SECTION STR
STARTING SYSTEM

CONTENTS

PRECAUTION

PRECAUTIONS

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

INFOID:0000000007136345

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 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.

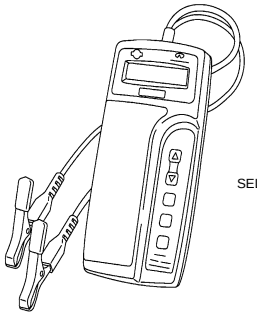
- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious 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.**

PREPARATION

PREPARATION

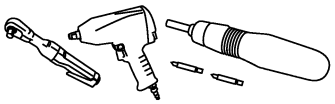
Special Service Tools

INFOID:0000000007136346

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

Commercial Service Tools

INFOID:0000000007136347

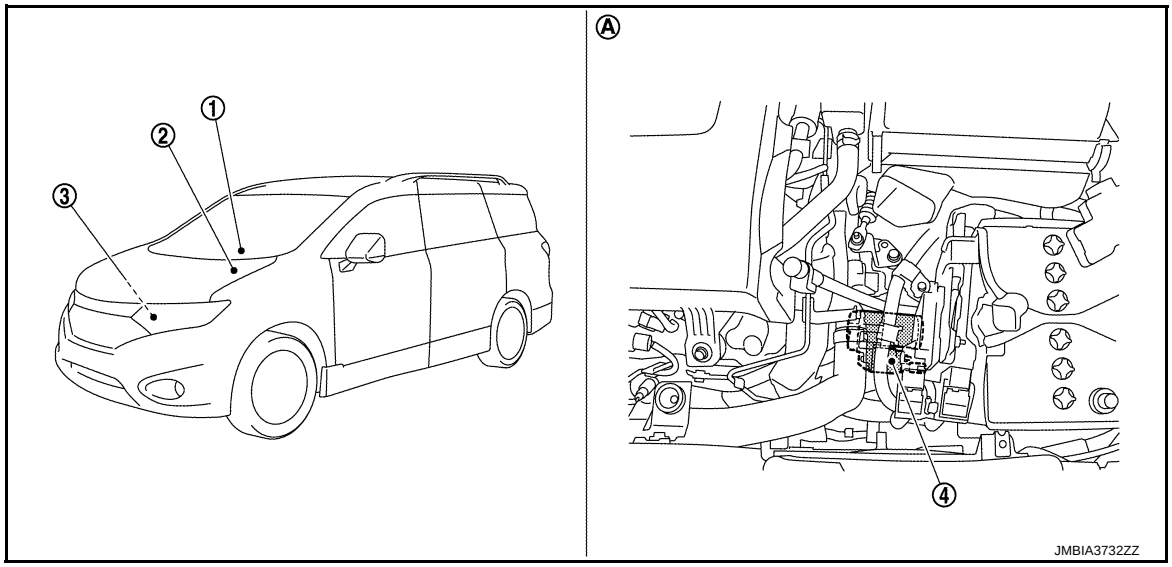
Tool name	Description
Power tool  PIIB1407E	Loosening bolts, nuts and screws

SYSTEM DESCRIPTION

COMPONENT PARTS

Component Parts Location

INFOID:0000000007136348



A. Engine room LH

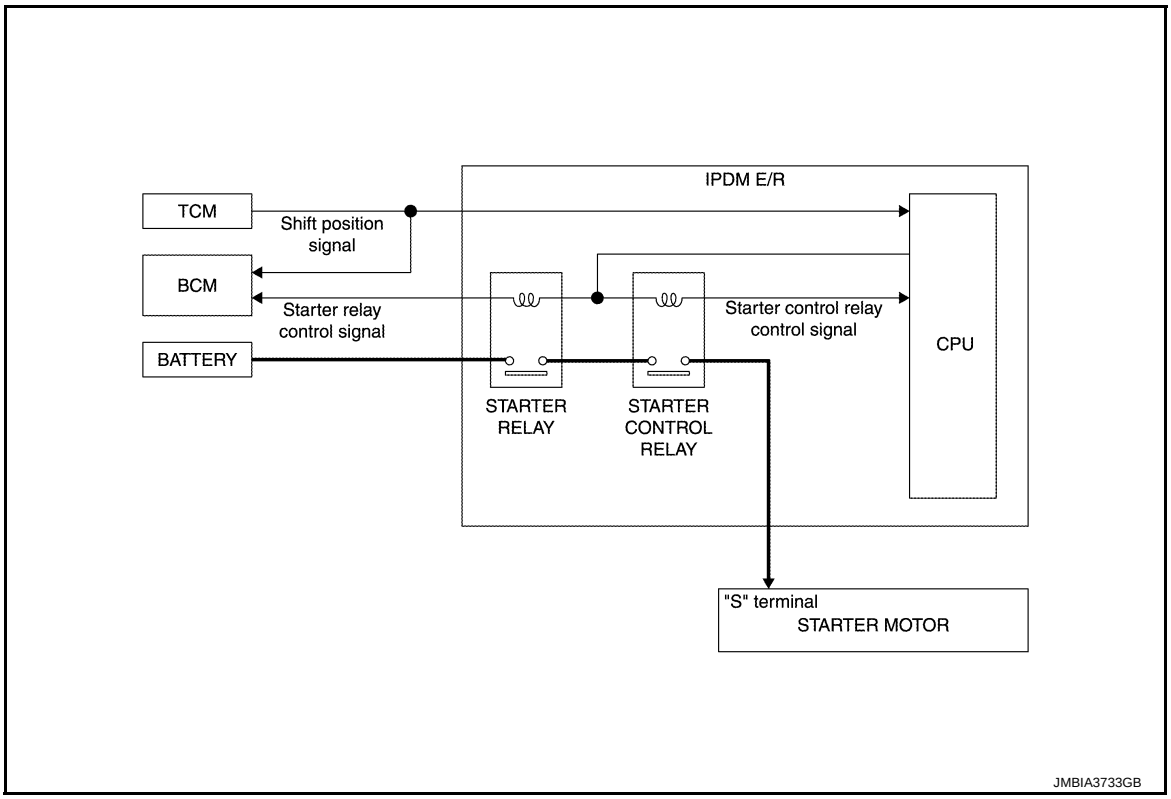
No.	Component part	Description
1.	BCM	BCM controls the starter relay. Refer to BCS-4, "BODY CONTROL SYSTEM : Component Parts Location".
2.	IPDM E/R	CPU inside IPDM E/R controls the starter control relay. Refer to PCS-4, "IPDM E/R : Component Parts Location".
4.	Starter motor	The starter motor plunger closes and the motor is supplied with battery power, which in turn cranks the engine, when the “S” terminal is supplied with electric power.
3.	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. Refer to TM-10, "CVT CONTROL SYSTEM : Component Parts Location".

SYSTEM

System Description

INFOID:0000000007136353

SYSTEM DIAGRAM



OUTLINE

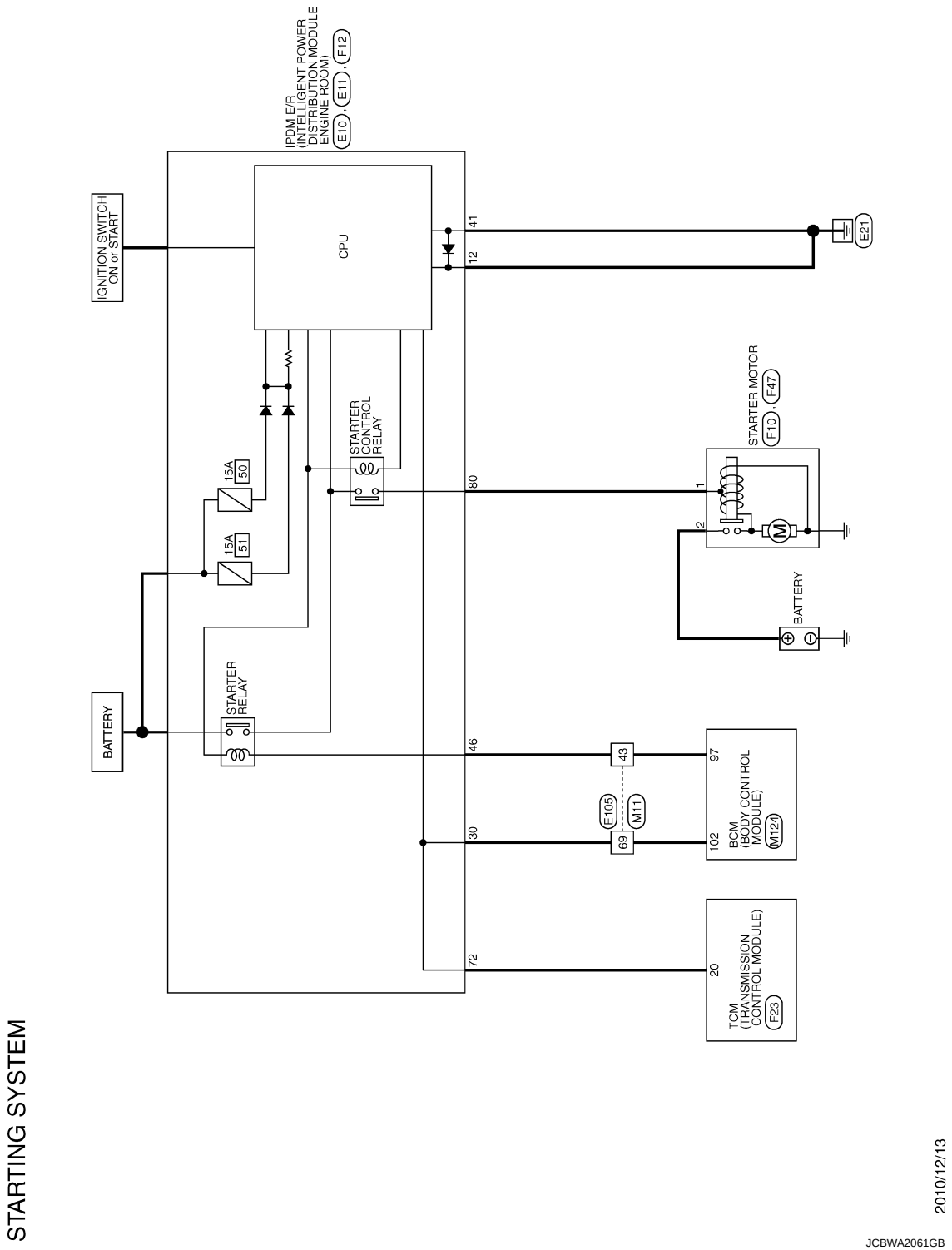
- TCM transmits shift position signal to BCM and IPDM E/R, when selector lever is in the P or N position.
- IPDM E/R supplies power supply to starter relay and starter control relay, when shift position signal is received.
- When starter operating condition is satisfied, IPDM E/R turns starter control relay ON by starter control relay control signal.
- When engine cranking condition is satisfied, BCM turns starter relay ON by starter control relay control signal.
- Then battery power is supplied to starter motor (“S” terminal) through starter control relay and starter relay.

WIRING DIAGRAM

STARTING SYSTEM

Wiring Diagram

INFOID:0000000007136356



STARTING SYSTEM

2010/12/13

JCBWA2061GB

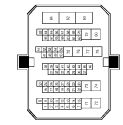
STARTING SYSTEM

Connector No.	E10
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH20FW-CS12-M4-1Y

Terminal No.	Color of Wire	Signal Name [Specification]
4	LG	–
5	Y	–
6	G	–
7	BR	–
10	P	–
12	B	–
13	G	–
15	L	–
16	R	–
18	P	–
19	V	–
20	W	–
21	O	–
22	SB	–
23	GR	–
24	G	–
25	GR	–
27	BR	–
28	G	–
30	LG	–
34	O	–
35	P	–
36	G	–
38	GR	–

Terminal No.	Color of Wire	Signal Name [Specification]
39	P	–
40	L	–
41	B	–
42	SB	–
43	LG	–
44	W	–
45	Y	–
46	O	–

Connector No.	E105
Connector Name	WIRE TO WIRE
Connector Type	TH70MW-CS10-M3



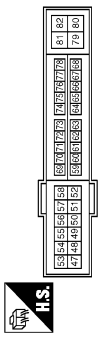
Terminal No.	Color of Wire	Signal Name [Specification]
6	LG	–
7	R	–
8	GR	–
9	SB	–
10	BR	–
11	Y	–
12	O	–
13	W	–
14	L	–
15	P	–
31	GR	–
32	R	–
33	W	–
37	BR	–
38	G	–
39	V	–
40	P	–
41	L	–
42	LG	–
43	O	–
45	GR	–
46	SB	–
47	V	–
49	L	–
51	BR	–
52	G	–

Terminal No.	Color of Wire	Signal Name [Specification]
53	B	–
54	O	–
55	Y	–
56	SHIELD	–
61	P	–
62	G	–
63	W/L	–
64	L/O	–
66	W	–
67	Y	–
69	SB	–
70	LG	–
71	R	–
72	L	–
73	GR	–
74	Y	–
75	SB	–
76	Y	–
77	G	–
78	O	–
80	R	–
81	L	–
82	LG	–
83	R	–

Connector No.	F10
Connector Name	STARTER MOTOR
Connector Type	–

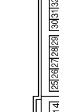
Terminal No.	Color of Wire	Signal Name [Specification]
2	B/R	–

Connector No.	F12
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH20FW-CS12-M4



Terminal No.	Color of Wire	Signal Name [Specification]
48	W	–
49	R/B	–
51	LG	–
52	Y/G	–
53	R/W	–
54	G/W	–
55	W/L	–
56	R/Y	–
57	O	–
58	Y	–
69	W/B	–
70	O	–
71	P	–
72	R/B	–
75	LG	–
76	SB	–
77	B	–
80	B	–

Connector No.	E11
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH08FW-NH



JCBWA2062GB

STARTING SYSTEM

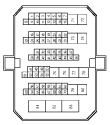
Connector No.	F23
Connector Name	TCM (TRANSMISSION CONTROL MODULE)
Connector Type	RH40FB-RZ8-L-RH

Terminal No.	Color of Wire	Signal Name [Specification]
1	P/B	TRANSMISSION RANGE SW 2
2	P/L	TRANSMISSION RANGE SW 3
3	G/O	TRANSMISSION RANGE SW 4
4	GR	TRANSMISSION RANGE SW 3 MON
5	B	GND
7	W	SENSOR GND
8	G/W	ROM ASSY (SEL 2)
9	L/R	ROM ASSY (SEL 1)
10	BR/R	ROM ASSY (SEL 3)
11	BR/W	TRANSMISSION RANGE SW 1
13	V	CVT FLUID TEMP SENSOR
14	R/W	PRI PRESS SENSOR
15	V/W	SEC PRESS SENSOR
19	G/B	BACK-UP LAMP RELAY
20	R/B	STARTER RELAY
25	W/R	SENSOR GND
26	L/O	SENSOR POWER
27	R/G	STEP MOTOR D
28	R	STEP MOTOR C
29	O/B	STEP MOTOR B
30	G/R	STEP MOTOR A
31	P	CAN-L
32	L	CAN-H
33	LG	PRI SPEED SENSOR
34	LG/R	SEC SPEED SENSOR
37	V/R	L/U SELECT SOL
38	L/W	TORQUE CONV CLUTCH SOL
39	W/B	SEC PRESS SOL
40	R/Y	LINE PRESS SOL
42	B	GND
46	Y	POWER SUPPLY
47	L/R	POWER SUPPLY (BUCK-UP)
48	Y	POWER SUPPLY

Connector No.	F47
Connector Name	STARTER MOTOR
Connector Type	X01FGY

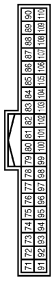
Terminal No.	Color of Wire	Signal Name [Specification]
1	B	–

Connector No.	M11
Connector Name	WIRE TO WIRE
Connector Type	TH70FW-CS10-M3



Terminal No.	Color of Wire	Signal Name [Specification]
6	O	–
7	G	–
8	G	–
9	B	–
10	R	–
11	W	–
12	LG	–
13	Y	–
14	L	–
15	P	–
31	R	–
32	V	–
33	Y	–
37	BR	–
38	BR	–
39	Y	–
40	P	–
41	L	–
42	G	–
43	W	–
45	LG	–
46	V	–
47	LG	–
49	G	–
51	SB	–
52	GR	–
53	B	–
54	R	–
55	L	–
56	SHIELD	–
61	BR	–
62	LG	–
63	W/L	–
64	L/O	–
66	O	–
67	SB	–
69	Y	–
70	R	–
71	R	–
72	L	–
73	R	–
74	Y	–
75	G	–
76	V	–
77	P	–
78	W	–
80	Y	–
81	W	–
82	L	–
83	R	–

Connector No.	M124
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	TH40FW-NH



Terminal No.	Color of Wire	Signal Name [Specification]
73	Y	ON IND
75	SB	DR DOOR REQ SW
76	V	PUSH SW
78	P	DR DOOR ANT+
79	V	DR DOOR ANT–
80	R	PASS DOOR ANT+
81	L	PASS DOOR ANT–
82	G	REAR BMPR ANT+
83	R	REAR BMPR ANT–
84	Y	ROOM ANT1+
85	BR	ROOM ANT1–
86	LG	ROOM ANT2+
87	V	ROOM ANT2–
88	W	LAGGAGE ROOM ANT+
89	B	LAGGAGE ROOM ANT–
90	P	PUSH-BTN IGN SW ILL PWR SPLY
91	SB	LOCK IND
92	G	PUSH-BTN IGN SW ILL GND
93	R	I-KEY WARN BUZZER
96	BR	ACC RELAY CONT OUTPUT
97	W	STARTER RELAY CONT
98	LG	IGN RELAY (IPDM E/R) CONT
99	GR	IGN RELAY (F/B) CONT OUTPUT
100	GR	PASS DOOR REQ SW
101	BR	IGN PWR SPLY 2
102	Y	P/N POSITION
104	L	CVT SHIFT SELECT PWR SPLY
105	GR	STOP LAMP SW 2
106	O	BLWR RELAY CONT OUTPUT
109	GR	ACC IND

JCBWA2063GB

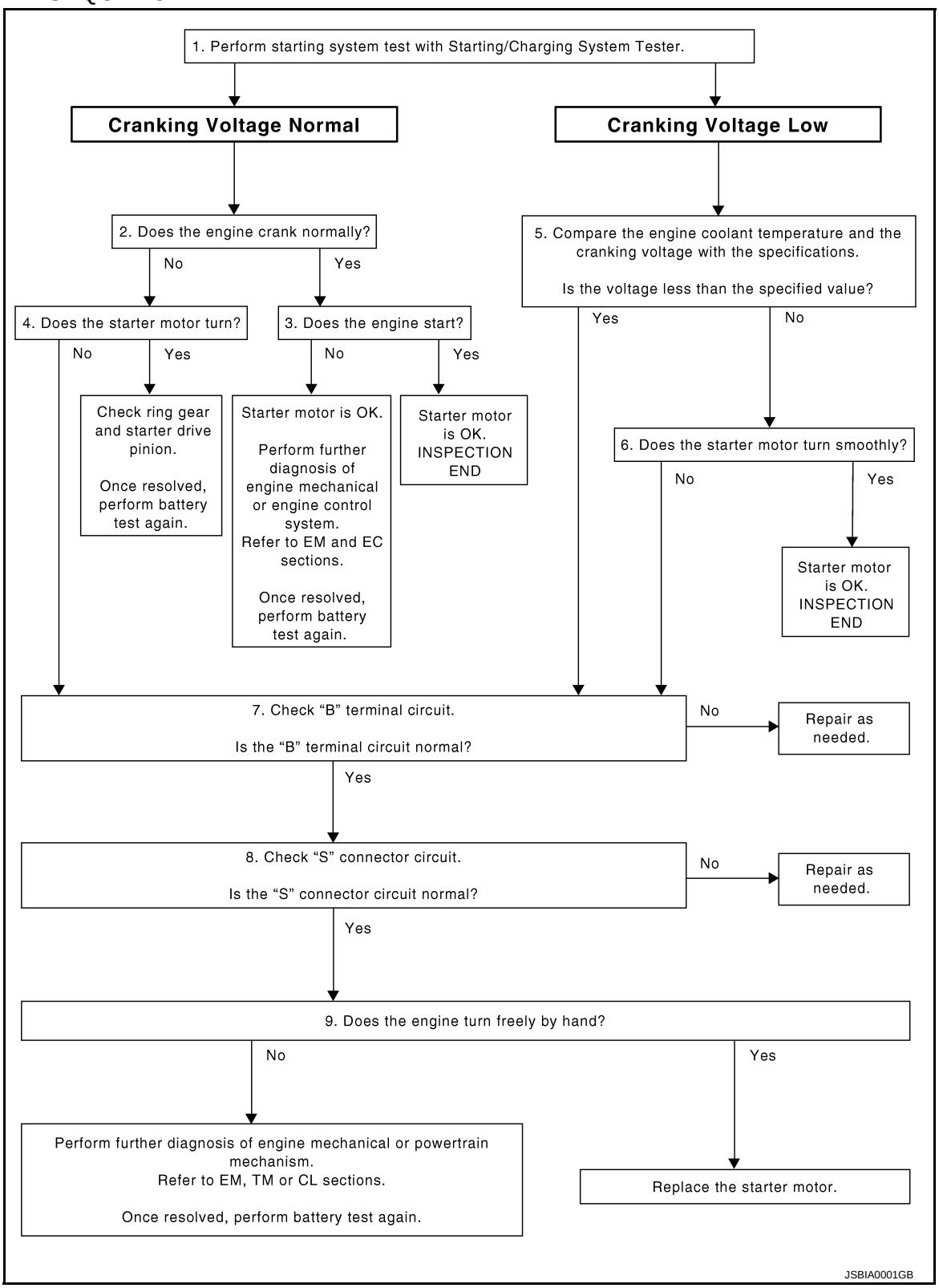
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow

INFOID:0000000007136360

OVERALL SEQUENCE



DETAILED FLOW

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-12, "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-13, "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. Refer to EM, TM or CL sections. Once resolved, perform battery test again. Refer to Technical Service Bulletin.

DTC/CIRCUIT DIAGNOSIS

B TERMINAL CIRCUIT

Description

INFOID:0000000007136361

The “B” terminal is constantly supplied with battery power.

Diagnosis Procedure

INFOID:0000000007136362

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		
F10	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 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	Terminal		
Battery positive terminal	F10	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 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-9, "Work Flow".
NO >> Check the starter motor case and ground for poor continuity.

S TERMINAL CIRCUIT

Description

INFOID:0000000007136363

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:0000000007136364

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” TERMINAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect starter motor connector.
3. Shift selector lever to “P” or “N” position.
4. Check voltage between starter motor harness connector and ground.

Terminals			Condition	Voltage (Approx.)
(+)		(–)		
Starter motor harness connector	Terminal			
F47	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-9, "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 STR-9, "Work Flow".
NO >> Repair the harness.

SYMPTOM DIAGNOSIS

STARTING SYSTEM

Symptom Table

INFOID:0000000007136365

Symptom	Reference
No normal cranking	Refer to STR-9, "Work Flow".
Starter motor does not rotate	

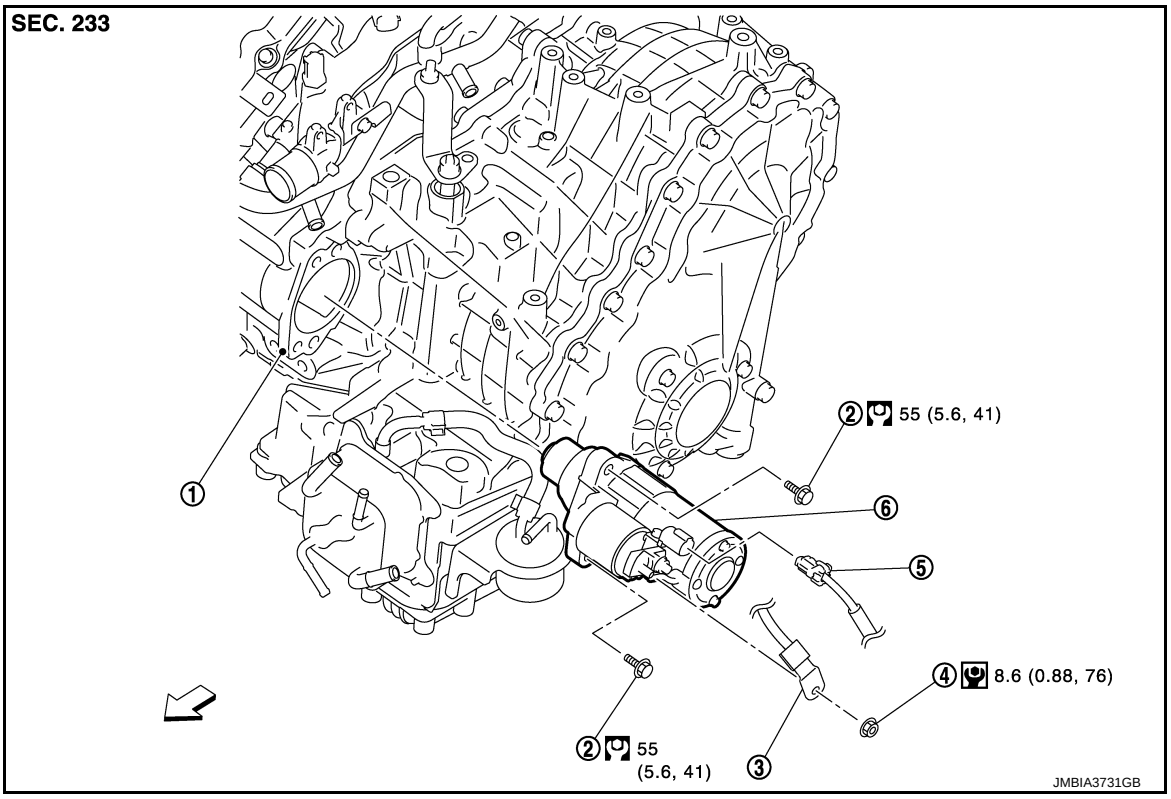
REMOVAL AND INSTALLATION

STARTER MOTOR

Exploded View

INFOID:0000000007136366

REMOVAL



1. Converter housing
2. Starter motor mounting bolt
3. “B” terminal harness
4. “B” terminal harness nut
5. “S” terminal harness connector
6. Starter motor

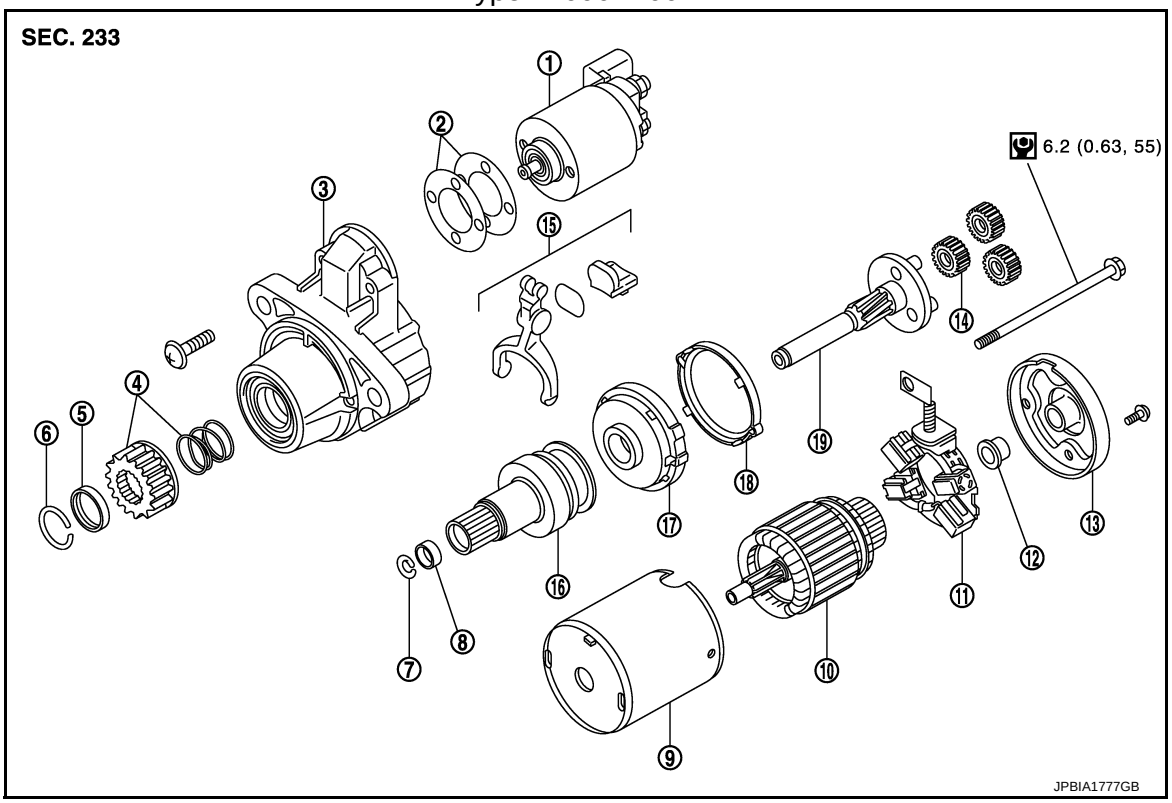
⇦ : Vehicle front

: N·m (kg-m, in-lb)

: N·m (kg-m, ft-lb)

DISASSEMBLY

Type: M000TA0072



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

: N·m (kg-m, in-lb)

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

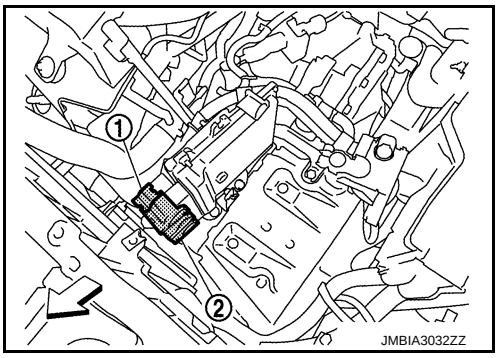
Removal and Installation

INFOID:0000000007136367

REMOVAL

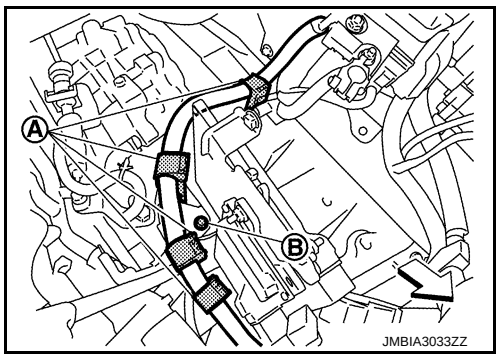
1. Remove battery. Refer to PG-136, "Removal and Installation".
2. Remove air duct (inlet) and air cleaner assembly. Refer to EM-26, "Removal and Installation".
3. Disconnect TCM harness connector (1) and ECM harness connectors (2).

: Vehicle front



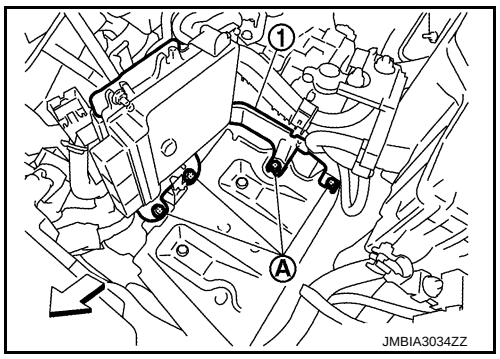
4. Remove harness fixing clips (A) and harness mounting bolt (B).

⇦ : Vehicle front



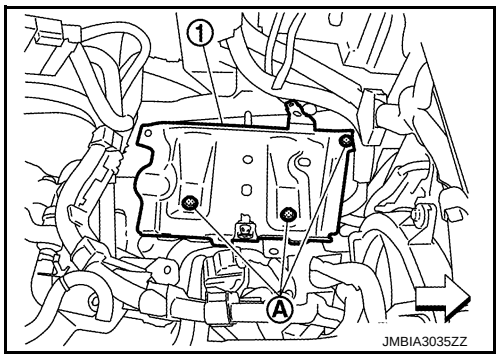
5. Remove ECM bracket mounting bolts (A), and then remove ECM bracket (1).

⇦ : Vehicle front



6. Remove battery tray mounting bolts (A), and then remove battery tray (1).

⇦ : Vehicle front



7. Disconnect “S” terminal harness connector
8. Remove “B” terminal harness nut, and then diconnect “B” terminal harness.
9. Remove splash guard LH. Refer to EXT-22, "Removal and Installation".
10. Remove starter motor mounting bolts form the left side of the vehicle and the engine room.
11. Remove starter motor form the vehicle

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.**
- **To prevent damage to the parts, connect the battery cable to the positive terminal first.**
- **To prevent damage to the vehicle, after connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.**
- **To prevent damage to the parts, check battery terminal for poor connection caused by corrosion.**

NOTE:

Reset electronic systems as necessary. Refer to GI-57, "ADDITIONAL SERVICE WHEN REMOVING BATTERY NEGATIVE TERMINAL : Required Procedure After Battery Disconnection".

Inspection

INFOID:0000000007136368

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)

Starter Motor

INFOID:0000000007136369

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 (1.53 - 2.08, 3.37 - 4.59)
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)