW

JRBWD9567GB

STARTING SYSTEM (VR ENGINE)

Connector No.	M39
Connector Name	WIRE TO WIRE
Connector Type	TH32FW-NH

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W/B	-
2	SB	-
3	L	-
4	P	- [Without Gateway]
5	BR	- [With Gateway]
6	SB	-
7	L	-
8	W	-
9	P	- [Without BOSE system]
9	V	- [With BOSE system]
10	V	-
11	SB	-
12	G	-
13	G	-
15	R	-
16	SB	-
17	SHIELD	-
18	W	-
19	Y	-
20	L	-
21	G	-
22	R	-
23	BR	-
24	R	-
25	L	-
26	Y	-
27	LG	-
28	BR	-
29	W/B	-
30	Y	-
31	W	-
32	L	- [With Anti-theft diode]
32	LG	- [Without Anti-theft diode]

Connector No.	M40
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4

Terminal No.	Color Of Wire	Signal Name [Specification]
1	BG	-
6	W/B	-
7	V	-
8	BG	- [With VR30 engine]
8	BR	- [With 2.0L turbo gasoline engine]
9	LG	- [With VR30 engine]
9	P	- [With 2.0L turbo gasoline engine]
10	W	-
11	W	- [With VR30 engine]
11	Y	- [With 2.0L turbo gasoline engine]
12	B	- [With VR30 engine]
12	BR	- [With 2.0L turbo gasoline engine]
13	GR	- [With VR30 engine]
13	SHIELD	- [With 2.0L turbo gasoline engine]
14	B	-
15	BG	- [With 2.0L turbo gasoline engine]
15	SB	- [With VR30 engine]
16	B	- [With VR30 engine]
16	BR	- [With 2.0L turbo gasoline engine]
17	LG	-
18	B	- [With VR30 engine]
18	W/B	- [With 2.0L turbo gasoline engine]
19	Y	-
31	W	-
32	G	- [With 2.0L turbo gasoline engine]
32	V	- [With VR30 engine]
33	L	- [With VR30 engine]
33	Y	- [With 2.0L turbo gasoline engine]
34	P	-
35	BG	-
36	G	-
37	B	- [With VR30 engine]
37	L	- [With 2.0L turbo gasoline engine]
38	L	- [With VR30 engine]
38	P	- [With 2.0L turbo gasoline engine and without gateway]
38	R	- [With 2.0L turbo gasoline engine and with gateway]

39	R	- [With 2.0L turbo gasoline engine]
39	Y	- [With VR30 engine]
40	GR	-
41	L	-
44	BR	-
45	L	- [With 2.0L turbo gasoline engine]
45	W	- [With VR30 engine]
46	G	- [With VR30 engine]
46	Y	- [With 2.0L turbo gasoline engine]
47	BG	- [With 2.0L turbo gasoline engine]
47	R	- [With VR30 engine]
48	SHIELD	-
49	B	- [With VR30 engine]
49	G	- [With 2.0L turbo gasoline engine]
50	B	- [With 2.0L turbo gasoline engine]
50	BR	- [With VR30 engine]
51	L	-
52	W	-
53	G	-
54	SB	- [With 2.0L turbo gasoline engine]
54	Y	- [With VR30 engine]
55	B	- [With 2.0L turbo gasoline engine]
55	P	- [With VR30 engine]
56	BG	- [With VR30 engine]
56	GR	- [With 2.0L turbo gasoline engine]
57	GR	- [With VR30 engine]
57	P	- [With 2.0L turbo gasoline engine]
58	B	-
59	SB	-
61	W/B	-
64	Y	-
65	R	-
66	P	- [Color of wire differs depending on production]
66	V	- [Color of wire differs depending on production]
67	LG	-
68	BG	-
69	L	-
70	R	-
71	V	- [With VR30 engine]
71	W	- [With 2.0L turbo gasoline engine]
72	L	- [With 2.0L turbo gasoline engine]
72	LG	- [With VR30 engine]
73	R	- [With VR30 engine]
73	W	- [With 2.0L turbo gasoline engine]
74	BR	- [With VR30 engine]
74	L	- [With 2.0L turbo gasoline engine]
75	B	- [With VR30 engine]
75	P	- [With 2.0L turbo gasoline engine and without gateway]
75	R	- [With 2.0L turbo gasoline engine and with gateway]
76	W/B	-

77	SB	-
78	G	- [With VR30 engine]
78	LG	- [With 2.0L turbo gasoline engine]
79	R	-
80	G	-
81	R	-
82	LG	-
83	BR	- [With 2.0L turbo gasoline engine]
83	R	- [With VR30 engine]
84	V	-
86	V	-
87	G	-
89	V	-
90	G	- [With VR30 engine]
90	V	- [With 2.0L turbo gasoline engine]
91	W	-
92	G	-
93	BR	-
94	GR	- [With VR30 engine]
94	L	- [With 2.0L turbo gasoline engine]
95	BR	- [With VR30 engine]
95	P	- [With 2.0L turbo gasoline engine and without gateway]
95	R	- [With 2.0L turbo gasoline engine and with gateway]
96	W	-
97	LG	-
98	Y	-
99	BR	- [With VR30 engine]
99	LG	- [With 2.0L turbo gasoline engine]
100	SHIELD	-

JRBWD9568GB

BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow (With GR8-1200 NI)

INFOID:0000000013599905

STARTING SYSTEM DIAGNOSIS WITH GR8-1200 NI

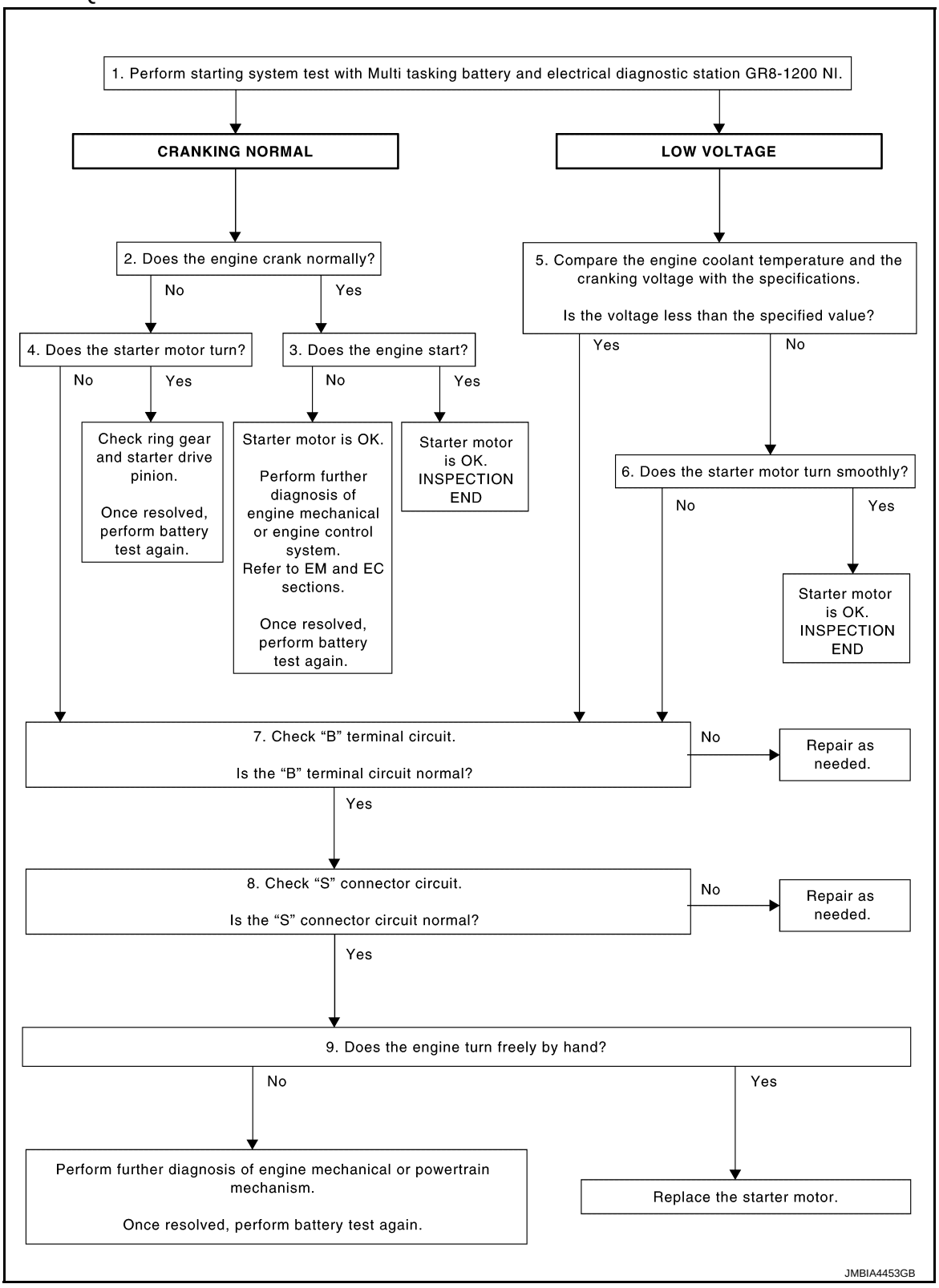
To test the starting system, use the following special service tool:

- Multitasking battery and electrical diagnostic station GR8-1200 NI

NOTE:

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

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

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 NORMAL>>GO TO 2.
LOW VOLTAGE>>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-41, "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-42, "Diagnosis Procedure".

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.

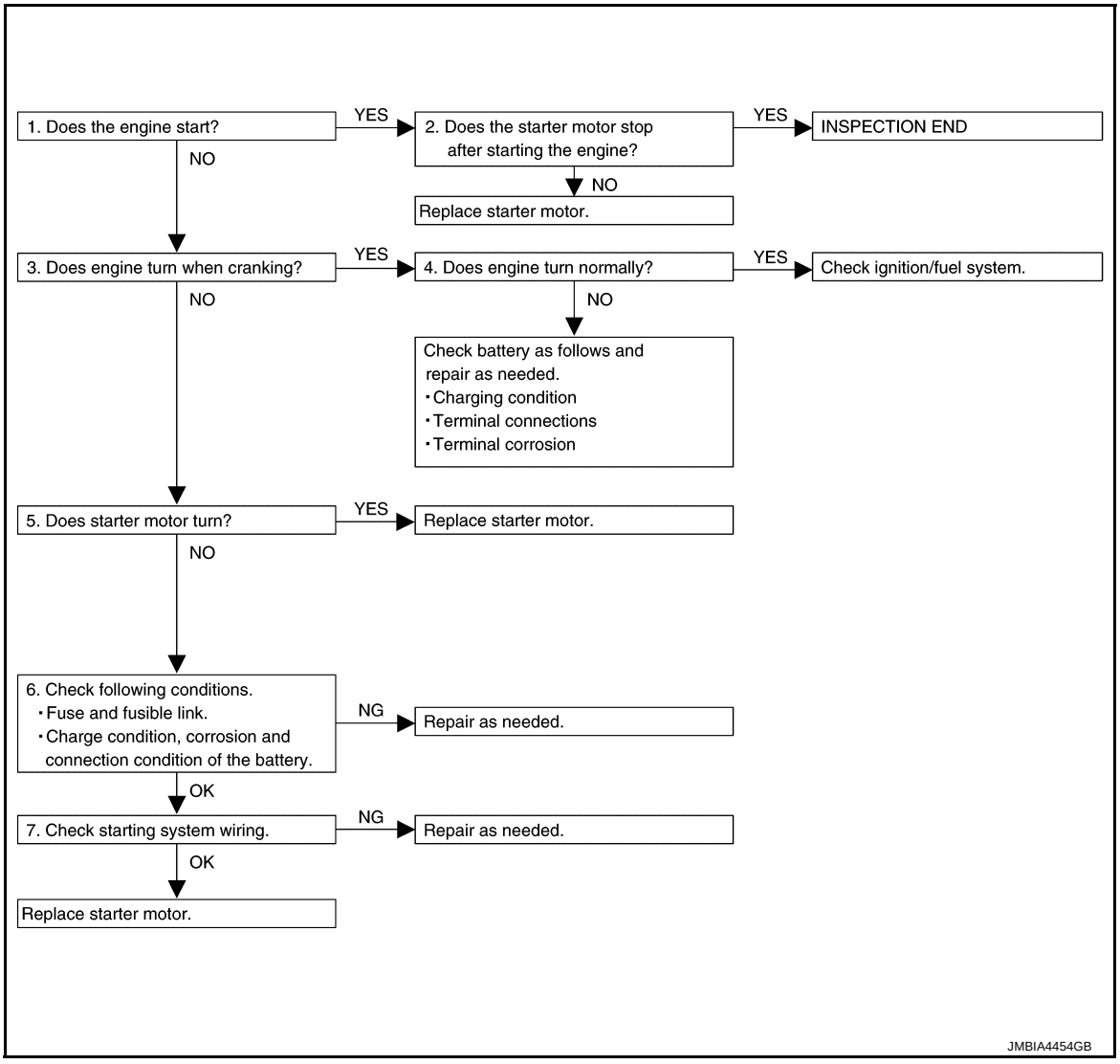
Does the engine turn freely by hand?

YES >> Replace starter motor. Refer to STR-45, "VR30DDTT : Removal and Installation (Electric Power Steering Models)" (Electric power steering models) or STR-47, "VR30DDTT : Removal and Installation (Direct Adaptive Steering Models)" (Direct adaptive steering models).
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:0000000013599906

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.

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-45, "VR30DDTT : Removal and Installation (Electric Power Steering Models)" (Electric power steering models) or STR-47, "VR30DDTT : Removal and Installation (Direct Adaptive Steering Models)" (Direct adaptive steering models).

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-245, "VR30DDTT : 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-45, "VR30DDTT : Removal and Installation (Electric Power Steering Models)" (Electric power steering models) or STR-47, "VR30DDTT : Removal and Installation (Direct Adaptive Steering Models)" (Direct adaptive steering models).
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-245, "VR30DDTT : 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-41, "Diagnosis Procedure".
- “S” connector circuit. Refer to STR-42, "Diagnosis Procedure".

Are these inspection results normal?

YES >> Replace starter motor. Refer to STR-45, "VR30DDTT : Removal and Installation (Electric Power Steering Models)" (Electric power steering models) or STR-47, "VR30DDTT : Removal and Installation (Direct Adaptive Steering Models)" (Direct adaptive steering models).
NO >> Repair as needed.

DTC/CIRCUIT DIAGNOSIS

B TERMINAL CIRCUIT

Description

INFOID:0000000013599907

The “B” terminal is constantly supplied with battery power.

Diagnosis Procedure

INFOID:0000000013599908

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.

(+)		(–)	Voltage (Approx.)
Starter motor			
Connector	Terminal		
E165	3	Ground	Battery voltage

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.

(+)	(–)		Condition	Voltage (Approx.)
	Starter motor			
	Connector	Terminal		
Battery positive terminal	E165	3	When the ignition switch is in START position	Less than 0.5 V

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-36, "Work Flow (With GR8-1200 NI)" or STR-39, "Work Flow (Without GR8-1200 NI)".
NO >> Check the starter motor case and ground for poor continuity.

S CONNECTOR CIRCUIT

Description

INFOID:0000000013599909

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.

Diagnosis Procedure

INFOID:0000000013599910

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.

(+)		(–)	Condition	Voltage (Approx.)
Starter motor				
Connector	Terminal			
F149	1	Ground	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-36, "Work Flow (With GR8-1200 NI)" or STR-39, "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		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F149	1	E122	51	Existed

Is the inspection result normal?

YES >> Further inspection is necessary. Refer to SEC-92, "Work Flow".
NO >> Repair the harness.

SYMPTOM DIAGNOSIS

STARTING SYSTEM

Symptom Table

INFOID:0000000013599911

Symptom	Reference
No normal cranking	Refer to STR-36, "Work Flow (With GR8-1200 NI)" or STR-39, "Work Flow (Without GR8-1200 NI)".
Starter motor does not rotate	

REMOVAL AND INSTALLATION

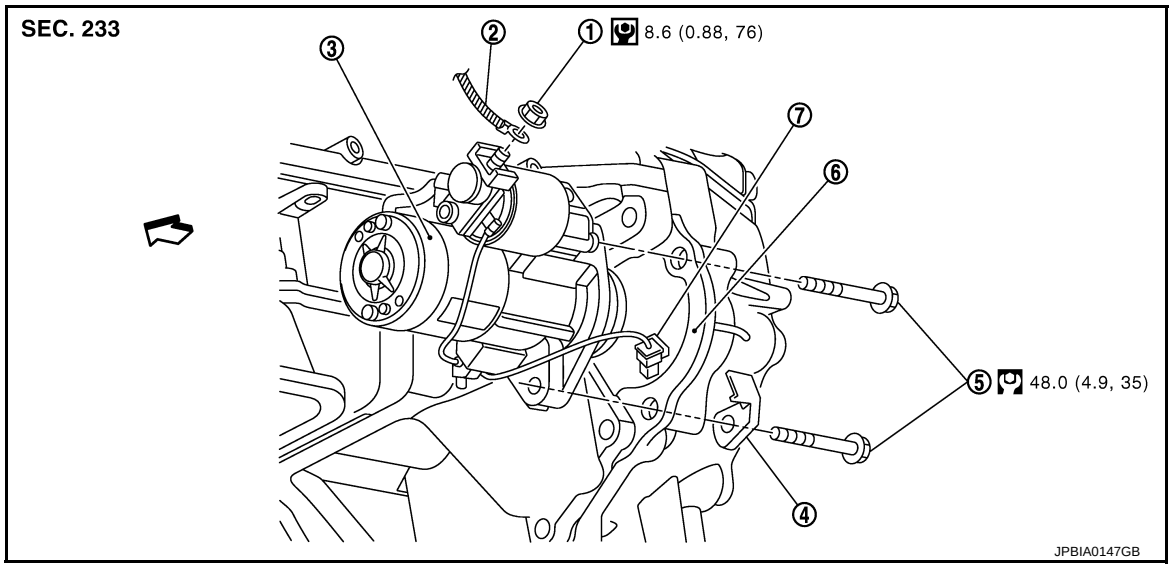
STARTER MOTOR

VR30DDTT

VR30DDTT : Exploded View

INFOID:0000000013599912

REMOVAL



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

⇦: Vehicle front

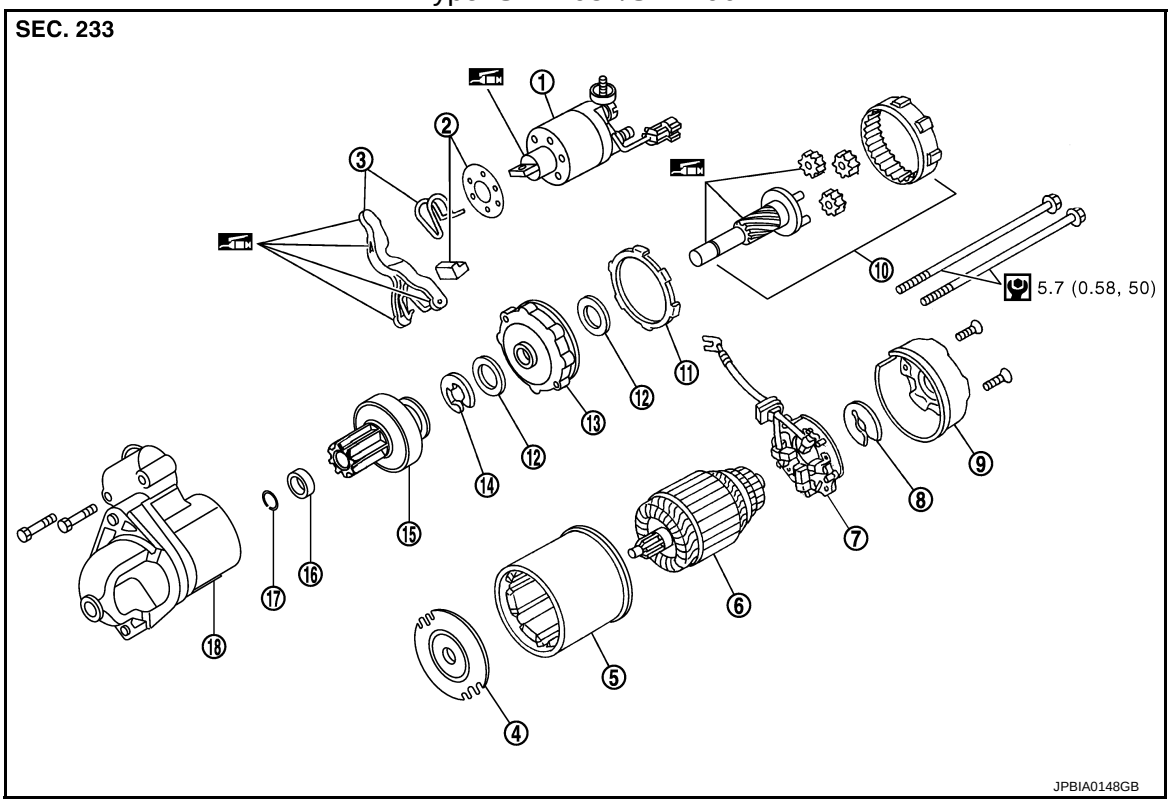
: N·m (kg-m, in-lb)

: N·m (kg-m, ft-lb)

DISASSEMBLY

Type: S114-932/S114-967

SEC. 233



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

: N·m (kg-m, in-lb)

: High-temperature grease point

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

VR30DDTT : Removal and Installation (Electric Power Steering Models)

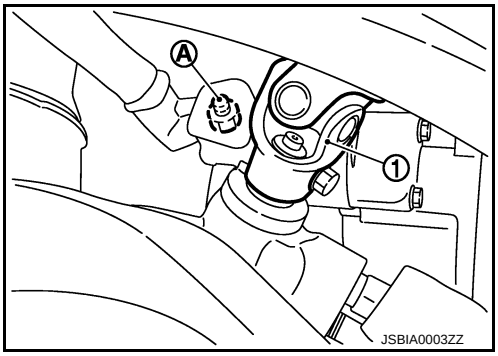
INFOID:0000000013599913

Removal

2WD models

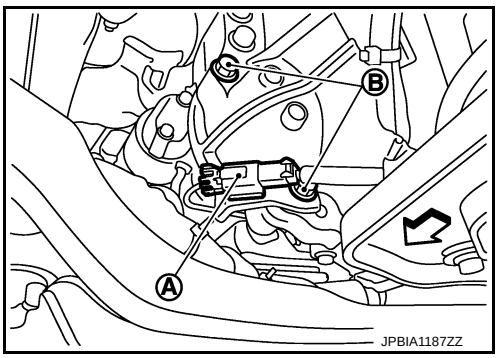
1. Disconnect battery cable from the negative terminal. Refer to PG-259, "VR30DDTT : Removal and Installation".
2. Remove front under cover. Refer to EXT-35, "FRONT UNDER COVER : Removal and Installation".
3. Remove road wheel and tire (front LH). Refer to WT-74, "Removal and Installation"

4. Remove steering lower joint ①, and then remove “B” terminal nut Ⓐ.
   • Steering lower joint: Refer to ST-89, "Removal and Installation".



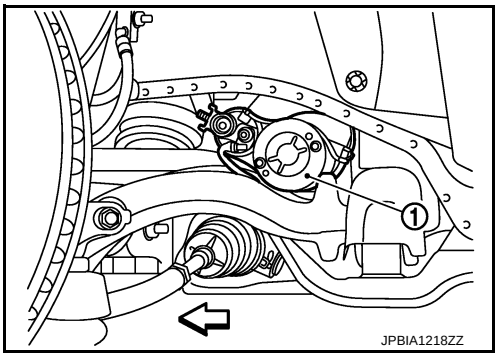
5. Disconnect “S” connector Ⓐ, and then remove starter motor mounting bolts Ⓑ,

   ⇦ : Vehicle front



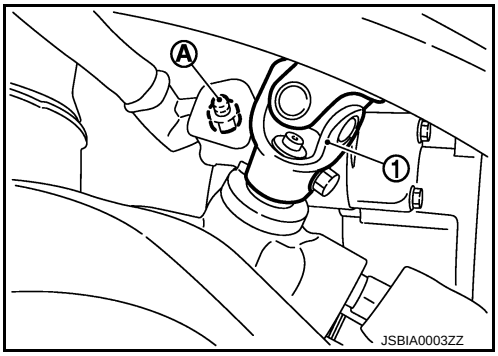
6. Remove starter motor ① from the left side of vehicle.

   ⇦ : Vehicle front



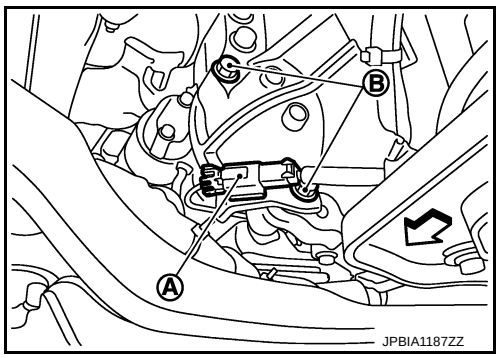
AWD models

1. Disconnect battery cable from the negative terminal. Refer to PG-259, "VR30DDTT : Removal and Installation".
2. Remove front under cover. Refer to EXT-35, "FRONT UNDER COVER : Removal and Installation".
3. Remove road wheel and tire (front LH). Refer to WT-74, "Removal and Installation"
4. Remove steering lower joint ①, and then remove “B” terminal nut Ⓐ.
   • Steering lower joint: Refer to ST-89, "Removal and Installation".



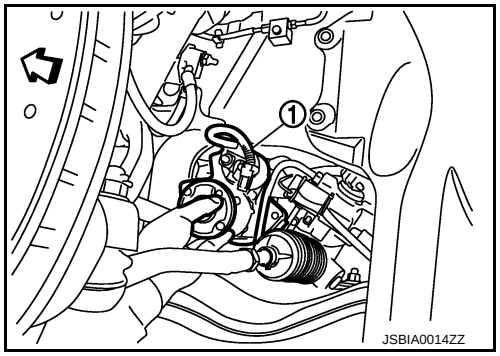
5. Disconnect “S” connector Ⓐ, and then remove starter motor mounting bolts Ⓑ.

⇦ : Vehicle front



6. Remove starter motor ① from the left side of vehicle.

⇦ : Vehicle front



INSTALLATION

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

CAUTION:

Be careful to tighten “B” terminal nut to the specified torque.

VR30DDTT : Removal and Installation (Direct Adaptive Steering Models)

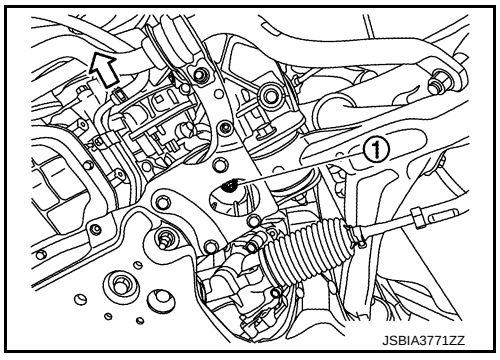
INFOID:0000000013599914

Removal

2WD models

1. Disconnect battery cable from the negative terminal. Refer to PG-259, "VR30DDTT : Removal and Installation".
2. Remove front under cover. Refer to EXT-35, "FRONT UNDER COVER : Removal and Installation".
3. Remove engine mount mounting nut ① (left side).

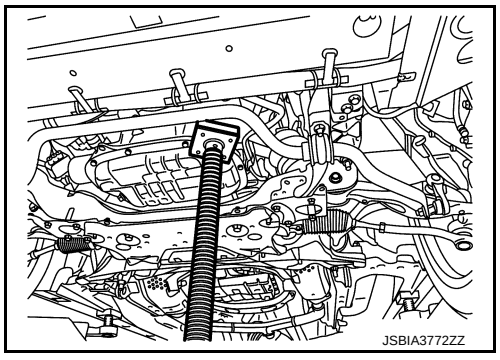
⇦ : Vehicle front



4. Set jack under oil pan edge, and then up to engine assembly about 25 mm (1.0 inch) and secure work space.

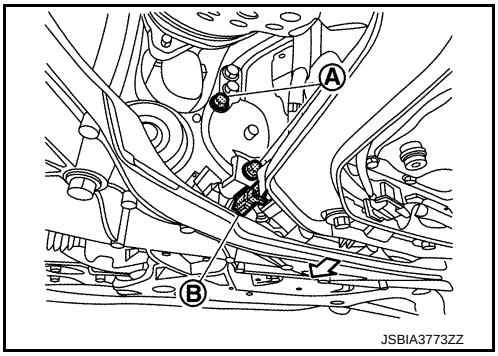
CAUTION:

- **Check the stable condition when using a jack.**
- **Never damage oil pan with a jack.**

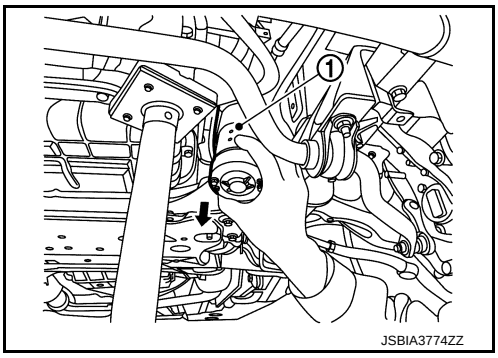


5. Remove “B” terminal nut.
6. Disconnect “S” connector Ⓑ, and then remove starter motor mounting bolts Ⓐ.

⇦ : Vehicle front

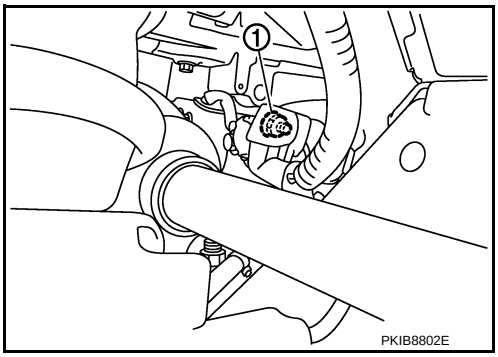


7. Remove starter motor ① from the front side of vehicle.



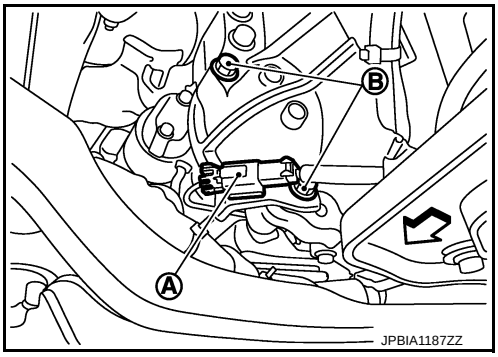
AWD models

1. Disconnect battery cable from the negative terminal. Refer to PG-259, "VR30DDTT : Removal and Installation".
2. Remove front under cover. Refer to EXT-35, "FRONT UNDER COVER : Removal and Installation".
3. Remove road wheel and tire (front LH). Refer to WT-74, "Removal and Installation"
4. Remove front drive shaft (left side). Refer to FAX-28, "LEFT SIDE : Removal and Installation".
5. Remove “B” terminal nut ①.



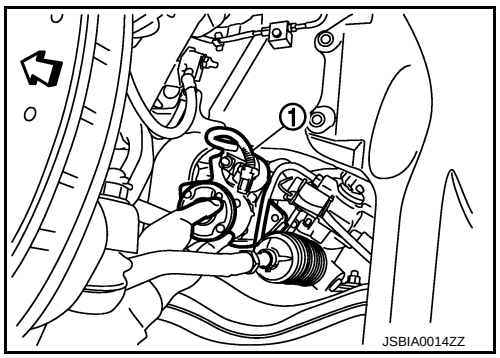
6. Disconnect “S” connector Ⓐ, and then remove starter motor mounting bolts Ⓑ.

⇦ : Vehicle front



7. Remove starter motor ① from the left side of vehicle.

⇦ : Vehicle front



INSTALLATION

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

CAUTION:

Be careful to tighten “B” terminal nut to the specified torque.

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Starter Motor

INFOID:0000000013599915

Applied model			VR30DDTT	
Type			Electric power steering models	Direct adaptive steering models
			S114-932	S114-967
			HITACHI make	
			Reduction gear type	
System voltage		[V]	12	
No-load	Terminal voltage	[V]	11	
	Current	[A]	Less than 110	
	Revolution	[rpm]	More than 2,700	
Minimum diameter of commutator		[mm (in)]	28.0 (1.102)	
Minimum length of brush		[mm (in)]	10.5 (0.413)	
Brush spring tension		[N (kg, lb)]	16.2 (1.65, 3.6)	
Clearance between bearing metal and armature shaft		[mm (in)]	Less than 0.2 (0.008)	
Clearance “L” between pinion front edge and pinion stopper		[mm (in)]	0.3 - 2.5 (0.012 - 0.098)	