

SECTION

STR

STR

STARTING SYSTEM

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# DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

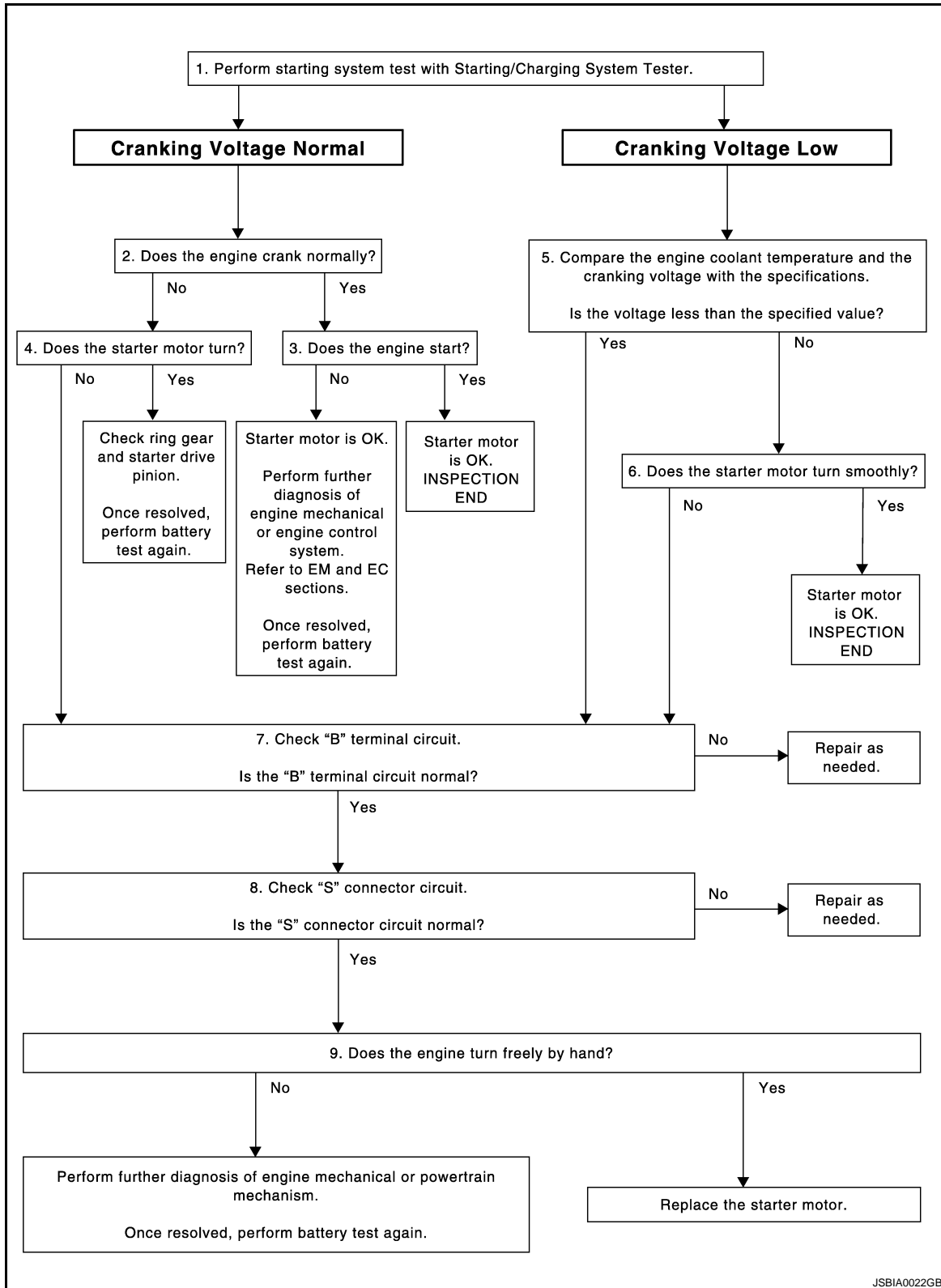
## BASIC INSPECTION

### DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:000000004457472

#### OVERALL SEQUENCE



#### DETAILED FLOW

# DIAGNOSIS AND REPAIR WORKFLOW

## < BASIC INSPECTION >

### NOTE:

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

## 1. DIAGNOSIS WITH STARTING/CHARGING SYSTEM TESTER

Perform the starting system test with Starting/Charging System Tester (SST: J-44373). For details and operating instructions, refer to Technical Service Bulletin.

### Test result

CRANKING VOLTAGE NORMAL>>GO TO 2.

CRANKING VOLTAGE LOW>>GO TO 5.

CHARGE BATTERY>>Perform the slow battery charging procedure. (Initial rate of charge is 10A for 12 hours.) Perform battery test again. Refer to Technical Service Bulletin.

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

## 2. CRANKING CHECK

Check that the starter motor operates correctly.

### Does the engine crank normally?

YES >> GO TO 3.

NO >> GO TO 4.

## 3. ENGINE START CHECK

Check that the engine starts.

### Does the engine start?

YES >> Starter motor is OK. INSPECTION END

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

## 4. STARTER MOTOR ACTIVATION

Check that the starter motor operates.

### Does the starter motor turn?

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

NO >> GO TO 7.

## 5. COMPARISON BETWEEN ENGINE COOLANT AND CRANKING VOLTAGE

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

### Minimum Specification of Cranking Voltage Referencing Coolant Temperature

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

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

YES >> GO TO 7.

NO >> GO TO 6.

## 6. STARTER OPERATION

Check the starter operation status.

### Does the starter motor turn smoothly?

YES >> Starter motor is OK. INSPECTION END

NO >> GO TO 7.

## 7. "B" TERMINAL CIRCUIT INSPECTION

Check "B" terminal circuit. Refer to [STR-9, "Diagnosis Procedure"](#).

### Is "B" terminal circuit normal?

A

STR

C

D

E

F

G

H

I

J

K

L

M

N

O

P

## DIAGNOSIS AND REPAIR WORKFLOW

### < BASIC INSPECTION >

---

- YES >> GO TO 8.
- NO >> Repair as needed.

### 8. "S" CONNECTOR CIRCUIT INSPECTION

---

Check "S" connector circuit. Refer to [STR-10. "Diagnosis Procedure"](#).

#### Is "S" connector circuit normal?

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

### 9. ENGINE ROTATION STATUS

---

Check that the engine can be rotated by hand.

#### Does the engine turn freely by hand?

- YES >> Replace starter motor.
- NO >> Perform further diagnosis of engine mechanical or powertrain mechanism. Once resolved, perform battery test again. Refer to Technical Service Bulletin.

# STARTING SYSTEM

< FUNCTION DIAGNOSIS >

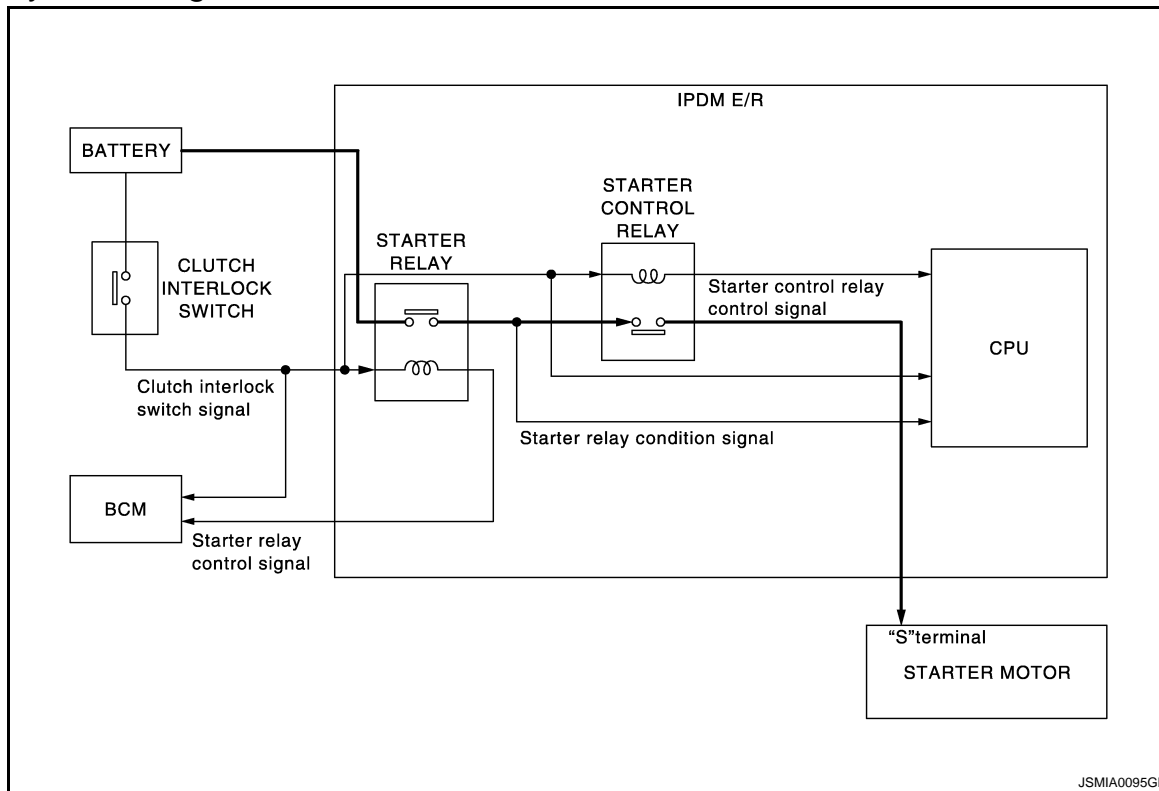
## FUNCTION DIAGNOSIS

### STARTING SYSTEM

M/T

M/T : System Diagram

INFOID:0000000004457473



M/T : System Description

INFOID:0000000004457474

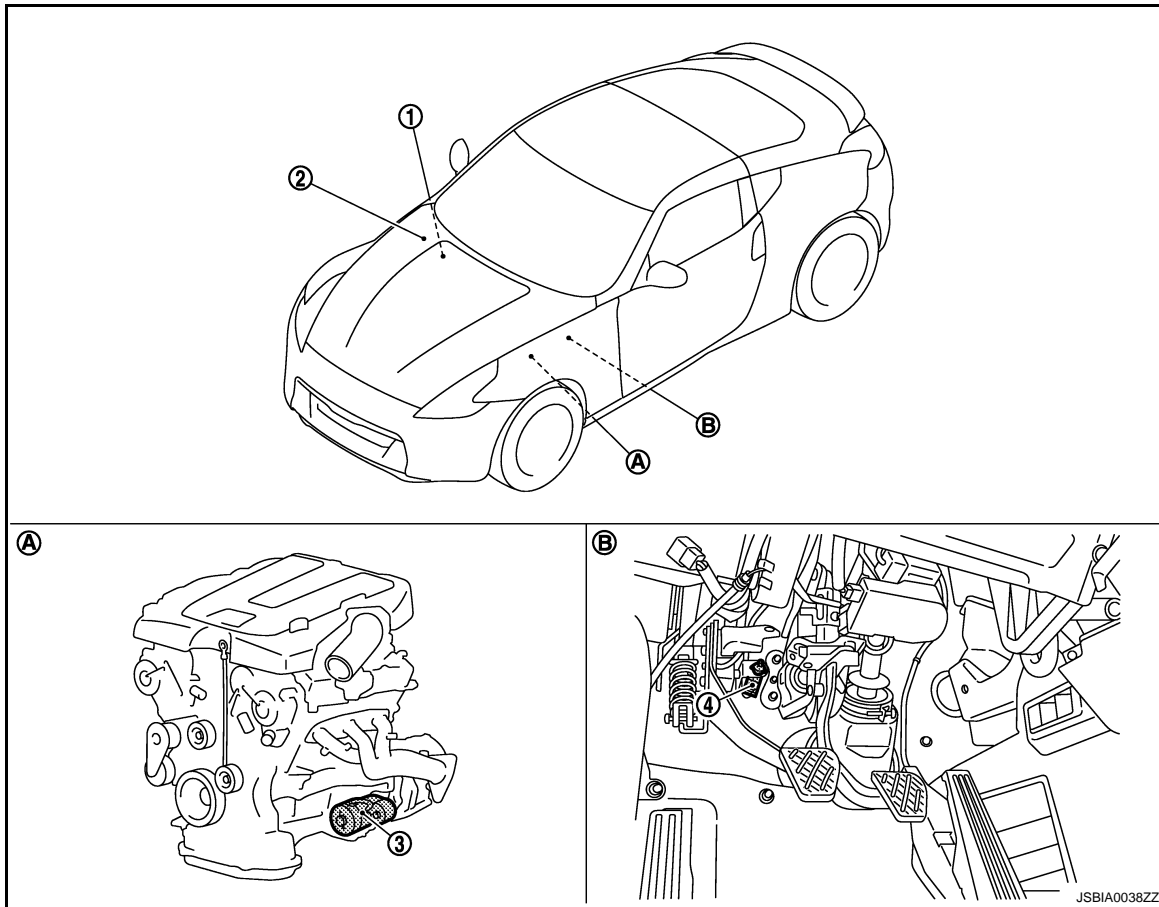
- When the clutch interlock switch is turned ON, power is supplied to starter relay and starter control relay. And BCM and IPDM E/R (CPU) detect clutch interlock switch condition by the inputted signal.
- When starter operating condition is satisfied, IPDM E/R turns starter control relay ON by starter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

# STARTING SYSTEM

< FUNCTION DIAGNOSIS >

M/T : Component Parts Location

INFOID:000000004457475



- |  |   |                  |
|--|---|------------------|
| 1. BCM<br>Refer to <a href="#">BCS-8. "Component Parts Location"</a> . | 2. IPDM E/R<br>Refer to <a href="#">PCS-5. "Component Parts Location"</a> . | 3. Starter motor |
| 4. Clutch interlock switch   |   |                  |
| A. Engine  | B. Clutch pedal   |                  |

M/T : Component Description

INFOID:000000004458493

Component part	Description
Clutch interlock switch	The switch turns ON and electric power is supplied to the starter relay and starter control relay inside IPDM E/R when the clutch pedal is depressed.
BCM	BCM controls the starter relay inside IPDM E/R.
IPDM E/R	CPU inside IPDM E/R controls the starter control relay.
Starter motor	The starter motor plunger closes and the motor is supplied with battery power, which in turn cranks the engine, when the "S" terminal is supplied with electric power.

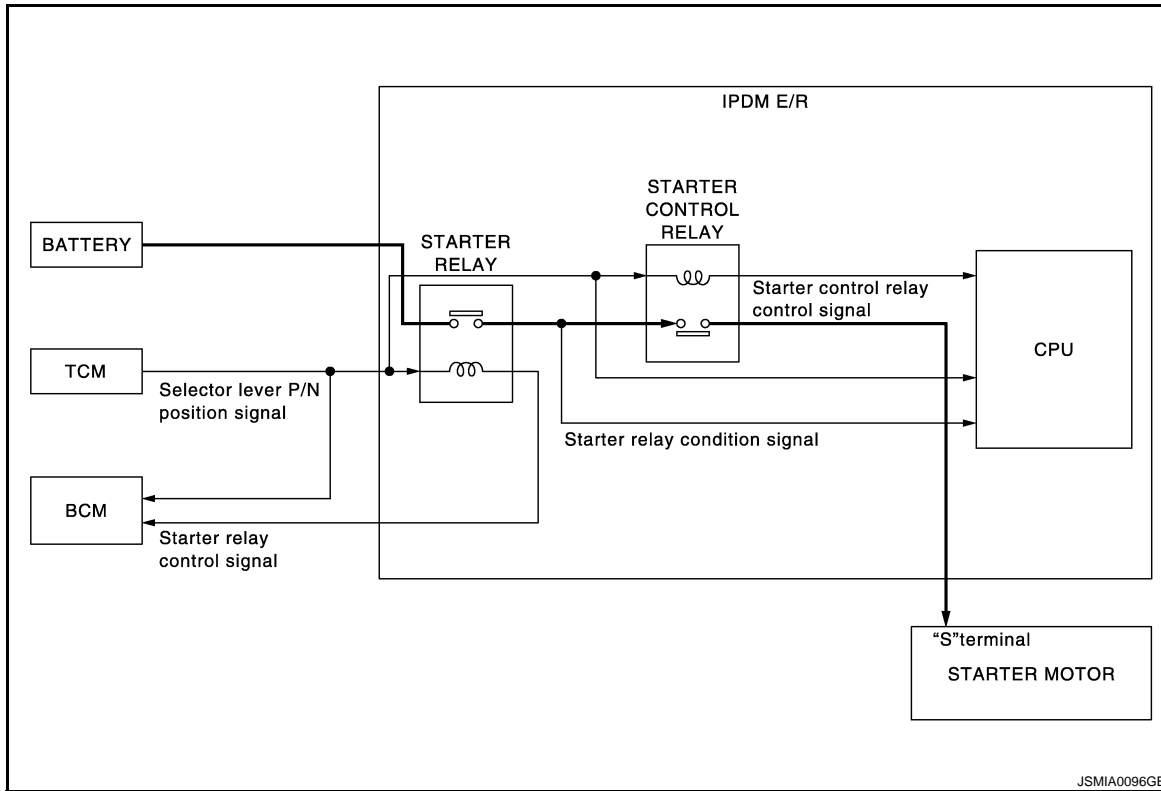
A/T

# STARTING SYSTEM

< FUNCTION DIAGNOSIS >

A/T : System Diagram

INFOID:000000004457498



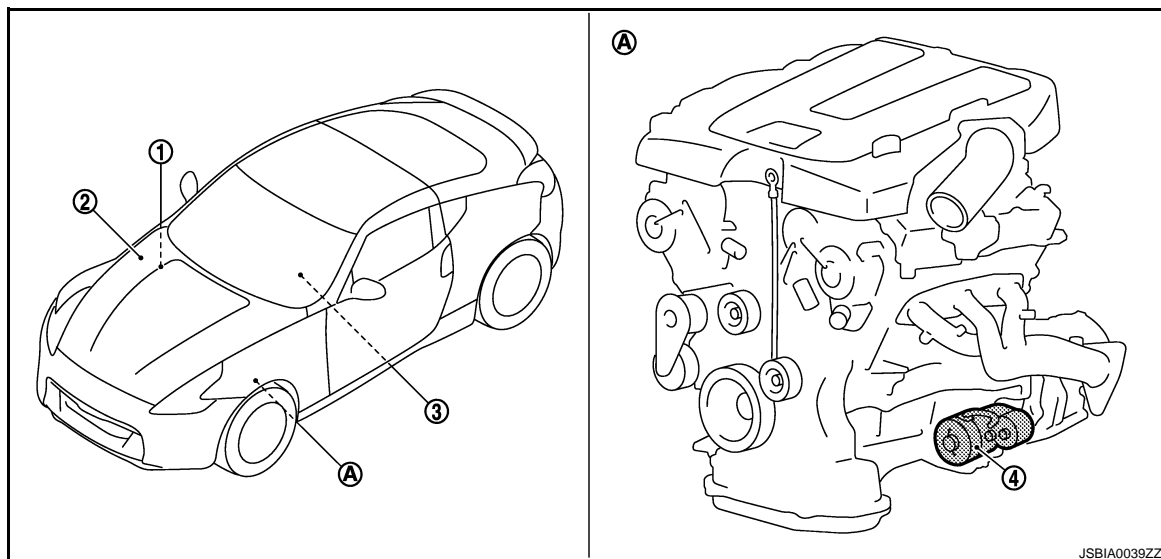
A/T : System Description

INFOID:000000004457497

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

A/T : Component Parts Location

INFOID:000000004457476



# STARTING SYSTEM

## < FUNCTION DIAGNOSIS >

1. BCM  
Refer to [BCS-8, "Component Parts Location"](#).
2. IPDM E/R  
Refer to [PCS-5, "Component Parts Location"](#).
3. TCM  
Refer to [TM-142, "Component Description"](#).
4. Starter motor
- A. Engine

## A/T : Component Description

INFOID:000000004457496

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



## B TERMINAL CIRCUIT

< COMPONENT DIAGNOSIS >

### COMPONENT DIAGNOSIS

#### B TERMINAL CIRCUIT

##### Description

INFOID:000000004457478

STR

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

##### Diagnosis Procedure

INFOID:000000004457479

##### CAUTION:

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

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

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

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

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

Is the inspection result normal?

YES >> GO TO 2.

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

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

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

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

Is the inspection result normal?

YES >> GO TO 3.

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

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

1. Shift A/T selector lever to "P" or "N" position. (A/T 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-2, "Work Flow"](#).

NO >> Check the starter motor case and ground for poor continuity.

# S CONNECTOR CIRCUIT

< COMPONENT DIAGNOSIS >

## S CONNECTOR CIRCUIT

### Description

INFOID:000000004457480

The starter motor magnetic switch is supplied with power when the ignition switch is turned to the START position while the selector lever is in the P or N position for A/T models or the clutch pedal is depressed for M/T models.

### Diagnosis Procedure

INFOID:000000004457481

#### CAUTION:

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

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

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

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

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

Is the inspection result normal?

YES >> "S" connector circuit is OK. Further inspection is necessary. Refer to [STR-2, "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.

Starter motor harness connector		IPDM E/R harness connector		Continuity
Connector No.	Terminal No.	Connector No.	Terminal No.	
F52	1	E7	80	Existed

Is the inspection result normal?

YES >> Further inspection is necessary. Refer to [STR-2, "Work Flow"](#).

NO >> Repair the harness.

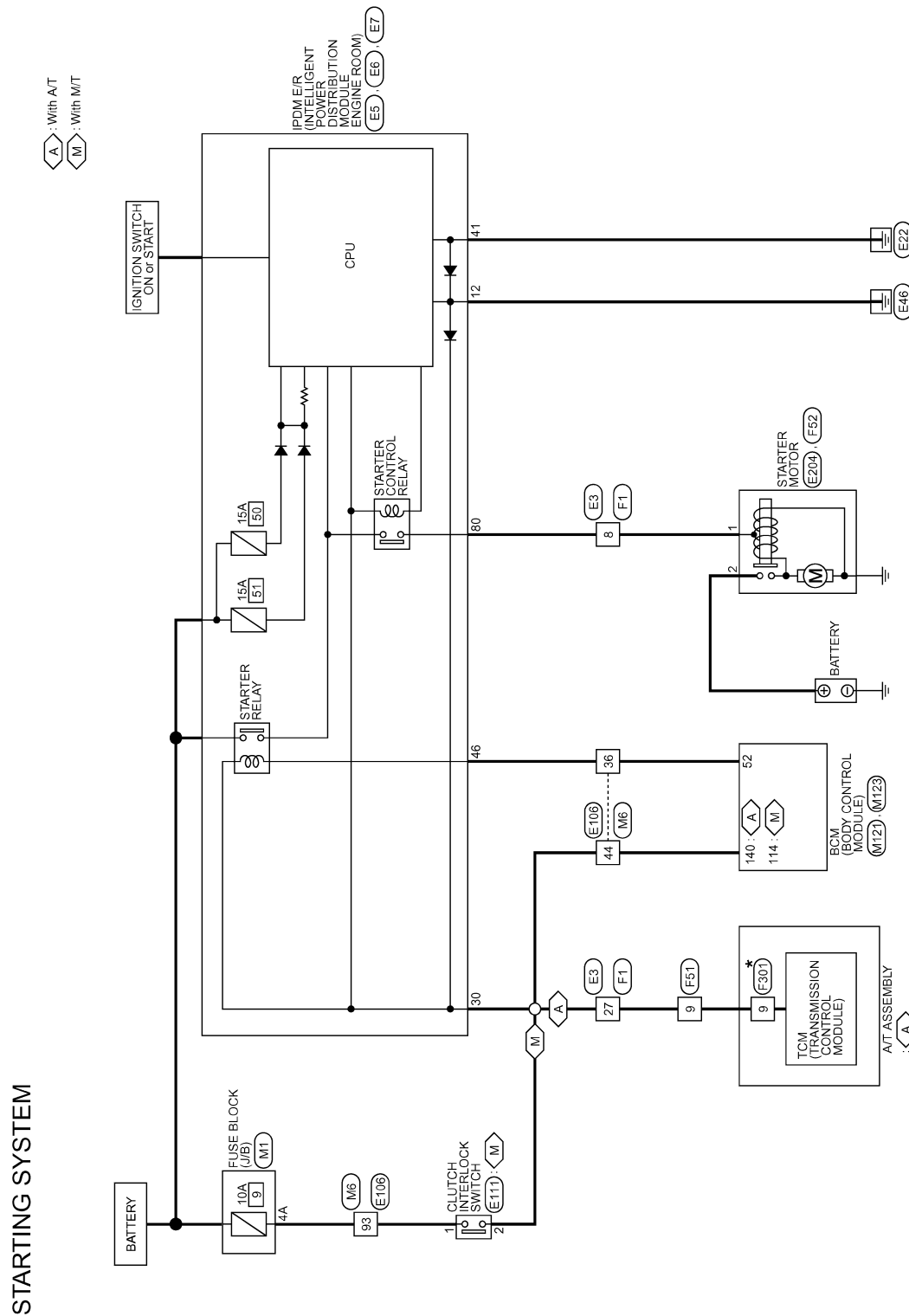
# STARTING SYSTEM

< COMPONENT DIAGNOSIS >

## STARTING SYSTEM

### Wiring Diagram - STARTING SYSTEM -

INFOID:000000004457482



2008/09/12

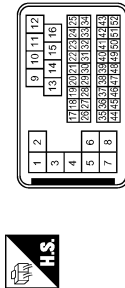
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# STARTING SYSTEM

## < COMPONENT DIAGNOSIS >

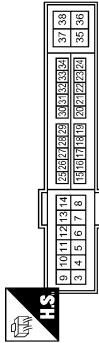
### STARTING SYSTEM

Connector No.	E3
Connector Name	WIRE TO WIRE
Connector Type	SAA38FE-RS8-SH23



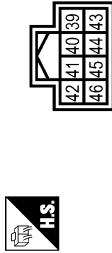
Terminal No.	Color of Wire	Signal Name [Specification]
8	W	—
27	GR	—

Connector No.	E5
Connector Name	IPDM E/R INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH20FW-CS12-M4-TV



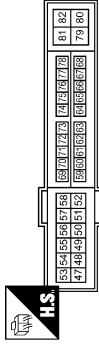
Terminal No.	Color of Wire	Signal Name [Specification]
12	B/W	—
30	GR	—

Connector No.	E6
Connector Name	IPDM E/R INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH08FW-NH



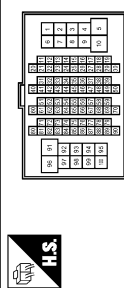
Terminal No.	Color of Wire	Signal Name [Specification]
41	B/W	—
46	V	—

Connector No.	E7
Connector Name	IPDM E/R INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH20FW-CS12-M4



Terminal No.	Color of Wire	Signal Name [Specification]
80	W	—

Connector No.	E108
Connector Name	WIRE TO WIRE
Connector Type	TH08FW-CS16-TM4



Terminal No.	Color of Wire	Signal Name [Specification]
36	V	—
44	GR	—
93	G	—

Connector No.	E111
Connector Name	CLUTCH INTERLOCK SWITCH
Connector Type	S02FL



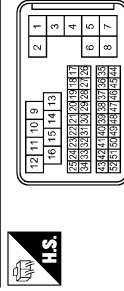
Terminal No.	Color of Wire	Signal Name [Specification]
1	G	—
2	GR	—

Connector No.	E204
Connector Name	STARTER MOTOR
Connector Type	2434S 51E61



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

Connector No.	F1
Connector Name	WIRE TO WIRE
Connector Type	SAA38FB-RS8-SH23



Terminal No.	Color of Wire	Signal Name [Specification]
8	W	—
27	GR	—

JCBWA1065GE

# STARTING SYSTEM

## < COMPONENT DIAGNOSIS >

### STARTING SYSTEM

Connector No.	F51
Connector Name	A/T ASSEMBLY
Connector Type	RK0FG-DGY



Terminal No.	9
Color of Wire	GR
Signal Name [Specification]	—

Connector No.	F52
Connector Name	STARTER MOTOR
Connector Type	X01MGY



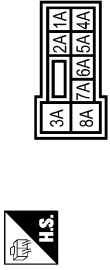
Terminal No.	1
Color of Wire	W
Signal Name [Specification]	—

Connector No.	F301
Connector Name	TCM (TRANSMISSION CONTROL MODULE)
Connector Type	SP10FG



Terminal No.	9
Color of Wire	Y
Signal Name [Specification]	STARTER RLY

Connector No.	M1
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS06FY-M2



Terminal No.	4A
Color of Wire	P
Signal Name [Specification]	—

Connector No.	M6
Connector Name	WIRE TO WIRE
Connector Type	TH6MW-CS16-TM4



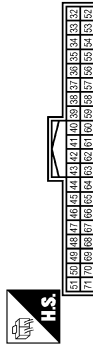
Terminal No.	36
Color of Wire	SB
Signal Name [Specification]	—
Terminal No.	44
Color of Wire	G
Signal Name [Specification]	— [With A/T]
Terminal No.	44
Color of Wire	R
Signal Name [Specification]	— [With M/T]
Terminal No.	93
Color of Wire	P
Signal Name [Specification]	—

Connector No.	M123
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	TH40FG-NH



Terminal No.	114
Color of Wire	R
Signal Name [Specification]	CLUTCH INTERLOCK SW
Terminal No.	140
Color of Wire	G
Signal Name [Specification]	SHIFT N/P [With A/T]

Connector No.	M121
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	TH40FGY-NH



Terminal No.	52
Color of Wire	SB
Signal Name [Specification]	STARTER RELAY COINT

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## STARTING SYSTEM

< SYMPTOM DIAGNOSIS >

### SYMPTOM DIAGNOSIS

#### STARTING SYSTEM

##### Symptom Table

INFOID:000000004457483

Symptom	Reference
No normal cranking	Refer to <a href="#">STR-2, "Work Flow"</a> .
Starter motor does not rotate	

# PRECAUTIONS

< PRECAUTION >

## PRECAUTION

### PRECAUTIONS

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

INFOID:000000004769555

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the "SRS AIRBAG" and "SEAT BELT" 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 "SRS AIRBAG".
- 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

When working near the Airbag Diagnosis Sensor Unit or other Airbag System sensors while ignition switch is ON or engine is running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration may activate the sensor(s), deploy the airbag(s), possibly cause serious injury. When using air or electric power tools or hammers, always turn OFF ignition switch, disconnect the battery, and wait 3 minutes or more before performing any service.

#### Precaution for Battery Service

INFOID:000000004769556

Before disconnecting the battery, lower both the driver and passenger windows. This will prevent any interference between the window edge and the vehicle when the door is opened/closed. During normal operation, the window slightly raises and lowers automatically to prevent any window to vehicle interference. The automatic window function will not work with the battery disconnected.

# PREPARATION

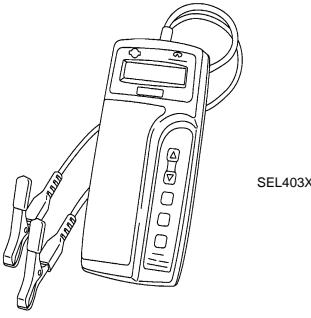
< PREPARATION >

## PREPARATION

### PREPARATION


#### Special Service Tools

INFOID:000000004457485

Tool number (Kent-Moore No.) Tool name	Description
<p>— (J-44373 Model MCR620) Starting/Charging System Tester</p>  <p>SEL403X</p>	<p>Tests starting and charging systems. For operating instructions, refer to Technical Service Bulletin.</p>

#### Commercial Service Tools

INFOID:000000004457486

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



# STARTER MOTOR

< ON-VEHICLE REPAIR >

## ON-VEHICLE REPAIR

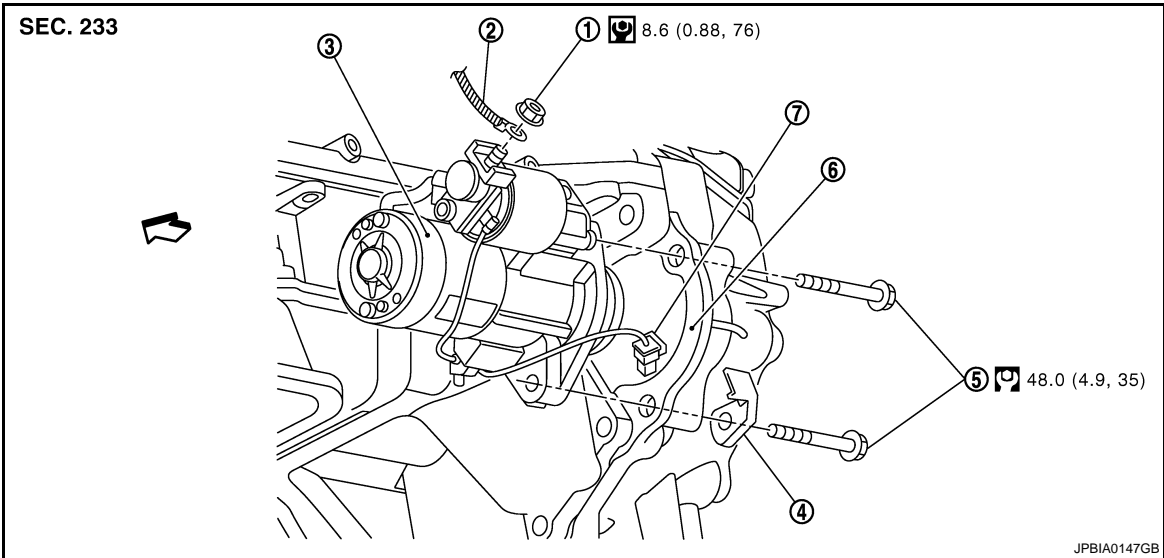
### STARTER MOTOR

Exploded View

INFOID:000000004457487

STR

#### REMOVAL



- |                         |                                |   |
|-------------------------|--------------------------------|---|
| 1. "B" terminal nut     | 2. "B" terminal harness        | 3. Starter motor  |
| 4. Harness clip bracket | 5. Starter motor mounting bolt | 6. Converter housing (A/T models)<br>Transmission case (M/T models) |
| 7. "S" connector        |                                |   |

⇨: Engine front

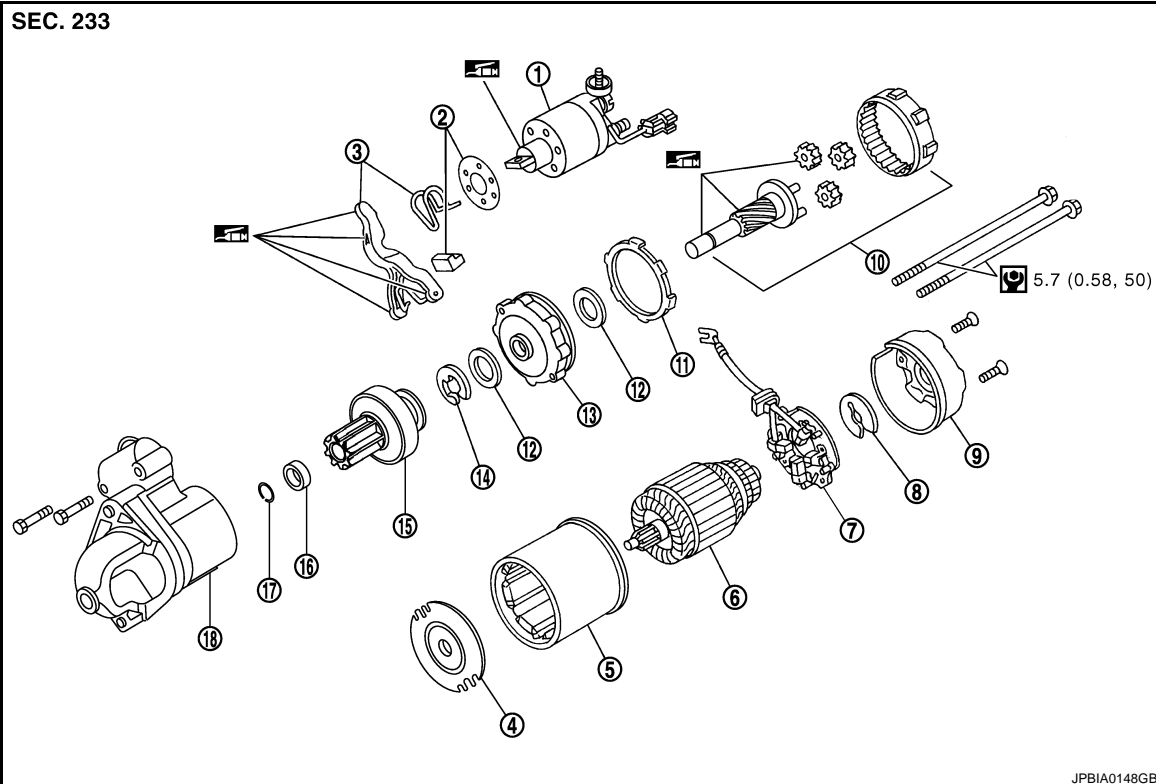
Refer to [GI-4, "Components"](#) for symbols in the figure.

#### DISASSEMBLY

# STARTER MOTOR

< ON-VEHICLE REPAIR >

Type: 114-932



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

High-temperature grease point

Refer to [GI-4, "Components"](#) for symbols not described on the above.

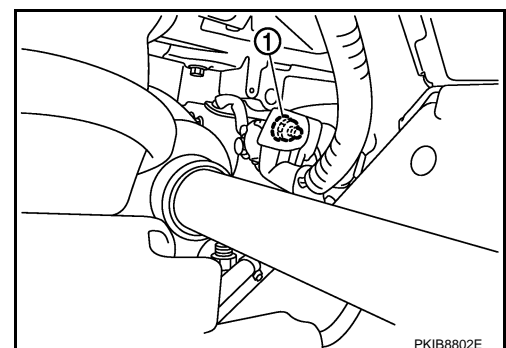
M/T

M/T : Removal and Installation

INFOID:000000004457488

## Removal

1. Disconnect the battery cable from the negative terminal.
2. Remove engine undercover using power tools.
3. Remove "B" terminal nut (1).

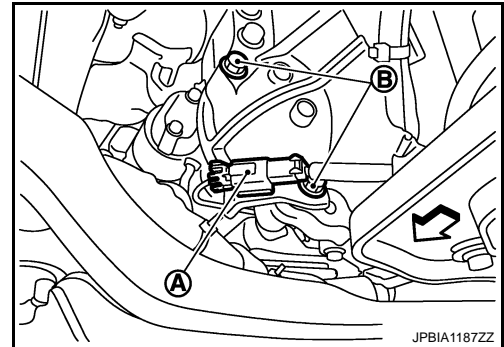


# STARTER MOTOR

## < ON-VEHICLE REPAIR >

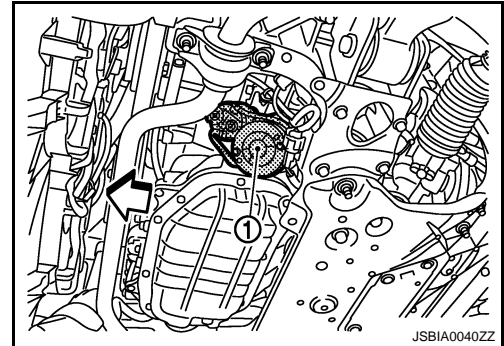
4. Disconnect "S" connector (A).
5. Remove starter motor mounting bolts (B) and harness bracket, using power tools.

⇐ : Vehicle front



6. Remove starter motor (1) forward from the vehicle.

⇐ : Vehicle front



## INSTALLATION

Install in the reverse order of removal.

### **CAUTION:**

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

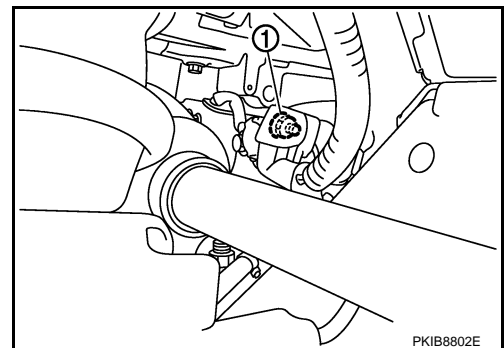
A/T

## A/T : Removal and Installation

INFOID:000000004458487

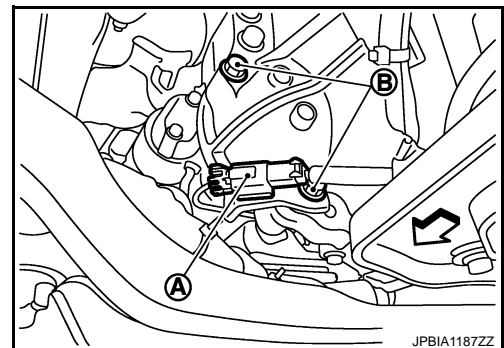
### Removal

1. Disconnect the battery cable from the negative terminal.
2. Remove engine undercover using power tools.
3. Remove "B" terminal nut (1).



4. Disconnect "S" connector (A).
5. Remove starter motor mounting bolts (B) and harness bracket, using power tools.

⇐ : Vehicle front

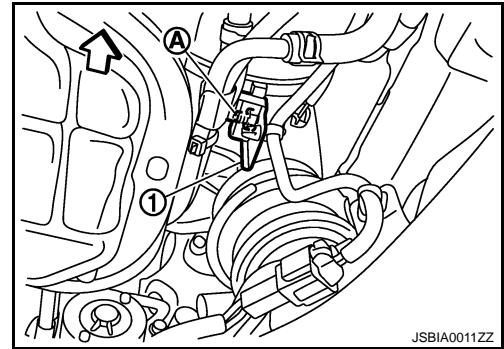


# STARTER MOTOR

## < ON-VEHICLE REPAIR >

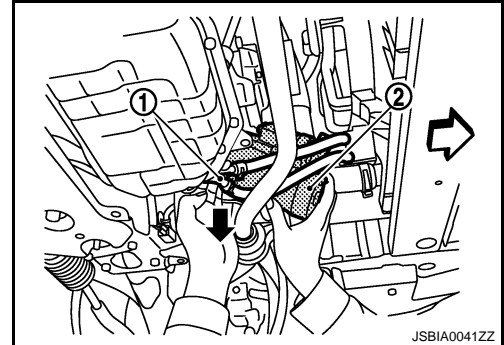
6. Remove the bolt (A) and remove the harness bracket (1).

⇐ : Vehicle front



7. Remove A/T fluid cooler tube clip bolts and bracket. Refer to [TM-295, "Exploded View"](#).  
8. Move A/T fluid cooler tube (1) downward.  
9. Remove starter motor (2) forward from the vehicle.

⇐ : Vehicle front



## INSTALLATION

Install in the reverse order of removal.

### **CAUTION:**

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

## Inspection

INFOID:0000000004457490

## INSPECTION AFTER DISASSEMBLY

### 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.
  - 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.
  - If it locks or rotates in both directions, or unusual resistance is evident, replace.

## SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

## SERVICE DATA AND SPECIFICATIONS (SDS)

### SERVICE DATA AND SPECIFICATIONS (SDS)

#### Starter Motor

INFOID:0000000004457494

STR

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