

SECTION STR

STARTING SYSTEM

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PRECAUTIONS

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PRECAUTION

PRECAUTIONS

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

INFOID:000000009452287

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 SR and SB section of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SR section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

- When working near the Airbag Diagnosis Sensor Unit or other Airbag System sensors with the Ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the Ignition OFF, disconnect the battery and wait at least three minutes before performing any service.

PREPARATION

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PREPARATION

Special Service Tool

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The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

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



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Commercial Service Tools

INFOID:000000009385557

Tool name	Description
Power tool	Loosening nuts, screws and bolts



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COMPONENT PARTS

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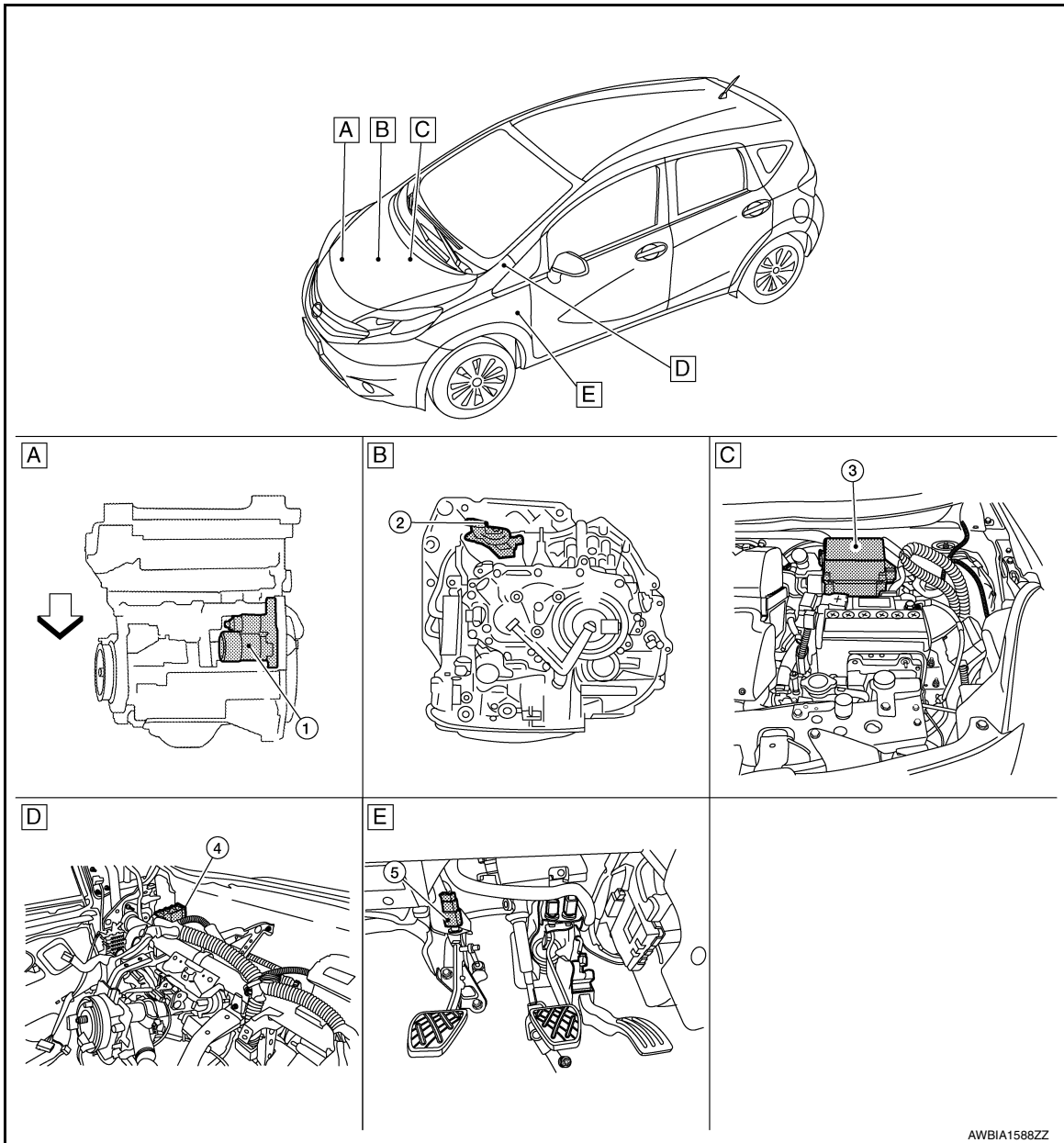
SYSTEM DESCRIPTION

COMPONENT PARTS

STARTING SYSTEM

STARTING SYSTEM : Component Parts Location

INFOID:000000009385560



← Vehicle front

- | | | |
|--|-----------------------------|------------------------|
| A. Engine front side | B. Transmission LH side | C. Engine room LH side |
| D. Instrument panel LH side (view with the instrument panel removed) | E. Pedal assemblies LH side | |

COMPONENT PARTS

< SYSTEM DESCRIPTION >

STARTING SYSTEM : Component Description

INFOID:000000009385561

No.	Component part	Description
1.	Starter motor	The starter motor plunger closes and the motor is supplied with battery power, which in turn cranks the engine, when the S terminal is supplied with electric power.
2.	Transmission range switch (CVT Models)	Supplies power to the starter relay and starter control relay (inside IPDM E/R) when the selector lever is shifted into the P or N position.
3.	IPDM E/R	CPU inside IPDM E/R operates the starter relay when the ignition switch is in the start position.
4.	BCM	BCM controls the starter relay inside the IPDM E/R.
5.	Clutch interlock switch (M/T Models)	Clutch interlock switch supplies power to the coil side of the starter relay when the clutch pedal is depressed to crank the engine.

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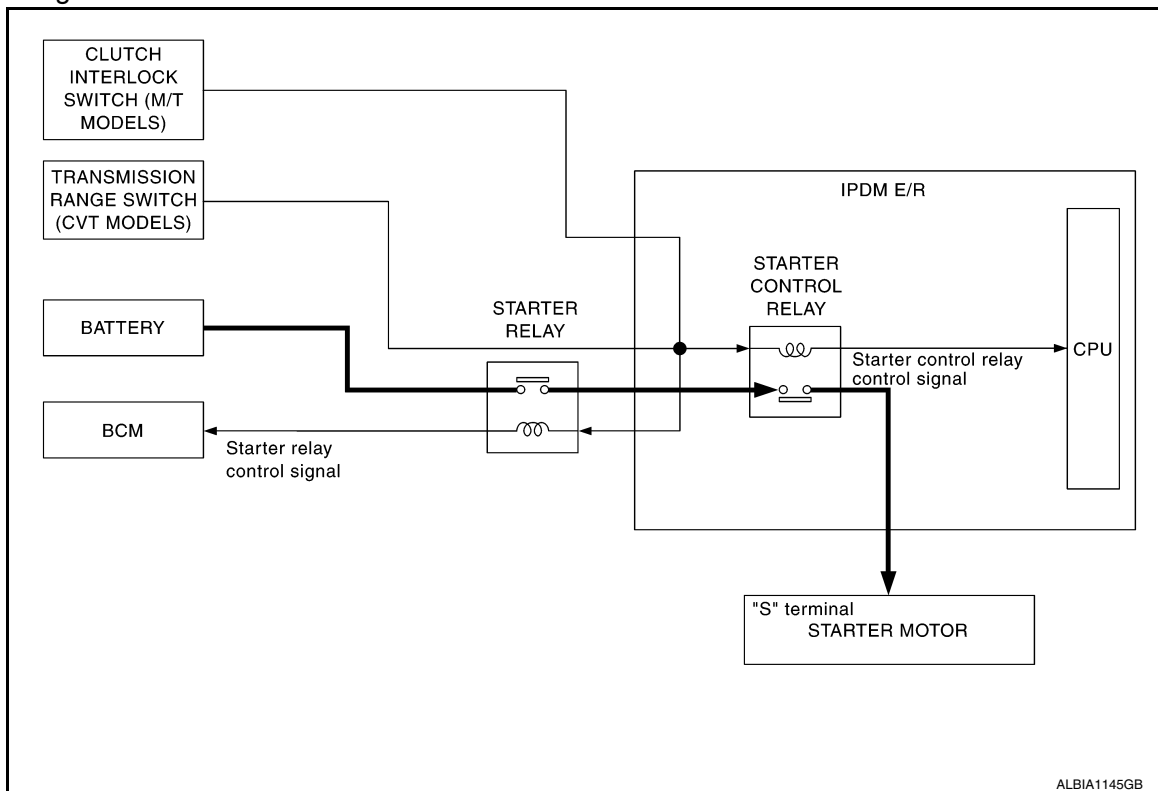
< SYSTEM DESCRIPTION >

SYSTEM

System Description

INFOID:000000009385565

System Diagram



The starter motor plunger closes and provides a closed circuit between the battery and starter motor. The starter motor is grounded to the cylinder block. With power and ground supplied, the starter motor operates.

STARTING SYSTEM

< WIRING DIAGRAM >

WIRING DIAGRAM

STARTING SYSTEM

Wiring Diagram

INFOID:000000009385566

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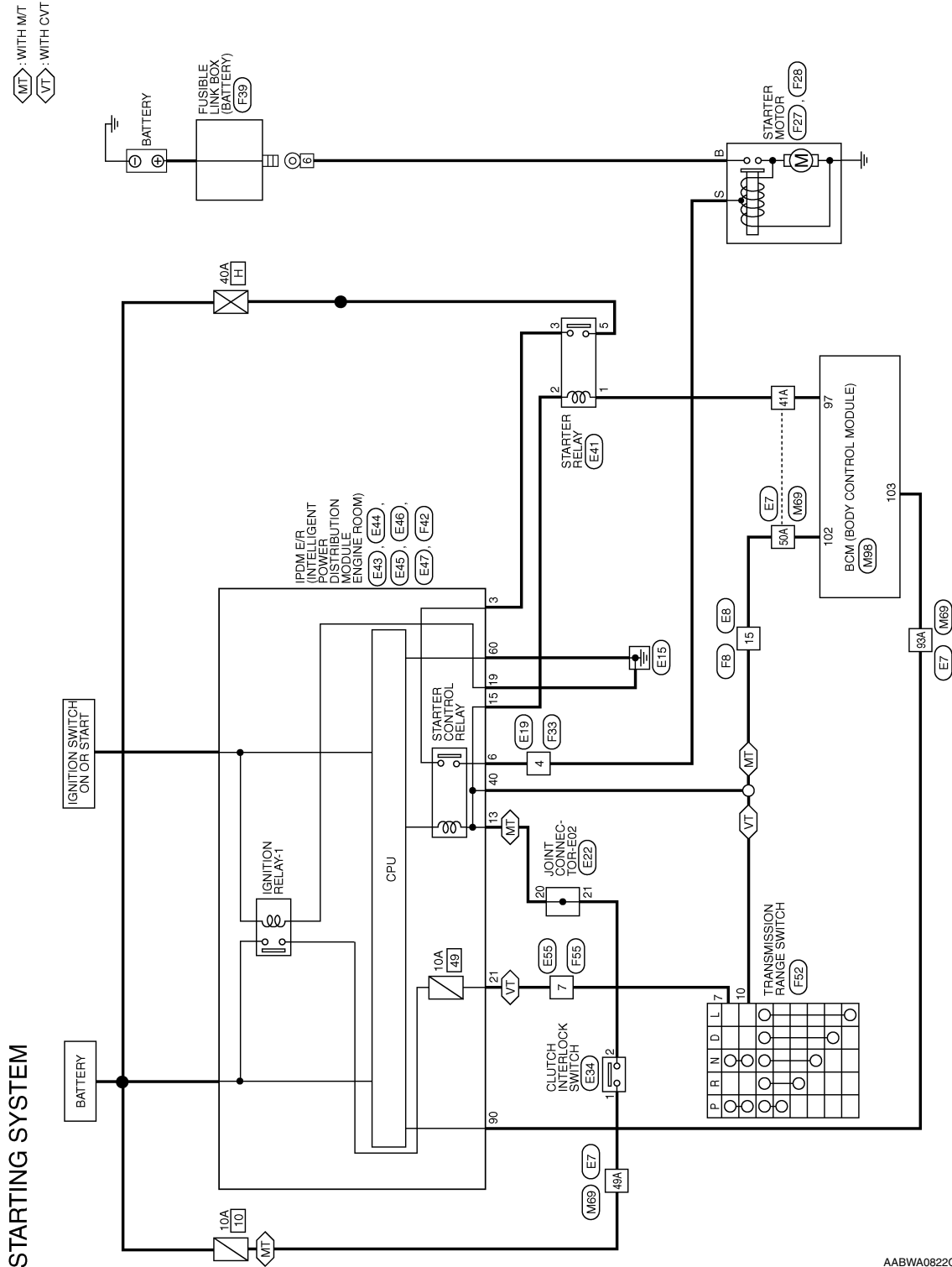
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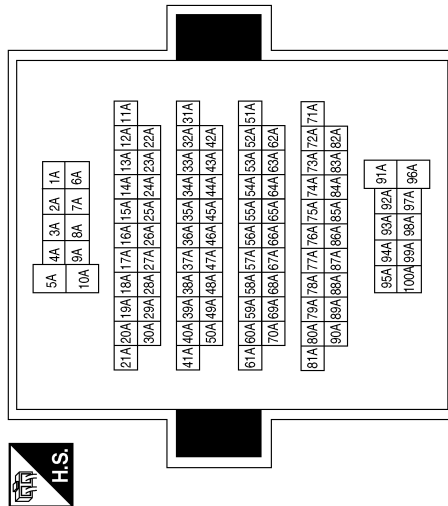
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STARTING SYSTEM

< WIRING DIAGRAM >

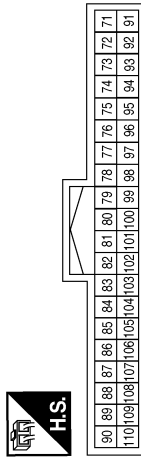
STARTING SYSTEM CONNECTORS

Connector No.	M69
Connector Name	WIRE TO WIRE
Connector Color	WHITE



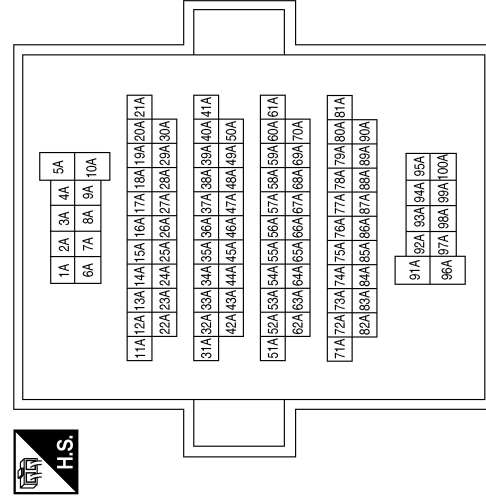
Terminal No.	Color of Wire	Signal Name
41A	R/Y	—
49A	G	—
50A	BR	—
93A	O	—

Connector No.	M98
Connector Name	BCM (BODY CONTROL MODULE)
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
97	R/Y	STARTER RELAY OUTPUT
103	O	IGN RELAY OUTPUT1 (USM)
102	BR	SHIFT N. P

Connector No.	E7
Connector Name	WIRE TO WIRE
Connector Color	WHITE

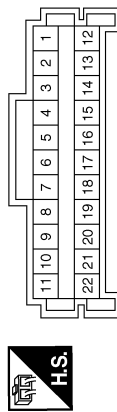


Terminal No.	Color of Wire	Signal Name
41A	G	—
49A	Y	—
50A	V	—
93A	L	—

STARTING SYSTEM

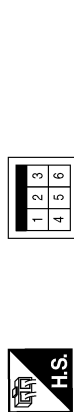
< WIRING DIAGRAM >

Connector No.	E22
Connector Name	JOINT CONNECTOR-E02
Connector Color	WHITE



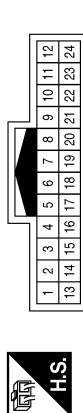
Terminal No.	Color of Wire	Signal Name
20	R	-
21	V	-

Connector No.	E19
Connector Name	WIRE TO WIRE
Connector Color	WHITE



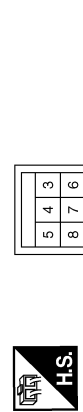
Terminal No.	Color of Wire	Signal Name
4	R	-

Connector No.	E8
Connector Name	WIRE TO WIRE
Connector Color	WHITE



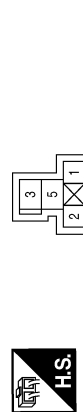
Terminal No.	Color of Wire	Signal Name
15	V	-

Connector No.	E43
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	BLACK



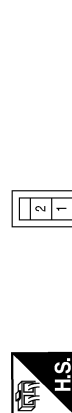
Terminal No.	Color of Wire	Signal Name
3	SB	F/L IGNSW (WITH INTELLIGENT KEY SYSTEM)
6	R	STARTER MOTOR

Connector No.	E41
Connector Name	STARTER RELAY
Connector Color	BLUE



Terminal No.	Color of Wire	Signal Name
1	G	-
2	LG	-
3	SB	-
5	L	-

Connector No.	E34
Connector Name	CLUTCH INTERLOCK SWITCH
Connector Color	BROWN



Terminal No.	Color of Wire	Signal Name
1	Y	-
2	V	-

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STARTING SYSTEM

< WIRING DIAGRAM >

Connector No.	E46
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



64	63	62	61	60	59	58	57	56	55	54	53
76	75	74	73	72	71	70	69	68	67	66	65

Terminal No.	60	Color of Wire	B	Signal Name	GND (SIGNAL)
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Connector No.	E45
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	BROWN



21	20			19	18	17
28	27	26	25	24	23	22

Terminal No.	19	Color of Wire	B	Signal Name	GND (POWER)
	21	R			AT ECU (WITH A/T OR CVT)

Connector No.	E44
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	BROWN



11		10	9
16	15	14	13
			12

Terminal No.	13	Color of Wire	R	Signal Name	CLUTCH I/L SW
	15	LG			ST RLY COIL

Connector No.	F8
Connector Name	WIRE TO WIRE
Connector Color	WHITE



12	11	10	9	8	7	6	5	4	3	2	1
24	23	22	21	20	19	18	17	16	15	14	13

Terminal No.	15	Color of Wire	BR	Signal Name	—
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Connector No.	E55
Connector Name	WIRE TO WIRE
Connector Color	GRAY



1	2	3	4	5		
6	7	8	9	10	11	12

Terminal No.	7	Color of Wire	R	Signal Name	—
--------------	---	---------------	---	-------------	---

Connector No.	E47
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



84	83	82	81	80	79	78	77
92	91	90	89	88	87	86	85

Terminal No.	90	Color of Wire	L	Signal Name	IGN SIGNAL
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STARTING SYSTEM

< WIRING DIAGRAM >

Connector No.	F27
Connector Name	STARTER MOTOR
Connector Color	-



Terminal No.	B
Color of Wire	B/R
Signal Name	-

Connector No.	F28
Connector Name	STARTER MOTOR
Connector Color	-



Terminal No.	S
Color of Wire	R
Signal Name	-

Connector No.	F33
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	4
Color of Wire	R
Signal Name	-

Connector No.	F39
Connector Name	FUSIBLE LINK BOX (BATTERY)
Connector Color	-



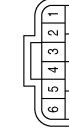
Terminal No.	6
Color of Wire	B/R
Signal Name	-

Connector No.	F42
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



Terminal No.	40
Color of Wire	BR
Signal Name	NPSW

Connector No.	F52
Connector Name	TRANSMISSION RANGE SWITCH (WITH CVT)
Connector Color	BLACK



Terminal No.	7
Color of Wire	R
Signal Name	-
Terminal No.	10
Color of Wire	BR
Signal Name	-

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STARTING SYSTEM

< WIRING DIAGRAM >

Connector No.	F55
Connector Name	WIRE TO WIRE
Connector Color	GRAY

5	4	3	2	1
12	11	10	9	8
7	6			



Terminal No.	Color of Wire	Signal Name
7	R	-

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DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow (With GR8-1200 NI)

INFOID:0000000009446820

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STARTING SYSTEM DIAGNOSIS WITH GR8-1200 NI

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

- GR8-1200 NI Multitasking battery and electrical diagnostic station

NOTE:

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

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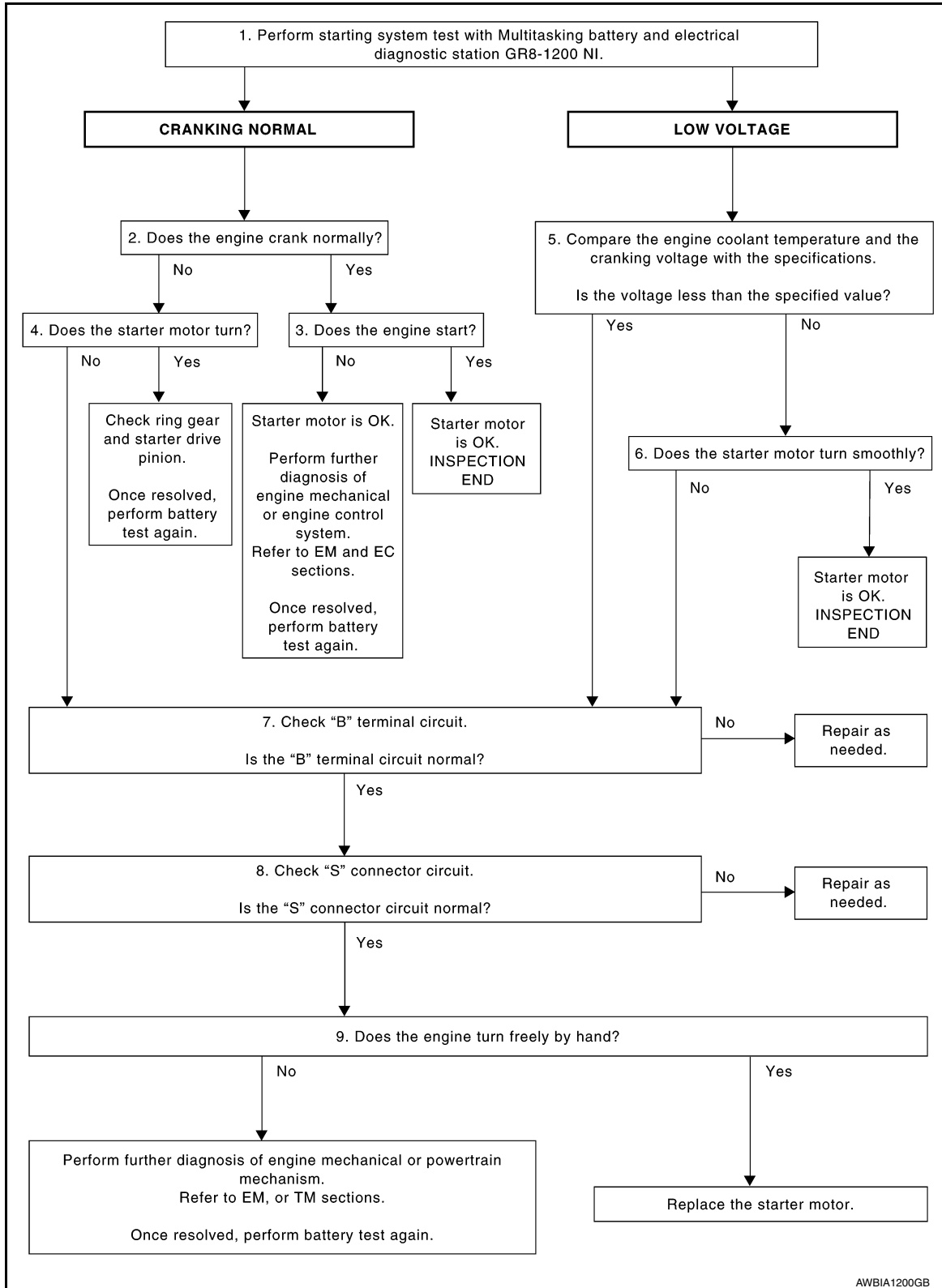
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DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

OVERALL SEQUENCE



DETAILED FLOW

NOTE:

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

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

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

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

Test result

CRANKING NORMAL>>GO TO 2.

LOW VOLTAGE>>GO TO 5.

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

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

2. CRANKING CHECK

Check that the starter motor operates properly.

Does the engine crank normally?

YES >> GO TO 3.

NO >> GO TO 4.

3. ENGINE START CHECK

Check that the engine starts.

Does the engine start?

YES >> Inspection End.

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

4. STARTER MOTOR ACTIVATION

Check that the starter motor operates.

Does the starter motor turn?

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

NO >> GO TO 7.

5. COMPARISON BETWEEN ENGINE COOLANT AND CRANKING VOLTAGE

Compare the engine coolant temperature and verify the cranking voltage is within specifications.

Minimum Specification of Cranking Voltage Referencing Coolant Temperature

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

Is the voltage less than the specified value?

YES >> GO TO 7.

NO >> GO TO 6.

6. STARTER OPERATION

Check the starter operation.

Does the starter motor turn smoothly?

YES >> Inspection End.

NO >> GO TO 7.

7. "B" TERMINAL CIRCUIT INSPECTION

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

Is "B" terminal circuit normal?

YES >> GO TO 8.

NO >> Repair as needed.

8. "S" CONNECTOR CIRCUIT INSPECTION

Check "S" connector circuit. Refer to [STR-21, "Diagnosis Procedure"](#).

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

Is "S" connector circuit normal?

YES >> GO TO 9.

NO >> Repair as needed.

9. ENGINE ROTATION STATUS

Check that the engine can be rotated by hand.

Does the engine turn freely by hand?

YES >> Replace starter motor.

NO >> Perform further diagnosis of engine mechanical or powertrain mechanism. Once resolved, perform battery test again using Multitasking battery and electrical diagnostic station GR8-1200 NI. Refer to the diagnostic station Instruction Manual for proper testing procedures.

Work Flow (Without GR8-1200 NI)

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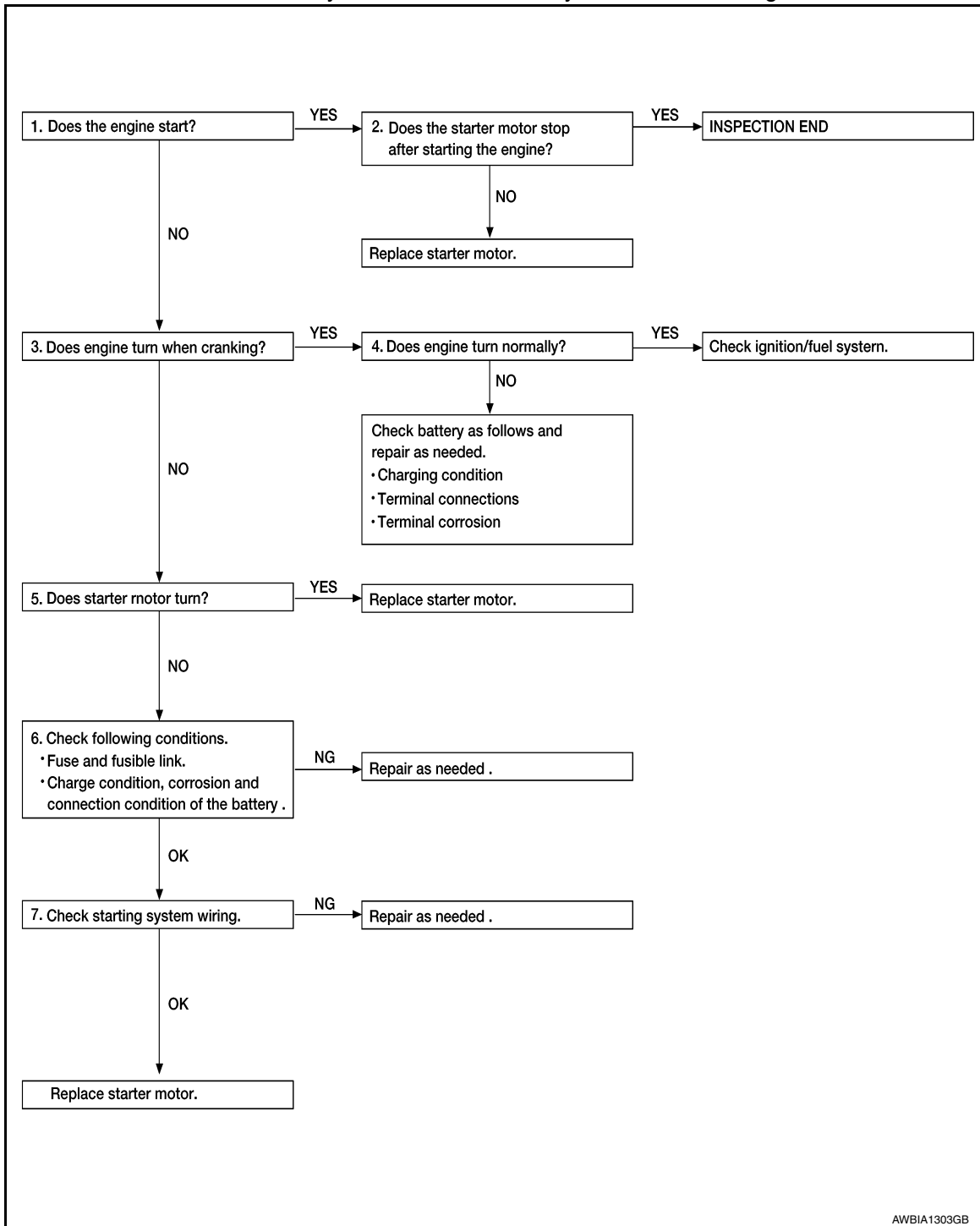
OVERALL SEQUENCE

NOTE:

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

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



DETAILED FLOW

1.CHECK ENGINE START

Crank the engine and check that the engine starts.

Does the engine start?

YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK THAT THE STARTER MOTOR STOPS

Check that the starter motor stops after starting the engine.

Does the starter motor stop?

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

YES >> Inspection End.

NO >> Replace starter motor. Refer to [STR-23, "Removal and Installation"](#).

3.CHECK THAT THE ENGINE TURNS WHEN CRANKING

Check that the engine turns when cranking.

Does engine turn when cranking?

YES >> GO TO 4.

NO >> GO TO 5.

4.CHECK THE ENGINE SPEED WHEN CRANKING

Check that the engine speed is not low when cranking.

Does engine turn normally?

YES >> Check ignition/fuel system.

NO >> Check charge condition, corrosion and connection condition of the battery.

5.CHECK STARTER MOTOR ACTIVATION

Check that the starter motor runs at cranking.

Does starter motor turn?

YES >> Replace starter motor. Refer to [STR-23, "Removal and Installation"](#).

NO >> GO TO 6.

6.CHECK POWER SUPPLY CIRCUIT

Check the following conditions:

- Fuse and fusible link
- Charge condition, corrosion and connection of the battery.

Are these inspection results normal?

YES >> GO TO 7.

NO >> Repair as needed.

7.CHECK STARTING SYSTEM WIRING

Check the following:

- "B" terminal circuit. Refer to [STR-19, "Diagnosis Procedure"](#).
- "S" terminal circuit. Refer to [STR-21, "Diagnosis Procedure"](#).

Are the inspection results normal?

YES >> Replace starter motor. Refer to [STR-23, "Removal and Installation"](#).

NO >> Repair as needed.

B TERMINAL CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

DTC/CIRCUIT DIAGNOSIS

B TERMINAL CIRCUIT

Description

INFOID:000000009446823

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Terminal "B" is constantly supplied with battery power.

Diagnosis Procedure

INFOID:000000009446824

Regarding Wiring Diagram information, refer to [STR-7. "Wiring Diagram"](#).

CAUTION:

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

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

1.CHECK "B" TERMINAL CIRCUIT

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

Terminals			Voltage (Approx.)
(+)		(-)	
Starter motor "B" terminal	Terminal		
F27	B	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.

NO >> Check harness between battery and starter motor for open circuit.

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

1. Shift selector lever to "P" (Park) or "N" (Neutral) position.
2. Check voltage between battery positive terminal and starter motor "B" terminal.

Terminals			Condition	Voltage (Approx.)
(+)	(-)			
	Starter motor "B" terminal	Terminal		
Battery positive terminal	F27	B	When the ignition switch is in START position	Less than 0.5V

Is the inspection result normal?

YES >> GO TO 3.

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

3.CHECK GROUND CIRCUIT STATUS (VOLTAGE DROP TEST)

1. Shift selector lever to "P" (Park) or "N" (Neutral) position.
2. Check voltage between starter motor case and battery negative terminal.

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

Is the inspection result normal?

B TERMINAL CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

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

S CONNECTOR CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

S CONNECTOR CIRCUIT

Description

INFOID:000000009446825

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

Diagnosis Procedure

INFOID:000000009446826

Regarding Wiring Diagram information, refer to [STR-7, "Wiring Diagram"](#).

CAUTION:

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

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

1.CHECK "S" CONNECTOR CIRCUIT

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

(+) Connector		(-) Terminal	Condition	Voltage (Approx.)
F28	S	Ground	When the ignition switch is in START position	Battery voltage

Is the inspection result normal?

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

NO >> GO TO 2.

2.CHECK HARNESS CONTINUITY (OPEN CIRCUIT)

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

Starter motor harness connector		IPDM E/R harness connector		Continuity
Connector	Terminal	Connector	Terminal	
F28	S	E43	6	Yes

3. Check continuity between starter motor terminal S and ground.

Connector	Terminal	—	Continuity
F28	S	Ground	No

Is the inspection result normal?

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

NO >> Repair or replace the harness or connectors.

STARTING SYSTEM

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS

STARTING SYSTEM

Symptom Table

INFOID:000000009385574

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

STARTER MOTOR

< REMOVAL AND INSTALLATION >

REMOVAL AND INSTALLATION

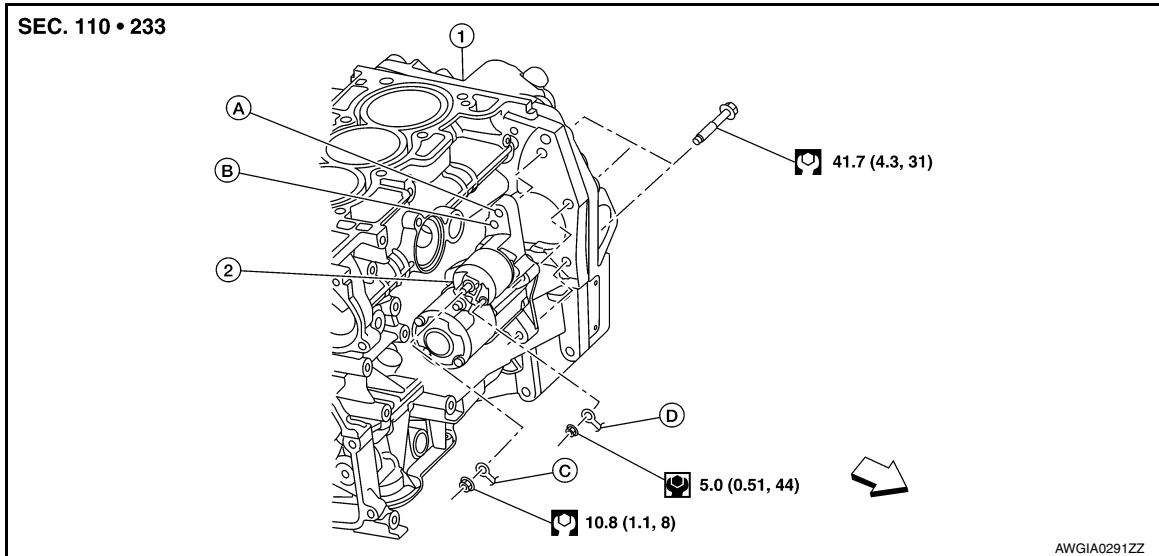
STARTER MOTOR

Exploded View

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REMOVAL AND INSTALLATION



1. Cylinder block
- B. Mounting hole for M/T
- ⇐ Front

2. Starter motor
- C. "B" terminal harness

- A. Mounting hole for CVT
- D. "S" terminal harness

Removal and Installation

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REMOVAL

1. Disconnect the battery cable from the negative terminal. Refer to [PG-69, "Exploded View"](#).
2. Remove the radiator core support upper. [DLK-122, "RADIATOR CORE SUPPORT UPPER : Removal and Installation"](#).
3. Remove "S" terminal nut and "S" terminal harness.
4. Remove "B" terminal nut and disconnect "B" terminal harness.
5. Remove the starter motor bolts.
6. Remove the starter motor.

CAUTION:

Be careful to not damage surrounding parts when removing starter motor from the vehicle.

INSTALLATION

Installation is in the reverse order of removal.

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Starter Motor

INFOID:000000009385578

Manufacturer		Mitsubishi
Model number*		M000T32175ZC
Type		Reduction gear type
System voltage		12V
No-load	Terminal voltage	11V
	Current	Less than 95A
	Revolution	More than 3,000 rpm

*: Always check with the Parts Department for the latest parts information.