

STR

SECTION

STARTING SYSTEM

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PRECAUTIONS

< PRECAUTION >

PRECAUTION

PRECAUTIONS

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

INFOID:0000000010430883

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:0000000010430885

CAUTION:

When performing an inspection and its related work with the engine at idle, always open the hood and release the stop/start system.

Precautions for Removing Battery Terminal

INFOID:0000000010503205

- 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.

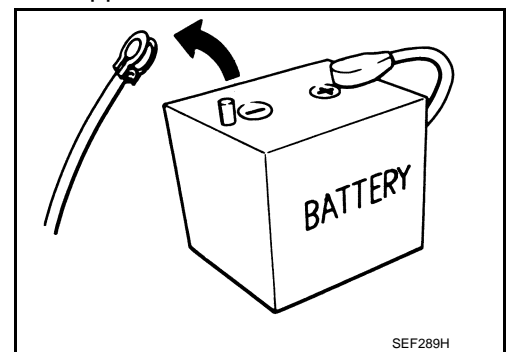
NOTE:

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.



PRECAUTIONS

< PRECAUTION >

HOW TO DISCONNECT 12V BATTERY TERMINAL

Disconnect 12V battery terminal according to instruction described below.

1. Open the hood.
2. Turn ignition switch to the ON position.
3. Turn ignition switch to the OFF position with the driver side door opened.
4. Get out of the vehicle and close the driver side door.
5. 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.

6. Remove 12V battery terminal.

CAUTION:

After installing 12V battery, always check self-diagnosis results of all ECUs and erase DTC.

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PREPARATION


< PREPARATION >

PREPARATION

PREPARATION

Commercial Service Tools

INFOID:0000000010430887

Tool name	Description
<p>Power tool</p>  <p>PIIB1407E</p>	<p>Loosening bolts, nuts and screws</p>

COMPONENT PARTS

< SYSTEM DESCRIPTION >

SYSTEM DESCRIPTION

COMPONENT PARTS

Component Parts Location

INFOID:0000000010430888

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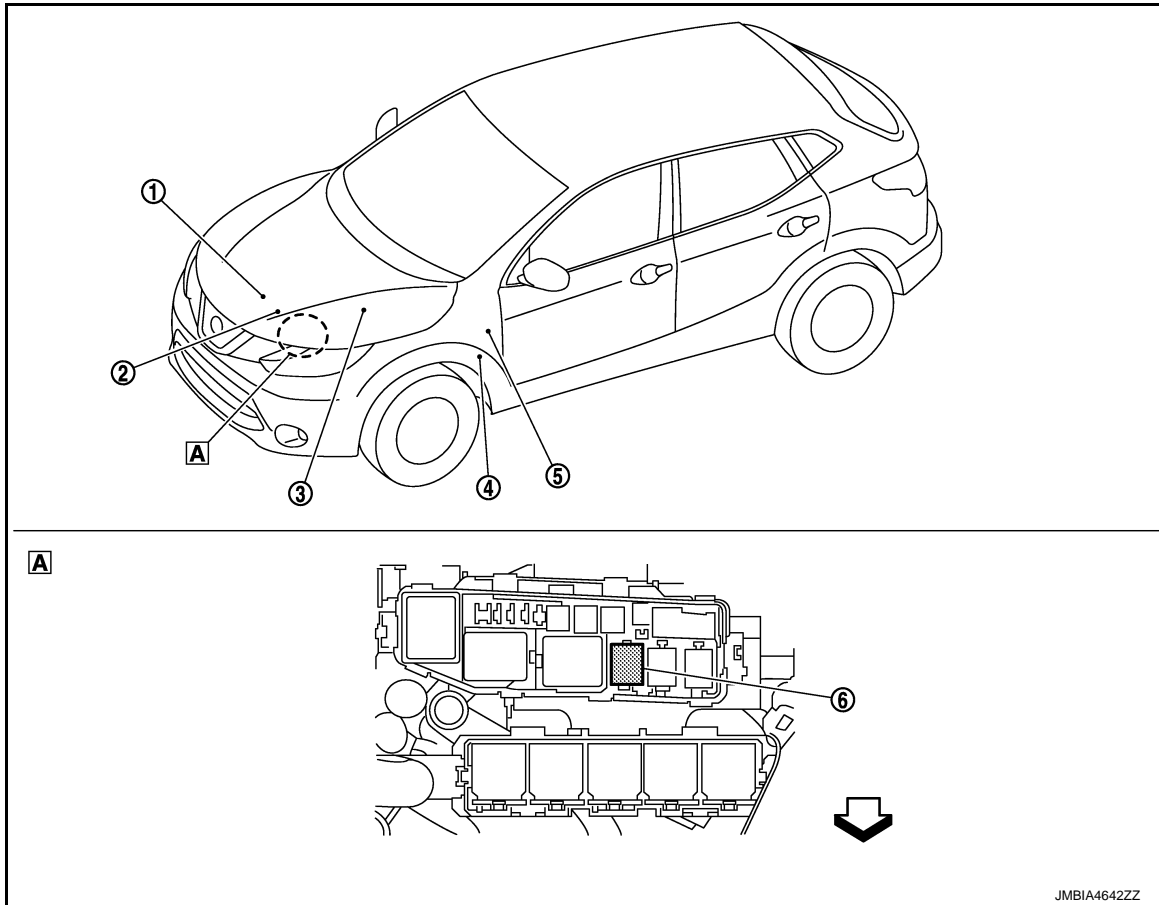
L

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JMBIA4642ZZ

A Front side of IPDM E/R

↩ : Vehicle front

No.	Component	Description
①	Starter motor	Refer to STR-6, "Starter motor" .
②	Transmission range switch (For CVT models)	Transmission range switch supplies power to the starter control relay when the selector lever is shifted to the P or N position. Refer to TM-430, "CVT CONTROL SYSTEM : Component Parts Location" for detailed installation location.
③	IPDM E/R	CPU inside IPDM E/R controls the starter control relay. Refer to PCS-5, "Component Parts Location" for detailed installation location.
④	Clutch interlock switch (MT models, except for Europe and Russia)	Clutch interlock switch supplies power to the starter control relay when the clutch pedal is depressed. Refer to CL-10, "Exploded View" for detailed installation location.
⑤	BCM	BCM controls the starter relay. Refer to BCS-7, "BODY CONTROL SYSTEM : Component Parts Location" for detailed installation location.
⑥	Starter relay	Power is supplied to the starter control relay with BCM control.

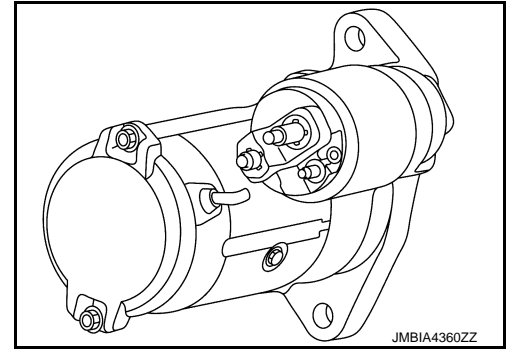
COMPONENT PARTS

< SYSTEM DESCRIPTION >

Starter motor

INFOID:0000000010430889

The starter motor plunger closes and the motor is supplied with battery power, which in turn cranks the engine, when the “S” terminal is supplied with electric power.



SYSTEM

< SYSTEM DESCRIPTION >

SYSTEM
STARTING SYSTEM

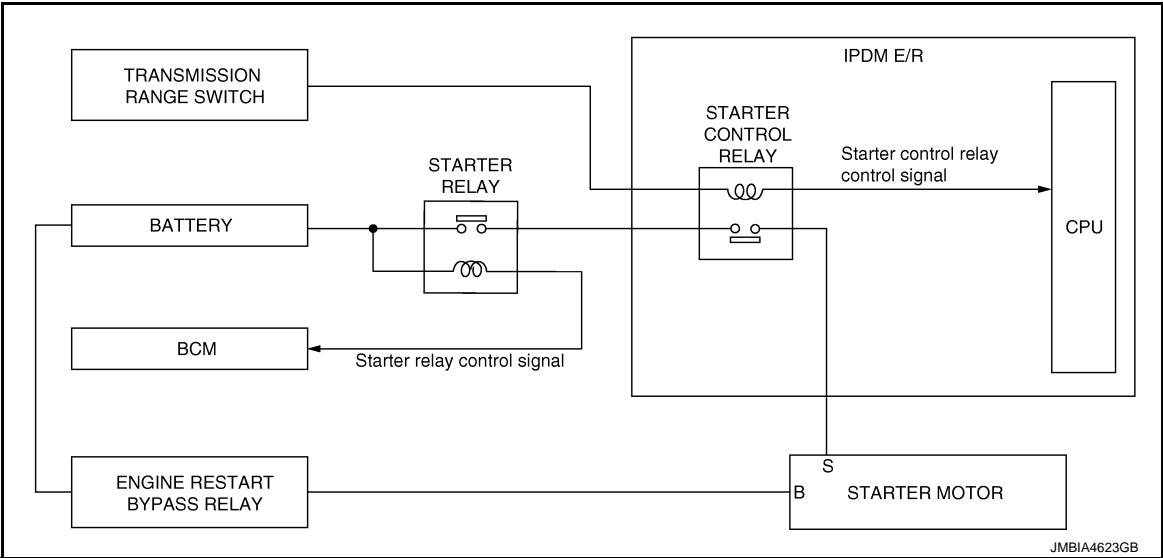
STARTING SYSTEM : System Description

INFOID:0000000010430891

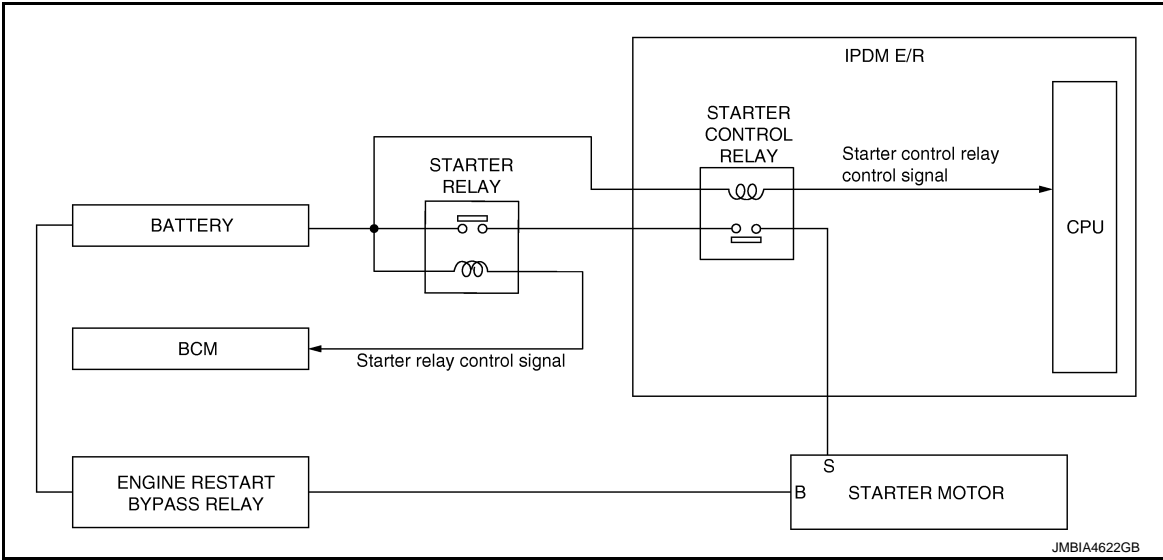
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SYSTEM DIAGRAM

CVT Models



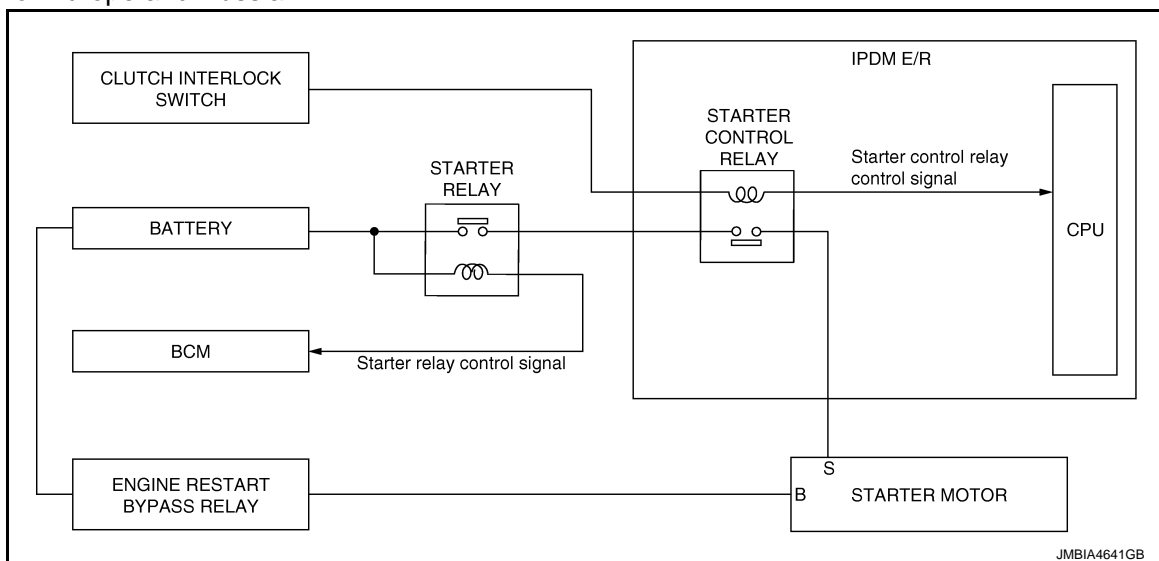
MT Models
For Europe and Russia



SYSTEM

< SYSTEM DESCRIPTION >

Except for Europe and Russia



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 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 relay and starter control relay.

M/T Models

For Europe and Russia

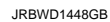
- “B” terminal is constantly supplied with battery power*.
- When starter operating condition is satisfied, IPDM E/R turns starter control relay ON by starter control relay control signal.
- When engine cranking condition is satisfied, BCM turns starter relay ON by starter relay control signal.
- Then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

Except for Europe and Russia

- “B” terminal is constantly supplied with battery power*.
- When the clutch pedal is depressed, power is supplied to starter control relay by clutch interlock switch.
- 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 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 >

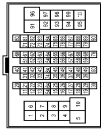


STARTING SYSTEM

< WIRING DIAGRAM >

STARTING SYSTEM

Connector No.	B13
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4



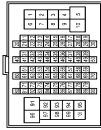
Terminal No.	Color	Wire	Signal Name [Specification]
1	G	-	-
2	G	-	-
3	G	-	-
4	G	-	-
5	G	-	-
6	G	-	-
7	G	-	-
8	G	-	-
9	G	-	-
10	G	-	-
11	G	-	-
12	G	-	-
13	G	-	-
14	G	-	-
15	G	-	-
16	G	-	-
17	G	-	-
18	G	-	-
19	G	-	-
20	G	-	-
21	BR	-	-
22	SB	-	-
23	EG	-	-
24	W	-	-
25	G	-	-
26	B	-	-
27	P	-	-

Connector No.	B35
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS16MW-CS



Terminal No.	Color	Wire	Signal Name [Specification]
1H	GR	-	-
2H	GR	-	-
3H	G	-	-
4H	P	-	-
5H	G	-	-
6H	Y	-	-

Connector No.	E3
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4



Terminal No.	Color	Wire	Signal Name [Specification]
1	G	-	-
2	G	-	-
3	G	-	-
4	G	-	-
5	EG	-	-
6	G	-	-
7	G	-	-
8	G	-	-
9	G	-	-
10	G	-	-
11	G	-	-
12	G	-	-
13	G	-	-
14	G	-	-
15	G	-	-
16	G	-	-
17	G	-	-
18	G	-	-
19	G	-	-
20	G	-	-
21	BR	-	-
22	SB	-	-
23	EG	-	-
24	SB	-	-
25	G	-	-
26	B	-	-
27	P	-	-

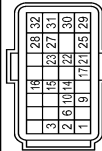
Connector No.	E8
Connector Name	WIRE TO WIRE
Connector Type	NS16MW-CS



Terminal No.	Color	Wire	Signal Name [Specification]
1	B	-	-
2	B	-	-
3	Y	-	-
4	L	-	-
5	GR	-	-
6	GR	-	-

6	EG	- [With HR engine with CVT]
7	G	- [Except for HR engine with CVT]
8	LG	-
9	B	- [With MR engine]
10	B	- [With HR engine]
11	V	- [With MR engine]
12	BR	- [With MR16 engine]
13	GR	- [HR engine without E160 or HR engine without CVT]
14	BR	- [HR engine with CVT]
15	Y	-
16	SB	-

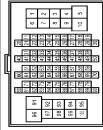
Connector No.	E9
Connector Name	ECM
Connector Type	RH24FB-R2Z-L4H



Terminal No.	Color	Wire	Signal Name [Specification]
1	L	-	CAN-H
2	P	-	CAN-L
3	SB	-	ASCD MAIN SWITCH
4	V	-	CLUTCH PEDAL INTERLOCK SWITCH
5	R	-	SPEED LIMITER MAIN SWITCH
6	V	-	SENSOR GROUND
7	BR	-	ASCD STEERING SWITCH
8	G	-	IGNITION SWITCH
9	LG	-	IGNITION SWITCH
10	Y	-	BRAKE MASTER SWITCH
11	V	-	SENSOR GROUND
12	W	-	ACCELERATOR PEDAL POSITION SENSOR 2
13	B	-	SENSOR POWER SUPPLY
14	B	-	SENSOR POWER SUPPLY
15	V	-	SENSOR POWER SUPPLY

28	G	-	POWER SUPPLY FOR ECM
29	V	-	POWER SUPPLY FOR ECM
30	GR	-	SENSOR GROUND
31	R	-	ACCELERATOR PEDAL POSITION SENSOR 1
32	B	-	ECM GROUND

Connector No.	E16
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4



Terminal No.	Color	Wire	Signal Name [Specification]
2	W	-	-
3	V	-	-
4	EG	-	-
5	L	-	-
6	LG	-	-
7	W	-	-
8	W	-	-
9	W	-	-
10	W	-	-
11	W	-	-
12	W	-	-
13	W	-	-
14	W	-	-
15	W	-	-
16	W	-	-
17	W	-	-
18	W	-	-
19	W	-	-
20	W	-	-
21	W	-	-
22	W	-	-
23	W	-	-
24	W	-	-
25	W	-	-
26	W	-	-
27	W	-	-
28	W	-	-
29	W	-	-
30	W	-	-
31	W	-	-
32	W	-	-
33	W	-	-
34	W	-	-
35	W	-	-
36	W	-	-
37	W	-	-
38	W	-	-
39	W	-	-
40	W	-	-
41	W	-	-
42	W	-	-
43	W	-	-
44	W	-	-

STARTING SYSTEM

< WIRING DIAGRAM >

STARTING SYSTEM

46	BR	-
47	GR	-
48	Y	-
49	P	-
51	P	-
52	W	-
53	R	-
55	BR	-
56	P	-
57	B	-
58	L	-
59	Y	-
60	G	-
61	SB	-
62	V	-
63	BR	-
64	SB	-
65	LG	-
66	Y	-
67	EG	-
68	R	-
69	W	-
70	G	-
71	Y	-
72	L	-
73	R	-
74	L	-
75	V	-
76	SB	-
78	LG	-
79	SHIELD	-
80	GR	-
82	Y	-
83	SB	-
84	L	-
85	G	-
86	Y	-
87	B	-
88	B	-
90	Y	-
91	R	-
93	Y	-
94	GR	-
97	W	-
98	V	-
99	GR	-

Connector No.	E57
Connector Name	POWER IN INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM
Connector Type	NS16FGY-CS



9	8	7	6	5	4	3
17	16	15	14	13	12	11

30	BG	- [With MR16 engine]
31	Y	- [Without MR16 engine]
32	GR	-
33	BR	-
39	L	-
40	P	-
41	W	- [Without MR16 engine]
42	R	- [With MR16 engine]
43	V	- [Without MR16 engine]



1	2
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Connector No.	E43
Connector Name	WIRE TO WIRE
Connector Type	M02MM-LC

Terminal No.	Signal Name [Specification]
6	-
7	-
8	-
9	-
12	-
16	-
17	-

Connector No.	E59
Connector Name	POWER IN INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM
Connector Type	retail: 2434S40B2



43	44	45
46	47	48

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

Connector No.	E52
Connector Name	CLUTCH INTERLOCK SWITCH
Connector Type	M02FBR-LC



2	1
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43	44	45
46	47	48

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

Connector No.	E58
Connector Name	POWER IN INTELLIGENT POWER DISTRIBUTION MODULE ENGINE
Connector Type	TH24FGY-NH



30	29	28	27	26	25	24	22	21	19	
42	41	40	39					33	32	31

43	44	45
46	47	48

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

Terminal No.	Color Of Wire	Signal Name [Specification]
19	LG	-
21	SB	-
22	P	-
23	L	-
25	G	-
26	B	-
27	BG	-
28	LG	-
29	P	- [With MR16 engine]
29	V	- [Without MR16 engine]

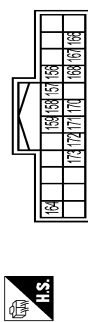
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STARTING SYSTEM

< WIRING DIAGRAM >

STARTING SYSTEM

Connector No.	E60
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	TH24EP-NH



Terminal No.	Color Of Wire	Signal Name [Specification]
156	V	CLUTCH INTERLOCK SW
157	LG	STOP LAMP SW 2
158	W	STOP LAMP SW
159	R	CLUTCH PEDAL POSITION SWITCH
164	Y	INTELLIGENT KEY WARNING BUZZER
165	P	STEERING LOCK UNIT POWER SUPPLY
166	BR	TURN SIG LH (FRONT)
167	GR	TURN SIG RH (FRONT)
168	GR	PTO RLY-3 CONT
170	L	STARTER RELAY CONT
171	G	PTO RLY-1 CONT
172	W	PTO RLY-2 CONT
173	BG	PTO RLY-2 CONT

Connector No.	E61
Connector Name	ECM
Connector Type	PR24EP-R28-L-LH



Terminal No.	Color Of Wire	Signal Name [Specification]
122	SB	ASCS MAIN SWITCH
123	P	CAN COMMUNICATION LINE (CAN-L)
124	L	CAN COMMUNICATION LINE (CAN-H)
127	V	CLUTCH INTERLOCK SWITCH
130	BR	FUEL PUMP CONTROL MODULE (FPCM) CHECK
131	V	SPEED LIMITER MAIN SWITCH
132	R	CLUTCH PEDAL POSITION SWITCH
133	LG	IGNITION SWITCH

134	G	ASCS STEERING SWITCH
135	BR	ASCS MAIN SWITCH
136	R	FUEL PUMP CONTROL MODULE (FPCM)
139	V	STOP LAMP SWITCH
140	BG	BRAKE PEDAL POSITION SWITCH
142	BG	SENSOR POWER SUPPLY
143	W	ACCELERATOR PEDAL POSITION SENSOR 2
144	Y	SENSOR GROUND
145	BR	POWER SUPPLY FOR ECM
146	V	SENSOR POWER SUPPLY
147	B	ECM GROUND
149	R	ACCELERATOR PEDAL POSITION SENSOR 1
150	BR	SENSOR GROUND
151	GR	SENSOR GROUND
152	B	ECM GROUND

Connector No.	E70
Connector Name	STARTER MOTOR
Connector Type	2/340 J304B



Terminal No.	Color Of Wire	Signal Name [Specification]
2	B/Y	— [Without MR16 engine]
2	B/Y	— [With MR16 engine]

Connector No.	E71
Connector Name	ENGINE RESTART BYPASS RELAY
Connector Type	E-BA8



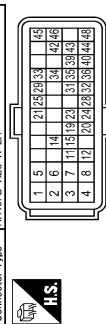
Terminal No.	Color Of Wire	Signal Name [Specification]
3	B/Y	—

Connector No.	E72
Connector Name	ENGINE RESTART BYPASS RELAY
Connector Type	E-BA8



Terminal No.	Color Of Wire	Signal Name [Specification]
2	B/Y	—

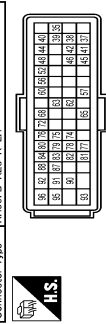
Connector No.	F15
Connector Name	ECM
Connector Type	RH40FB-R28-R-LH



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	FUEL INJECTOR No. 1 (HI)
2	L	FUEL INJECTOR No. 2 (HI)
3	B	FUEL INJECTOR No. 3 (HI)
4	W	FUEL INJECTOR No. 4 (HI)
5	R	FUEL INJECTOR No. 1 (LO)
6	P	FUEL INJECTOR No. 2 (LO)
7	W	FUEL INJECTOR No. 3 (LO)
8	W	FUEL INJECTOR No. 4 (LO)
11	B	ECM GROUND
12	SHIELD	SHIELD
14	W	PNP SIGNAL
15	R	SENSOR GROUND (CRANKSHAFT POSITION SENSOR)
19	W	CRANKSHAFT POSITION SENSOR
20	GR	SENSOR GROUND (MASS AIR FLOW SENSOR)

21	L	SENSOR POWER SUPPLY (CRANKSHAFT POSITION SENSOR)
22	V	SENSOR POWER SUPPLY FUEL PUMP PRESSURE SENSOR
23	Y	MASS AIR FLOW SENSOR
25	L	ENGINE COOLANT TEMPERATURE SENSOR
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 (KNOCK SENSOR)
38	R	SENSOR GROUND
40	W	KNOCK SENSOR
42	B	SENSOR GROUND (VALVE TIMING CONTROL SENSOR)
43	P	SENSOR POWER SUPPLY (CRANKSHAFT POSITION SENSOR)
44	BR	SENSOR GROUND (CRANKSHAFT POSITION SENSOR)
45	G	IGN
46	LG	EXHAUST VALVE TIMING CONTROL POSITION SENSOR
48	GR	CRANKSHAFT POSITION SENSOR

Connector No.	F17
Connector Name	ECM
Connector Type	RH50FB-R28-R-LH



Terminal No.	Color Of Wire	Signal Name [Specification]
35	R	CRANKSHAFT POSITION SENSOR
37	B	SENSOR GROUND
38	W	KNOCK SENSOR
39	Y	ENGINE RESTART RELAY
40	GR	EXHAUST VALVE TIMING CONTROL SOLENOID VALVE
41	W	SENSOR POWER SUPPLY
42	B	SENSOR GROUND
43	BR	EXHAUST VALVE TIMING CONTROL SOLENOID VALVE
45	W	SENSOR POWER SUPPLY
46	SHIELD	SENSOR GROUND
48	G	THERMOSTAT WATER CONTROL SOLENOID VALVE
52	GR	THERMOSTAT WATER CONTROL SOLENOID VALVE
56	LG	VOLTAGE STABILIZER
57	L	SENSOR POWER SUPPLY

STARTING SYSTEM

< WIRING DIAGRAM >

STARTING SYSTEM

62	P	ENGINE COOLANT TEMPERATURE CONTROL SOLENOID VALVE
63	R	SENSOR GROUND
64	G	FUEL RAIL PRESSURE SENSOR
65	R	SENSOR POWER SUPPLY
66	G	TURBOCHARGER BYPASS VALVE CONTROL SOLENOID VALVE
72	P	IGNITION SIGNAL NO. 1
74	LG	INTAKE AIR TEMPERATURE SENSOR
75	BR	ENGINE COOLANT TEMPERATURE SENSOR
76	LG	IGNITION SIGNAL NO. 2
77	V	SENSOR GROUND
78	P	REFRIGERANT PRESSURE SENSOR
79	Y	IGNITION SIGNAL NO. 3
80	SB	SENSOR GROUND
81	P	THROTTLE POSITION SENSOR 1
82	W	THROTTLE POSITION SENSOR 2
83	G	ENGINE RESTART BYPASS CONTROL RELAY
84	SB	ENGINE OIL PRESSURE CONTROL SOLENOID VALVE
87	G	THROTTLE POSITION SENSOR 1
88	G	INTAKE VALVE TIMING CONTROL SOLENOID VALVE
90	B	SENSOR GROUND
91	SB	HEATED OXYGEN SENSOR 1 HEATER
92	L	HEATED OXYGEN SENSOR 2 HEATER
93	R	POWER SUPPLY FOR ECM
95	W	HIGH PRESSURE FUEL PUMP (H)
96	B	HIGH PRESSURE FUEL PUMP (LO)

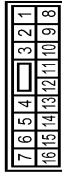
Connector No.	F18
Connector Name	ECM
Connector Type	RH56FY-R28-R-LH



Terminal No.	Color Of Wire	Signal Name [Specification]
87	V	TURBOCHARGER BOOST SENSOR
89	V	HEATED OXYGEN SENSOR 1
100	B	SENSOR GROUND
102	W	INTAKE MANIFOLD PRESSURE SENSOR
106	BR	SENSOR GROUND
111	P	ECM RELAY (SELF SHUT-OFF)
112	W	HEATED OXYGEN SENSOR 2
114	R	SENSOR GROUND
115	L	FUEL PUMP RELAY

117	G	SENSOR POWER SUPPLY
121	R	SENSOR POWER SUPPLY
122	B	SENSOR GROUND
123	G	ENGINE COMMUNICATION LINE
126	B	SENSOR GROUND
127	L	EXHAUST VALVE TIMING CONTROL POSITION SENSOR
132	R	THROTTLE CONTROL MOTOR (OPEN)
133	GR	SENSOR POWER SUPPLY
134	Y	SENSOR GROUND
135	L	CAMSHAFT POSITION SENSOR
136	P	THROTTLE CONTROL MOTOR (CLOSE)
137	P	SENSOR POWER SUPPLY
143	W	REVERSE / NEUTRAL POSITION SWITCH
153	LG	FUEL INJECTOR No. 1 (H)
154	LG	FUEL INJECTOR No. 2 (H)
155	P	FUEL INJECTOR No. 3 (H)
156	W	FUEL INJECTOR No. 4 (H)
157	R	FUEL INJECTOR No. 1 (LO)
158	SB	FUEL INJECTOR No. 2 (LO)
159	V	FUEL INJECTOR No. 3 (LO)
160	B	FUEL INJECTOR No. 4 (LO)

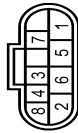
Connector No.	F21
Connector Name	WIRE TO WIRE
Connector Type	NS16PW-C3



Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	- [With MR16 engine]
1	P	- [With diesel engine]
1	V	- [With MR16 engine]
2	B	- [With MR20 engine]
2	GR	- [With MR20 engine]
2	P	- [With diesel engine]
3	P	- [With RSM engine and K9K engine]
3	SB	- [With RSM engine]
4	BR	- [With MR engine]
4	L	- [With HR engine or RSM engine]
4	W	- [With K9K engine]
5	B	- [With MR engine]
5	R	- [With RSM engine]

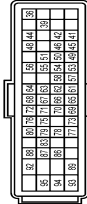
5	W	- [With HR engine]
6	RG	- [Without active grille shutters]
6	L	- [With active grille shutters]
6	V	- [Without active grille shutters] [With MR20 engine]
7	G	-
8	SB	-
9	B	- [With HR engine]
9	BQ	- [With HR engine]
9	W	- [With diesel engine]
10	B	- [With K9K engine]
10	L	- [With K9K engine]
10	V	- [With RSM or HR engine]
11	BR	- [With K9K engine]
11	K	- [With K9K engine]
11	R	- [With MR engine or RSM engine]
12	Y	- [With HR engine without CVT]
12	P	- [With HR engine with CVT or with MR engine]
13	G	- [With MR16 engine]
13	R	- [With RSM engine or HR engine with CVT]
13	W	- [With HR engine with MT]
13	Y	- [With MR20 engine]
14	GR	- [With CVT]
14	V	- [With M7]
15	L	-
15	L	-
16	LG	-

Connector No.	F81
Connector Name	TRANSMISSION RANGE SWITCH
Connector Type	YD68FEB-H54



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	GR	-
2	GR	-
3	W	-
4	V	-
5	G	-
6	P	- [Except without RSM engine and ISS]
6	R	- [Without HR engine and ISS]
7	Y	-

Connector No.	F80
Connector Name	ECM
Connector Type	RH56FY-R28-R-LH



Terminal No.	Color Of Wire	Signal Name [Specification]
36	G	ECM RELAY (SELF SHUT-OFF)
39	BR	WATER HEATER 2
41	P	SENSOR POWER SUPPLY CAMSHAFT POSITION SENSOR
42	Y	CAMSHAFT POSITION SENSOR
44	BQ	WATER HEATER 1
45	L	SENSOR POWER SUPPLY FUEL RAIL PRESSURE SENSOR
46	GR	MASS AIR FLOW SENSOR
48	Y	ENGINE RESTART RELAY CONTROL
49	L	SENSOR POWER SUPPLY LOW FUEL PRESSURE SENSOR
50	V	SENSOR GROUND CAMSHAFT POSITION SENSOR
51	LG	VOLTAGE STABILIZER SIGNAL
52	SB	SENSOR GROUND LOW FUEL PRESSURE SENSOR
54	SB	ENGINE RESTART BYPASS CONTROL RELAY CONTROL
55	G	ENGINE RESTART BYPASS CONTROL RELAY CONTROL
56	R	GLOW PLUG CONTROL (COMMAND)
57	BQ	SENSOR POWER SUPPLY SIGNAL EXHAUST VALVE TIMING CONTROL
58	B	SENSOR GROUND DIFFERENTIAL PRESSURE SENSOR
61	W	SENSOR POWER SUPPLY THROTTLE POSITION SENSOR
62	BR	SENSOR GROUND EXHAUST THROTTLE POSITION SENSOR
63	SB	WATER HEATER 3
64	R	TURBOCHARGER BOOST CONTROL SOLENOID VALVE
65	R	SENSOR POWER SUPPLY LOW FUEL PRESSURE SENSOR
66	B	SENSOR GROUND EXHAUST VALVE TIMING CONTROL
67	BR	SENSOR GROUND THROTTLE POSITION SENSOR
68	B	SENSOR GROUND FUEL RAIL PRESSURE SENSOR
69	V	SENSOR GROUND FUEL RAIL PRESSURE SENSOR
70	BQ	WATER HEATER 1
71	G	THROTTLE POSITION SENSOR
72	R	FUEL RAIL PRESSURE SENSOR
73	L	SENSOR POWER SUPPLY MASS AIR FLOW SENSOR
75	P	HIGH PRESSURE FUEL PUMP (H) POSITION SENSOR
76	GR	EXHAUST THROTTLE VALVE POSITION SENSOR
77	LG	SENSOR POWER SUPPLY EXHAUST GAS PRESSURE SENSOR

JRBWD1452GB

STARTING SYSTEM

< WIRING DIAGRAM >

STARTING SYSTEM

78	GR	SENSOR GROUND (EXHAUST GAS PRESSURE SENSOR 1)
79	L	SENSOR GROUND (EXHAUST GAS PRESSURE SENSOR 2)
80	LG	DPF DIFFERENTIAL PRESSURE SENSOR
83	Y	EXHAUST GAS TEMPERATURE SENSOR 1
86	G	SENSOR GROUND (MASS AIR FLOW SENSOR)
87	V	INTAKE AIR TEMPERATURE SENSOR
88	W	LOW FUEL PRESSURE SENSOR
89	GR	FUEL PUMP RELAY CONTROL VALVE
92	Y	FUEL FLOW VOLUME CONTROL VALVE
93	GR	POWER SUPPLY FOR ECM
94	GR	FUEL HEATER RELAY CONTROL
95	B	

Connector No.	F22
Connector Name	ECM
Connector Type	RH56FP-R28-R-LH



96		88		80	75	58		60	56																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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< WIRING DIAGRAM >

Terminal No.	Color Of Wire	Signal Name [Specification]
2	B/R	- [Except for HR engine with CVT]
2	B/Y	- [HR engine with CVT]

STARTING SYSTEM

< WIRING DIAGRAM >

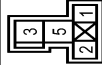
STARTING SYSTEM

Connector No.	F148
Connector Name	ENGINE RESTART BYPASS RELAY
Connector Type	E-848



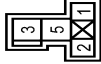
Terminal No.	Color Of Wire	Signal Name [Specification]
3	B/R	— [Except for HR engine with CVT]
3	B/Y	— [HR engine with CVT]

Connector No.	F162
Connector Name	STARTER RELAY
Connector Type	24381.4BA1A



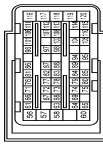
Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	—
2	SB	—
3	GR	—
5	L	—

Connector No.	F163
Connector Name	ENGINE RESTART RELAY
Connector Type	24381.4BA1A



Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	—
2	R	— [With diesel engine]
2	W	— [With diesel engine]
3	BR	— [With gasoline engine]
3	L	— [With diesel engine]
5	P	—

Connector No.	F226
Connector Name	ECM
Connector Type	MA85FB-ME810-LH



Terminal No.	Color Of Wire	Signal Name [Specification]
56	R	TURBOCHARGER BYPASS CONTROL VALVE POWER SUPPLY
57	W	EGR VOLUME CONTROL VALVE MOTOR (+)
58	R	EGR VOLUME CONTROL VALVE MOTOR (-)
60	B	ECM GROUND
61	W	SENSOR POWER SUPPLY
63	B	SENSOR GROUND
64	SHIELD	SHIELD
65	Y	ELECTRIC MASTER CONTROL ACTUATOR
66	R	SENSOR POWER SUPPLY
67	W	CAMSHAFT POSITION SENSOR
68	BR	EGR VOLUME CONTROL VALVE
69	LG	EXHAUST VALVE TIMING CONTROL POSITION SENSOR
71	B	SENSOR GROUND
72	B	SENSOR GROUND

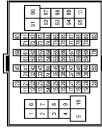
72	Y	SENSOR POWER SUPPLY
73	G	AIR FUEL RATIO (A/F) SENSOR 1
75	G	MULTI-WAY CONTROL VALVE
76	R	EGR TEMPERATURE SENSOR
77	R	INTAKE AIR TEMPERATURE SENSOR 2
78	R	SENSOR GROUND
79	Y	AIR FUEL RATIO (A/F) SENSOR 1
80	W	THROTTLE POSITION SENSOR 2
81	BR	ECM RELAY (SELF SHUT-OFF)
82	Y	FUEL PUMP RELAY
83	B	SENSOR POWER SUPPLY
84	W	HEATED OXYGEN SENSOR 2
85	R	SENSOR GROUND
86	L	ENGINE COMMUNICATION LINE (DO/DO CONVERTER)
87	W	ENGINE RESTART BYPASS CONTROL RELAY
88	Y	ENGINE RESTART BYPASS CONTROL RELAY
89	LG	VOLTAGE STABILIZER SIGNAL
94	Y	ENGINE RESTART RELAY CONTROL SIGNAL
95	BR	IGNITION SIGNAL No. 2
96	Y	IGNITION SIGNAL No. 1
97	Y	THROTTLE MOTOR RELAY
98	R	ENGINE OIL PRESSURE CONTROL SOLENOID VALVE
101	SB	IGNITION SIGNAL No. 4
102	SB	PHP SIGNAL
104	W	IGNITION SIGNAL No. 3
105	BR	TURBOCHARGER BYPASS CONTROL VALVE
106	R	ELECTRIC MASTER GATE CONTROL ACTUATOR MOTOR (+)
107	R	ELECTRIC MASTER GATE CONTROL ACTUATOR MOTOR (-)
108	G	ECM GROUND
109	BR	EXHAUST VALVE TIMING CONTROL SOLENOID VALVE
110	W	INTAKE VALVE TIMING CONTROL SOLENOID VALVE
111	W	EXHAUST VALVE TIMING CONTROL SOLENOID VALVE
112	G	POWER SUPPLY FOR ECM
113	L	POWER SUPPLY FOR ECM
114	L	WIPER VALVE TRIMMING/STABILIZER LOCK CONTROL SOLENOID VALVE
115	BG	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
116	P	AIR FUEL RATIO (A/F) SENSOR 1 HEATER
117	G	HEATED OXYGEN SENSOR 2 HEATER
118	GR	THROTTLE CONTROL MOTOR POWER SUPPLY
119	GR	THROTTLE CONTROL MOTOR (OPEN)
120	BR	THROTTLE CONTROL MOTOR (CLOSE)

Connector No.	F229
Connector Name	ENGINE RESTART BYPASS RELAY
Connector Type	X01FGY



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

Connector No.	M32
Connector Name	WIRE TO WIRE
Connector Type	TH80MM-DS16-TM



Terminal No.	Color Of Wire	Signal Name [Specification]
2	R	—
5	V	—
7	GR	—
8	P	—
9	SB	—
10	R	—
14	W	—
20	L	—
21	P	—
22	SHIELD	—
24	BR	—
31	Y	—
32	GR	—
33	SC	—
34	LG	—
35	BG	— [Without MR16 engine]
35	LG	— [With MR16 engine]
36	BG	— [With MR16 engine]
36	LG	— [Without MR16 engine]

STARTING SYSTEM

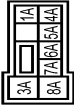
< WIRING DIAGRAM >

STARTING SYSTEM

Terminal No.	Color Of Wire	Signal Name [Specification]
38	G	- [Without MR18 engine]
39	R	- [With MR18 engine]
39	BR	-
40	L	-
41	P	-
42	W	-
43	R	-
44	Y	-
45	LG	-
46	L	-
47	EG	-
48	V	-
49	P	-
50	BR	-
51	SP	-
52	LG	- [With Intelligent Key and HR engine without CPT]
53	W	- [Except with Intelligent Key and HR engine without CPT]
55	BR	-
56	P	-
57	B	-
58	L	-
59	GR	-
60	G	-
61	SB	-
62	V	-
63	BR	-
64	Y	-
65	GR	-
66	L	-
67	L	-
68	R	-
69	W	-
70	G	-
71	Y	-
72	EG	-
73	R	-
76	L	-
77	V	-
78	LG	-
79	SHIELD	-
80	GR	-
81	GR	-
83	LG	-
84	SB	-
85	G	-
86	G	-
87	B	-
88	B	-
90	Y	-

91	L	-
93	W	-
96	LG	-
97	BR	-
98	V	-
99	R	-

Connector No.	M75
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS90FW-M2



Terminal No.	Color Of Wire	Signal Name [Specification]
1A	G	-
3A	Y	-
4A	LG	-
5A	R	-
6A	EG	-
7A	P	-
8A	SB	-

Connector No.	RS
Connector Name	PERSONAL LAMP LH
Connector Type	TT03FW



Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	-
2	V	-
3	G	-

JRBWD1456GB

DIAGNOSIS AND REPAIR WORK FLOW

< BASIC INSPECTION >

BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow

INFOID:0000000010430894

A

STR

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 connector is disconnected. Refer to [ECH-120, "Work Procedure"](#) (HR engine), [ECK-146, "Work Procedure"](#) (K9K engine), [EC9-155, "Work Procedure"](#) (R9M engine) or [ECM-203, "Work Procedure"](#) (MR16DDT engine).

1.CHECK ENGINE TYPE

Check the vehicle information.

Type	Engine
1	HR engine
	K9K engine
	R9M engine
	MR16DDT engine
2	MR20DD 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-147, "Work Flow WITHOUT STOP/START SYSTEM"](#).

6.CHECK STARTER MOTOR ACTIVATION

Check that the starter motor runs at cranking.

Does starter motor turn?

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DIAGNOSIS AND REPAIR WORK FLOW

< BASIC INSPECTION >

- 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-29, "MR20DD : Inspection"](#).
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-147, "Work Flow WITH-OUT STOP/START SYSTEM"](#).

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-29, "MR20DD : Inspection"](#).
- 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.

B TERMINAL CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

DTC/CIRCUIT DIAGNOSIS

B TERMINAL CIRCUIT

Diagnosis Procedure

INFOID:0000000010430895

STR

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 [ECH-120, "Work Procedure"](#) (HR engine), [ECK-146, "Work Procedure"](#) (K9K engine), [EC9-155, "Work Procedure"](#) (R9M engine) or [ECM-203, "Work Procedure"](#) (MR16DDT engine).

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.

Except for MR engine

Exception for WIX engine		(-)	Voltage (Approx.)
(+)			
Starter motor			
Connector	Terminal		
F105	2	Ground	Battery voltage

For MR engine

For MX engine		(-)	Voltage (Approx.)
(+)			
Starter motor			
Connector	Terminal		
E70	2	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.

Except for MR engine

Exception for WIX engine				
(+)	(-)		Condition	Voltage (Approx.)
	Starter motor			
	Connector	Terminal		
Battery positive terminal	F105	2	When the ignition switch is in START position	Less than 0.5 V

For MR engine

For 1.6L engine				
(+) <				

Is the inspection result normal?

YES >> GO TO 3.

NO >> Check harness between the battery and the starter motor for poor continuity.

B TERMINAL CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

3. CHECK GROUND CIRCUIT STATUS (VOLTAGE DROP TEST)

- Shift selector lever to "P" or "N" position. (CVT models)
Keep depressing clutch pedal fully. (M/T models)
- 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

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

Except for MR16DDT engine

Starter motor		Engine restart bypass relay		Continuity
Connector	Terminal	Connector	Terminal	
F105	2	F147	2	Existed

For MR16DDT engine

Starter motor		Engine restart bypass relay		Continuity
Connector	Terminal	Connector	Terminal	
E70	2	E72	2	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.

Except for MR16DDT engine

(+)		(−)	Voltage (Approx.)
Engine restart bypass relay			
Connector	Terminal		
F148	3	Ground	Battery voltage

For MR16DDT engine

(+)		(−)	Voltage (Approx.)
Engine restart bypass relay			
Connector	Terminal		
E71	3	Ground	Battery voltage

Is the inspection result normal?

YES >> Replace engine restart bypass relay. Refer to [ECH-322, "Removal and Installation"](#) (HR engine), [ECK-402, "Removal and Installation"](#) (K9K engine), [EC9-413, "Removal and Installation"](#) (R9M engine) or [ECM-619, "Removal and Installation"](#) (MR16DDT engine).

NO >> Repair or replace harness.

S TERMINAL CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

S TERMINAL CIRCUIT

Diagnosis Procedure

INFOID:000000010430896

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 [ECH-120, "Work Procedure"](#) (HR engine), [ECK-146, "Work Procedure"](#) (K9K engine), [EC9-155, "Work Procedure"](#) (R9M engine) or [ECM-203, "Work Procedure"](#) (MR16DDT engine).

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.

Except for MR engine

(+) Starter motor		(-)	Condition	Voltage (Approx.)
Connector	Terminal			
F104	1	Ground	When the ignition switch is in START position	Battery voltage

For MR engine

(+) Starter motor		(-)	Condition	Voltage (Approx.)
Connector	Terminal			
F106	1	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.

Except for MR engine

Starter motor		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F104	1	F88	65	Existed

For MR engine

Starter motor		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F106	1	F88	65	Existed

Is the inspection result normal?

- YES >> Further inspection is necessary. Refer to [SEC-78, "Work Flow"](#) (With Intelligent Key System) or [SEC-237, "Work Flow"](#) (Without Intelligent Key System).
NO >> Repair or replace harness.

STARTING SYSTEM

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS

STARTING SYSTEM

Symptom Table

INFOID:0000000010430897

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

STARTER MOTOR

< REMOVAL AND INSTALLATION >

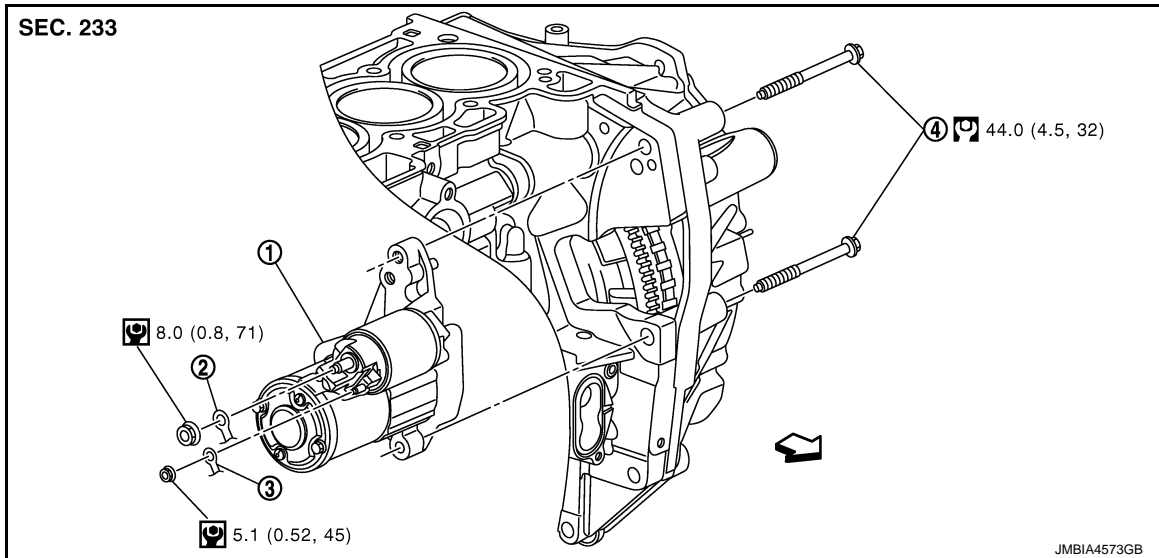
REMOVAL AND INSTALLATION

STARTER MOTOR

HRA2DDT

HRA2DDT : Exploded View

INFOID:0000000010324198



1. Starter motor
2. "B" terminal harness
3. "S" terminal harness
4. Starter motor mounting bolt

↔ : Vehicle front

⊙ : N·m (kg-m, in-lb)

⊙ : N·m (kg-m, ft-lb)

HRA2DDT : Removal and Installation

INFOID:0000000010324199

REMOVAL

1. Disconnect the battery cable from the negative terminal. Refer to [PG-154, "Exploded View"](#).
2. Drain engine coolant from radiator. Refer to [CO-12, "Draining"](#).
CAUTION:
Perform this step when engine is cold.
3. Remove intake manifold. Refer to [EM-26, "Removal and Installation"](#).
4. Disconnect water hose from water inlet.
5. Remove "B" terminal nut and "B" terminal harness.
6. Remove "S" terminal nut and "S" terminal harness.
7. Remove starter motor mounting bolts.
8. Remove starter motor forward from the vehicle.

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 removed or replaced. Refer to [ECH-120, "Work Procedure"](#).
- Replace the engine restart relay and the fuel pump relay when the starter motor models with STOP/START SYSTEM is replaced.

MR16DDT

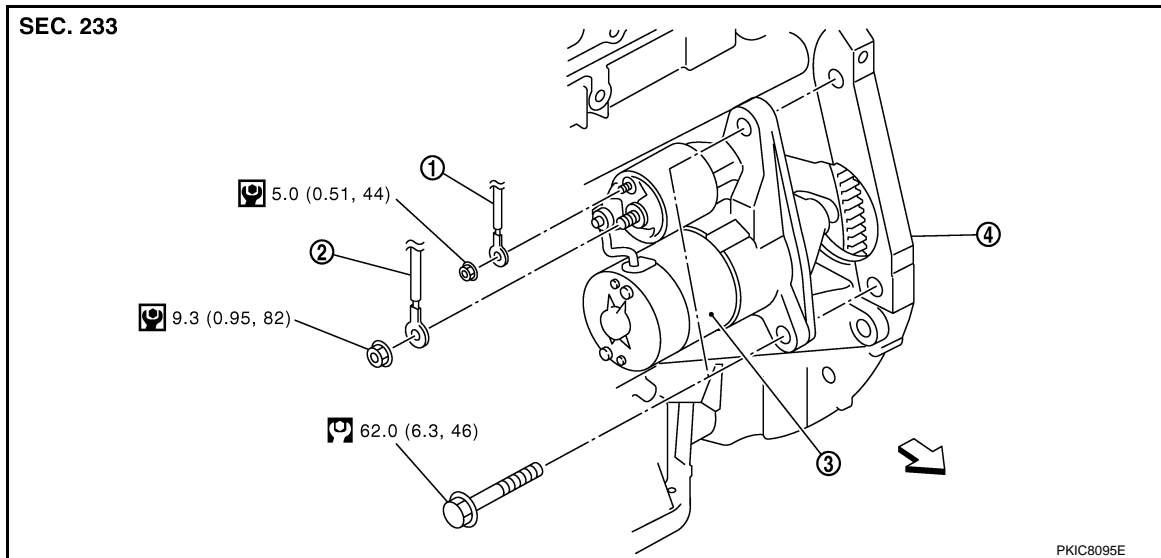
STARTER MOTOR

< REMOVAL AND INSTALLATION >

MR16DDT : Exploded View

INFOID:0000000011732944

REMOVAL



1. "S" terminal harness

2. "B" terminal harness

3. Starter motor

4. Cylinder block

↔ : Vehicle front

⊙ : N·m (kg-m, in-lb)

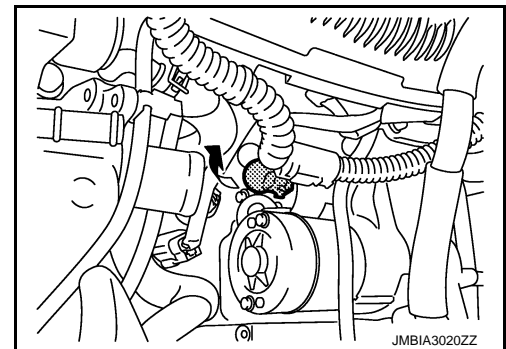
⊙ : N·m (kg-m, ft-lb)

MR16DDT : Removal and Installation

INFOID:0000000011732945

REMOVAL

1. Disconnect the battery cable from the negative terminal. Refer to [PG-155, "Removal and Installation"](#).
2. Remove intake manifold. Refer to [EM-151, "Removal and Installation"](#).
3. Open "B" terminal cover, in the direction indicated by an arrow as shown in the figure.

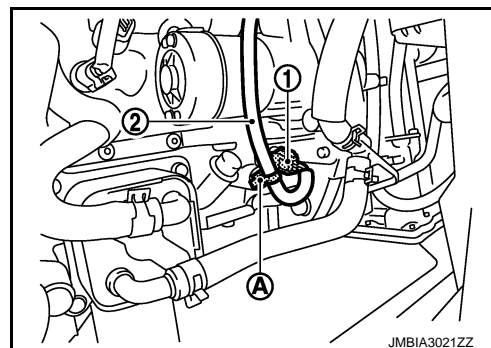


4. Remove "B" terminal nut and "B" terminal harness.
5. Remove "S" terminal nut and "S" terminal harness.
6. Disconnect harness connector from oil level sensor and oil pressure control solenoid valve. Refer to [EM-171, "Exploded View"](#).

STARTER MOTOR

< REMOVAL AND INSTALLATION >

7. Disconnect harness connector (1) from crankshaft position sensor.
8. Remove harness fixing clip (A) from oil pan (upper), and then move harness (2) to a location where they do not inhibit work.



9. Remove starter motor mounting bolts.
10. Remove starter motor from the vehicle.

CAUTION:

For models with STOP/START SYSTEM, never erase the starter operation counter except when replacing starter motor.

INSTALLATION

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

CAUTION:

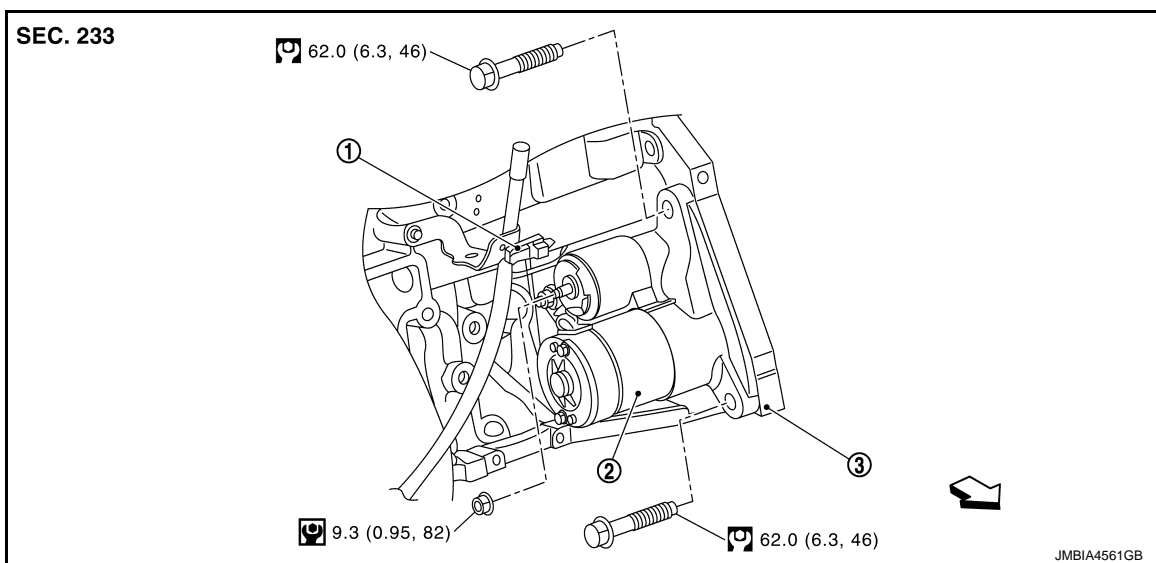
- Be careful to tighten "B" terminal nut to the specified torque.
- Erase the starter operation counter when the starter motor for models with STOP/START SYSTEM is replaced. Refer to [ECM-203, "Work Procedure"](#).
- Replace the engine restart bypass relay and the fuel pump relay when the starter motor models with STOP/START SYSTEM is replaced.
 - Engine restart bypass relay: Refer to [ECM-619, "Removal and Installation"](#).
 - Fuel pump relay (IPDM E/R): Refer to [PCS-68, "Removal and Installation"](#).

MR20DD

MR20DD : Exploded View

INFOID:0000000010376819

REMOVAL



1. "S" terminal connector

2. Starter motor

3. Cylinder block

↙ : Vehicle front

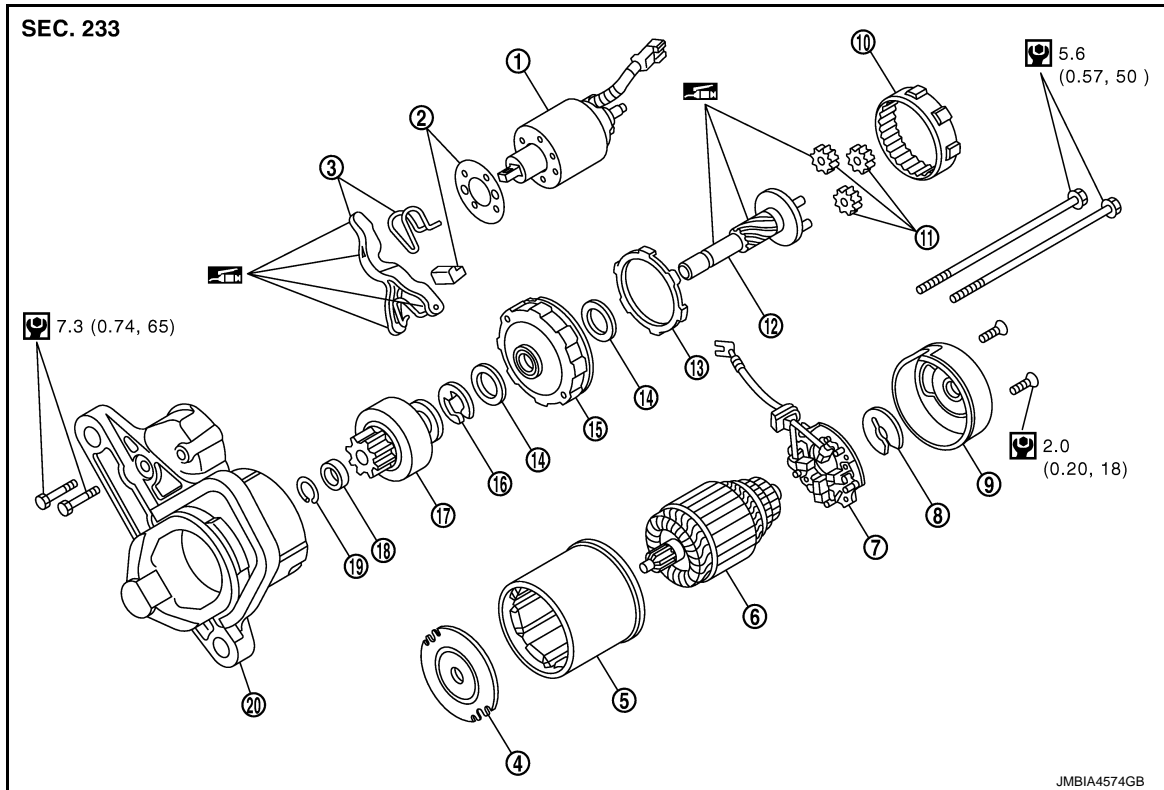
⚙ : N·m (kg-m, in-lb)

⚙ : N·m (kg-m, ft-lb)

STARTER MOTOR

< REMOVAL AND INSTALLATION >

DISASSEMBLY



- | | | |
|-----------------------------|------------------------|------------------------|
| 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

: N·m (kg-m, in-lb)

MR20DD : Removal and Installation

INFOID:0000000010376820

REMOVAL

1. Disconnect the battery cable from the negative terminal. Refer to [PG-154. "Exploded View"](#).
2. Disconnect the oil pressure switch connector.
3. Remove "B" terminal nut and "B" terminal harness.
4. Remove "S" terminal nut and "S" terminal harness.
5. Remove starter motor mounting bolts.
6. Remove starter motor upward from the vehicle.

CAUTION:

Never damage oil pressure switch when removing starter motor.

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.

STARTER MOTOR

< REMOVAL AND INSTALLATION >

MR20DD : Disassembly and Assembly

INFOID:000000010376821

ASSEMBLY

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

Carefully observe the following instructions.

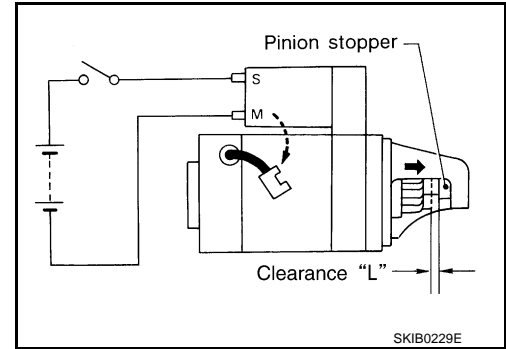
Pinion Protrusion Length Adjustment

CLEARANCE

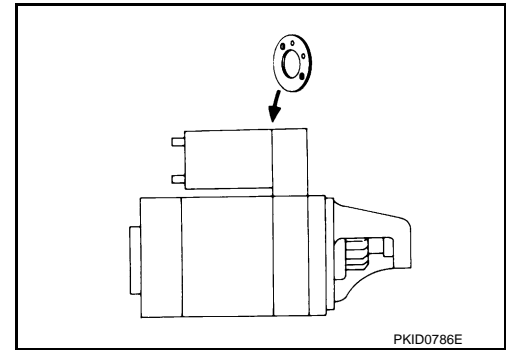
- With pinion driven out by magnetic switch, push pinion back to remove slack and measure clearance "L" between the front edge of the pinion and the pinion stopper.

Clearance "L"

: Refer to SDS [STR-36](#),
["Starter Motor"](#).



- Adjust with the adjusting plate if the measurement value is not in the specified area.



MR20DD : Inspection

INFOID:000000010376822

INSPECTION

Magnetic Switch Check

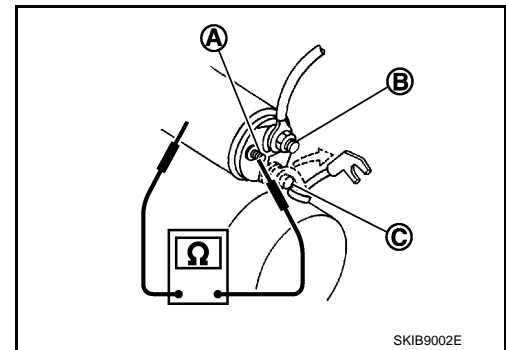
- Before starting to check, disconnect the battery cable from the negative terminal.
- Disconnect "M" terminal of starter motor.

- Continuity test [between "S" terminal (A) and switch body]

B : "B" terminal

C : "M" terminal

- Replace magnetic switch if continuity does not exist.



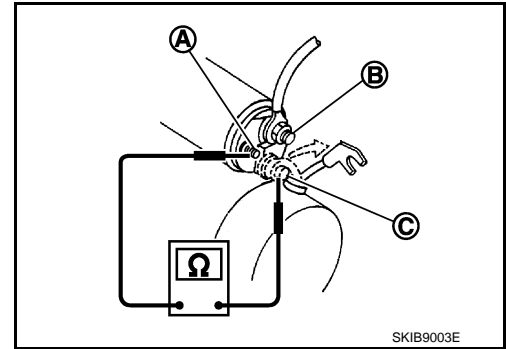
STARTER MOTOR

< REMOVAL AND INSTALLATION >

2. Continuity test [between "S" terminal (A) and "M" terminal (C)]

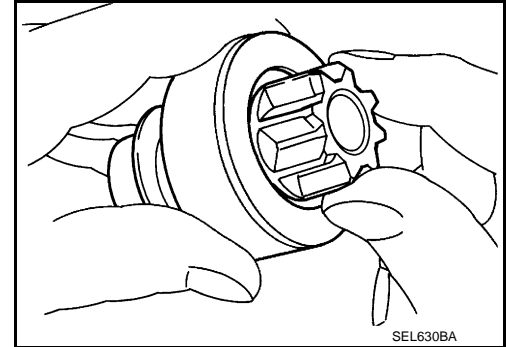
B : "B" terminal

- Replace magnetic switch if continuity does not exist.



Pinion/Clutch Check

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.

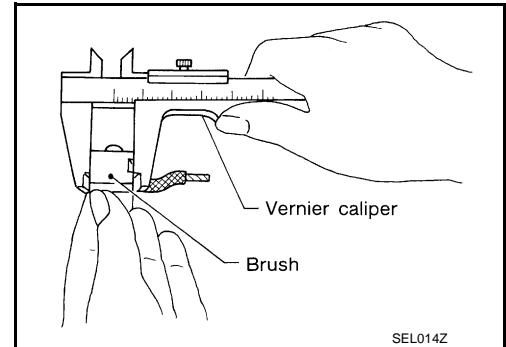


Brush Check

- Check wear of brush.

Minimum length of brush : Refer to SDS [STR-36](#), "[Starter Motor](#)".

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

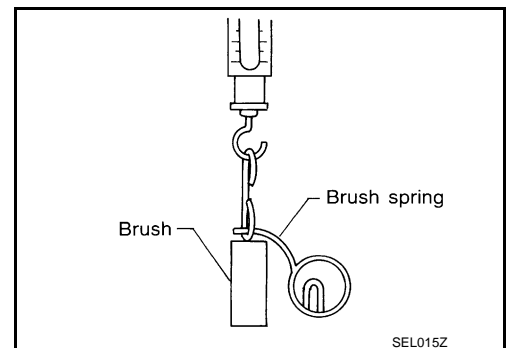


Brush Spring Check

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

Spring tension (with new brush) : Refer to SDS [STR-36](#), "[Starter Motor](#)".

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

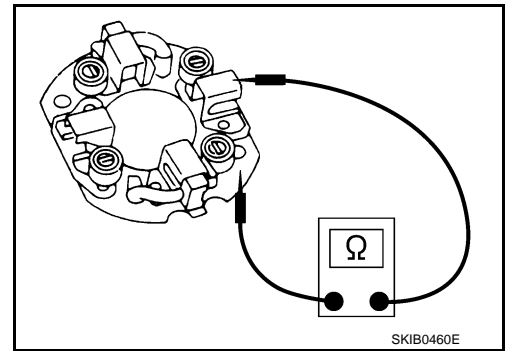


Brush Holder Check

STARTER MOTOR

< REMOVAL AND INSTALLATION >

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.

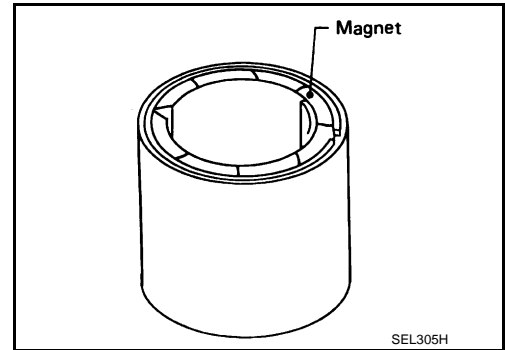


Yoke Check

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.

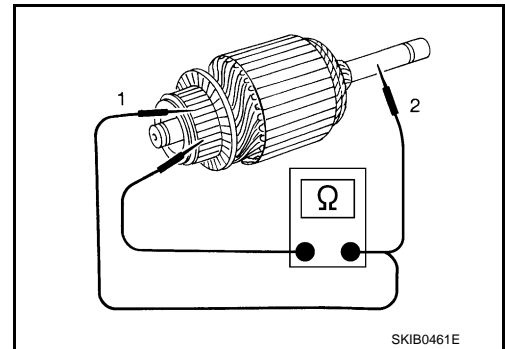
CAUTION:

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

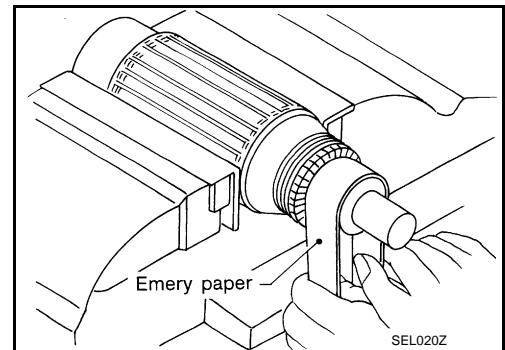


Armature Check

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



3. Check commutator surface.
 - Grind with No. 500 - 600 emery paper if it has a rough surface.



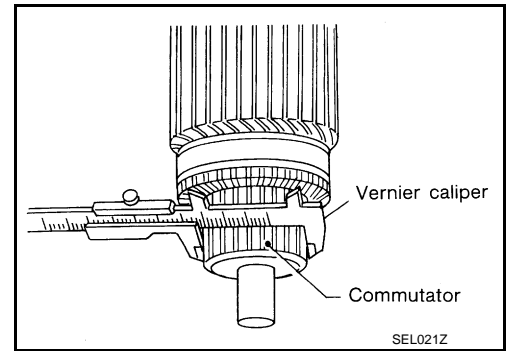
STARTER MOTOR

< REMOVAL AND INSTALLATION >

4. Check diameter of commutator.

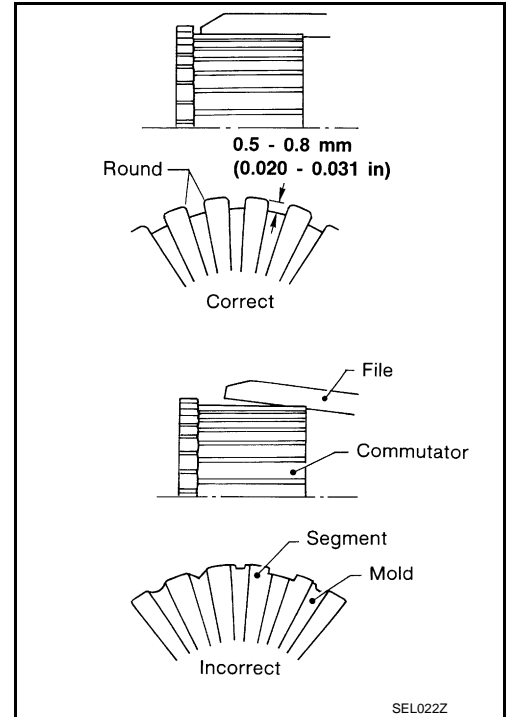
Commutator minimum diameter : Refer to SDS [STR-36](#),
"Starter Motor".

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



5. Check depth of insulating mold from commutator surface.

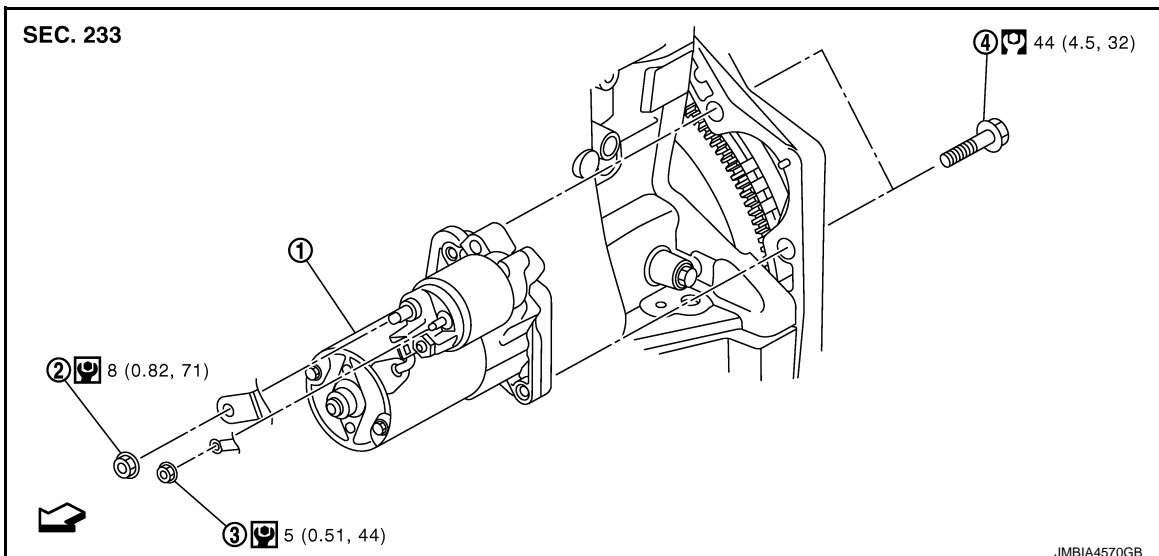
- Undercut to 0.5 to 0.8 mm (0.020 to 0.031 in) if the depth is 0.2 mm (0.008 in) or less.



K9K



K9K : Exploded View

INFOID:000000010324190



STARTER MOTOR

< REMOVAL AND INSTALLATION >

- | | | |
|--------------------------------|---------------------|---------------------|
| 1. Starter motor | 2. "B" terminal nut | 3. "S" terminal nut |
| 4. Starter motor mounting bolt | | |
- ↔ : Vehicle front
-  : N·m (kg-m, in-lb)
-  : N·m (kg-m, ft-lb)

A

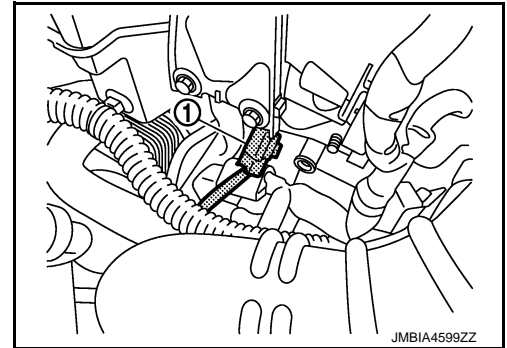
STR

K9K : Removal and Installation

INFOID:000000010324191

REMOVAL

1. Disconnect the battery cable from the negative terminal. Refer to [PG-154, "Exploded View"](#).
2. Remove air inlet tube. Refer to [EM-428, "Exploded View"](#).
3. Disconnect the fuel rail pressure (FRP) sensor harness connector (1).



4. Remove "S" terminal nut and "S" terminal harness.
5. Remove "B" terminal nut and "B" terminal harness.
6. Remove starter motor mounting bolts.
7. Remove starter motor upward from the vehicle.

CAUTION:

For models with STOP/START SYSTEM, never erase the starter operation counter except when replacing starter motor.

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 [ECK-146, "Work Procedure"](#).
- Replace the engine restart relay and the fuel pump relay when the starter motor models with STOP/START SYSTEM is replaced.

R9M

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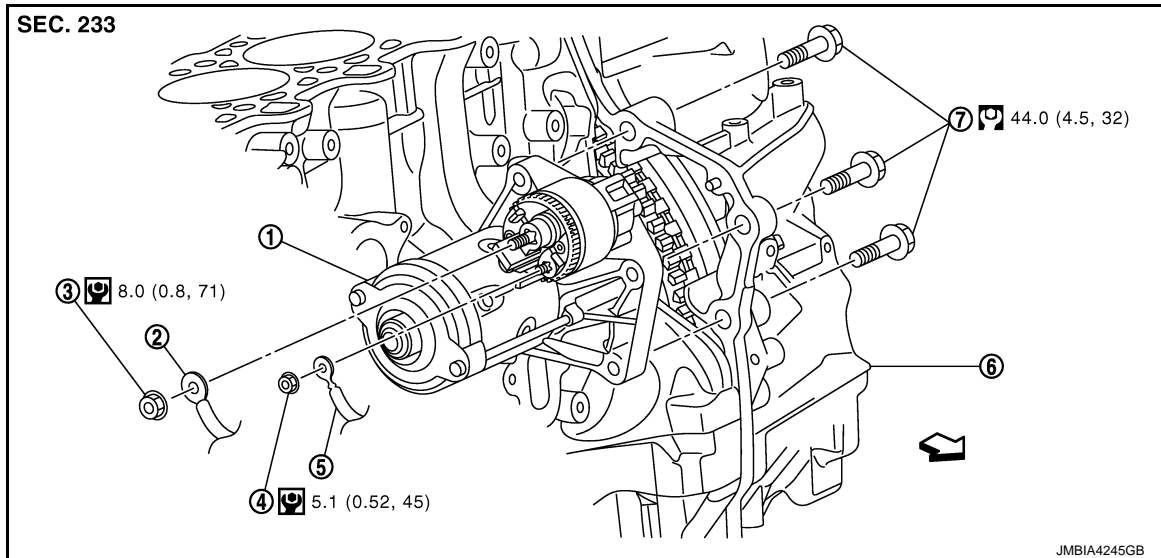
P

STARTER MOTOR

< REMOVAL AND INSTALLATION >

R9M : Exploded View

INFOID:000000010324196



- | | | |
|--------------------------------|-------------------------|-------------------------|
| 1. Starter motor | 2. "B" terminal harness | 3. "B" terminal nut |
| 4. "S" terminal nut | 5. "S" terminal harness | 6. Transmission housing |
| 7. Starter motor mounting bolt | | |

⇨ : Vehicle front

: N·m (kg-m, in-lb)

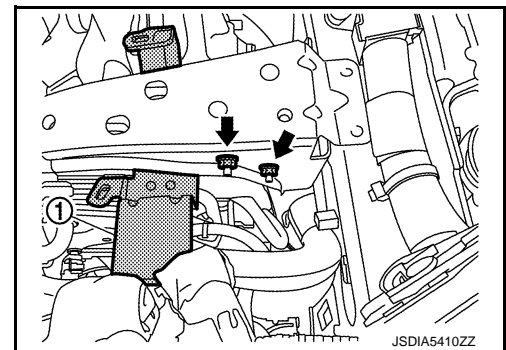
: N·m (kg-m, ft-lb)

R9M : Removal and Installation

INFOID:000000010324197

REMOVAL

1. Remove the battery and battery tray. Refer to [PG-155, "Removal and Installation"](#).
2. Remove the ECM (TCM) bracket and ECM (TCM). Refer to [TM-632, "Removal and Installation"](#).
3. Remove the harness bracket mounting nuts (⇨) and remove the harness bracket (1) from the vehicle.



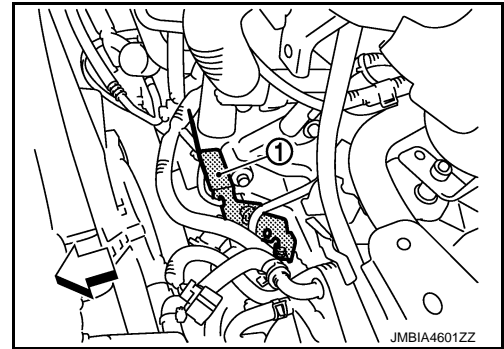
4. Remove the air inlet tube. Refer to [EM-530, "Exploded View"](#).
5. Remove the radiator hose (lower). Refer to [CO-125, "Exploded View"](#).
6. Remove the alternator. Refer to [CHG-33, "R9M : Removal and Installation"](#).
7. Remove the oil level gauge and oil level gauge guide.
CAUTION:
Cover the openings to avoid entry of foreign materials.
8. Remove the water hose. Refer to [CO-133, "Exploded View"](#).

STARTER MOTOR

< REMOVAL AND INSTALLATION >

9. Remove harness bracket (1).

⇐ : Vehicle front

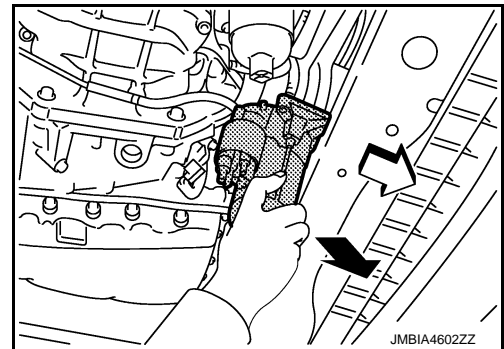


10. Remove "B" terminal nut (A) and "B" terminal harness.
11. Remove "S" terminal nut (B) and "S" terminal harness.
12. Remove starter motor mounting bolts.
13. Remove starter motor (1) downward from the vehicle.

CAUTION:

For models with STOP/START SYSTEM, never erase the starter operation counter except when replacing starter motor.

⇐ : 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 [EC9-155, "Work Procedure"](#).
- Replace the engine restart relay and the fuel pump relay when the starter motor models with STOP/START SYSTEM is replaced.

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Starter Motor

INFOID:0000000010201146

Engine		HR			K9K
		M000TD0371	M000TD0375	M000T46571	0 001 170 605
Type		MITUBISHI make			BOSCH make
		Reduction gear type			
System voltage		[V] 12			
No-load	Terminal voltage	[V] 11.5			—
	Current	[A] Less than 110	Less than 110	Less than 40	—
	Revolution	[rpm] More than 2,800	More than 2,800	More than 5,000	—
Minimum diameter of commutator		[mm (in)] —	—	—	—
Minimum length of brush		[mm (in)] —	—	—	—
Brush spring tension		[N (kg, lb)] —	—	—	—
Clearance between bearing metal and armature shaft		[mm (in)] —	—	—	—
Clearance "L" between pinion front edge and pinion stopper		[mm (in)] —	—	—	—

Engine		R9M	MR20DD	MR16DDT
Type		0 001 170 607	S114 - 971	S116 - 001
		BOSCH make	HITACHI make	
		Reduction gear type		
System voltage [V]		12		
No-load	Terminal voltage [V]	—	11	
	Current [A]	—	Less than 110	
	Revolution [rpm]	—	More than 3,300	More than 3,500
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)	—