

A

SECTION STR

STR

STARTING SYSTEM

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CONTENTS

D

E

BASIC INSPECTION	2	Symptom Table	12	F
DIAGNOSIS AND REPAIR WORKFLOW	2	PRECAUTION	13	
Work Flow	2	PRECAUTIONS	13	G
FUNCTION DIAGNOSIS	5	Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"	13	H
STARTING SYSTEM	5	PREPARATION	14	
System Diagram	5	PREPARATION	14	I
System Description	5	Special Service Tools	14	
Component Parts Location	5	Commercial Service Tools	14	J
Component Description	6	ON-VEHICLE REPAIR	15	
COMPONENT DIAGNOSIS	7	STARTER MOTOR	15	K
B TERMINAL CIRCUIT	7	Exploded View	15	
Description	7	Removal and Installation	16	L
Diagnosis Procedure	7	Inspection	16	
S CONNECTOR CIRCUIT	8	SERVICE DATA AND SPECIFICATIONS (SDS)	18	M
Description	8	SERVICE DATA AND SPECIFICATIONS (SDS)	18	
Diagnosis Procedure	8	Starter Motor	18	N
STARTING SYSTEM	9			O
Wiring Diagram - STARTING SYSTEM -	9			P
SYMPTOM DIAGNOSIS	12			
STARTING SYSTEM	12			

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

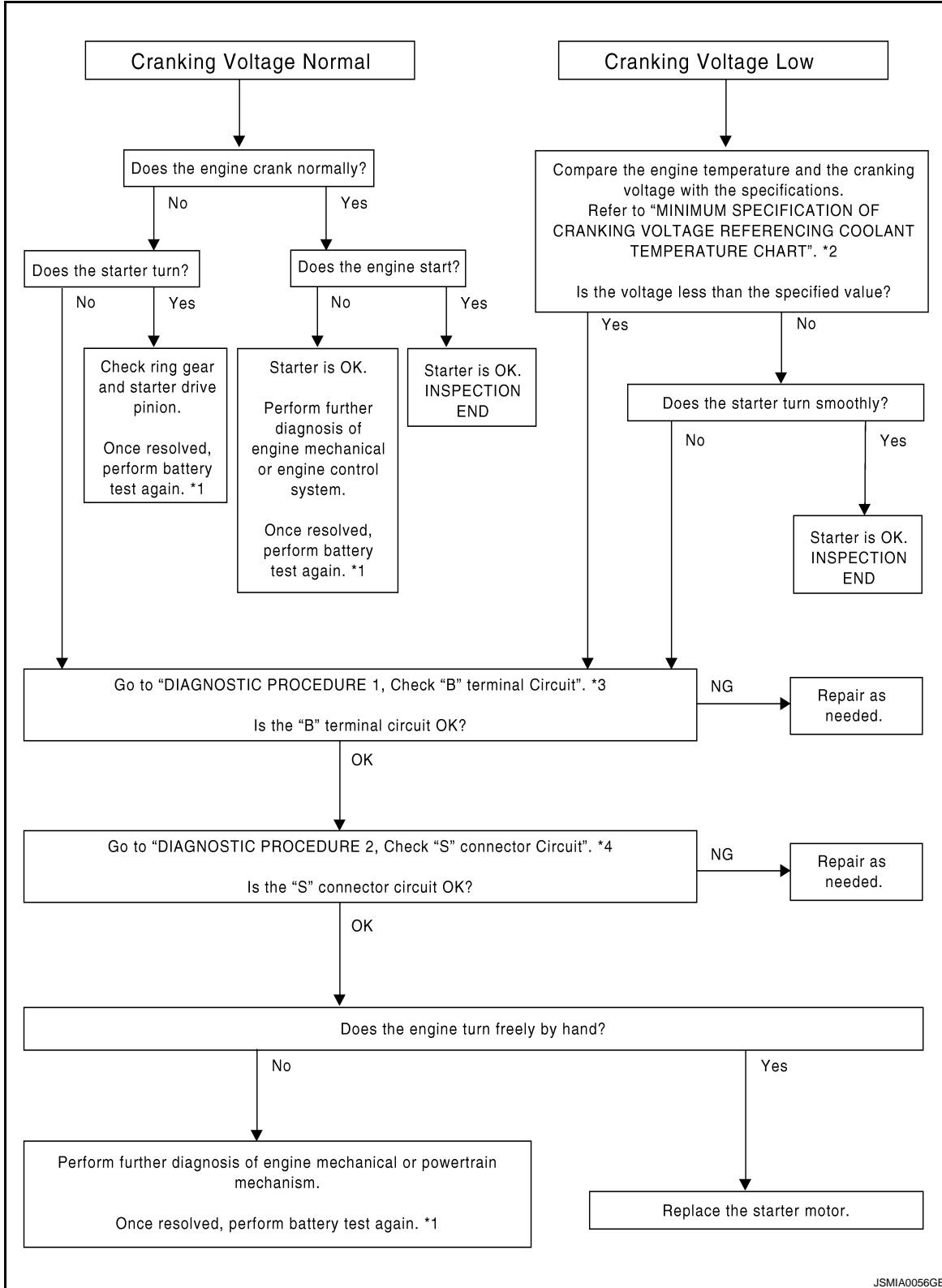
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:000000003412966

OVERALL SEQUENCE



JSMIA0056GB

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 >> Perform further diagnosis of engine mechanical or engine control system. 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-7, "Diagnosis Procedure"](#).

Is "B" terminal circuit normal?

A

STR

C

D

E

F

G

H

I

J

K

L

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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-8. "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.

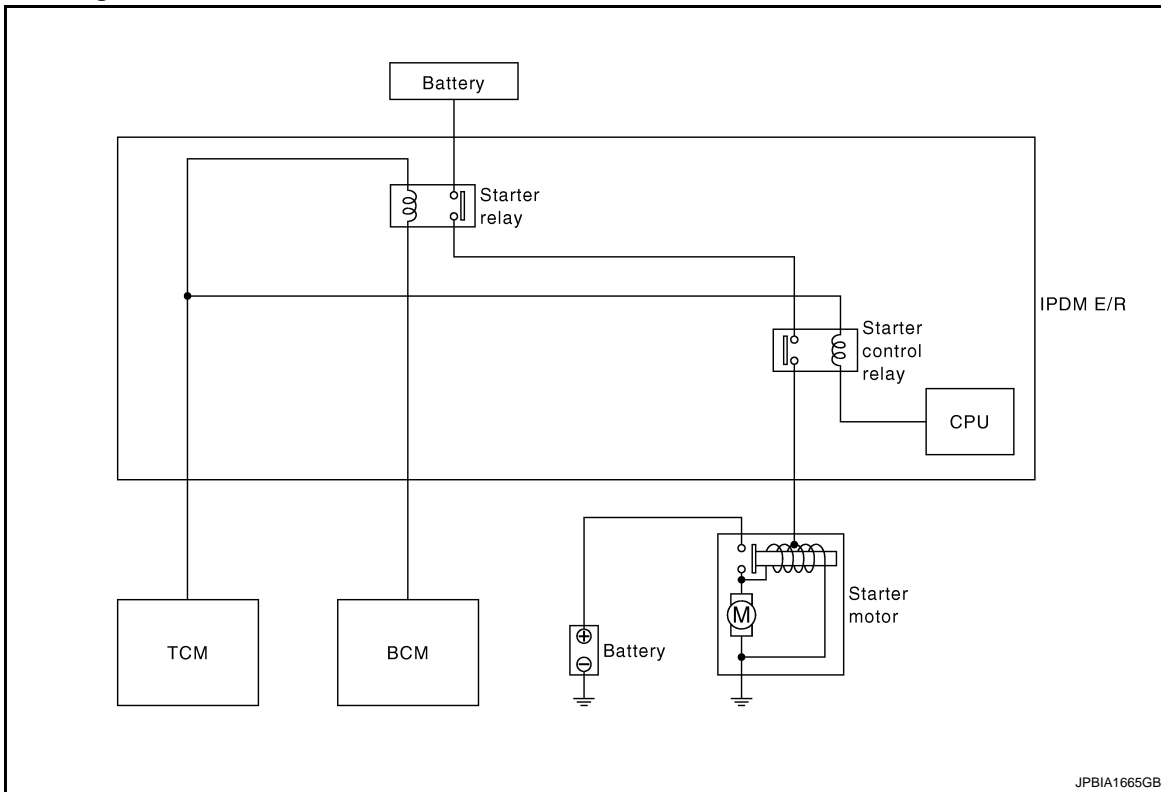
STARTING SYSTEM

< FUNCTION DIAGNOSIS >

FUNCTION DIAGNOSIS

STARTING SYSTEM

System Diagram



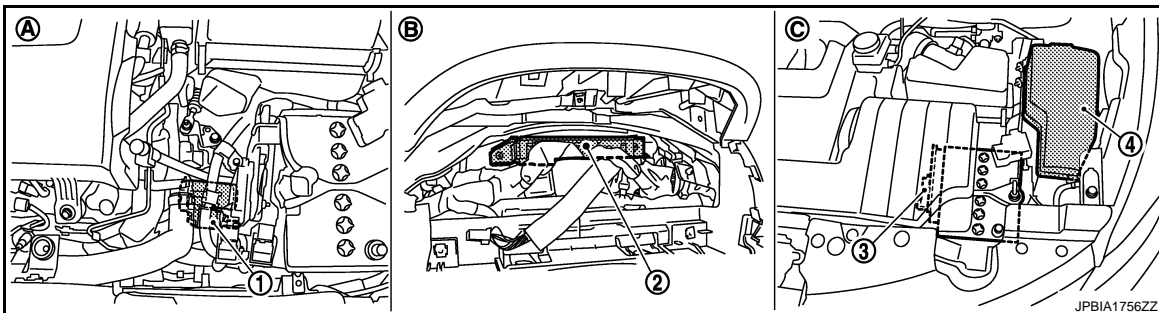
System Description

INFOID:0000000003412968

The starter motor plunger closes and provides a closed circuit between the battery and starter motor. The starter motor is grounded to the engine block. With power and ground supplied, cranking occurs and the engine starts.

Component Parts Location

INFOID:0000000003412969



- | | | |
|-----------------------------|---------------------------------|--------------------------------|
| 1. Starter motor | 2. BCM | 3. TCM |
| 4. IPDM E/R | | |
| A. Cylinder block left side | B. Behind the combination meter | C. Engine room dash panel (LH) |

STARTING SYSTEM

< FUNCTION DIAGNOSIS >

Component Description

INFOID:000000003412970

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:000000003412971

STR

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

Diagnosis Procedure

INFOID:000000003412972

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	Battery voltage
F10	2	
	Ground	

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 the selector lever to "P" or "N" position.
2. Check voltage between battery positive terminal and starter motor "B" terminal.

Terminals		Condition	Voltage (Approx.)
(+)	(-)		
	Starter motor "B" terminal	When the ignition switch is in START position	Less than 0.5 V
	Terminal		
Battery positive terminal	F10		
	2		

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 the selector lever to "P" or "N" position.
2. Check voltage between starter motor case and battery negative terminal.

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

Is the inspection result normal?

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

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

S CONNECTOR CIRCUIT

< COMPONENT DIAGNOSIS >

S CONNECTOR CIRCUIT

Description

INFOID:000000003412973

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

Diagnosis Procedure

INFOID:000000003412974

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 the selector lever to "P" or "N" position.
4. Check voltage between starter motor harness connector and ground.

Terminals		(-)	Condition	Voltage (Approx.)
(+)	Terminal			
Starter motor harness connector				
F47	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.	
F47	1	F12	80	Existed

Is the inspection result normal?

- YES >> Further inspection is necessary. Refer to [SEC-8, "Work Flow"](#) in SEC section.
NO >> Repair the harness.

STARTING SYSTEM

< COMPONENT DIAGNOSIS >

STARTING SYSTEM

Wiring Diagram - STARTING SYSTEM -

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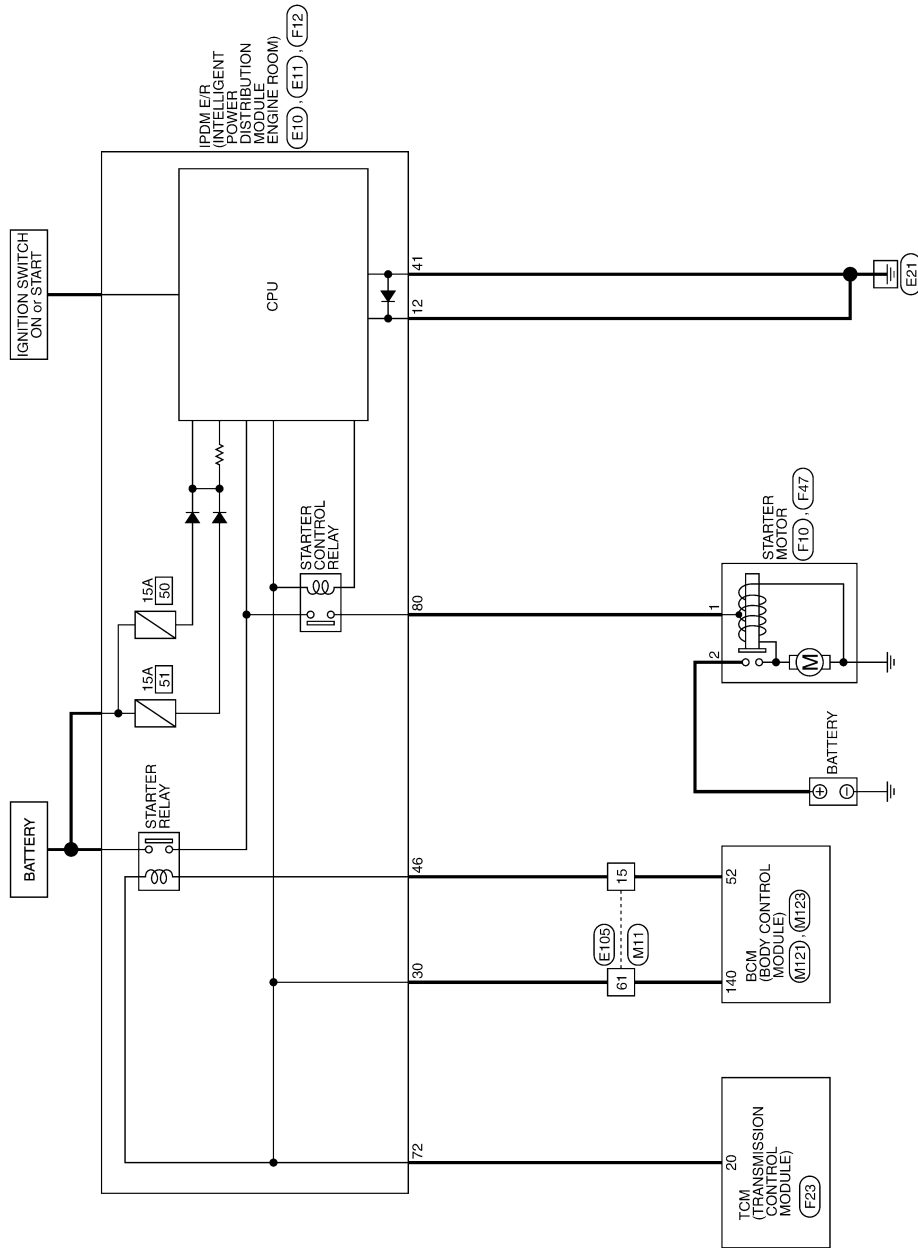
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STARTING SYSTEM



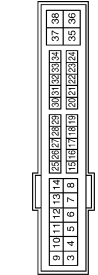

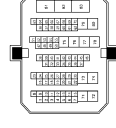

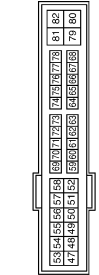
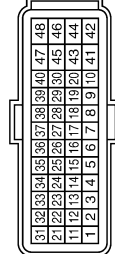

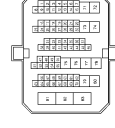
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STARTING SYSTEM

< COMPONENT DIAGNOSIS >

STARTING SYSTEM

<table border="1"> <tr> <td>Connector No.</td> <td>E10</td> </tr> <tr> <td>Connector Name</td> <td>IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)</td> </tr> <tr> <td>Connector Type</td> <td>TH20FW-CS12-M4-TV</td> </tr> </table>  <p>H.S.</p> <table border="1"> <tr> <td>Terminal No.</td> <td>Color of Wire</td> <td>Signal Name [Specification]</td> </tr> <tr> <td>12</td> <td>B</td> <td>-</td> </tr> <tr> <td>30</td> <td>BR</td> <td>-</td> </tr> </table>	Connector No.	E10	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	-	30	BR	-	<table border="1"> <tr> <td>Connector No.</td> <td>E11</td> </tr> <tr> <td>Connector Name</td> <td>IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)</td> </tr> <tr> <td>Connector Type</td> <td>TH08FW-NH</td> </tr> </table>  <p>H.S.</p> <table border="1"> <tr> <td>Terminal No.</td> <td>Color of Wire</td> <td>Signal Name [Specification]</td> </tr> <tr> <td>41</td> <td>B</td> <td>-</td> </tr> <tr> <td>46</td> <td>BR</td> <td>-</td> </tr> </table>	Connector No.	E11	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	-	46	BR	-	<table border="1"> <tr> <td>Connector No.</td> <td>E105</td> </tr> <tr> <td>Connector Name</td> <td>WIRE TO WIRE</td> </tr> <tr> <td>Connector Type</td> <td>TH70FW-CS10-M3</td> </tr> </table>  <p>H.S.</p> <table border="1"> <tr> <td>Terminal No.</td> <td>Color of Wire</td> <td>Signal Name [Specification]</td> </tr> <tr> <td>15</td> <td>BR</td> <td>-</td> </tr> <tr> <td>61</td> <td>BR</td> <td>-</td> </tr> </table>	Connector No.	E105	Connector Name	WIRE TO WIRE	Connector Type	TH70FW-CS10-M3	Terminal No.	Color of Wire	Signal Name [Specification]	15	BR	-	61	BR	-	<table border="1"> <tr> <td>Connector No.</td> <td>F10</td> </tr> <tr> <td>Connector Name</td> <td>STARTER MOTOR</td> </tr> <tr> <td>Connector Type</td> <td>-</td> </tr> </table>  <p>H.S.</p> <table border="1"> <tr> <td>Terminal No.</td> <td>Color of Wire</td> <td>Signal Name [Specification]</td> </tr> <tr> <td>2</td> <td>B/R</td> <td>-</td> </tr> <tr> <td>61</td> <td>BR</td> <td>-</td> </tr> </table>	Connector No.	F10	Connector Name	STARTER MOTOR	Connector Type	-	Terminal No.	Color of Wire	Signal Name [Specification]	2	B/R	-	61	BR	-
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STARTING SYSTEM

< COMPONENT DIAGNOSIS >

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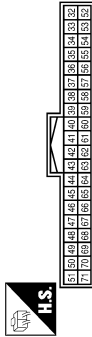
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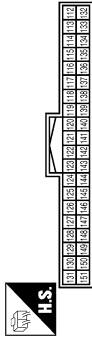
STARTING SYSTEM

Connector No.	M121
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	TH4BFG-NH



Terminal No.	52	R	Signal Name [Specification]	STARTER RELAY CONT
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Connector No.	M123
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	TH4BFG-NH



Terminal No.	140	GR	Signal Name [Specification]	SHIFT N/P
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JCBWM1070GI

STARTING SYSTEM

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS

STARTING SYSTEM

Symptom Table

INFOID:000000003412976

Symptom	Reference
No normal cranking	Refer to STR-2, "Work Flow" .
Starter motor does not rotate	

PRECAUTIONS

< PRECAUTION >

PRECAUTION

PRECAUTIONS

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

INFOID:000000003412977

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".
- 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.

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C

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PREPARATION

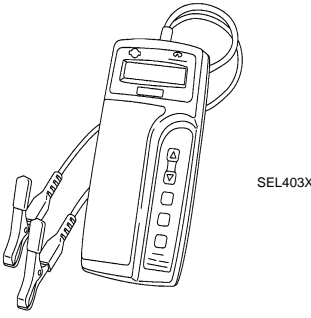
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PREPARATION


Special Service Tools

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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:000000003412979

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

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REMOVAL

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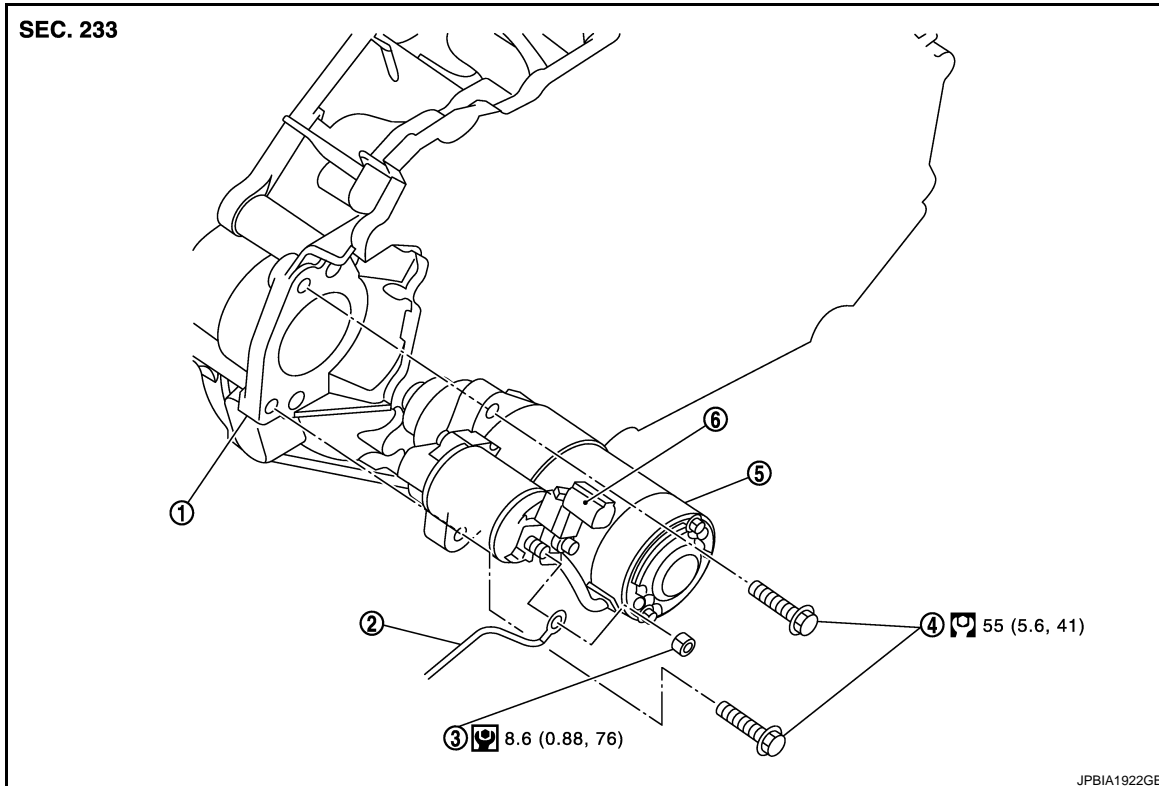
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|--------------------------------|-------------------------|-----------------------------------|
| 1. Converter housing | 2. "B" terminal harness | 3. Starter motor "B" terminal nut |
| 4. Starter motor mounting bolt | 5. Starter motor | 6. "S" connector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

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

DISASSEMBLY

Type: M000TA0072

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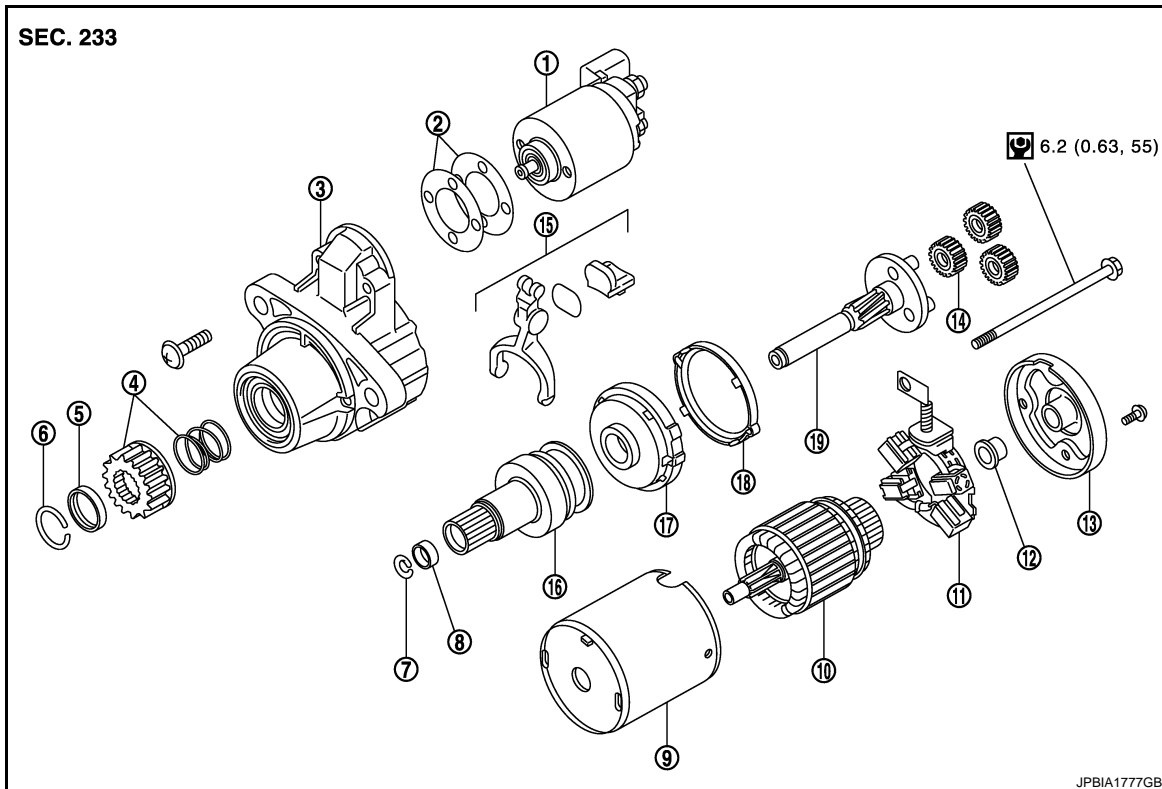
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STARTER MOTOR

< ON-VEHICLE REPAIR >



- | | | |
|-----------------------------|---------------------------|-----------------------|
| 1. Magnetic switch assembly | 2. Dust cover kit | 3. Gear case assembly |
| 4. Pinion assembly | 5. Stopper | 6. Ring |
| 7. Ring | 8. Stopper | 9. Yoke assembly |
| 10. Armature assembly | 11. Brush holder assembly | 12. Metal |
| 13. Rear cover | 14. Gear assembly | 15. Shift lever set |
| 16. Clutch gear assembly | 17. Center bracket | 18. Packing |
| 19. Gear shaft | | |

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

Removal and Installation

INFOID:000000003416500

REMOVAL

1. Remove the battery Refer to [PG-106, "Removal and Installation"](#).
2. Remove the air cleaner assembly and air ducts.
3. Disconnect the following unit connectors:
 - ECM
 - TCM
 - IPDM E/R
4. Remove the battery tray.
5. Disconnect the starter motor harness connectors.
6. Remove the starter motor mounting bolts, using power tools.
7. Remove the starter motor.

INSTALLATION

Installation is in the reverse order of removal.

Inspection

INFOID:000000003469058

INSPECTION AFTER DISASSEMBLY

Pinion/Clutch Check

STARTER MOTOR

< ON-VEHICLE REPAIR >

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.

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SERVICE DATA AND SPECIFICATIONS (SDS)

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SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Starter Motor

INFOID:000000003412983

Type	M000TA0072	
	MITSUBISHI make	
	Reduction gear type	
System voltage	(V)	12
No-load	Terminal voltage	(V) 11
	Current	(A) Less than 90
	Revolution	(rpm) More than 2,400
Minimum diameter of commutator	[mm (in)]	28.0 (1.102)
Minimum length of brush	[mm (in)]	5.5 (0.217)
Brush spring tension	[N (kg, lb)]	15.0 - 20.4 (1.5 - 3.4)
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)]	0.5 - 2.0 (0.020 - 0.079)