SECTION STR
STARTING SYSTEM

CONTENTS

PRECAUTION

PRECAUTIONS

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

INFOID:0000000010957639

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. 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 Stop/Start System Service

INFOID:0000000010957657

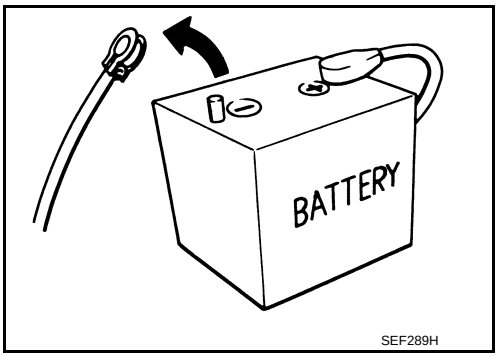
CAUTION:

When performing an inspection and its related work with the engine at idle, always turn the stop/start OFF switch ON or open the hood to release the stop/start system.

Precautions for Removing Battery Terminal

INFOID:0000000010957641

- With the adoption of Auto ACC function, ACC power is automatically supplied by operating the intelligent key or remote keyless entry or by opening/closing the driver side door. In addition, ACC power is supplied even after the ignition switch is turned to the OFF position, i.e. ACC power is supplied for a certain fixed time.
- When disconnecting the 12V battery terminal, turn off the ACC power before disconnecting the 12V battery terminal, observing “How to disconnect 12V battery terminal” described below.
  NOTE:
  Some ECUs operate for a certain fixed time even after ignition switch is turned OFF and ignition power supply is stopped. If the battery terminal is disconnected before ECU stops, accidental DTC detection or ECU data damage 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.



SEF289H

HOW TO DISCONNECT 12V BATTERY TERMINAL

Disconnect 12V battery terminal according to Instruction 1 or Instruction 2 described below.
For vehicles parked by ignition switch OFF, refer to Instruction 2.

INSTRUCTION 1

1. Open the hood.
2. Turn key switch to the OFF position with the driver side door opened.
3. Get out of the vehicle and close the driver side door.
4. Wait at least 3 minutes. For vehicle with the engine listed below, remove the battery terminal after a lapse of the specified time.

D4D engine	: 20 minutes
HRA2DDT	: 12 minutes
K9K engine	: 4 minutes
M9R engine	: 4 minutes
R9M engine	: 4 minutes
V9X engine	: 4 minutes

CAUTION:
While waiting, never operate the vehicle such as locking, opening, and closing doors. Violation of this caution results in the activation of ACC power supply according to the Auto ACC function.

5. Remove 12V battery terminal.
CAUTION:
After installing 12V battery, always check self-diagnosis results of all ECUs and erase DTC.

INSTRUCTION 2 (FOR VEHICLES PARKED BY IGNITION SWITCH OFF)

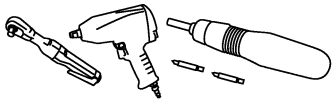
1. Unlock the door with intelligent key or remote keyless entry.
NOTE:
At this moment, ACC power is supplied.
2. Open the driver side door.
3. Open the hood.
4. Close the driver side door.
5. Wait at least 3 minutes.
CAUTION:
While waiting, never operate the vehicle such as locking, opening, and closing doors. Violation of this caution results in the activation of ACC power supply according to the Auto ACC function.
6. Remove 12V battery terminal.
CAUTION:
After installing 12V battery, always check self-diagnosis results of all ECUs and erase DTC.

PREPARATION

PREPARATION

Commercial Service Tools

INFOID:0000000010957642

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

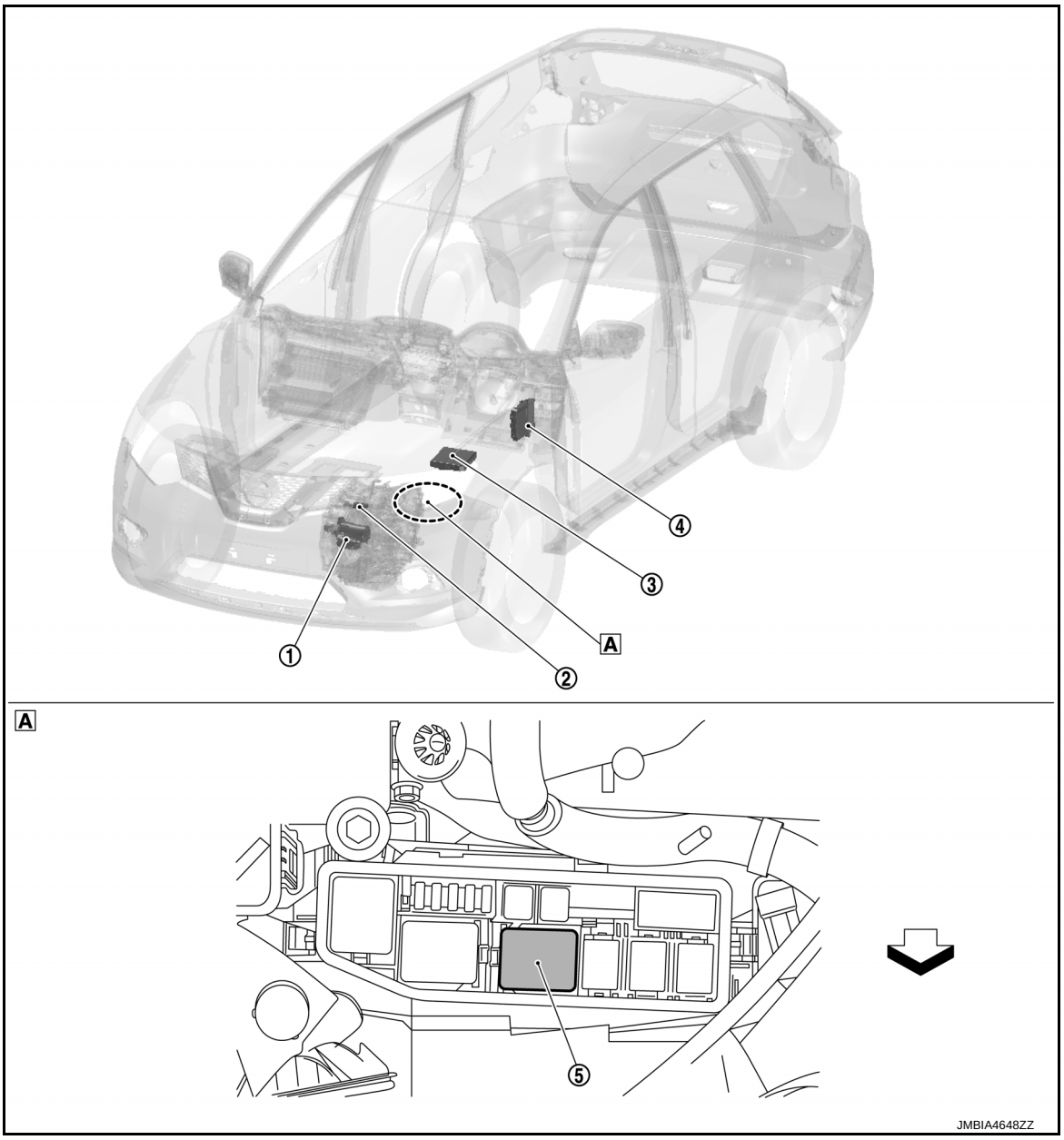
SYSTEM DESCRIPTION

COMPONENT PARTS

Component Parts Location

INFOID:0000000010957652

QR ENGINE



A Front side of IPDM E/R

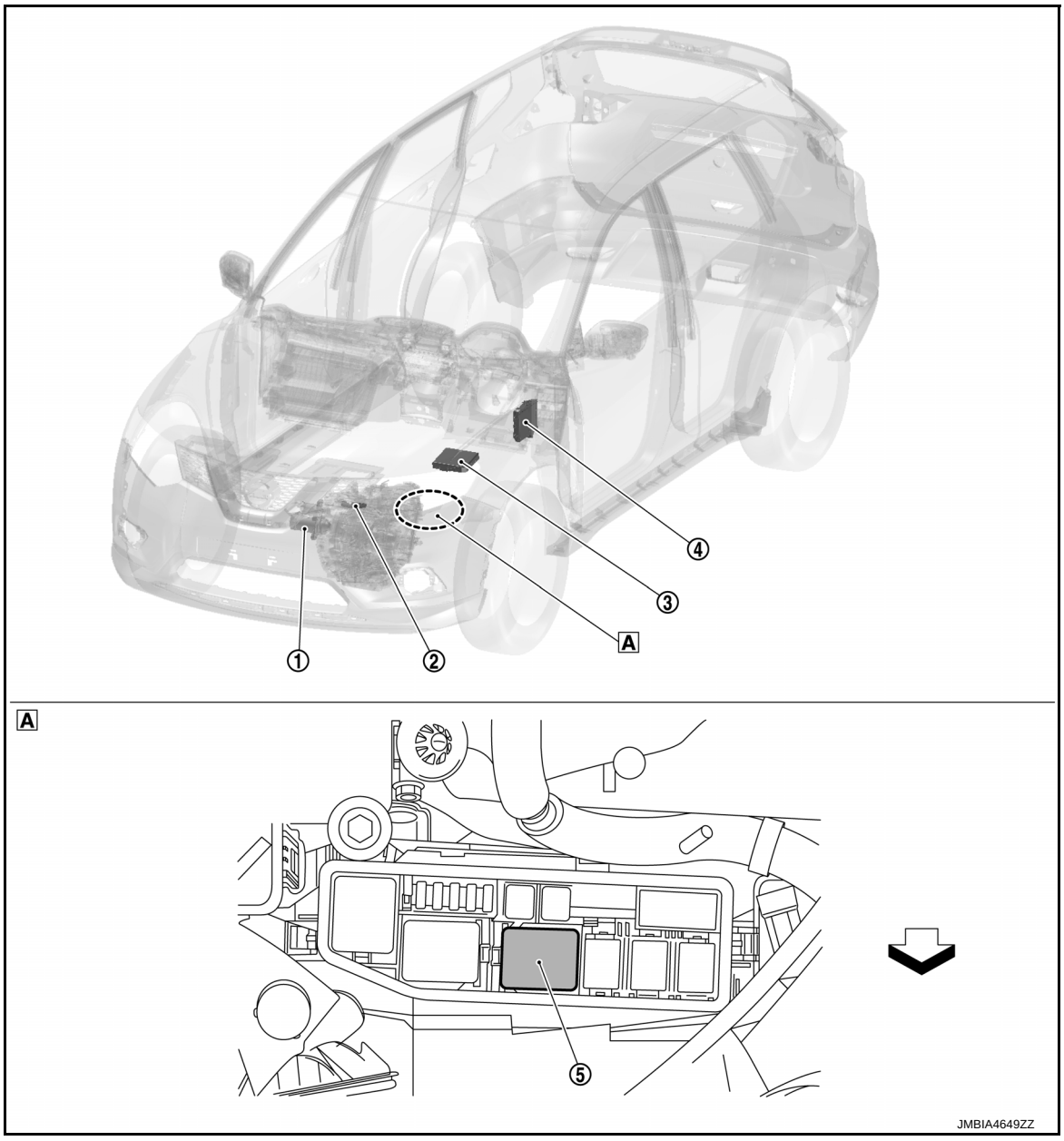
⇦ : Vehicle front

No.	Component	Function
①	Starter motor	Refer to STR-8, "Starter motor".
②	Transmission range switch	Transmission range switch supplies power to the starter relay inside IPDM E/R when the selector lever is shifted to the “P” or “N” position.

No.	Component	Function
③	IPDM E/R	CPU inside IPDM E/R controls starter relay. Refer to PCS-5, "Component Parts Location" for detailed installation location.
④	BCM	BCM controls starter control relay. Refer to BCS-6, "BODY CONTROL SYSTEM : Component Parts Location" for detailed installation location.
⑤	Starter control relay	Power is supplied to the starter control relay with BCM control.

EXCEPT FOR QR ENGINE

For LHD models

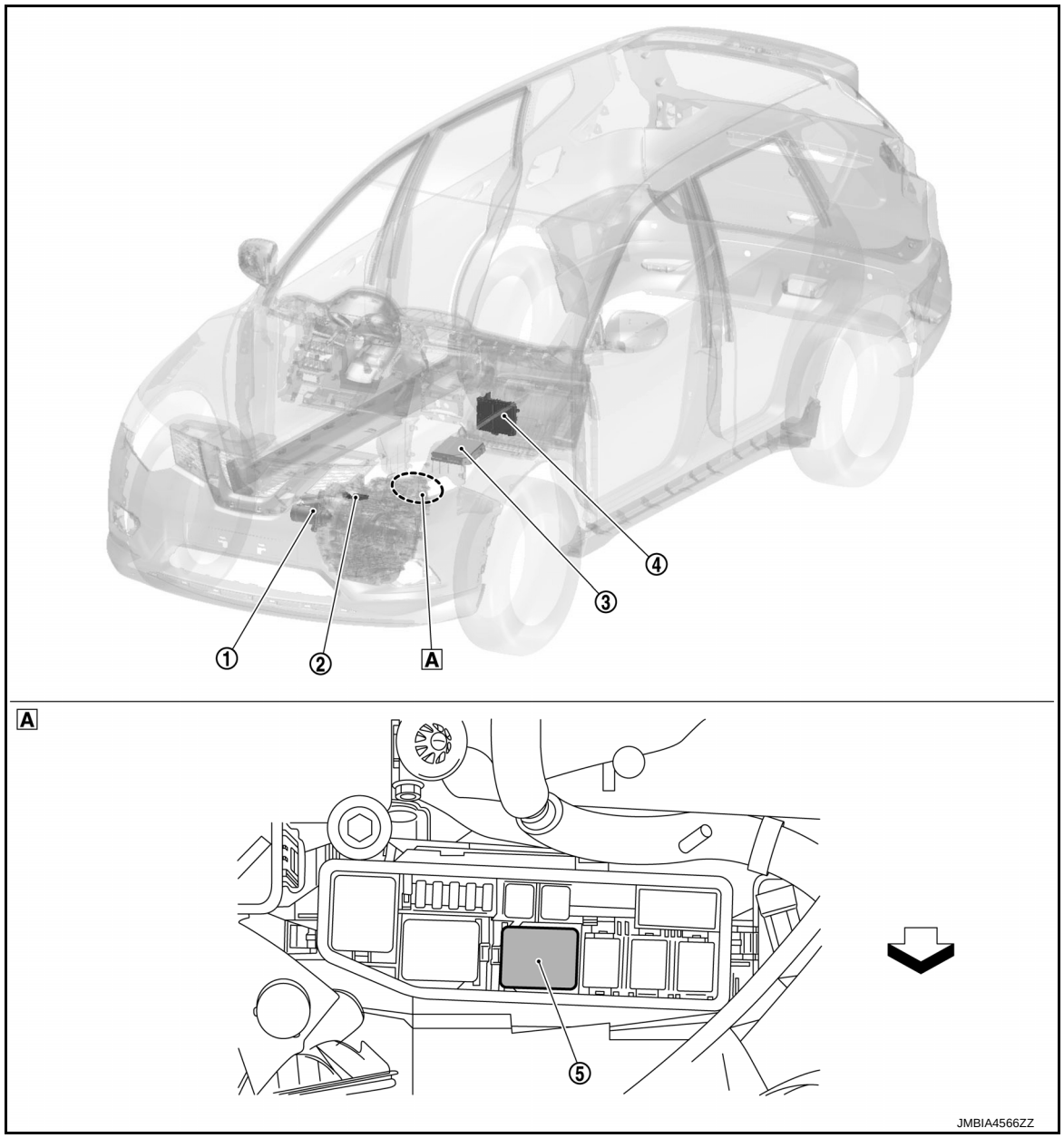


A Front side of IPDM E/R

⇦ : Vehicle front

No.	Component	Function
①	Starter motor	Refer to STR-8, "Starter motor".
②	Transmission range switch (For CVT models)	Transmission range switch supplies power to the starter relay inside IPDM E/R when the selector lever is shifted to the “P” or “N” position.
③	IPDM E/R	CPU inside IPDM E/R controls starter relay. Refer to PCS-5, "Component Parts Location" for detailed installation location.
④	BCM	BCM controls starter control relay. Refer to BCS-6, "BODY CONTROL SYSTEM : Component Parts Location" for detailed installation location.
⑤	Starter control relay	Power is supplied to the starter control relay with BCM control.

For RHD models



A Front side of IPDM E/R

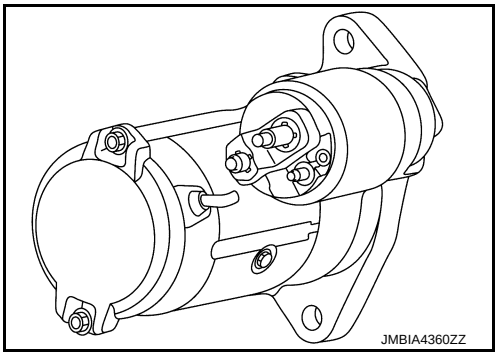
⇦ : Vehicle front

No.	Component	Function
①	Starter motor	Refer to STR-8, "Starter motor".
②	Transmission range switch (For CVT models)	Transmission range switch supplies power to the starter relay inside IPDM E/R when the selector lever is shifted to the “P” or “N” position.
③	IPDM E/R	CPU inside IPDM E/R controls starter relay. Refer to PCS-5, "Component Parts Location" for detailed installation location.
④	BCM	BCM controls starter control relay. Refer to BCS-6, "BODY CONTROL SYSTEM : Component Parts Location" for detailed installation location.
⑤	Starter control relay	Power is supplied to the starter control relay with BCM control.

Starter motor

INFOID:0000000010957644

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.

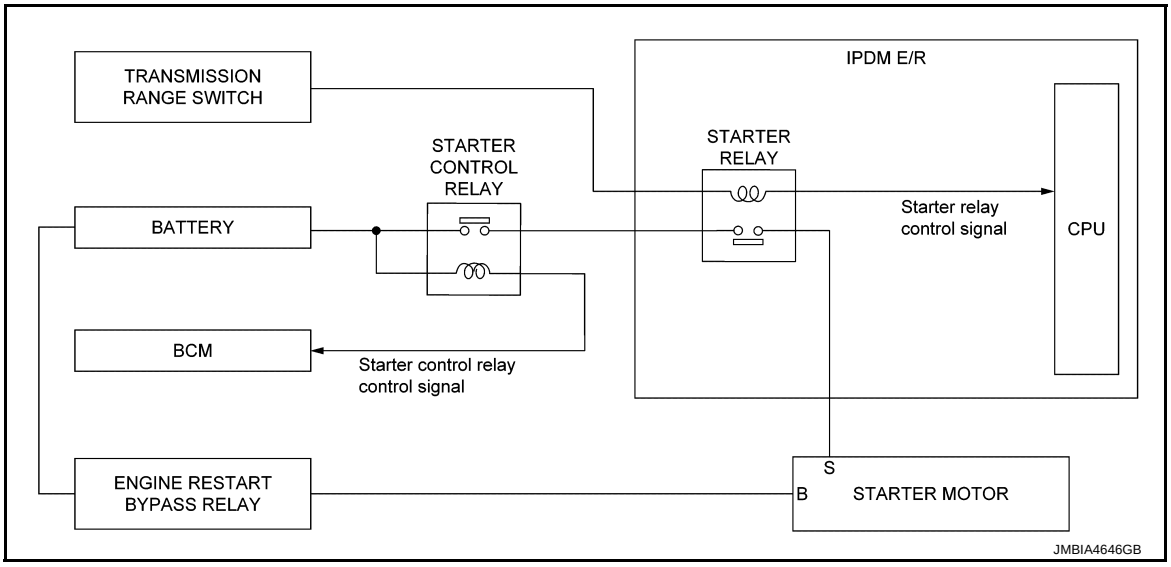


SYSTEM
STARTING SYSTEM
STARTING SYSTEM : System Description

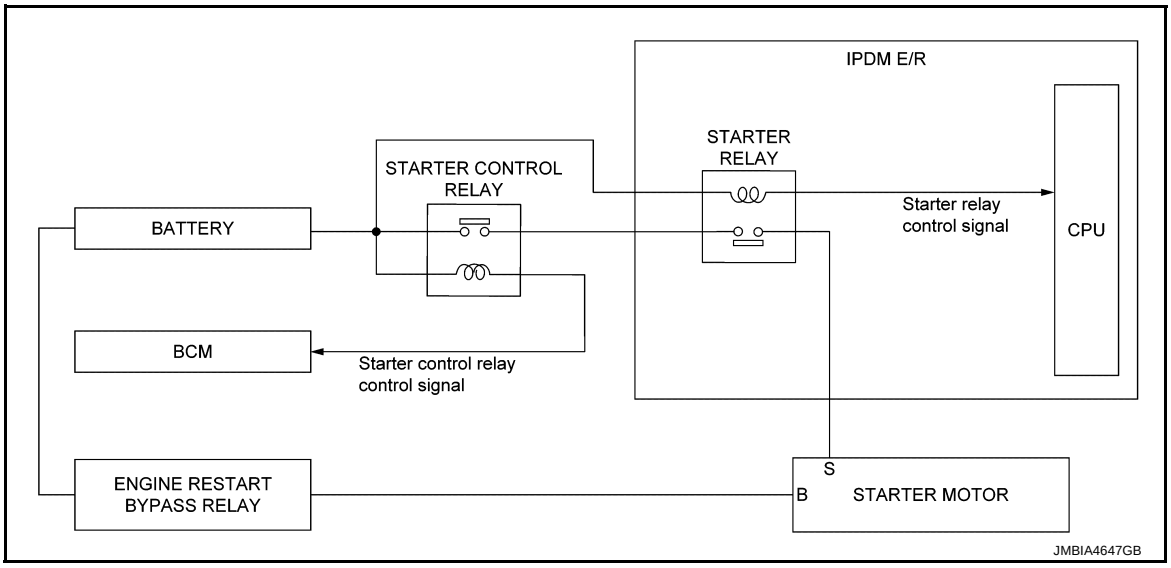
INFOID:0000000010957645

SYSTEM DIAGRAM

CVT Models



MT Models



NOTE:
For models without stop/start system, starter motor “B” terminal is connect to battery directly.

SYSTEM DESCRIPTION

CVT Models
- “B” terminal is constantly supplied with battery power*.
- When selector lever is P or N, power is supplied to starter control relay by transmission range switch.
- When starter operating condition is satisfied, IPDM E/R turns starter relay ON by starter relay control signal.
- When engine cranking condition is satisfied, BCM turns starter control relay ON by starter control relay control signal.
- Then battery power is supplied to starter motor (“S” terminal) through starter control relay and starter relay.

M/T Models
- “B” terminal is constantly supplied with battery power*.
- When starter operating condition is satisfied, IPDM E/R turns starter relay ON by starter relay control signal.

< SYSTEM DESCRIPTION >

- When engine cranking condition is satisfied, BCM turns starter control relay ON by starter control relay control signal.
- Then battery power is supplied to starter motor (“S” terminal) through starter relay and starter control relay.

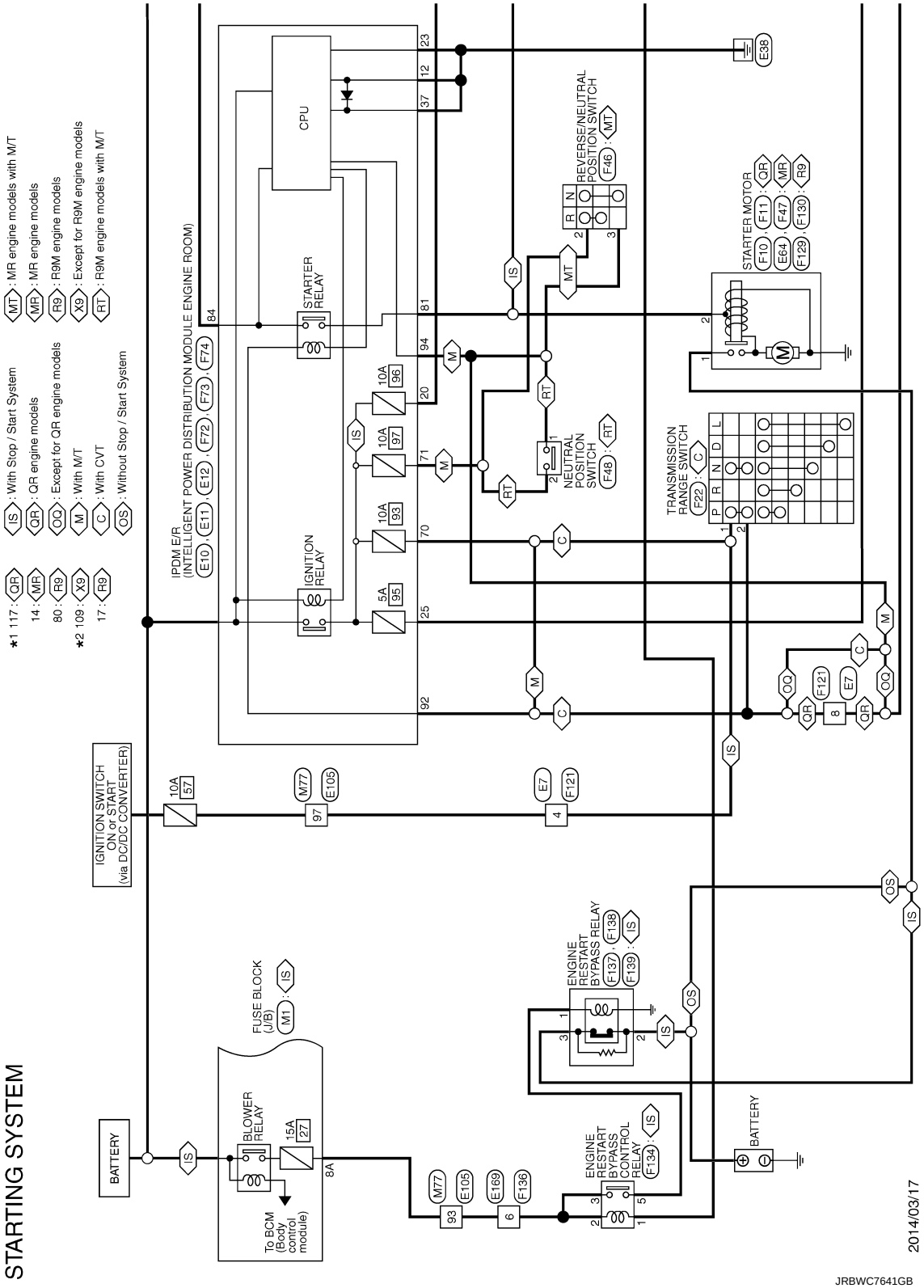
*: For models with stop/start system, starter motor “B” terminal receives the battery power via engine restart bypass relay.

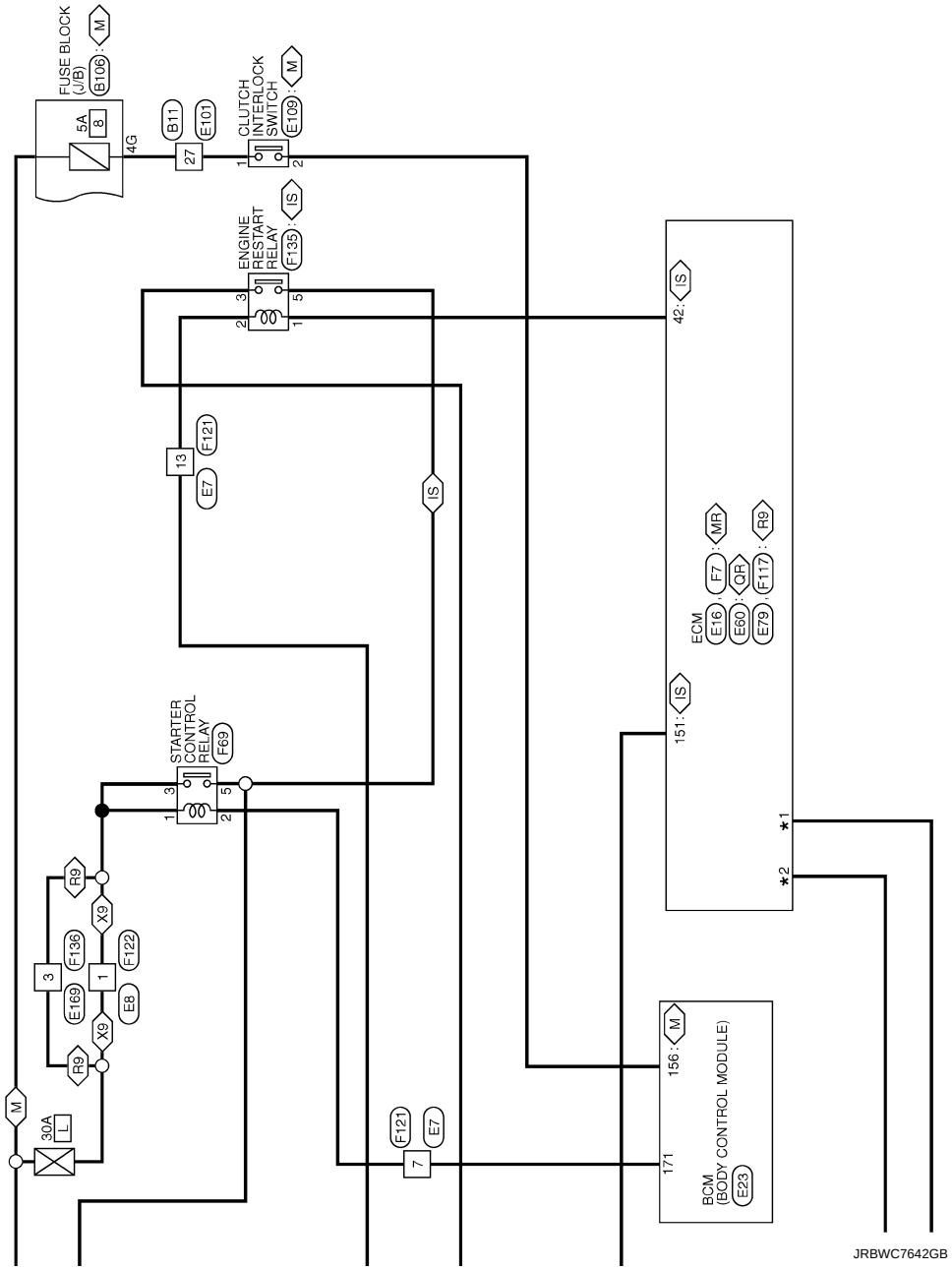
WIRING DIAGRAM

STARTING SYSTEM

Wiring Diagram

INFOID:0000000010957646




FUSE BLOCK (J/B)
B106
M
5A
8
4G
B11
E101
27
CLUTCH INTERLOCK SWITCH
E109
M
1
2
ENGINE RESTART RELAY
F135
IS
3
5
2
1
13
F121
E7
IS
STARTER CONTROL RELAY
F69
3
5
1
2
R9
X9
F136
E169
3
1
F122
E8
X9
R9
M
30A
L
F121
E7
7
42
IS
ECM
E16
E60
E79
F7
QR
F117
MR
R9
151
IS
*1
*2
156
M
171
BCM (BODY CONTROL MODULE)
E23
JRBWC7642GB

STARTING SYSTEM

Connector No.	B11
Connector Name	WIRE TO WIRE
Connector Type	TH80MDGY-CS16-TM4

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	-
2	LA/BR	-
5	BG	-
11	BR	-
12	W	-
13	P	-
14	SB	-
15	V	-
16	P	-
17	P	-
18	G	-
19	P	-
20	R	-
21	BR	-
22	Y	-
23	BG	-
24	SB	-
25	G	-
26	B	-
27	P	-
28	R	-
29	LG	-
30	P	-
92	BR	-
93	GR	-
94	Y	-
95	LG	-
97	LG	-

Connector No.	B106
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS06FW-CS

Terminal No.	Color Of Wire	Signal Name [Specification]
1G	LA/R	-
2G	P	-
3G	G	-
4G	P	-
5G	G	-

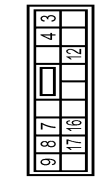
Connector No.	E7
Connector Name	WIRE TO WIRE
Connector Type	NS16MBR-CS

Terminal No.	Color Of Wire	Signal Name [Specification]
1	BR	- [With MR20 or QR25 engine]
1	SB	- [With R9M engine]
2	BR	- [With MR20 or QR25 engine]
2	GR	- [With R9M engine]
3	G	-
4	R	-
5	B	- [With MR20 engine]
5	L	- [With R9M engine]
5	LG	- [With QR25 engine]
6	BG	-
7	G	-
8	V	- [With MR20 engine or R9M engine]
8	W	- [With QR25 engine]
9	BG	- [With R9M engine]
9	BR	- [With MR20 engine]
10	BR	-
11	Y	-
12	L	- [With R9M Engine]
12	LG	- [With QR25 engine]
13	BR	- [With MR20 or QR25 engine]
13	R	- [With R9M engine]
15	L	-
16	SB	-

Connector No.	E8
Connector Name	WIRE TO WIRE
Connector Type	M02MW-LC

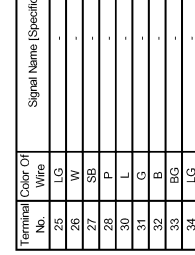
Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-

Connector No.	E10
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS16FGY-CS



Terminal No.	Color Of Wire	Signal Name [Specification]
3	P	-
4	Y	-
7	L	-
8	BG	-
9	L	-
12	B	-
16	G	-
17	W	-

Connector No.	E11
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	renault_243405408R

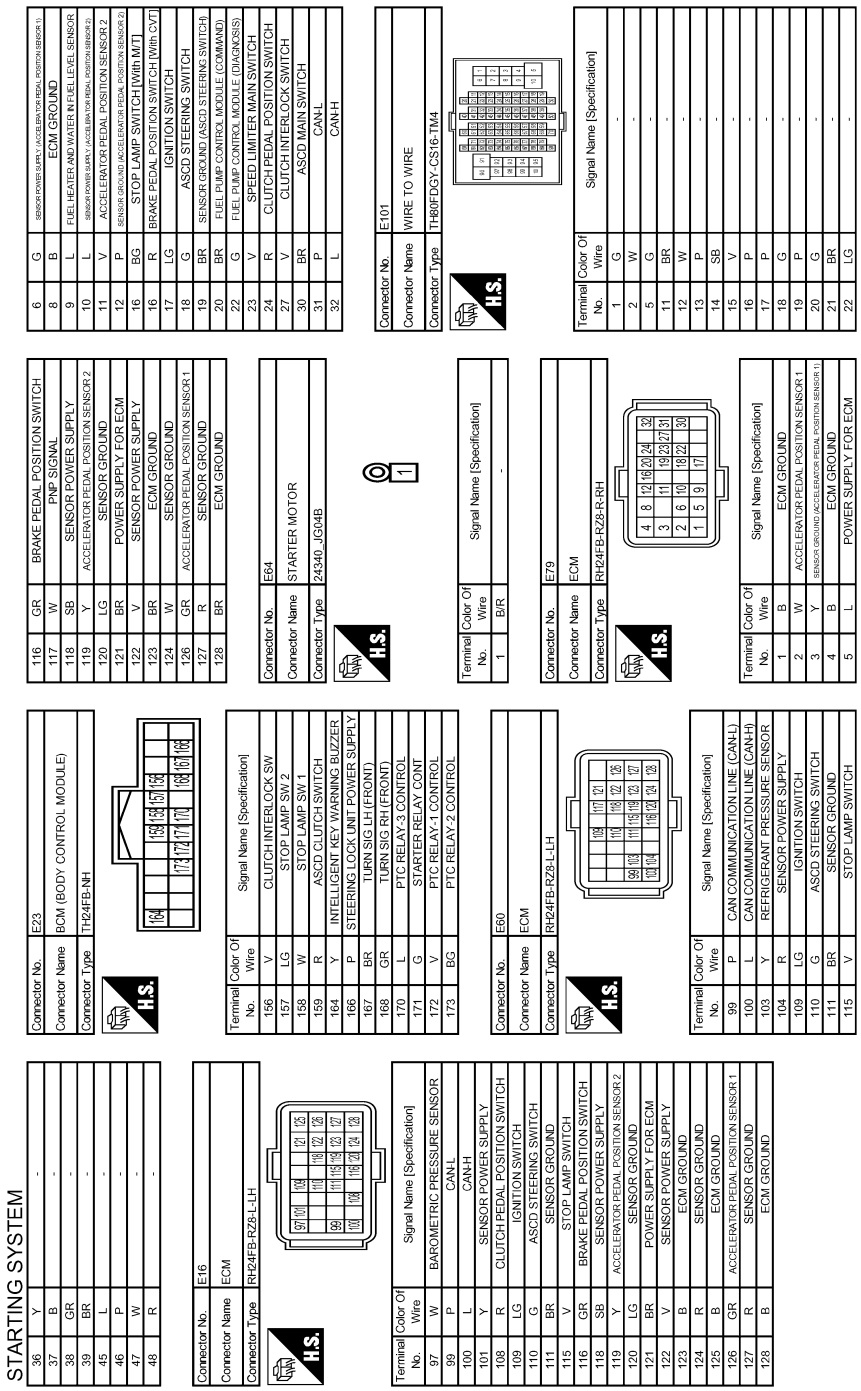


Terminal No.	Color Of Wire	Signal Name [Specification]
19	V	-
20	R	-
21	LG	-
22	Y	-
23	B	-
24	W	-

Connector No.	E12
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH24FGY-NH

Terminal No.	Color Of Wire	Signal Name [Specification]
25	LG	-
26	W	-
27	SB	-
28	P	-
30	L	-
31	G	-
32	B	-
33	BG	-
34	LG	-
35	V	-

JRBWC7643GB



JRBWC7644GB

STARTING SYSTEM

23	Y	-
24	SB	-
25	G	-
26	B	-
27	P	-
28	R	-
29	LG	-
30	P	-
92	BR	-
93	GR	-
94	R	-
95	L	-
97	LG	-

48	SB	-
51	P	-
52	L	-
53	W	-
54	Y	-
55	BR	-
56	P	-
57	B	-
58	L	-
59	W	-
60	G	-
61	BR	-
62	V	-
63	BR	-
64	GR	-
65	LG	-
66	BG	-
67	L	-
68	R	-
71	V	-
72	L	-
73	R	-
76	L	-
77	V	-
78	LG	-
79	SHIELD	-
80	GR	-
82	Y	-
83	SB	-
84	L	-
85	G	-
86	Y	-
87	B	-
88	B	-
91	R	-
92	BR	-
93	W	-
96	GR	-
98	V	-
99	Y	-

Connector No.	E105
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
2	W	-
5	V	- [Without ISS]
5	W	- [With ISS]
8	L	-
9	LG	-
10	W	-
20	W	-
21	B	-
22	SHIELD	-
31	Y	-
32	W	-
33	SB	-
34	LG	-
35	BG	-
36	LG	-
37	V	-
38	G	-
39	BR	-
40	L	-
41	P	-
47	GR	-

Connector No.	E109
Connector Name	CLUTCH INTERLOCK SWITCH
Connector Type	M02FBR-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	-
2	V	-

Connector No.	E169
Connector Name	WIRE TO WIRE
Connector Type	M06MW-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	BG	-
3	L	-
4	W	-
5	G	-
6	W	-

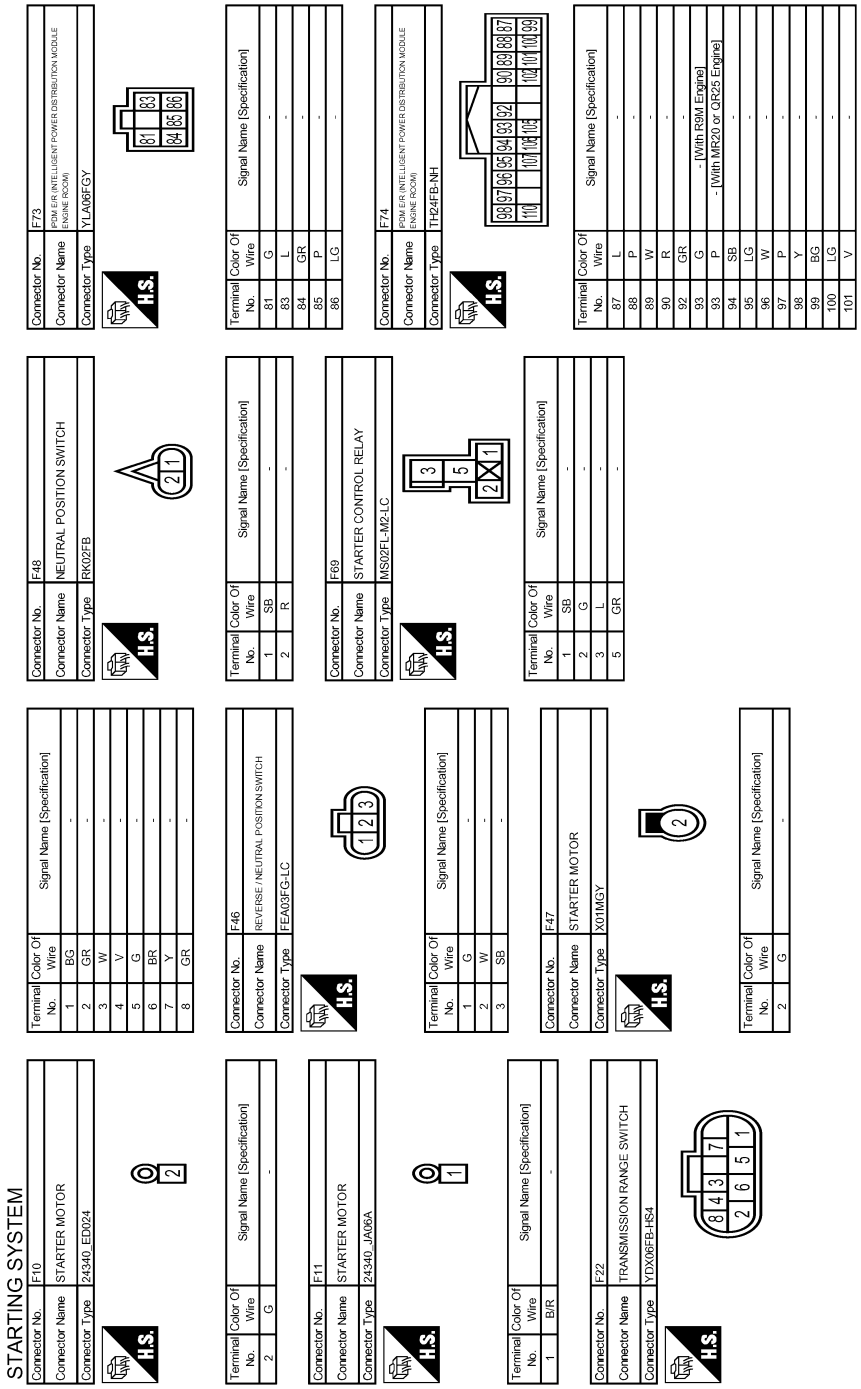
Connector No.	F7
Connector Name	ECM
Connector Type	RH40FB-RZ8-R-LH

H.S.

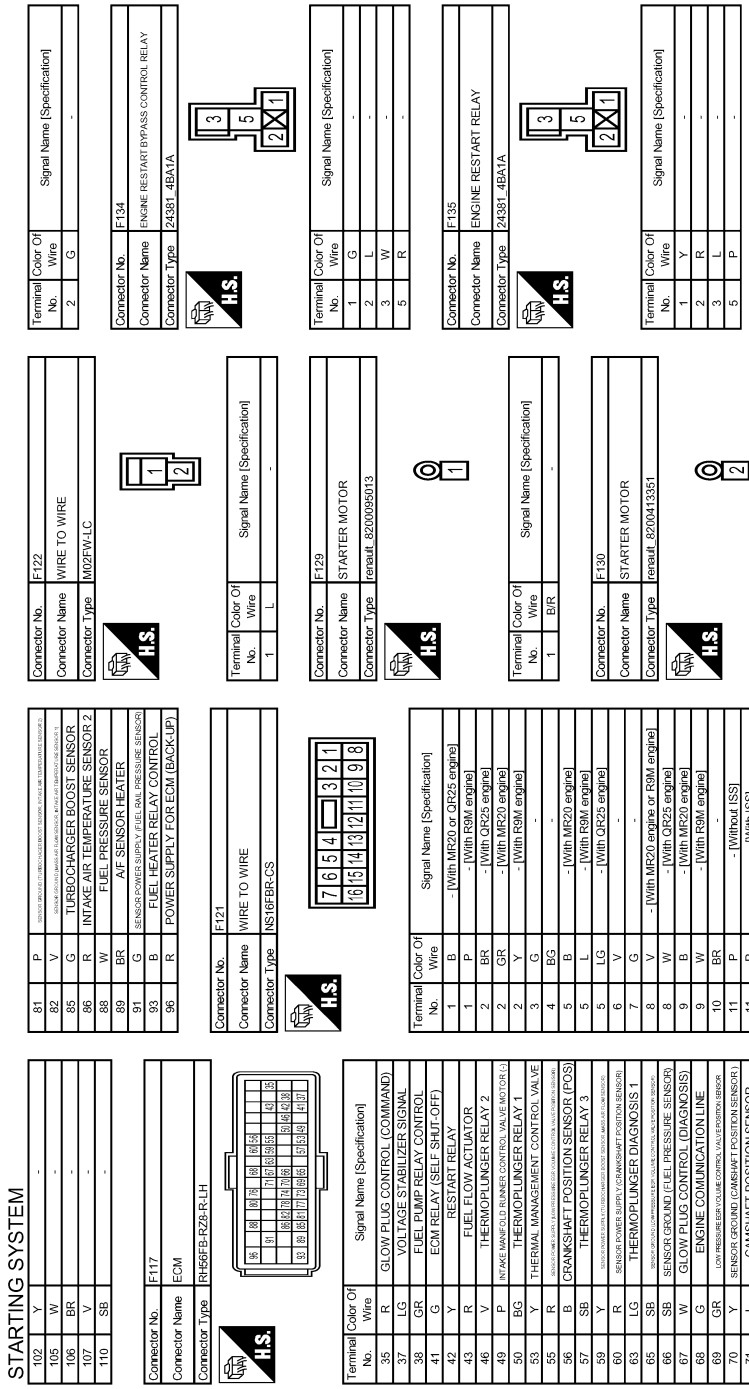
Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	FUEL INJECTOR NO.1(HI)
2	W	FUEL INJECTOR NO.2(HI)
3	W	FUEL INJECTOR NO.3(HI)
4	W	FUEL INJECTOR NO.4(HI)
5	B	FUEL INJECTOR NO.1(LO)
6	B	FUEL INJECTOR NO.2(LO)
7	B	FUEL INJECTOR NO.3(LO)
8	B	FUEL INJECTOR NO.4(LO)
11	B	ECM GROUND
12	BR	SHIELD
14	W	PARK/NEUTRAL POSITION SIGNAL
15	R	GNDA-PHASE
19	W	CAMSHAFT POSITION SENSOR
20	L	SENSOR GROUND
21	L	SENSOR POWER SUPPLY
23	Y	SENSOR POWER SUPPLY
24	Y	SENSOR POWER SUPPLY
25	L	SENSOR GROUND
28	BR	MASS AIR FLOW SENSOR
29	GR	ENGINE OIL PRESSURE SENSOR
31	G	ENGINE COOLANT TEMPERATURE SENSOR
32	P	ENGINE OIL TEMPERATURE SENSOR
33	G	FUEL RAIL PRESSURE SENSOR
34	P	REFRIGERANT PRESSURE SENSOR
35	V	INTAKE AIR TEMPERATURE SENSOR
36	SHIELD	SENSOR GROUND
39	R	SENSOR GROUND
40	W	KNOCK SENSOR
42	B	SENSOR GROUND
43	G	SENSOR POWER SUPPLY
44	BR	SENSOR GROUND
45	G	LIN COMMUNICATION LINE [Without ISS]
45	L	LIN COMMUNICATION LINE [With ISS]
46	LG	EXHAUST VALVE TIMING CONTROL POSITION SENSOR
48	GR	CRANKSHAFT POSITION SENSOR

JRBWC7645GB

STARTING SYSTEM



JRBWC7646GB



JRBWC7647GB

STARTING SYSTEM

Connector No.	F136
Connector Name	WIRE TO WIRE
Connector Type	M06FW-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	BG	-
3	L	-
4	W	-
5	BG	-
6	W	-

Connector No.	F137
Connector Name	ENGINE RESTART BYPASS RELAY
Connector Type	E-BA8

H.S.

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

Connector No.	F138
Connector Name	ENGINE RESTART BYPASS RELAY
Connector Type	E-BA8

H.S.

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

Connector No.	F139
Connector Name	ENGINE RESTART BYPASS RELAY
Connector Type	X01FGY

H.S.

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

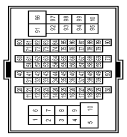
Connector No.	M1
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS06FW-M2

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1A	L	-
2A	LG	-
3A	Y	-
4A	LG	-
5A	R	-
6A	BG	-
7A	BR	-
8A	SB	-

Connector No.	M77
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
2	LA/R	-
5	V	- [Without ISS]
5	W	- [With ISS]
8	G	-
9	Y	-
10	R	-
20	W	-
21	B	-
22	SHIELD	-
31	V	-
32	GR	-
33	G	-
34	LG	-
35	BG	-
36	LG	-
37	V	-
38	G	-
39	BR	-
40	L	-
41	P	-
47	Y	-
48	BG	-
51	GR	-
52	SB	-
53	R	-
54	LA/L	-
55	BR	-
56	P	-
57	B	-
58	L	-
59	W	-
60	LA/R	-
61	P	-
62	V	-
63	LA/BR	-
64	Y	-
65	GR	-
66	BG	-
67	L	-
68	R	-
71	V	-
72	L	-
73	Y	-
76	L	-
77	V	-
78	LG	-
79	SHIELD	-
80	L	- [With ISS]
80	LA/L	- [Without ISS]
82	GR	-
83	LG	-
84	SB	-
85	G	-
86	G	-
87	B	-
88	B	-
91	L	-
92	W	-
93	W	-
96	LG	-
97	BR	-
98	V	-
99	R	-

JRBWC7648GB

BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow

INFOID:0000000010957647

DETAILED FLOW

NOTE:

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

CAUTION:

For models with stop/start system, erase the starter operation counter when the starter motor is replaced. Refer to EC-960, "Work Procedure".

1.CHECK ENGINE TYPE

Check the vehicle information.

Type	Engine
1	R9M engine
2	QR engine
	MR engine

>> GO TO 2.

2.CHECK ENGINE START

Crank the engine and check that the engine starts.

Does the engine start?

YES >> GO TO 3.
NO >> GO TO 4.

3.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-1 >> Type 1: Replace starter motor.
NO-2 >> Type 2: Replace magnetic switch.

4.CHECK THE ENGINE SPEED WITH CRANKING

Check that the engine runs at cranking.

Does engine turn by cranking?

YES >> GO TO 5.
NO >> GO TO 6.

5.CHECK THE ENGINE SPEED WITH CRANKING

Check that the engine speed is not low at cranking.

Does engine turn normally?

YES >> Check ignition/fuel system.
NO >> Check charge condition, corrosion and connection condition of the battery. Refer to PG-120, "R9M : Work Flow" (R9M engine) or PG-124, "EXCEPT FOR R9M : Work Procedure" (Except for R9M engine).

6.CHECK STARTER MOTOR ACTIVATION

Check that the starter motor runs at cranking.

Does starter motor turn?

YES-1 >> Type 1: Replace starter motor.
YES-2 >> Type 2: GO TO 7.
NO >> GO TO 8.

7.CHECK STARTER MOTOR UNIT

1. Remove starter motor.
2. Check that the gear shaft of starter motor rotates.

Does gear shaft turn?

YES >> Check pinion clutch. Refer to STR-28, "MR20DD : Inspection" (MR engine) or STR-35, "QR25DE : Inspection" (QR engine)
NO >> Check reduction gear, armature and gear shaft.

8.CHECK POWER SUPPLY CIRCUIT

Check the following conditions.
- Fuse and fusible link
- Charge condition, corrosion and connection condition of the battery. Refer to PG-120, "R9M : Work Flow" (R9M engine) or PG-124, "EXCEPT FOR R9M : Work Procedure" (Except for R9M engine).

Are these inspection results normal?

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

9.CHECK STARTING SYSTEM WIRING

Check the following.
- “B” terminal circuit. Refer to STR-21, "Diagnosis Procedure".
- “S” terminal circuit. Refer to STR-23, "Diagnosis Procedure".

Are these inspection results normal?

YES-1 >> Type 1: Replace starter motor.
YES-2 >> Type 2: GO TO 10.
NO >> Repair as needed.

10.CHECK MAGNETIC SWITCH OPERATION SOUND

Check that a magnetic switch operation sound can be heard when the ignition switch is set at the starting position.

Does magnetic switch operation sound occur?

YES >> GO TO 11.
NO >> Replace magnetic switch.

11.PINION AND RING GEAR ENGAGEMENT CHECK

Check condition of pinion and ring gear mesh.

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12.CHECK STARTER MOTOR UNIT

Check the following.
- Adjust pinion movement. Refer to STR-28, "MR20DD : Inspection" (MR engine) or STR-35, "QR25DE : Inspection" (QR engine).
- Check pinion moving mechanism.
- Check ring gear.

Are these inspection results normal?

YES >> INSPECTION END
NO >> Repair or replace, if necessary.

13.CHECK STARTER MOTOR UNIT

Check that the starter motor runs when connecting the positive terminal (12 V) to starter motor terminal M and the negative terminal (ground) to starter motor body.

Does the starter motor run?

YES >> Replace magnetic switch.
NO >> Repair starter motor.

DTC/CIRCUIT DIAGNOSIS

B TERMINAL CIRCUIT

Diagnosis Procedure

INFOID:0000000010957648

CAUTION:

- **Perform diagnosis under the condition that engine cannot start by the following procedure.**
- **Remove fuel pump fuse.**
- **Crank or start the engine (where possible) until the fuel pressure is released.**
- **For models with stop/start system, erase the starter operation counter when the starter motor connector is disconnected. Refer to EC-960, "Work Procedure".**

1. CHECK “B” TERMINAL CIRCUIT 1

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.

For QR engine

(+)		(–)	Voltage (Approx.)
Starter motor			
Connector	Terminal		
F11	1	Ground	Battery voltage

For MR engine

(+)		(–)	Voltage (Approx.)
Starter motor			
Connector	Terminal		
E64	1	Ground	Battery voltage

For R9M engine

(+)		(–)	Voltage (Approx.)
Starter motor			
Connector	Terminal		
F129	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO-1 >> For models with stop/start system: GO TO 4.
NO-2 >> For models without stop/start system: Check harness between battery and starter motor for open circuit.

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

1. Shift selector lever to “P” or “N” position. (CVT models)
   Keep depressing clutch pedal fully. (M/T models)
2. Check voltage between battery positive terminal and starter motor “B” terminal.

For QR engine

(+)	(–)		Condition	Voltage (Approx.)
	Starter motor			
	Connector	Terminal		
Battery positive terminal	F11	1	When the ignition switch is in START position	Less than 0.5 V

For MR engine

(+)	(–)		Condition	Voltage (Approx.)
	Starter motor			
	Connector	Terminal		
Battery positive terminal	E64	1	When the ignition switch is in START position	Less than 0.5 V

For R9M engine

(+)	(–)		Condition	Voltage (Approx.)
	Starter motor			
	Connector	Terminal		
Battery positive terminal	F129	1	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 selector lever to “P” or “N” position. (CVT models)
   Keep depressing clutch pedal fully. (M/T models)
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-19, "Work Flow".
NO >> Check the starter motor case and ground for poor continuity.

4.CHECK “B” TERMINAL CIRCUIT 2

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

Starter motor		Engine restart bypass relay		Continuity
Connector	Terminal	Connector	Terminal	
F129	1	F138	3	Existed

Is the inspection result normal?

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

5.CHECK ENGINE RESTART BYPASS RELAY CIRCUIT

Check voltage between engine restart bypass relay harness connector and ground.

(+)		(–)	Voltage (Approx.)
Engine restart bypass relay			
Connector	Terminal		
F137	2	Ground	Battery voltage

Is the inspection result normal?

YES >> Replace engine restart bypass relay. Refer to EC-1230, "Removal and Installation".
NO >> Repair or replace harness.

S TERMINAL CIRCUIT

Diagnosis Procedure

INFOID:0000000010957649

CAUTION:

- **Perform diagnosis under the condition that engine cannot start by the following procedure.**
- **Remove fuel pump fuse.**
- **Crank or start the engine (where possible) until the fuel pressure is released.**
- **For models with stop/start system, erase the starter operation counter when the starter motor connector is disconnected. Refer to EC-960, "Work Procedure".**

1. CHECK “S” TERMINAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect starter motor connector.
3. Shift selector lever to “P” or “N” position. (CVT models)
   Keep depressing clutch pedal fully. (M/T models)
4. Check voltage between starter motor harness connector and ground.

For QR engine

(+)		(–)	Condition	Voltage (Approx.)
Starter motor				
Connector	Terminal			
F10	2	Ground	When the ignition switch is in START position	Battery voltage

For MR engine

(+)		(–)	Condition	Voltage (Approx.)
Starter motor				
Connector	Terminal			
F47	2	Ground	When the ignition switch is in START position	Battery voltage

For R9M engine

(+)		(–)	Condition	Voltage (Approx.)
Starter motor				
Connector	Terminal			
F130	2	Ground	When the ignition switch is in START position	Battery voltage

Is the inspection result normal?

YES >> “S” terminal circuit is OK. Further inspection is necessary. Refer to STR-19, "Work Flow".
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.

For QR engine

Starter motor		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F10	2	F73	81	Existed

For MR engine

Starter motor		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F47	2	F73	81	Existed

For R9M engine

Starter motor		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F130	2	F73	81	Existed

Is the inspection result normal?

YES >> Further inspection is necessary. Refer to SEC-97, "Work Flow" (With Intelligent Key System) or SEC-259, "Work Flow" (Without Intelligent Key System).

NO >> Repair or replace harness.

SYMPTOM DIAGNOSIS

STARTING SYSTEM

Symptom Table

INFOID:0000000010957650

Symptom	Reference
No normal cranking	Refer to STR-19, "Work Flow".
Starter motor does not rotate	

REMOVAL AND INSTALLATION

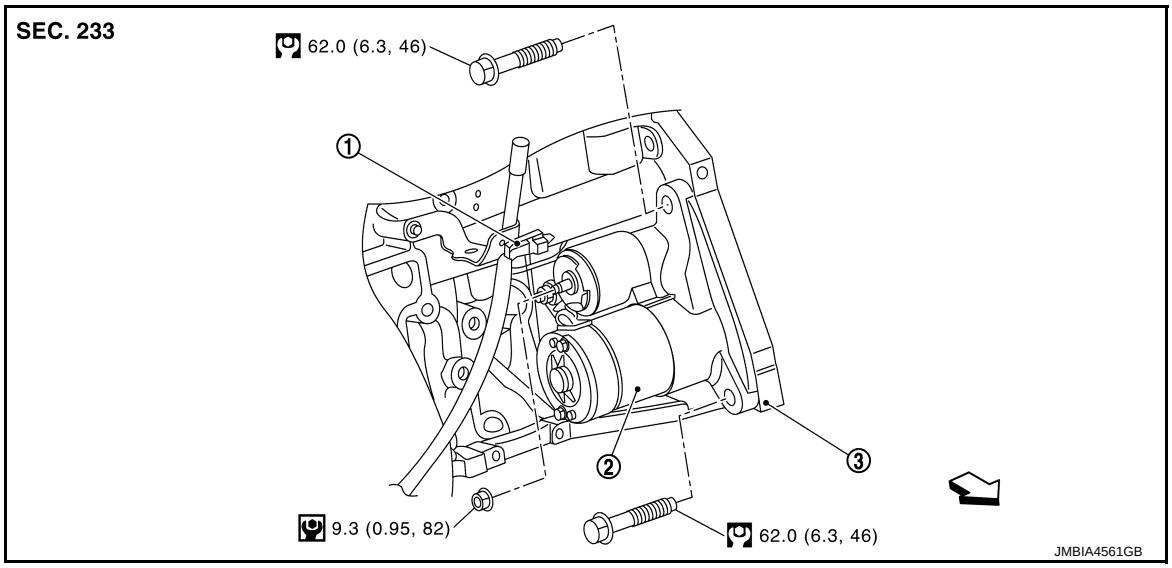
STARTER MOTOR

MR20DD

MR20DD : Exploded View

INFOID:0000000010728720

REMOVAL



① “S” terminal connector ② Starter motor ③ Cylinder block

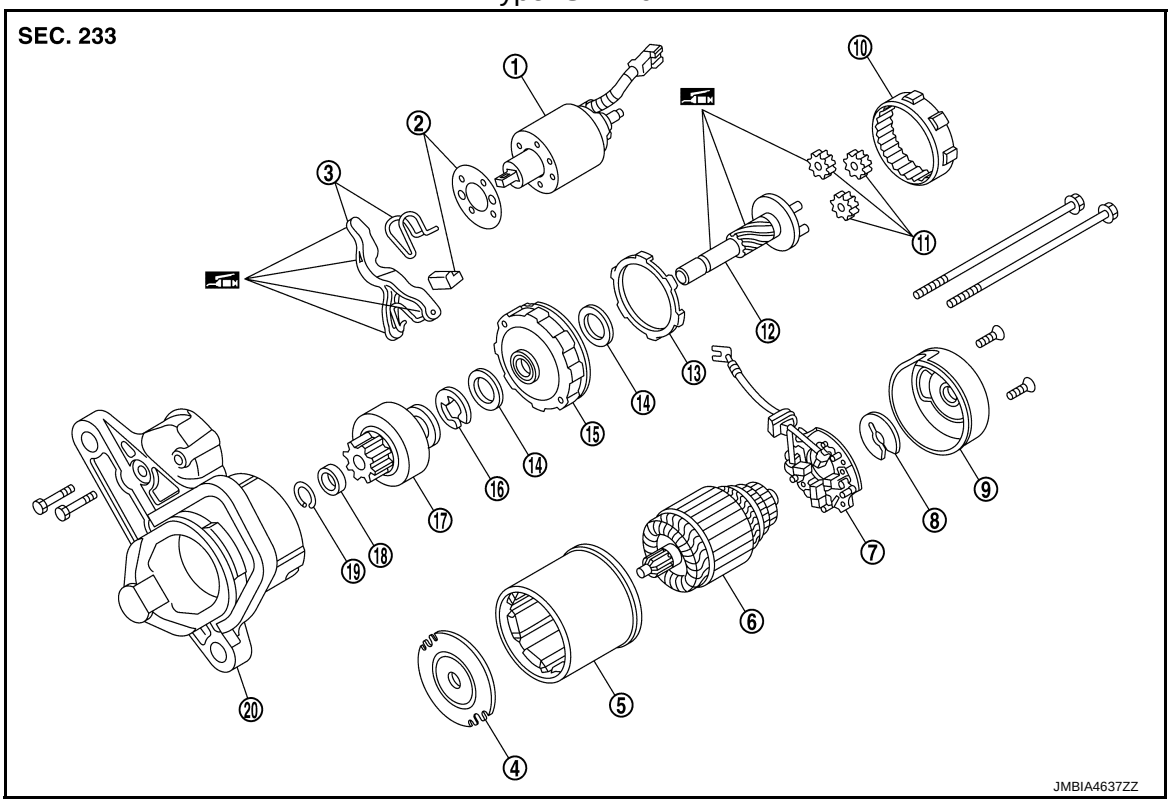
⇦ : Vehicle front

: N·m (kg-m, in-lb)

: N·m (kg-m, ft-lb)

DISASSEMBLY

Type: S114-971



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 Internal gear	⑪ Planetary gear	⑫ Pinion shaft
⑬ Packing	⑭ Thrust washer	⑮ Center bracket (P)
⑯ E-ring	⑰ Pinion assembly	⑱ Pinion stopper
⑲ Pinion stopper clip	⑳ Gear case assembly	

: High-temperature grease point

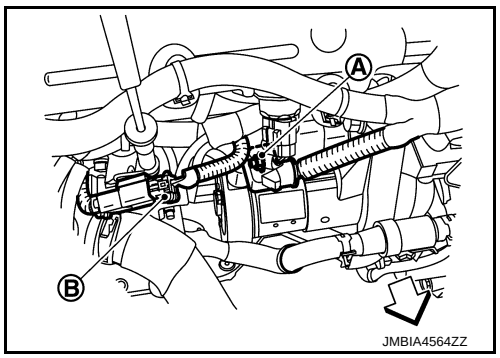
MR20DD : Removal and Installation

INFOID:0000000010728721

REMOVAL

1. Disconnect battery cable from negative terminal. Refer to PG-142, "EXCEPT FOR R9M : Removal and Installation".
2. Remove “B” terminal nut Ⓐ and “B” terminal harness.
3. Disconnect “S” terminal connector Ⓑ.

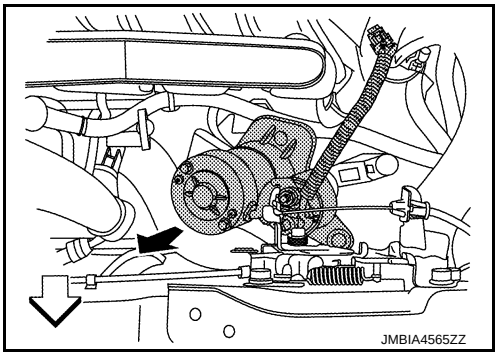
⇦ : Vehicle front



4. Remove starter motor mounting bolts.

5. Remove starter motor upward from the 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.

MR20DD : Inspection

INFOID:0000000010728722

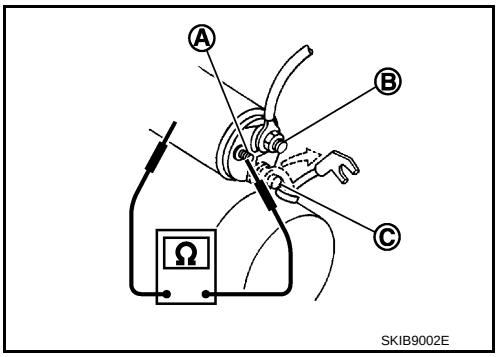
MAGNETIC SWITCH

- Before starting to check, disconnect the battery cable from the negative terminal.
- Disconnect “M” terminal of starter motor.

1. Continuity test (between “S” terminal and switch body)

Ⓐ : “S” terminal
Ⓑ : “B” terminal
Ⓒ : “M” terminal

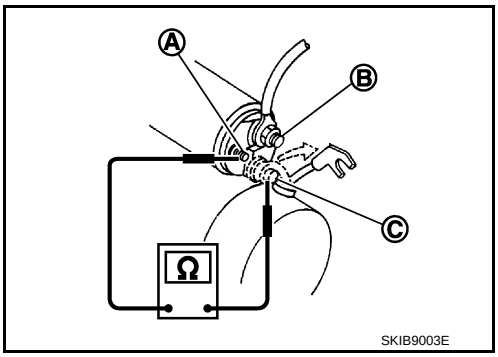
- Replace magnetic switch if continuity does not exist.



2. Continuity test (between “S” terminal and “M” terminal)

Ⓐ : “S” terminal
Ⓑ : “B” terminal
Ⓒ : “M” terminal

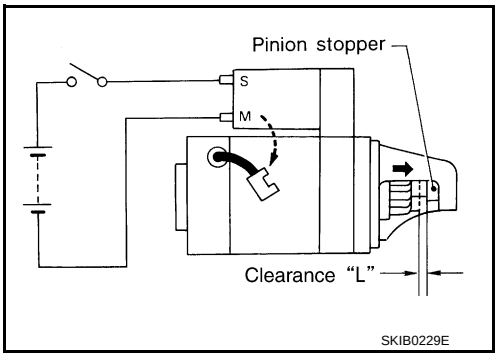
- Replace magnetic switch if continuity does not exist.



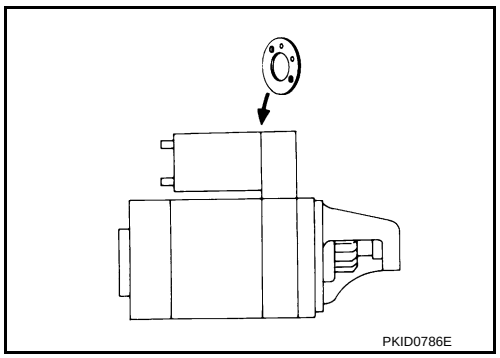
PINION PROTRUSION LENGTH

- With pinion driven out by magnetic switch, push pinion back to remove slack and measure the clearance “L” between the front edge of the pinion and the pinion stopper.

Clearance “L” **: Refer to SDS STR-42, "Starter Motor".**

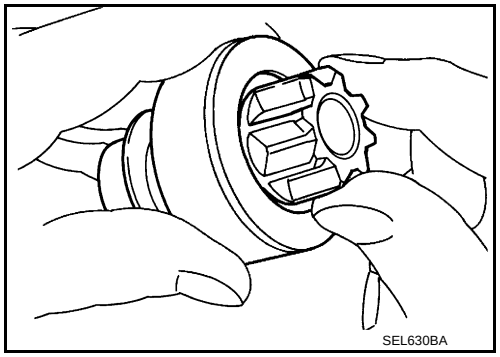


- If the measurement value is not in the specified area, adjust with the adjusting plate.


PKID0786E

PINION ASSEMBLY

1. Inspect pinion teeth.
   - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Inspect reduction gear teeth (If equipped).
   - Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)
3. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
   - Replace pinion assembly if it is locked or rotated in both directions or unusual resistance is evident.


SEL630BA

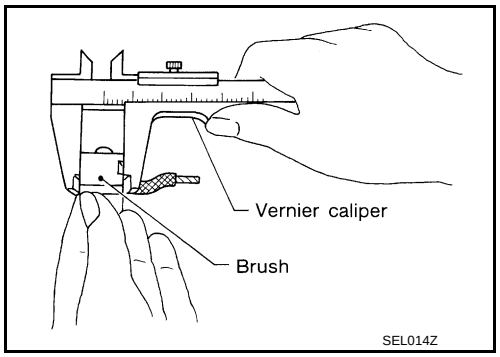
BRUSH HOLDER ASSEMBLY

Brush

- Check wear of brush.

Minimum length of brush : **Refer to SDS STR-42, "Starter Motor".**

- Replace brush if the measurement value is less than the specified value.



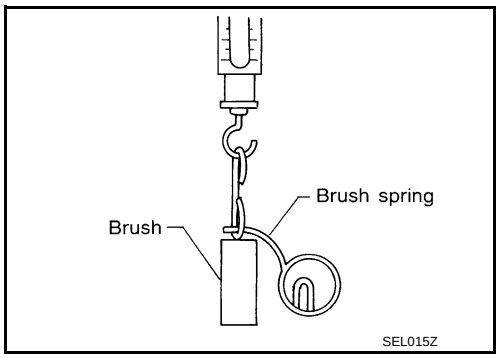
SEL014Z

Brush Spring

- Check brush spring tension with brush spring detached from brush.

Spring tension (with new brush) : **Refer to SDS STR-42, "Starter Motor".**

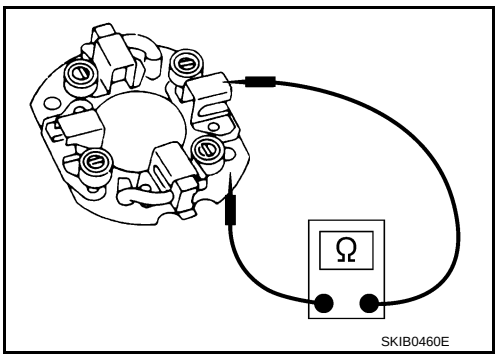
- Replace brush spring if the measurement value is less than the specified value.



SEL015Z

Brush Holder

1. Perform insulation test between brush holder (positive side) and its base (negative side).
- Replace brush holder assembly if continuity does not exist.
2. Check brush to see if it moves smoothly.
- If brush holder is bent, replace it.
- If sliding surface is dirty, clean it.

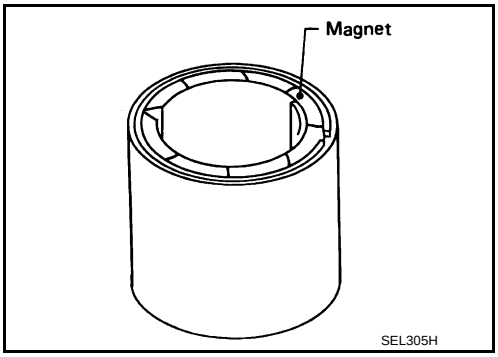


YOKE CHECK

Magnet is secured to yoke by bonding agent. Check magnet to see that it is secured to yoke and for any cracks. Replace malfunctioning parts as an assembly.

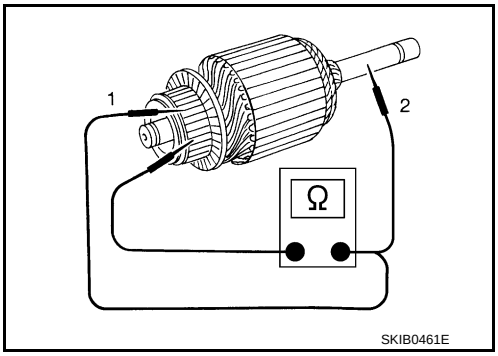
CAUTION:

Never clamp yoke in a vise or strike it with a hammer.

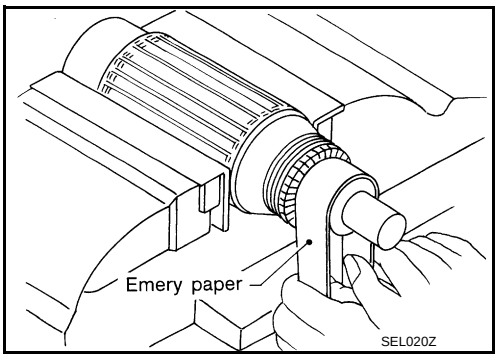


ARMATURE CHECK

1. Continuity test (between two segments side by side)
- Replace if continuity does not exist.
2. Insulation test (between each commutator bar and shaft)
- Replace if continuity exists.



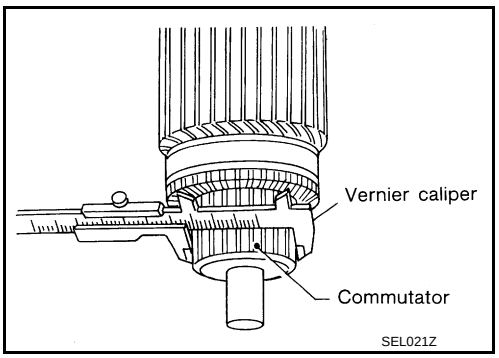
3. Check commutator surface.
- Grind commutator with No. 500 – 600 emery paper if the surface is rough.



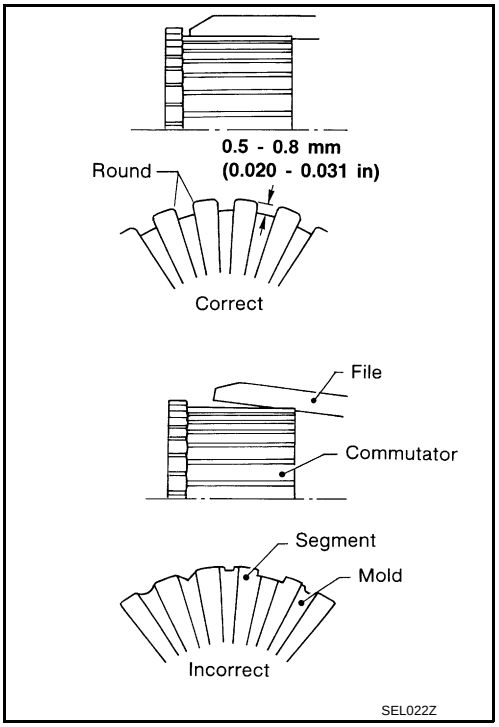
4. Check diameter of commutator.

Commutator minimum diameter	**: Refer to SDS STR-42, "Starter Motor".**

- Replace armature assembly if the measurement value is less than the specified value.



5. Check depth of insulating mold from commutator surface.
- Undercut to 0.5 – 0.8 mm (0.020 – 0.031 in) if the depth is 0.2 mm (0.008 in) or less.

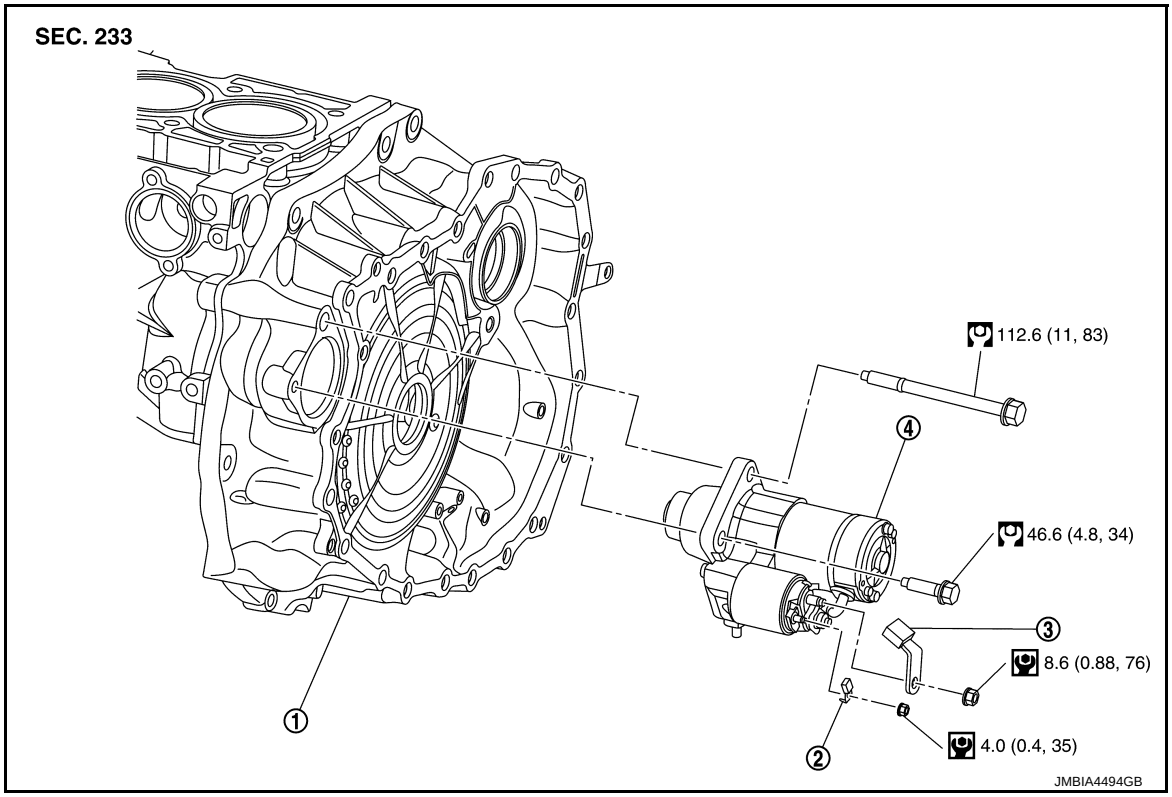


QR25DE

QR25DE : Exploded View

INFOID:0000000010728723

REMOVAL



① Converter housing ② "S" terminal harness ③ "B" terminal harness

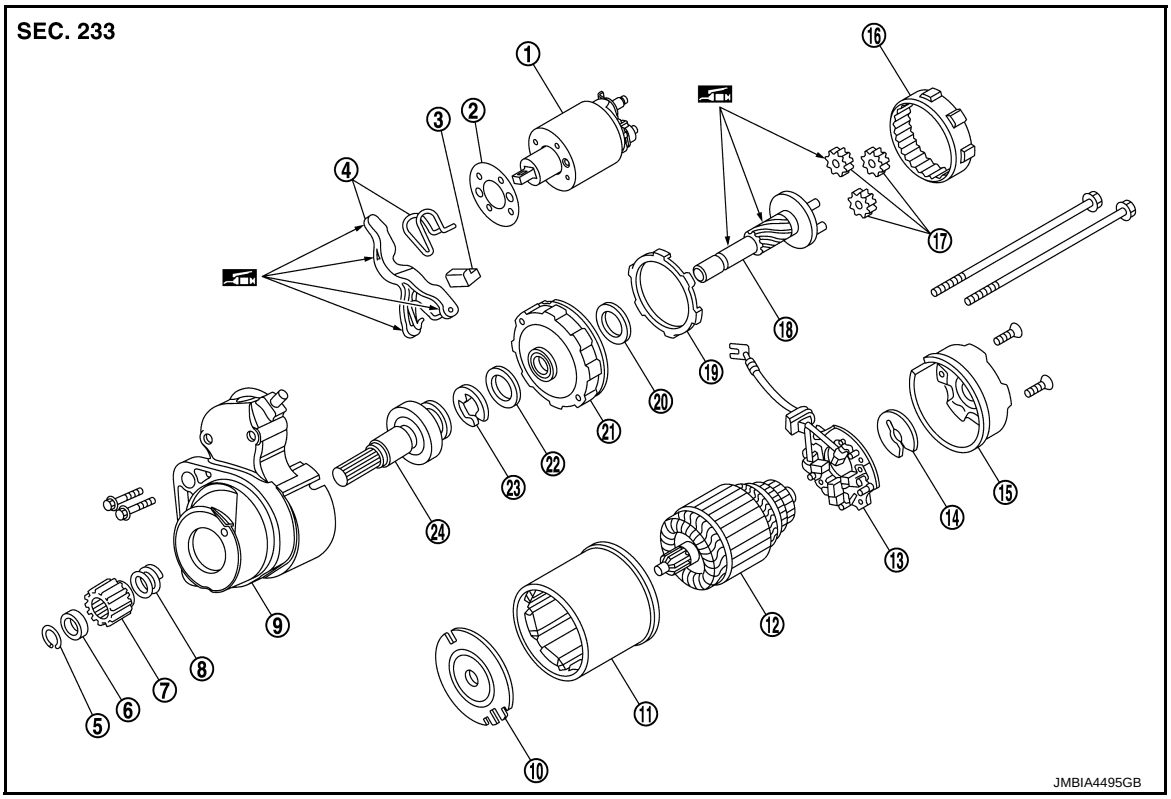
④ Starter motor

: N·m (kg-m, in-lb)

: N·m (kg-m, ft-lb)

DISASSEMBLY

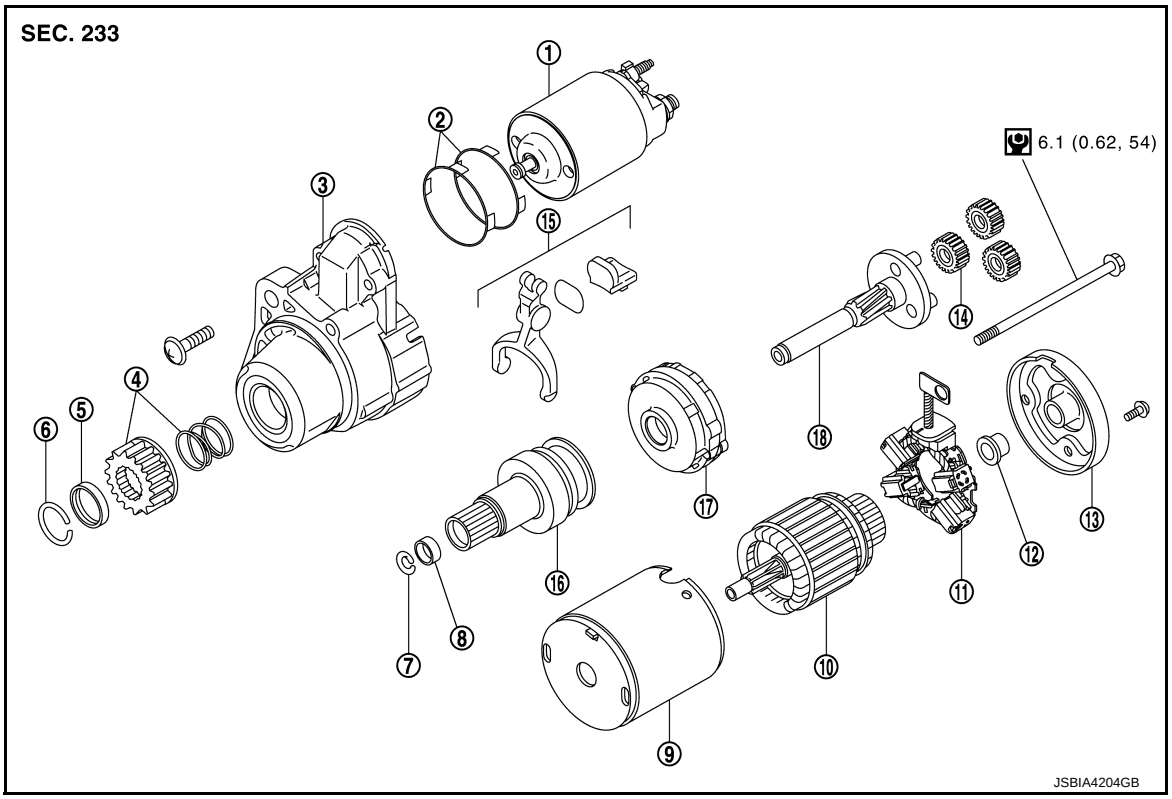
S114-961



① Magnetic switch assembly	② Adjusting plate	③ Dust cover
④ Shift lever set	⑤ Pinion stopper clip	⑥ Pinion stopper
⑦ Pinion	⑧ Pinion spring	⑨ Gear case assembly
⑩ Center bracket (A)	⑪ Yoke assembly	⑫ Armature assembly
⑬ Brush holder assembly	⑭ Thrust washer	⑮ Rear cover
⑯ Internal gear	⑰ Planetary gear	⑱ Pinion shaft
⑲ Packing	⑳ Thrust washer	㉑ Center gear assembly
㉒ Thrust washer	㉓ E-ring	㉔ Clutch gear assembly

: High-temperature grease point

M000TB0071



① Magnetic switch assembly	② Dust cover kit	③ Gear case assembly
④ Pinion assembly	⑤ Stopper	⑥ Ring
⑦ Ring	⑧ Stopper	⑨ Yoke assembly
⑩ Armature assembly	⑪ Brush holder assembly	⑫ Metal
⑬ Rear cover	⑭ Gear assembly	⑮ Shift lever set
⑯ Clutch gear assembly	⑰ Center bracket	⑱ Gear shaft

: N·m (kg-m, in-lb)

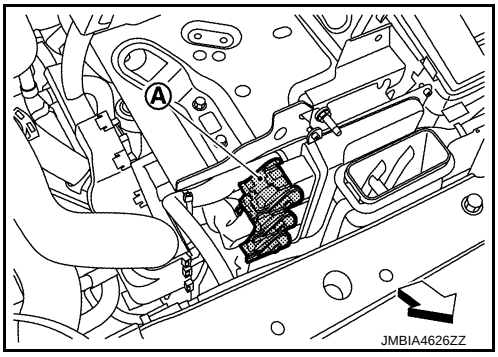
QR25DE : Removal and Installation

INFOID:0000000010728724

REMOVAL

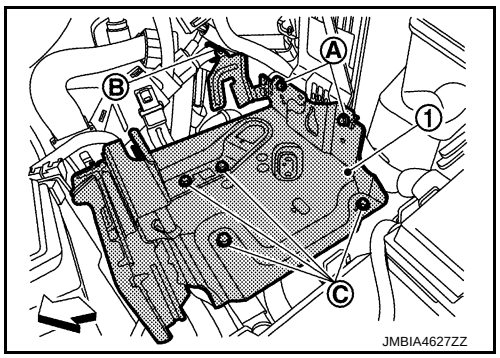
1. Remove battery. Refer to PG-142, "EXCEPT FOR R9M : Removal and Installation".
2. Remove air duct. Refer to EM-175, "Removal and Installation".
3. Disconnect ECM harness connectors Ⓐ.

⇦ : Vehicle front



4. Remove TCM bracket mounting bolts Ⓐ.
5. Remove harness fixing clip Ⓑ.
6. Remove battery tray mounting bolts Ⓒ, and then remove battery tray ①.

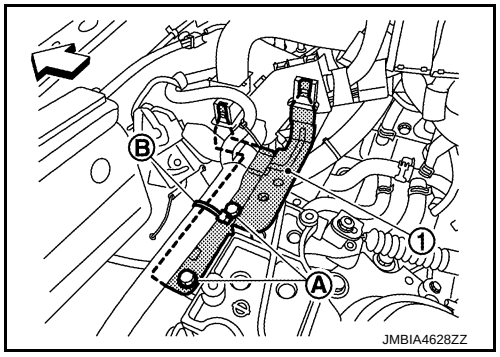
⇦ : Vehicle front



JMBIA4627ZZ

7. Remove harness bracket mounting bolts Ⓐ and harness fixing clip Ⓑ.
8. Remove harness bracket ①.

⇦ : Vehicle front



JMBIA4628ZZ

9. Remove “B” terminal nut and “B” terminal harness.
10. Remove “S” terminal nut and “S” terminal harness.
11. Remove starter motor mounting bolts.
12. Remove starter motor upward 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 to the specified torque.

QR25DE : Inspection

INFOID:0000000010728725

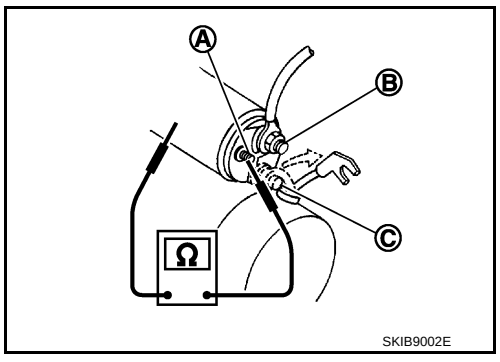
MAGNETIC SWITCH

- Before starting to check, disconnect the battery cable from the negative terminal.
- Disconnect “M” terminal of starter motor.

1. Continuity test (between “S” terminal and switch body)

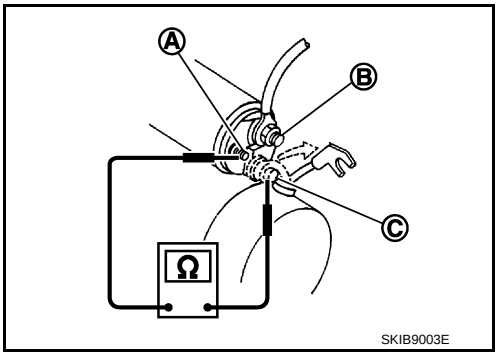
Ⓐ : “S” terminal
Ⓑ : “B” terminal
Ⓒ : “M” terminal

- Replace magnetic switch if continuity does not exist.



SKIB9002E

2. Continuity test (between “S” terminal and “M” terminal)



Ⓐ : “S” terminal

Ⓑ : “B” terminal

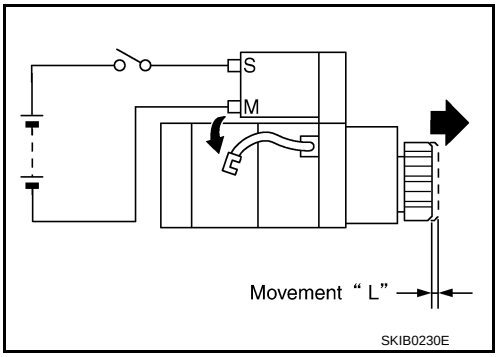
Ⓒ : “M” terminal

- Replace magnetic switch if continuity does not exist.

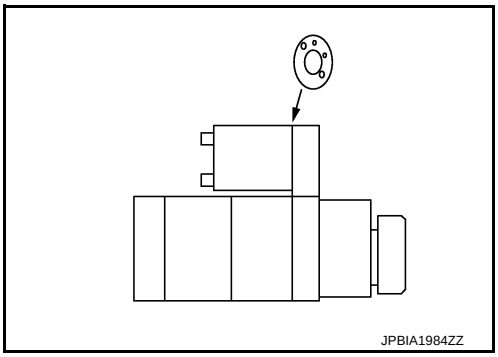
PINION PROTRUSION LENGTH

- Compare movement “L” in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

Movement “L” **: Refer to SDS STR-42, "Starter Motor".**

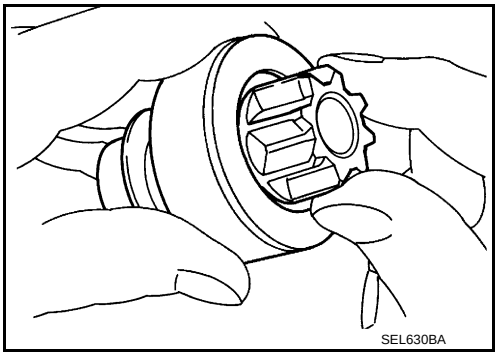


- If the measurement value is not in the specified area, adjust with the adjusting plate.



PINION ASSEMBLY

1. Inspect pinion teeth.
   - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Inspect reduction gear teeth.
   - Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)
3. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
   - Replace pinion assembly if it is locked or rotated in both directions or unusual resistance is evident.



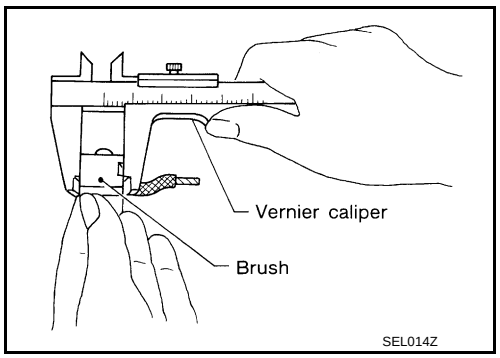
BRUSH HOLDER ASSEMBLY

Brush

- Check wear of brush.

Minimum length of brush : **Refer to SDS STR-42, "Starter Motor".**

- Replace brush if the measurement value is less than the specified value.

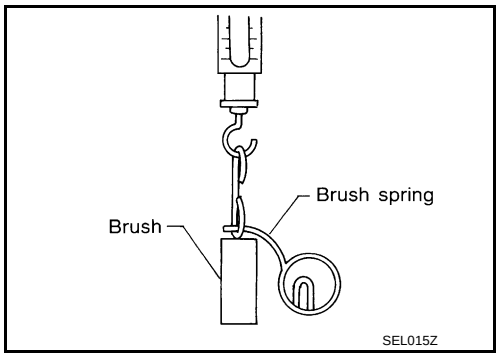


Brush Spring

- Check brush spring tension with brush spring detached from brush.

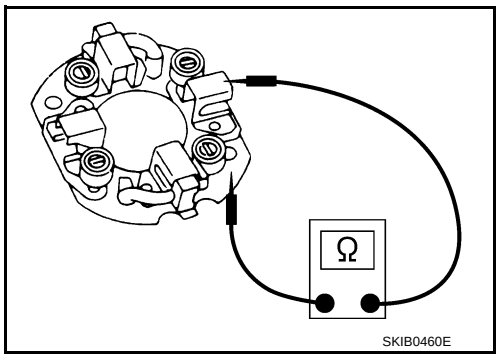
Spring tension (with new brush) : **Refer to SDS STR-42, "Starter Motor".**

- Replace brush spring if the measurement value is less than the specified value.



Brush Holder

1. Perform insulation test between brush holder (positive side) and its base (negative side).
- Replace brush holder assembly if continuity does not exist.
2. Check brush to see if it moves smoothly.
- If brush holder is bent, replace it if sliding surface is dirty, clean.

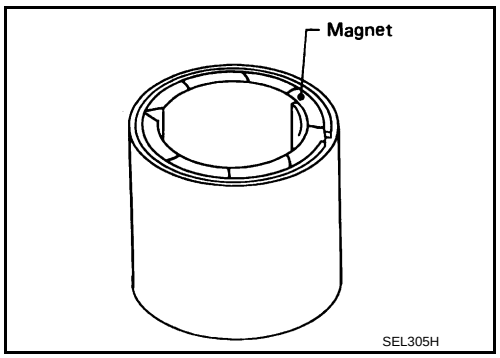


YOKE CHECK

Magnet is secured to yoke by bonding agent. Check magnet to see that it is secured to yoke and for any cracks. Replace malfunctioning parts as an assembly.

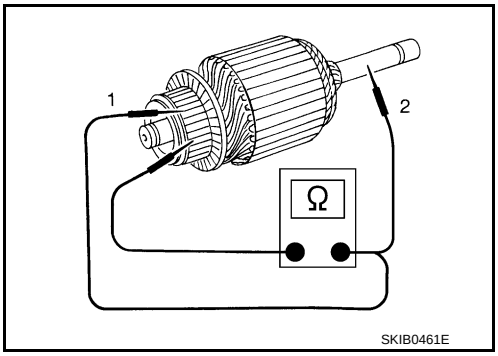
CAUTION:

Never clamp yoke in a vise or strike it with a hammer.

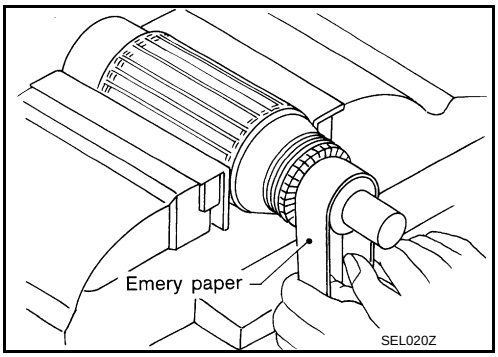


ARMATURE CHECK

1. Continuity test (between two segments side by side)
- Replace if continuity does not exist.
2. Insulation test (between each commutator bar and shaft)
- Replace if continuity exists.



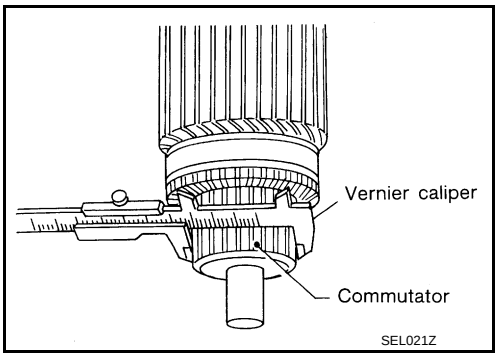
3. Check commutator surface.
- Grind commutator with No. 500 – 600 emery paper if the surface is rough.



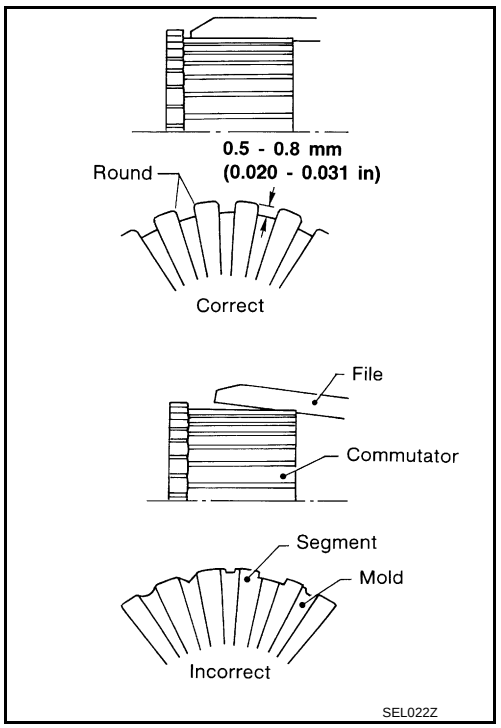
4. Check diameter of commutator.

Commutator minimum diameter	**: Refer to SDS STR-42, "Starter Motor".**

- Replace armature assembly if the measurement value is less than the specified value.



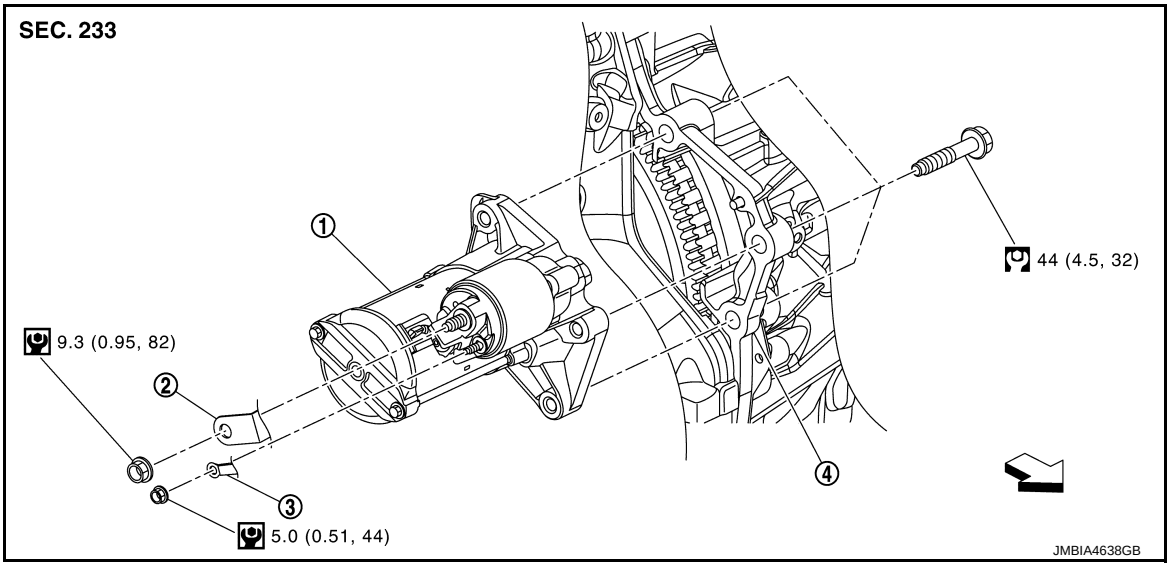
5. Check depth of insulating mold from commutator surface.
- Undercut to 0.5 – 0.8 mm (0.020 – 0.031 in) if the depth is 0.2 mm (0.008 in) or less.



R9M

R9M : Exploded View

INFOID:0000000010728730



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

R9M : Removal and Installation

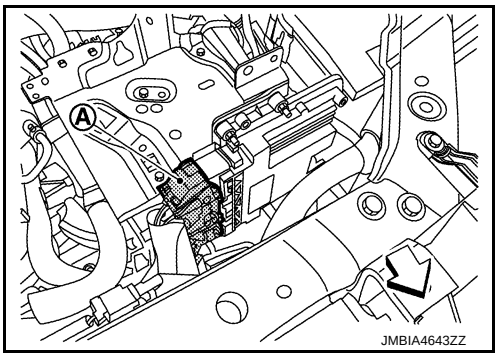
INFOID:0000000010728731

REMOVAL

1. Remove battery. Refer to PG-139, "R9M : Removal and Installation".

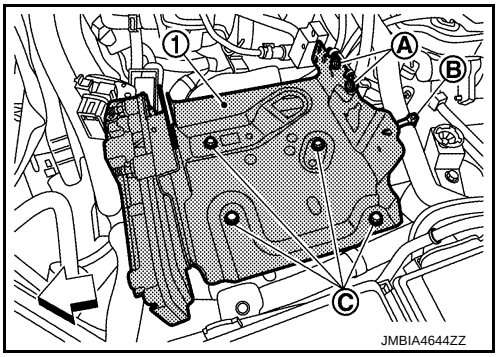
2. Remove air duct (inlet). Refer to EM-308, "Removal and Installation".
3. Disconnect ECM harness connectors Ⓐ.

⇦ : Vehicle front



4. Remove harness bracket mounting bolts Ⓐ.
5. Remove harness fixing clip Ⓑ.
6. Remove battery tray mounting bolts Ⓒ, and then remove battery tray ①.

⇦ : Vehicle front



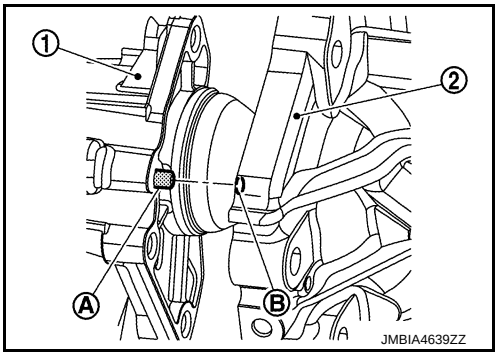
7. Remove electric throttle control actuator. Refer to EM-314, "Removal and Installation".
   CAUTION:
   Cover the openings to avoid entry of foreign materials.
8. Remove air inlet hose 2. Refer to EM-314, "Removal and Installation".
9. Remove “B” terminal nut and “B” terminal harness.
10. Remove “S” terminal nut and “S” terminal harness.
11. Remove starter motor mounting bolts.
12. Remove starter motor upward from the vehicle.
    CAUTION:
    Never contact with and damage surrounding parts when removing starter motor from the vehicle.

INSTALLATION

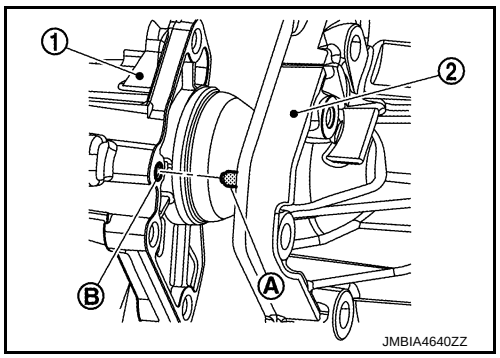
Note the following items, and then install in the reverse order of removal.

CAUTION:

- **Be careful to insert pin Ⓐ of starter motor ① into hole Ⓑ of transmission housing ②. (CVT models)**



- **Be careful to insert pin Ⓐ of transmission housing ② into hole Ⓑ of starter motor ①. (MT models)**



- **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 EC-960, "Work Procedure".**
- **Replace the engine restart relay and the fuel pump 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:0000000010957651

Engine			QR	MR	R9M	
Type			M000TB0071	S114-971	0 001 A01 527	0 001 A02 157
			MITUBISHI make	HITACHI make	BOSCH make	
			Reduction gear type			
System voltage		[V]	12			
No-load	Terminal voltage	[V]	11	11	—	—
	Current	[A]	Less than 90	Less than 110	—	—
	Revolution	[rpm]	More than 2,370	More than 3,300	—	—
Minimum diameter of commutator		[mm (in)]	28.0 (1.102)	28.0 (1.102)	—	—
Minimum length of brush		[mm (in)]	5.5 (0.217)	10.5 (0.413)	—	—
Brush spring tension		[N (kg, lb)]	15.0 - 20.4 (1.53 - 2.08, 3.37 - 4.58)	16.2 (1.65, 3.6)	—	—
Clearance between bearing metal and armature shaft		[mm (in)]	Less than 0.2 (0.008)	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)	—	—
Movement “L” in height of pinion assembly		[mm (in)]	0.5 - 2.0 (0.020 - 0.079)	—	—	—