SECTION STR
STARTING SYSTEM

CONTENTS

PRECAUTION

PRECAUTIONS

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

INFOID:0000000006604165

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the “SRS AIR BAG” and “SEAT BELT” of this Service Manual.

The vehicle may be equipped with a passenger air bag deactivation switch. Because no rear seat exists where a rear-facing child restraint can be placed, the switch is designed to turn off the passenger air bag so that a rear-facing child restraint can be used in the front passenger seat. The switch is located in the center of the instrument panel, near the ashtray. When the switch is turned to the ON position, the passenger air bag is enabled and could inflate for certain types of collision. When the switch is turned to the OFF position, the passenger air bag is disabled and will not inflate. A passenger air bag OFF indicator on the instrument panel lights up when the passenger air bag is switched OFF. The driver air bag always remains enabled and is not affected by the passenger air bag deactivation switch.

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 AIR BAG”.**
- **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.**
- **The vehicle may be equipped with a passenger air bag deactivation switch which can be operated by the customer. When the passenger air bag is switched OFF, the passenger air bag is disabled and will not inflate. When the passenger air bag is switched ON, the passenger air bag is enabled and could inflate for certain types of collision. After SRS maintenance or repair, make sure the passenger air bag deactivation switch is in the same position (ON or OFF) as when the vehicle arrived for service.**

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

WARNING:

- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag 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 3 minutes before performing any service.**

Precaution Necessary for Steering Wheel Rotation after Battery Disconnect

INFOID:0000000006604229

NOTE:

- Before removing and installing any control units, first turn the ignition switch to the LOCK position, then disconnect both battery cables.
- After finishing work, confirm that all control unit connectors are connected properly, then re-connect both battery cables.
- Always use CONSULT-III to perform self-diagnosis as a part of each function inspection after finishing work. If a DTC is detected, perform trouble diagnosis according to self-diagnosis results.

For vehicle with steering lock unit, if the battery is disconnected or discharged, the steering wheel will lock and cannot be turned.

If turning the steering wheel is required with the battery disconnected or discharged, follow the operation procedure below before starting the repair operation.

OPERATION PROCEDURE

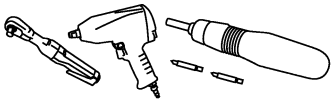
1. Connect both battery cables.
   NOTE:
   Supply power using jumper cables if battery is discharged.
2. Turn the ignition switch to ACC position.
   (At this time, the steering lock will be released.)
3. Disconnect both battery cables. The steering lock will remain released with both battery cables disconnected and the steering wheel can be turned.
4. Perform the necessary repair operation.
5. When the repair work is completed, re-connect both battery cables. With the brake pedal released, turn the ignition switch from ACC position to ON position, then to LOCK position. (The steering wheel will lock when the ignition switch is turned to LOCK position.)
6. Perform self-diagnosis check of all control units using CONSULT-III.

PREPARATION

PREPARATION

Commercial Service Tools

INFOID:0000000006530920

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

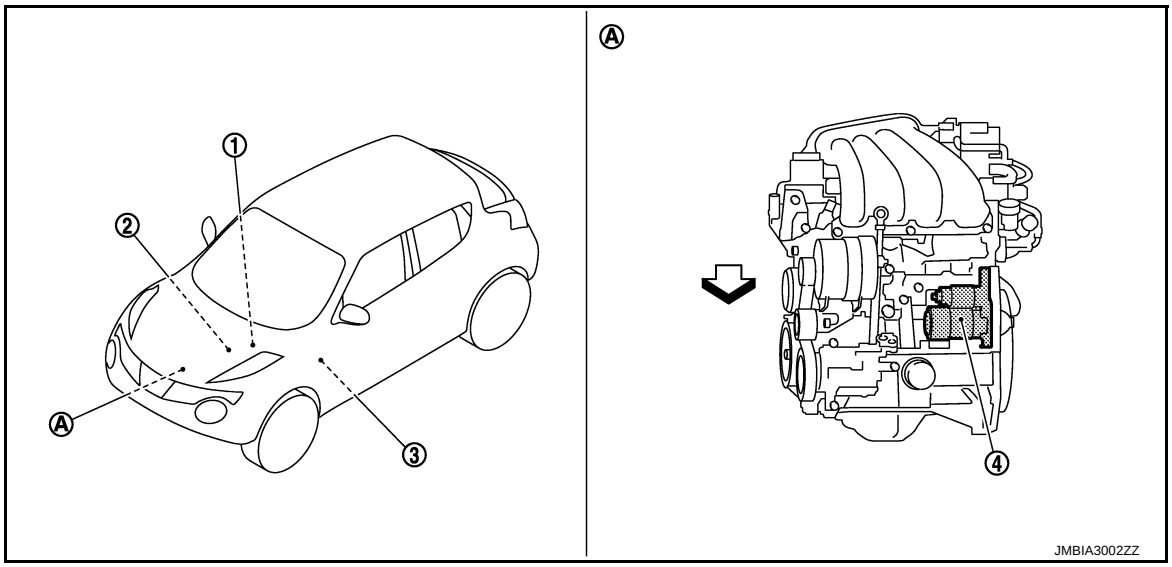
SYSTEM DESCRIPTION

COMPONENT PARTS

STARTING SYSTEM (WITH INTELLIGENT KEY)

STARTING SYSTEM (WITH INTELLIGENT KEY) : Component Parts Location

INFOID:0000000006530921



1. IPDM E/R
   Refer to PCS-5, "Component Parts Location".
2. Transmission range switch (CVT models)
   Refer to TM-131, "CVT CONTROL SYSTEM : Component Parts Location" (MR16DDT), TM-314, "CVT CONTROL SYSTEM : Component Parts Location" (HR16DE).
3. BCM
   Refer to BCS-6, "BODY CONTROL SYSTEM : Component Parts Location".
4. Starter motor

A. Engine

⇦ :Vehicle front

STARTING SYSTEM (WITH INTELLIGENT KEY) : Component Description

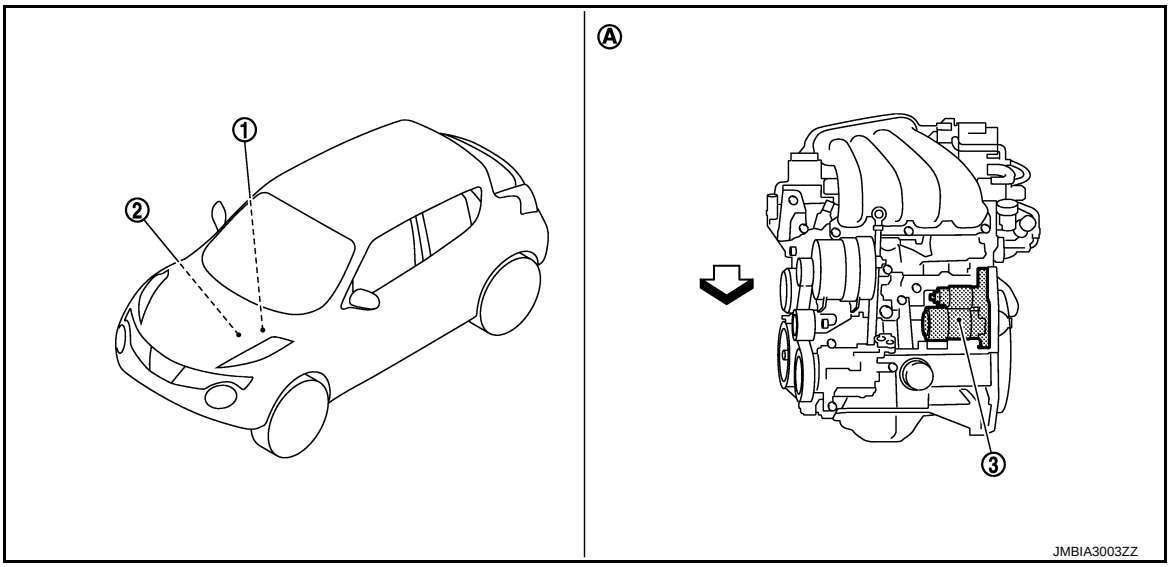
INFOID:0000000006530922

Component part	Description
BCM	BCM controls the starter relay.
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.
Transmission range switch (CVT models)	Transmission range switch 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.

STARTING SYSTEM (WITHOUT INTELLIGENT KEY)

STARTING SYSTEM (WITHOUT INTELLIGENT KEY) : Component Parts Location

INFOID:0000000006530923



1. IPDM E/R
   Refer to PCS-37, "Component Parts Location".
2. Transmission range switch (CVT models)
   Refer to TM-131, "CVT CONTROL SYSTEM : Component Parts Location" (MR16DDT), TM-314, "CVT CONTROL SYSTEM : Component Parts Location" (HR16DE).
3. Starter motor

A. Engine

⇦ :Vehicle front

STARTING SYSTEM (WITHOUT INTELLIGENT KEY) : Component Description

INFOID:0000000006530924

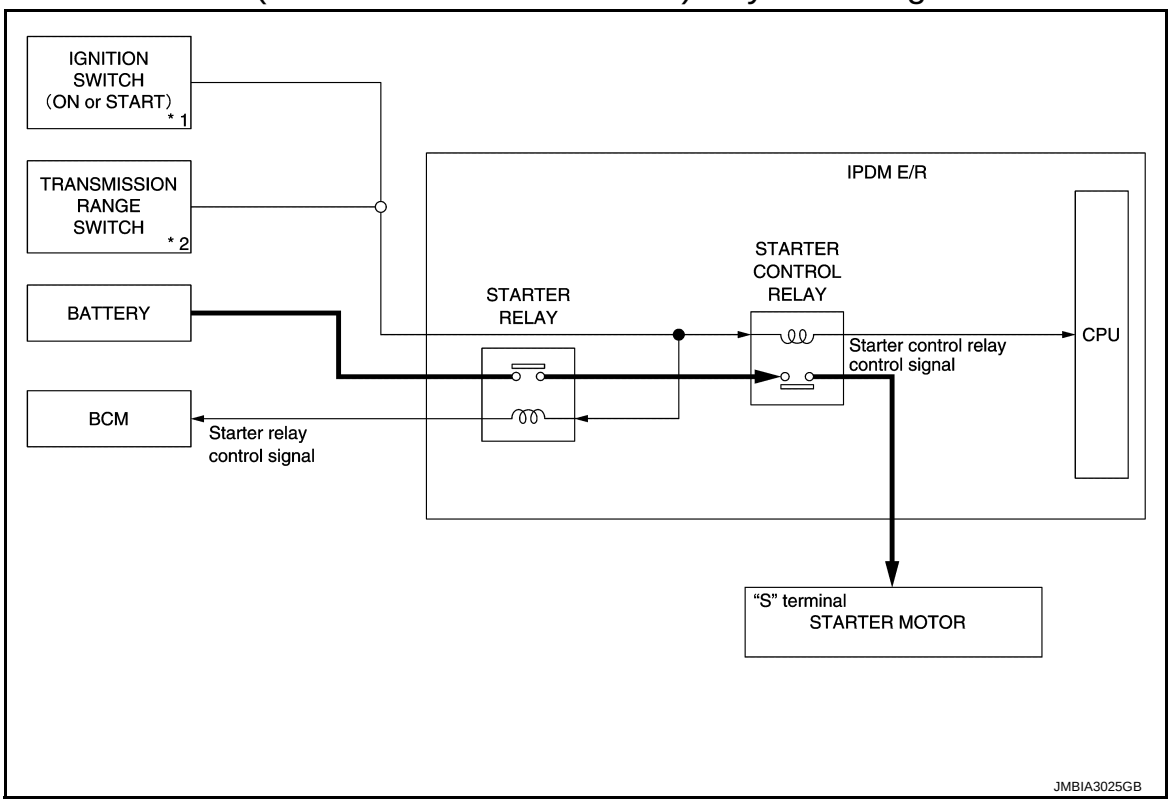
Component part	Description
IPDM E/R	CPU inside IPDM E/R controls the starter control relay.
Starter motor	The starter motor plunger closes and the motor is supplied with battery power, which in turn cranks the engine, when the “S” terminal is supplied with electric power.
Transmission range switch (CVT models)	Transmission range switch supplies power to the starter control relay inside IPDM E/R when the selector lever is shifted to the P or N position.

SYSTEM

STARTING SYSTEM (WITH INTELLIGENT KEY)

STARTING SYSTEM (WITH INTELLIGENT KEY) : System Diagram

INFOID:0000000006530925



*1: M/T models

*2: CVT models

STARTING SYSTEM (WITH INTELLIGENT KEY) : System Description

INFOID:0000000006530926

CVT MODELS

- When selector lever is P or N, power is supplied to starter relay and starter control relay by transmission range switch. 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 control relay control signal.
- Then battery power is supplied to starter motor ("S" terminal) through starter control relay and starter relay.

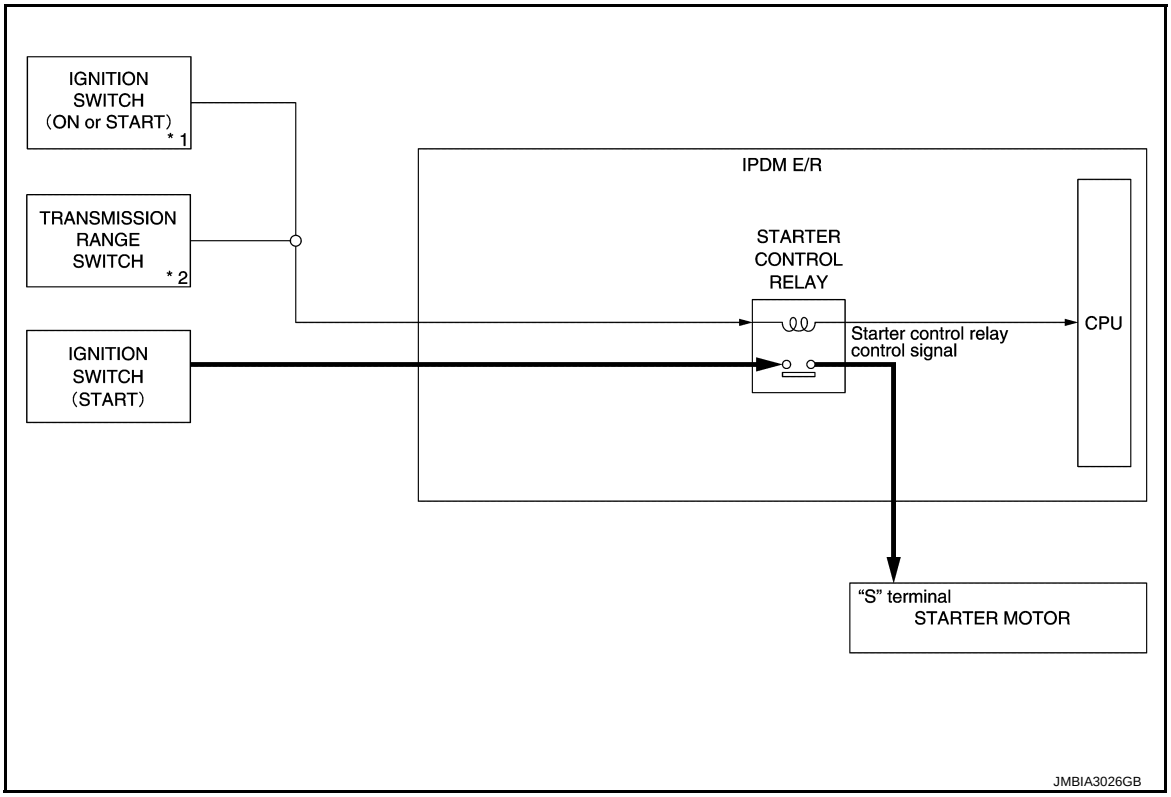
M/T MODELS

- When the ignition switch is turned ON or START position power is supplied to starter relay and starter control relay. And BCM and IPDM E/R (CPU) detect ignition switch position 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 control relay control signal.
- Then battery power is supplied to starter motor ("S" terminal) through starter control relay and starter relay.

STARTING SYSTEM (WITHOUT INTELLIGENT KEY)

STARTING SYSTEM (WITHOUT INTELLIGENT KEY) : System Diagram

INFOID:0000000006530927



*1: M/T models

*2: CVT models

STARTING SYSTEM (WITHOUT INTELLIGENT KEY) : System Description

INFOID:0000000006530928

CVT MODELS

- When selector lever is P or N, power is supplied to starter control relay by transmission range switch. And IPDM E/R (CPU) detect selector lever P/N condition by the inputted signal.
- When engine cranking condition is satisfied, then battery power is supplied to starter motor ("S" terminal) through starter control relay.

M/T MODELS

When ignition switch is START position, battery power is supplied to starter motor ("S" terminal).

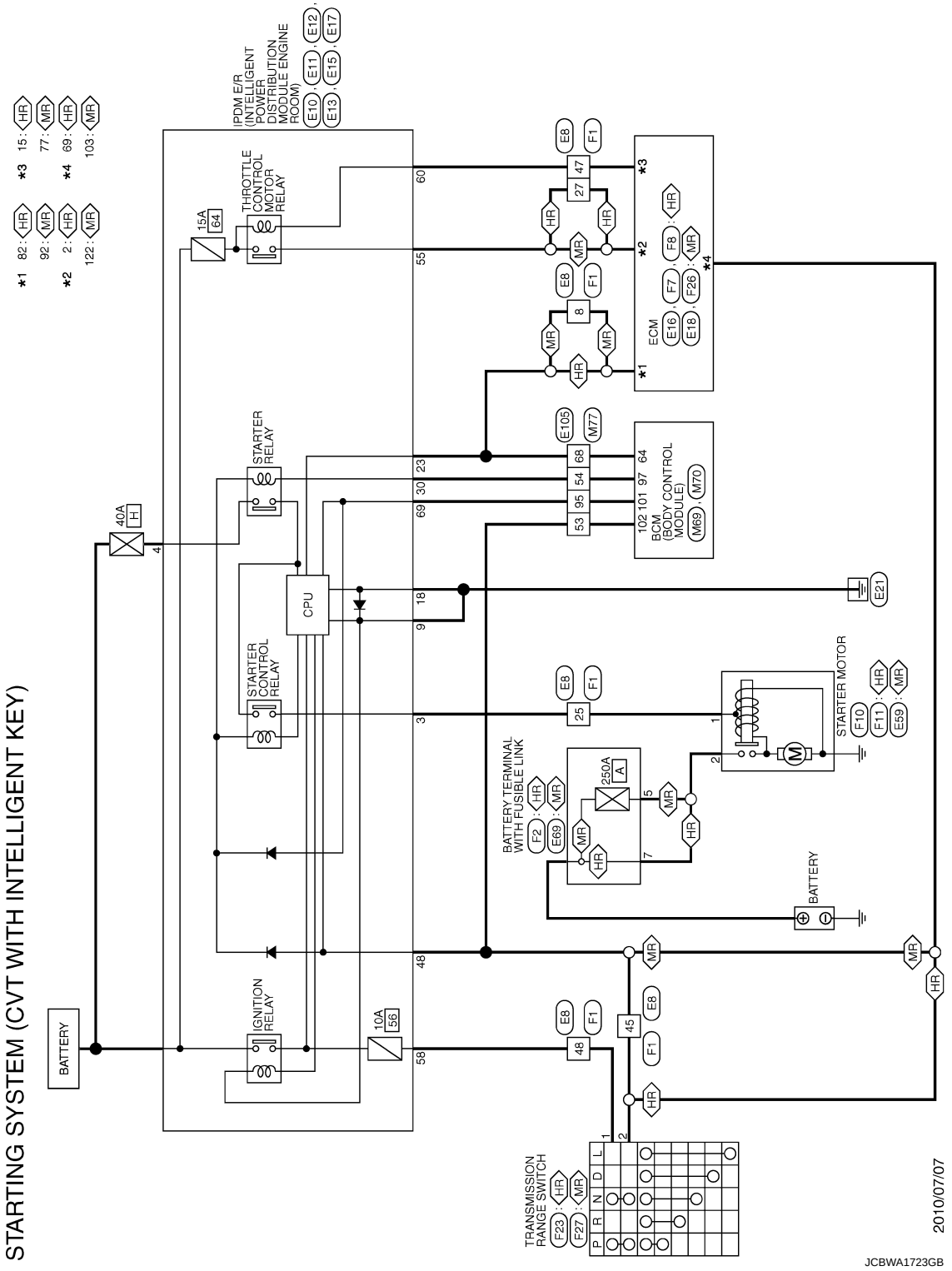
WIRING DIAGRAM

STARTING SYSTEM (WITH INTELLIGENT KEY)
CVT

CVT : Wiring Diagram

INFOID:0000000006530929

For connector terminal arrangements, harness layouts, and alphabets in a ⬡ (option abbreviation; if not described in wiring diagram), refer to GI-12, "Connector Information/Explanation of Option Abbreviation".

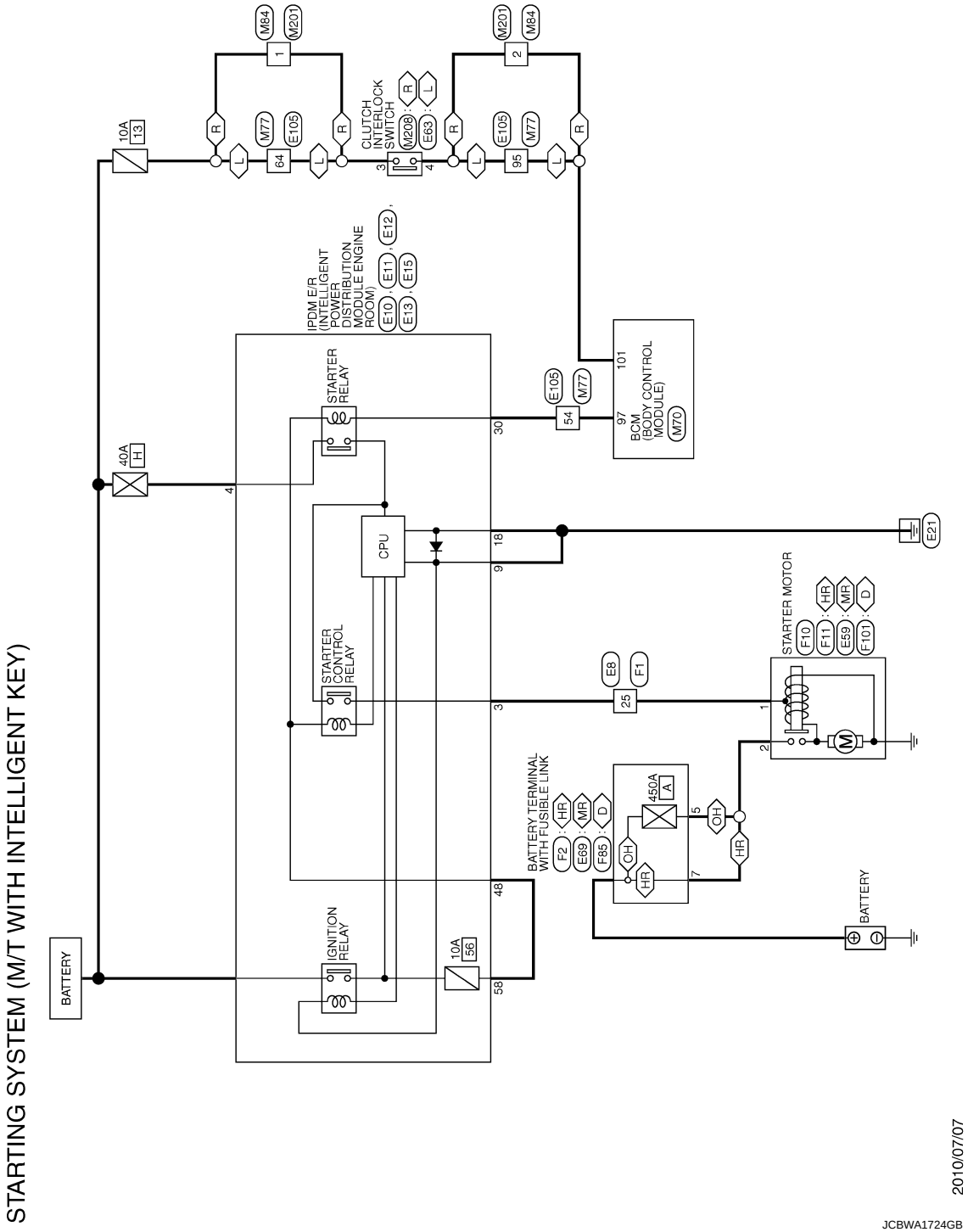


M/T

M/T : Wiring Diagram

INFOID:0000000006635280

For connector terminal arrangements, harness layouts, and alphabets in a ⬡ (option abbreviation; if not described in wiring diagram), refer to GI-12, "Connector Information/Explanation of Option Abbreviation".



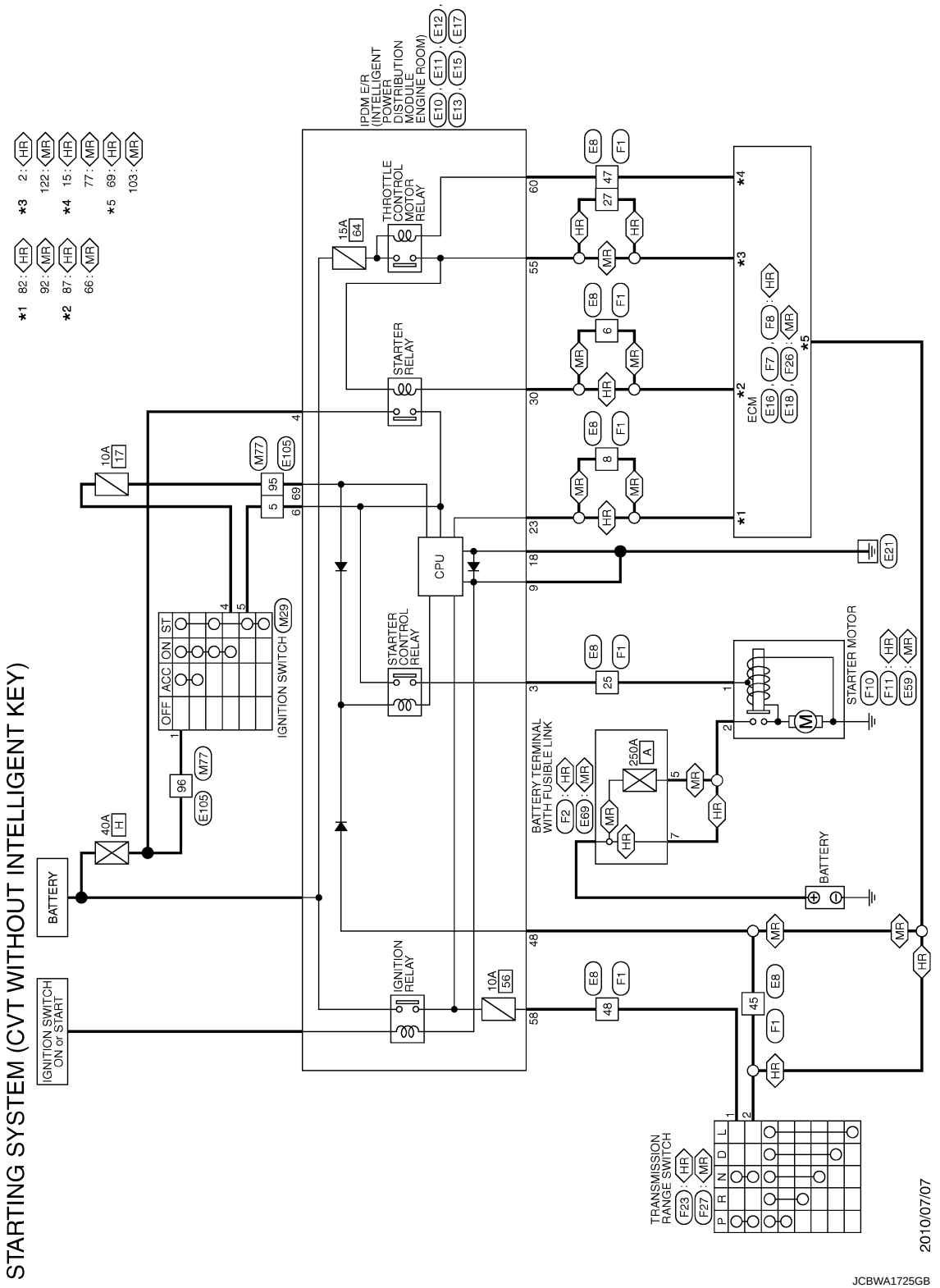
STARTING SYSTEM (WITHOUT INTELLIGENT KEY)

CVT

CVT : Wiring Diagram

INFOID:0000000006635283

For connector terminal arrangements, harness layouts, and alphabets in a ⬡ (option abbreviation; if not described in wiring diagram), refer to GI-12, "Connector Information/Explanation of Option Abbreviation".

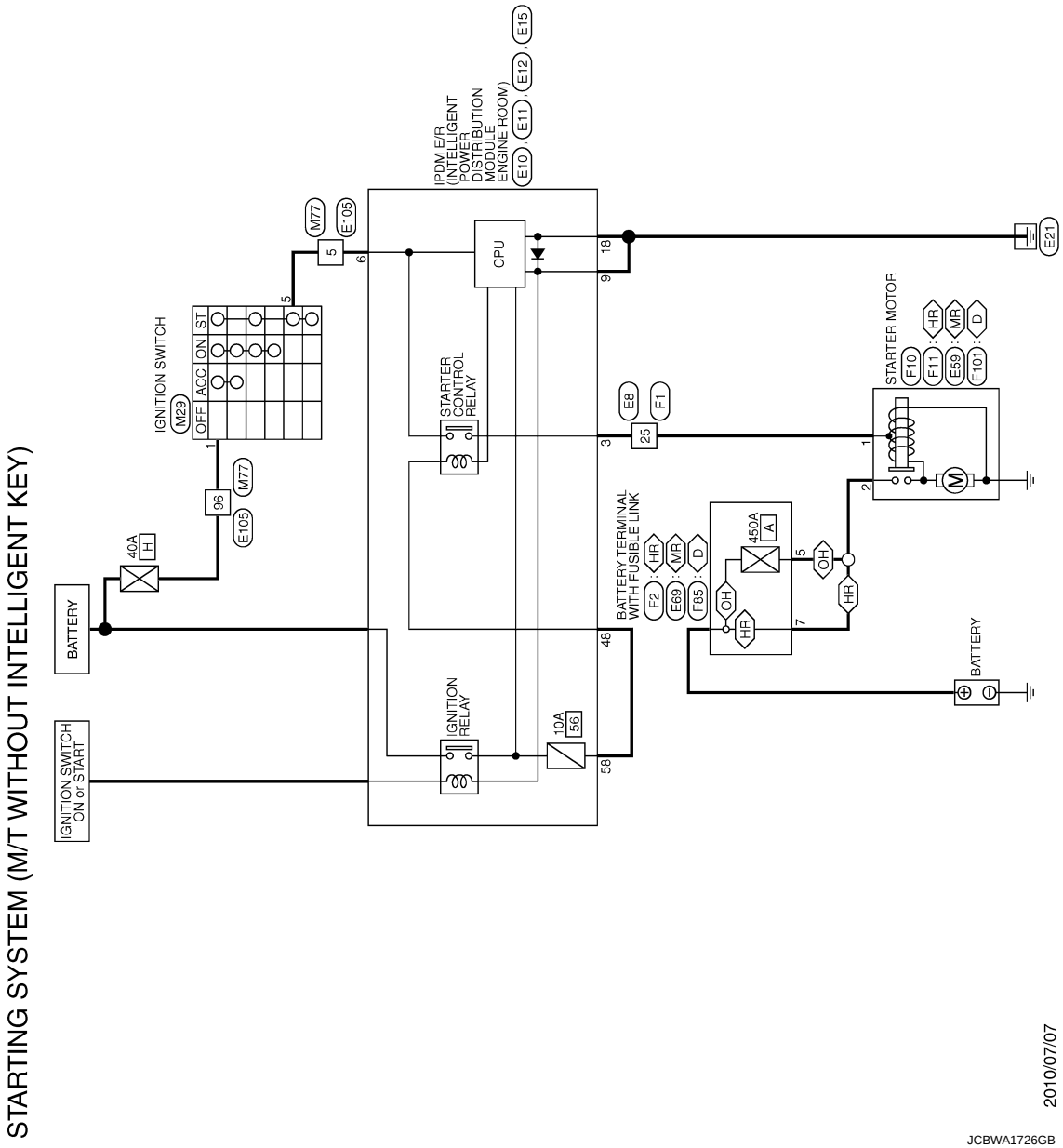


M/T

M/T : Wiring Diagram

INFOID:0000000006635284

For connector terminal arrangements, harness layouts, and alphabets in a ⬡ (option abbreviation; if not described in wiring diagram), refer to GI-12, "Connector Information/Explanation of Option Abbreviation".



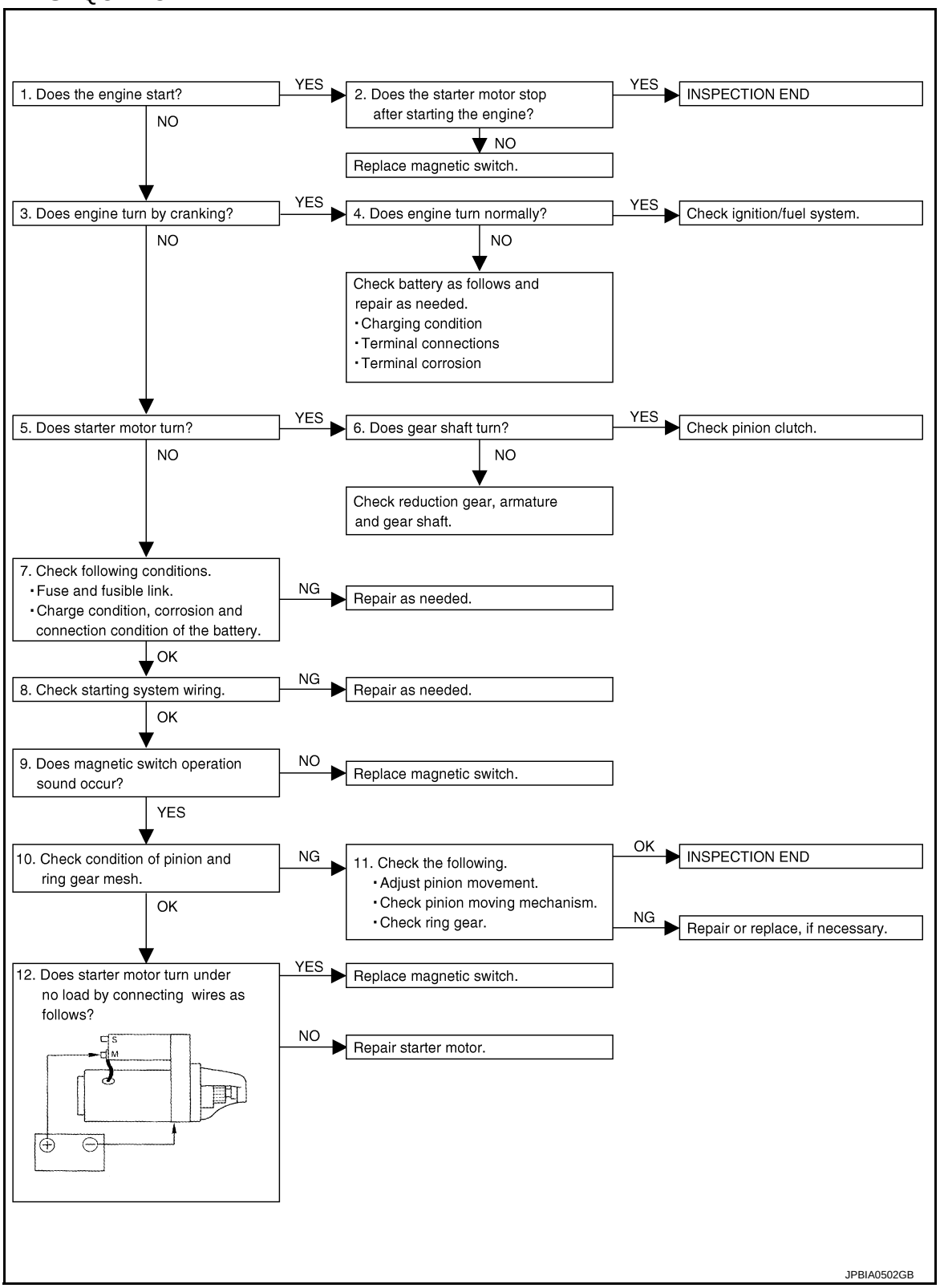
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow

INFOID:0000000006530931

OVERALL SEQUENCE



DETAILED FLOW

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

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?

YES >> INSPECTION END
NO >> Replace magnetic switch.

3.CHECK THE ENGINE SPEED WITH CRANKING

Check that the engine runs at cranking.

Does engine turn by cranking?

YES >> GO TO 4.
NO >> GO TO 5.

4.CHECK THE ENGINE SPEED WITH CRANKING

Check that the engine speed is not low at cranking.

Does engine turn normally?

YES >> Check ignition/fuel system.
NO >> Check charge condition, corrosion and connection condition of the battery. Refer to PG-113, "Work Flow".

5.CHECK STARTER MOTOR ACTIVATION

Check that the starter motor runs at cranking.

Does starter motor turn?

YES >> GO TO 6.
NO >> GO TO 7.

6.CHECK STARTER MOTOR UNIT

1. Remove starter motor.
2. Check that the gear shaft of starter motor rotates.

Does gear shaft turn?

YES >> Check pinion clutch. Refer to STR-24, "HR16DE : Inspection and Adjustment" (HR16DE) or STR-30, "MR16DDT : Inspection and Adjustment" (MR16DDT).
NO >> Check reduction gear, armature and gear shaft.

7.CHECK POWER SUPPLY CIRCUIT

Check the following conditions.
- Fuse and fusible link
- Charge condition, corrosion and connection condition of the battery. Refer to PG-113, "Work Flow".

Are these inspection results normal?

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

8.CHECK STARTING SYSTEM WIRING

Check the following.
- “B” terminal circuit. Refer to STR-17, "Diagnosis Procedure".
- “S” terminal circuit. Refer to STR-19, "Diagnosis Procedure".

Are these inspection results normal?

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

9.CHECK MAGNETIC SWITCH OPERATION SOUND

Check that a magnetic switch operation sound can be heard when the ignition switch is set at the starting position.

Does magnetic switch operation sound occur?

YES >> GO TO 10.
NO >> Replace magnetic switch.

10.PINION AND RING GEAR ENGAGEMENT CHECK

Check condition of pinion and ring gear mesh.

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11.CHECK STARTER MOTOR UNIT

Check the following.

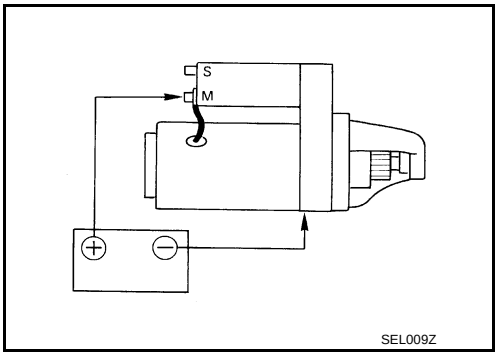
- Adjust pinion movement. Refer to STR-24, "HR16DE : Inspection and Adjustment" (HR16DE) or STR-30, "MR16DDT : Inspection and Adjustment" (MR16DDT).
- Check pinion moving mechanism.
- Check ring gear.

Are these inspection results normal?

YES >> INSPECTION END
NO >> Repair or replace, if necessary.

12.CHECK STARTER MOTOR UNIT

Check that the starter motor runs when connecting the positive terminal (12 V) to starter motor terminal M and the negative terminal (ground) to starter motor body.



Does the starter motor run?

YES >> Replace magnetic switch.
NO >> Repair starter motor.

DTC/CIRCUIT DIAGNOSIS

B TERMINAL CIRCUIT

Description

INFOID:0000000006530932

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

Diagnosis Procedure

INFOID:0000000006530933

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.INSPECTION START

Check which type of engine the vehicle is equipped with.

Which type of engine?

HR16DE engine models>>GO TO 4.
Except HR16DE engine models>>GO TO 2.

2.CHECK FUSIBLE LINK

Check that the following fusible link is not blown.

Terminal No.	Signal name	Fusible link No.
2	Battery power supply	A (250A): CVT models
		A (450A): M/T models

Is the fusible link blown?

YES >> Replace the blown fusible link after repairing the affected circuit if a fusible link is blown.
NO >> GO TO 3.

3.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		
E59 (MR16DDT) F11 (HR16DE) F101 (K9K)	2	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.
NO >> Check harness between battery and starter motor for open circuit.

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

1. Shift selector lever to “P” or “N” position. (CVT models)
   Keep depressing clutch pedal fully. (M/T models with Intelligent Key system)
2. Check voltage between battery positive terminal and starter motor “B” terminal.

Terminals			Condition	Voltage (Approx.)
(+)	(–)			
	Starter motor “B” terminal	Terminal		
Battery positive terminal	E59 (MR16DDT) F11 (HR16DE) F101 (K9K)	2	When the ignition switch is in START position	Less than 0.5 V

Is the inspection result normal?

YES >> GO TO 5.
NO >> Check harness between the battery and the starter motor for poor continuity.

5.CHECK GROUND CIRCUIT STATUS (VOLTAGE DROP TEST)

1. Shift selector lever to “P” or “N” position. (CVT models)
   Keep depressing clutch pedal fully. (M/T models with Intelligent Key system)
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-14, "Work Flow".
NO >> Check the starter motor case and ground for poor continuity.

S TERMINAL CIRCUIT

Description

INFOID:0000000006530934

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 CVT models or the clutch pedal is depressed for M/T models.

Diagnosis Procedure

INFOID:0000000006530935

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. (CVT 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			
F10	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-14, "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.	
F10	1	E10	3	Existed

Is the inspection result normal?

YES >> Further inspection is necessary. Refer to STR-14, "Work Flow".
NO >> Repair the harness.

SYMPTOM DIAGNOSIS

STARTING SYSTEM

Symptom Table

INFOID:0000000006530936

Symptom	Reference
No normal cranking	Refer to STR-14, "Work Flow".
Starter motor does not rotate	

REMOVAL AND INSTALLATION

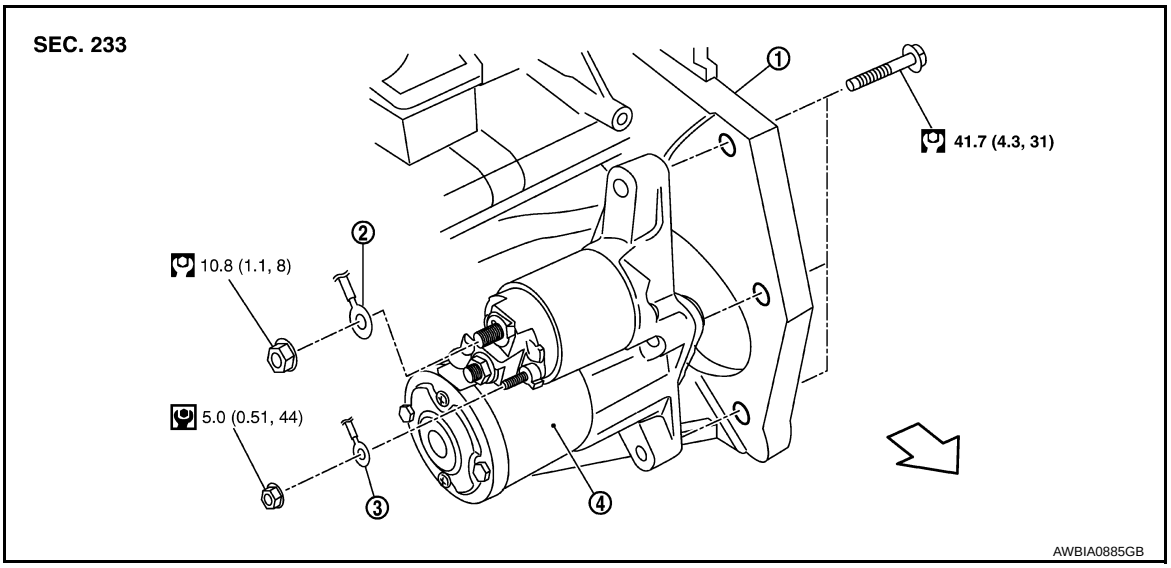
STARTER MOTOR

HR16DE

HR16DE : Exploded View

INFOID:0000000006601084

REMOVAL



1. Cylinder block
2. “B” terminal harness
3. “S” terminal harness
4. Starter motor

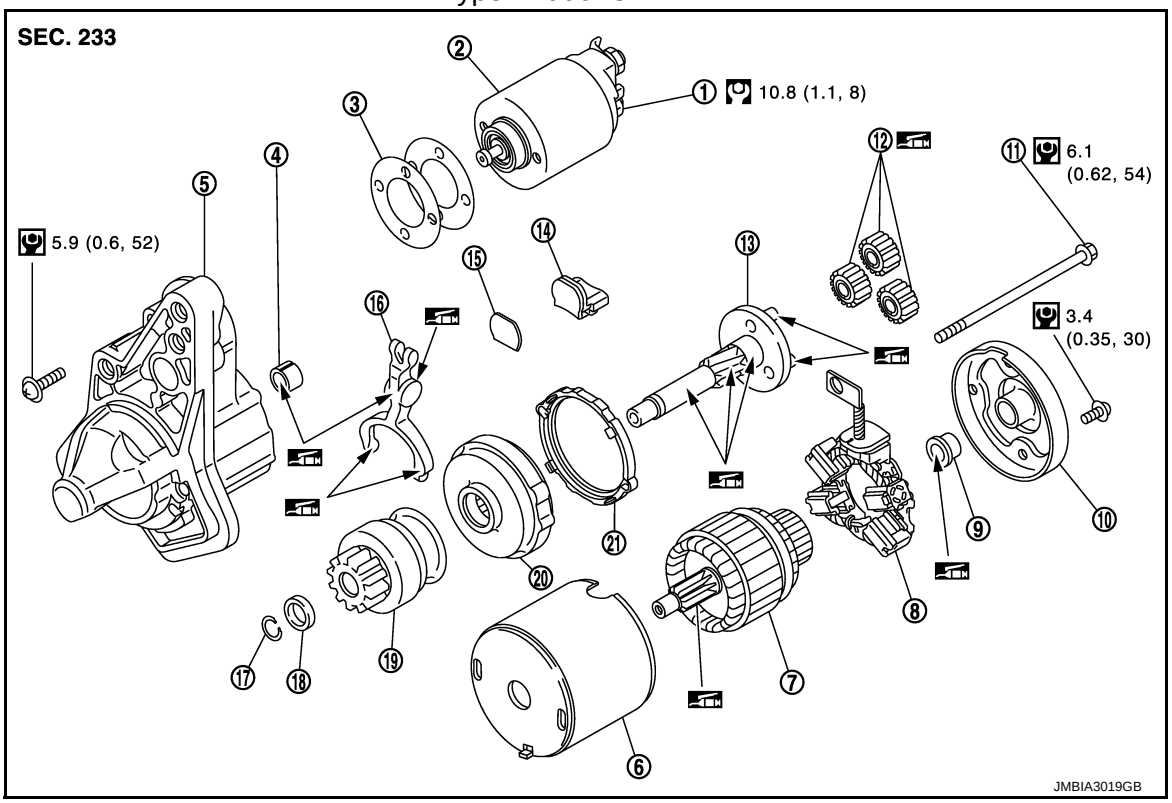
⇦ : Vehicle front

: N·m (kg-m, in-lb)

: N·m (kg-m, ft-lb)

DISASSEMBLY

Type: M000T32172ZE



1. "M" terminal nut
2. Magnetic switch assembly
3. Adjusting plate
4. Metal FR
5. Gear case
6. Yoke
7. Armature
8. Brush holder assembly
9. Metal RR
10. Rear cover
11. Through bolt
12. Planetary gear
13. Gear shaft
14. Packing
15. Plate
16. Shift lever
17. Stopper ring
18. Stopper
19. Pinion assembly
20. Internal gear
21. Packing

: N·m (kg-m, in-lb)

: N·m (kg-m, ft-lb)

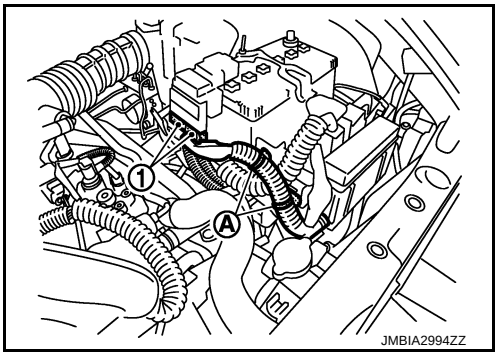
: High-temperature grease point

HR16DE : Removal and Installation

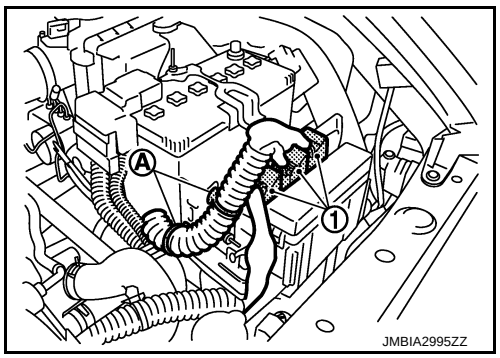
INFOID:0000000006601085

REMOVAL

1. Disconnect the battery cable from the negative terminal. Refer to PG-124, "Removal and Installation".
2. Remove radiator reservoir tank. Refer to CO-17, "Exploded View".
3. Disconnect harness connectors (1) from battery terminal with fusible link.
4. Remove harness fixing clips (A) from F/L·fuse holder bracket.

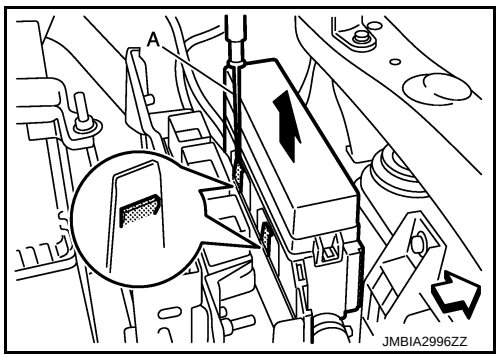


5. Remove harness fixing clips (A) from F/L·fuse holder bracket.
6. Disconnect harness connector (1) from ECM.

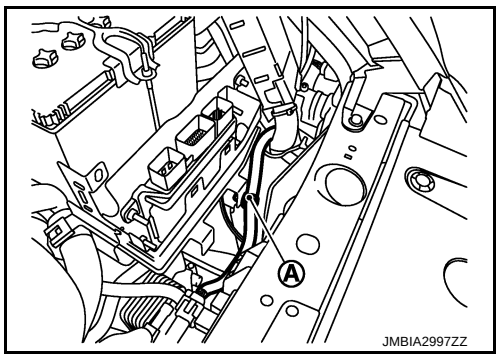


7. Disengage pawl using a flat-bladed screwdriver (A). Remove F/L·fuse holder.

⇦ : Vehicle front

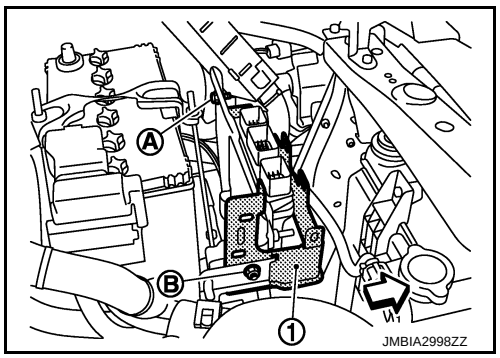


8. Move F/L·fuse holder and harness to a location where they do not inhibit work.
9. Remove harness fixing clips (A) from F/L·fuse holder bracket.



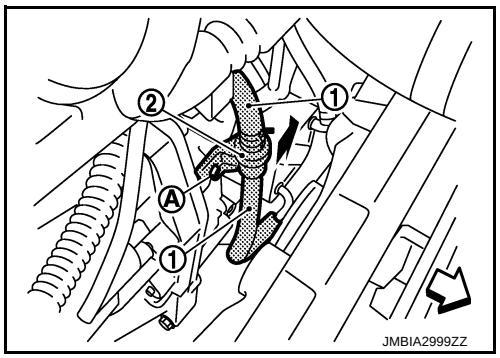
10. Remove mounting bolt (A) and nut (B) of F/L·fuse holder bracket (1), and then remove F/L·fuse holder bracket.

⇦ : Vehicle front



11. Remove mounting bolt (A), and then move water hose (1) and heater thermostat (2) to a location where they do not inhibit work (CVT models).

⇦ : Vehicle front



12. Remove “B” terminal nut and “B” terminal harness.
13. Remove “S” terminal nut and “S” terminal harness.
14. Remove starter motor mounting bolts.
15. Remove starter motor towards vehicle upper.

INSTALLATION

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

CAUTION:

Be careful to tighten “B” terminal nut to the specified torque.

HR16DE : Inspection and Adjustment

INFOID:0000000006530939

INSPECTION

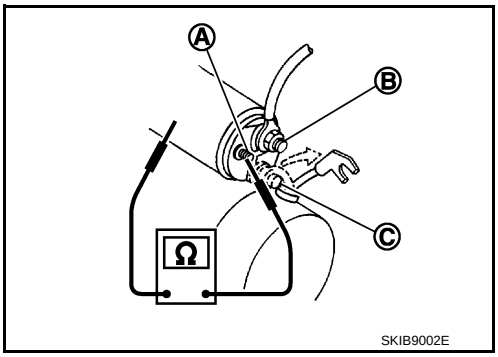
Magnetic Switch Check

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

1. Continuity test [between “S” terminal (A) and switch body]

   B : “B” terminal
   C : “M” terminal

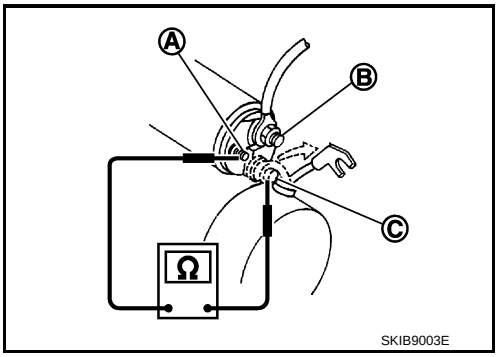
   - Replace magnetic switch if continuity does not exist.



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

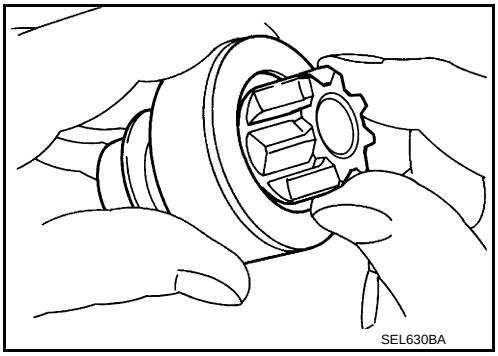
   B : “B” terminal

   - Replace magnetic switch if continuity does not exist.



Pinion/Clutch Check

1. Inspect pinion teeth.
   - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Inspect reduction gear teeth (If equipped).
   - Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)
3. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
   - Replace pinion assembly if it is locked or rotated in both directions or unusual resistance is evident.

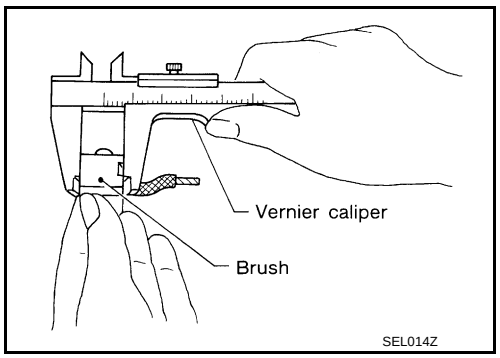


Brush Check

- Check wear of brush.

Minimum length of brush : **Refer to SDS STR-35, "Starter Motor".**

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

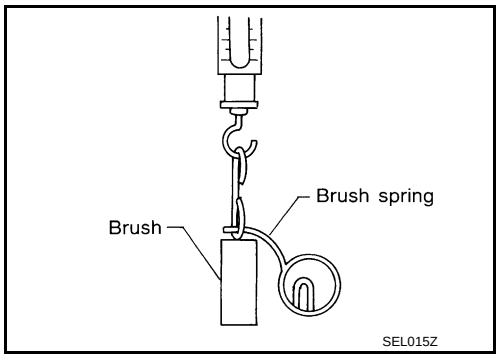


Brush Spring Check

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

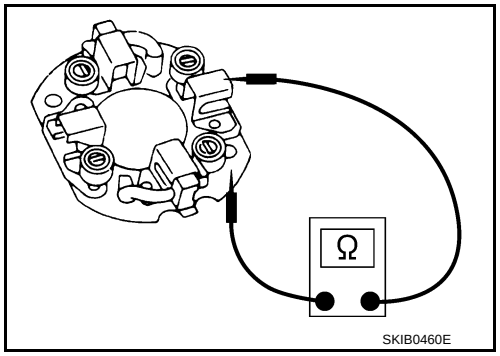
Spring tension (with new brush) : **Refer to SDS STR-35, "Starter Motor".**

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



Brush Holder Check

1. Perform insulation test between brush holder (positive side) and its base (negative side).
   - Replace brush holder assembly if continuity does not exist.
2. Check brush to see if it moves smoothly.
   - If brush holder is bent, replace it; if sliding surface is dirty, clean.

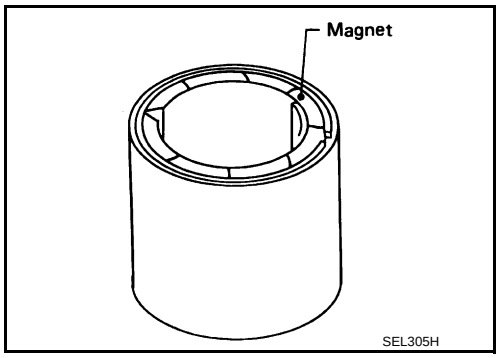


Yoke Check

Magnet is secured to yoke by bonding agent. Check magnet to see that it is secured to yoke and for any cracks. Replace malfunctioning parts as an assembly.

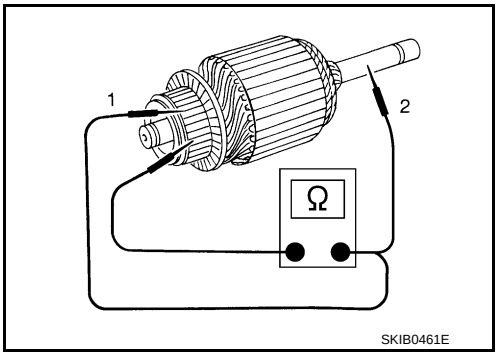
CAUTION:

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

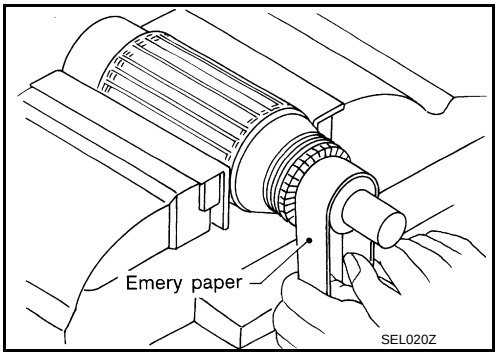


Armature Check

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



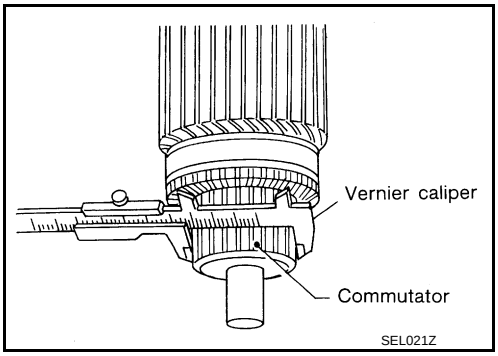
3. Check commutator surface.
   - Grind with No. 500 - 600 emery paper if it has a rough surface.



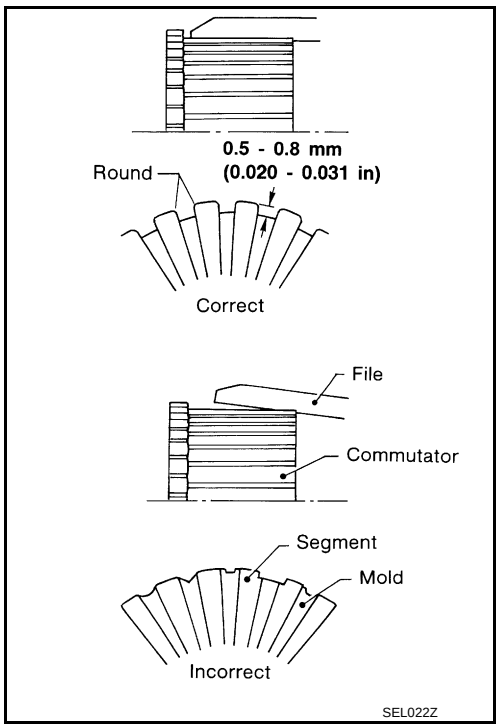
4. Check diameter of commutator.

   Commutator minimum diameter : **Refer to SDS STR-35, "Starter Motor".**

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



5. Check depth of insulating mold from commutator surface.
   - Undercut to 0.5 to 0.8 mm (0.020 to 0.031 in) if the depth is 0.2 mm (0.008 in) or less.



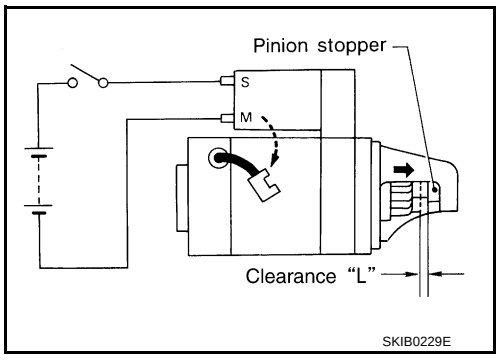
ADJUSTMENT

Pinion Protrusion Length Adjustment

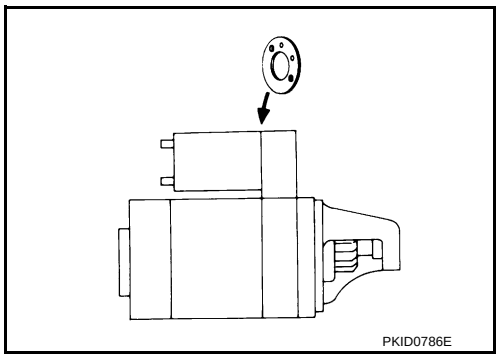
CLEARANCE

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

Clearance “L” : Refer to SDS STR-35, "Starter Motor".



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

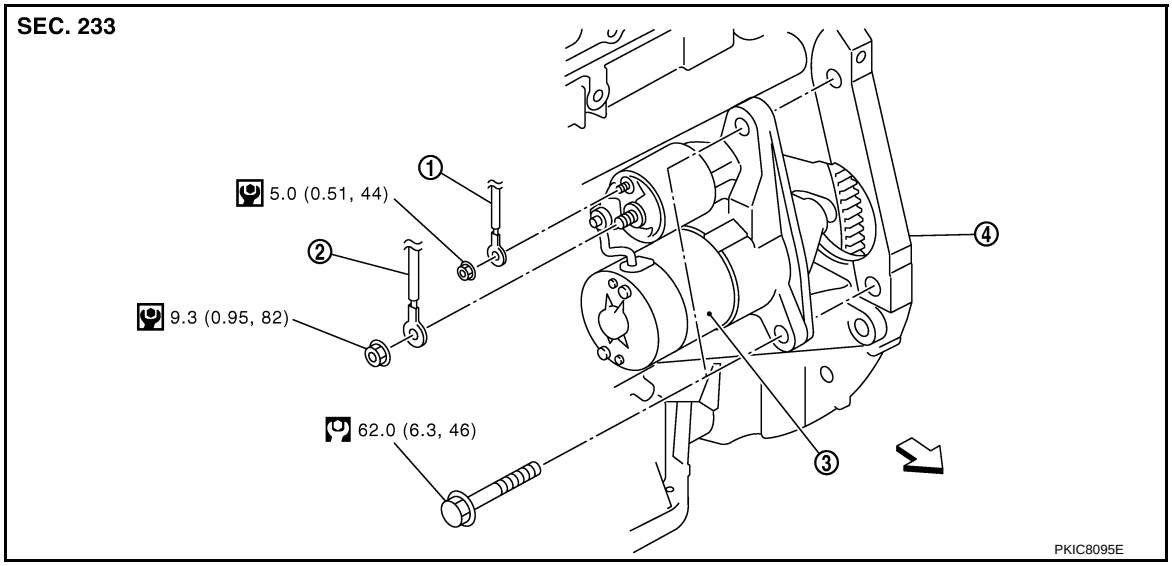


MR16DDT

MR16DDT : Exploded View

INFOID:0000000006601360

REMOVAL



1. "S" terminal harness
2. "B" terminal harness
3. Starter motor
4. Cylinder block

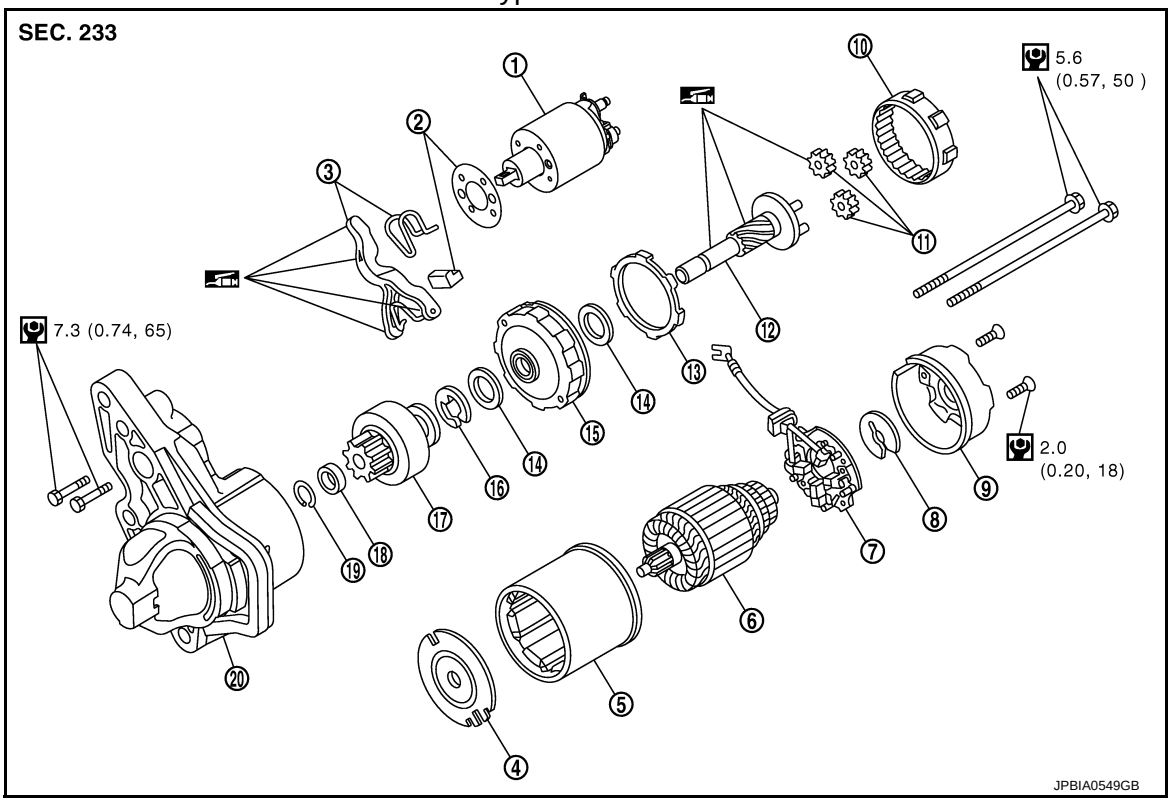
⇦ : Vehicle front

: N·m (kg-m, in-lb)

: N·m (kg-m, ft-lb)

DISASSEMBLY

Type: S114-902



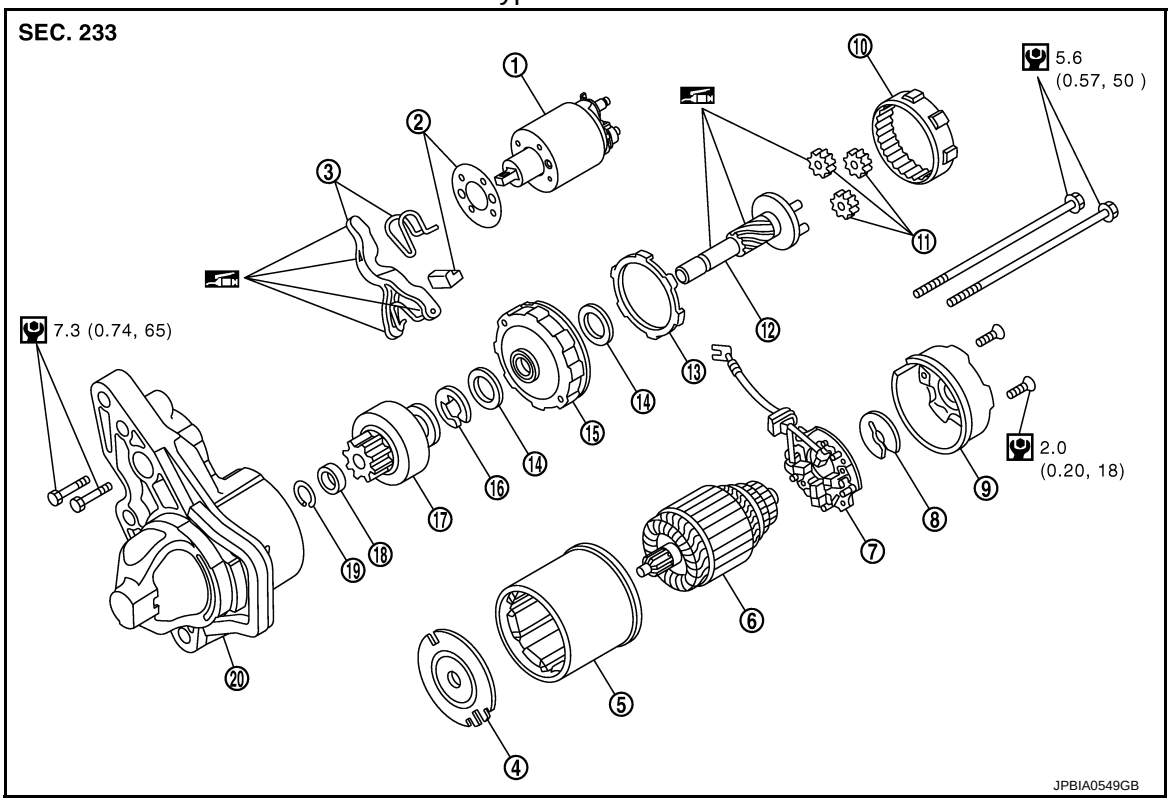
1. Magnetic switch assembly
2. Dust cover kit
3. Shift lever set
4. Center bracket (A)
5. Yoke assembly
6. Armature assembly
7. Brush holder assembly
8. Thrust washer
9. Rear cover assembly

10. Internal gear
11. Planetary gear
12. Pinion shaft
13. Packing
14. Thrust washer
15. Center bracket (P)
16. E-ring
17. Pinion assembly
18. Pinion stopper
19. Pinion stopper clip
20. Gear case assembly

: N·m (kg-m, in-lb)

: High-temperature grease point

Type: S114-955



1. Magnetic switch assembly
2. Dust cover kit
3. Shift lever set
4. Center bracket (A)
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14. Thrust washer
15. Center bracket (P)
16. E-ring
17. Pinion assembly
18. Pinion stopper
19. Pinion stopper clip
20. Gear case assembly

: N·m (kg-m, in-lb)

: High-temperature grease point

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

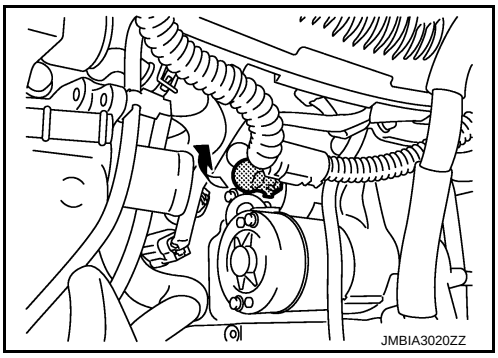
MR16DDT : Removal and Installation

INFOID:0000000006530941

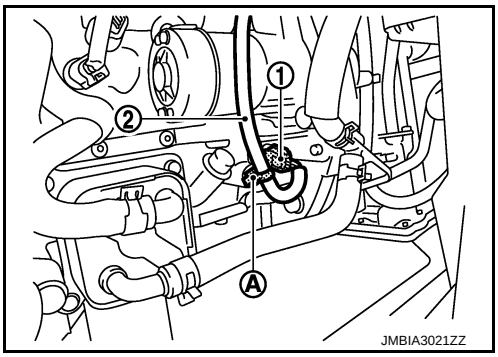
REMOVAL

1. Disconnect the battery cable from the negative terminal. Refer to PG-124, "Removal and Installation".
2. Drain engine coolant from radiator. Refer to CO-11, "Draining".
3. Remove charge air cooler. Refer to EM-31, "Removal and Installation".
4. Remove CVT water hose A on thermostat housing side (CVT models). Refer to CO-17, "Exploded View".
5. Remove radiator hose (lower) on thermostat housing side. Refer to CO-17, "Removal and Installation".

6. Move CVT water hose A and radiator hose (lower) to a location where they do not inhibit work.
7. Open “B” terminal cover, in the direction indicated by an arrow, as shown in the figure.



8. Remove “B” terminal nut and “B” terminal harness.
9. Remove “S” terminal nut and “S” terminal harness.
10. Disconnect harness connector (1) from crankshaft position sensor.
11. Remove harness fixing clip (A) from oil pan (upper), and then move harness (2) to a location where they do not inhibit work.



12. Remove starter motor mounting bolts.
13. Remove starter motor forward from 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.**
- **After work is complete fill engine coolant. Refer to CO-12, "Refilling".**

MR16DDT : Inspection and Adjustment

INFOID:0000000006530942

INSPECTION

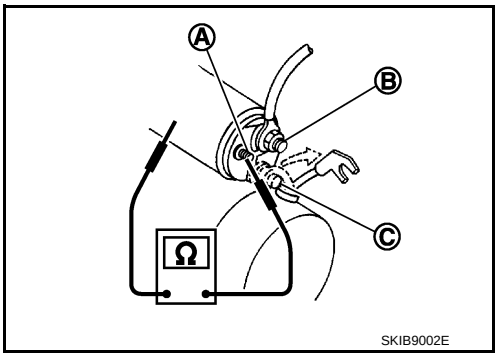
Magnetic Switch Check

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

1. Continuity test [between “S” terminal (A) and switch body]

B : “B” terminal
C : “M” terminal

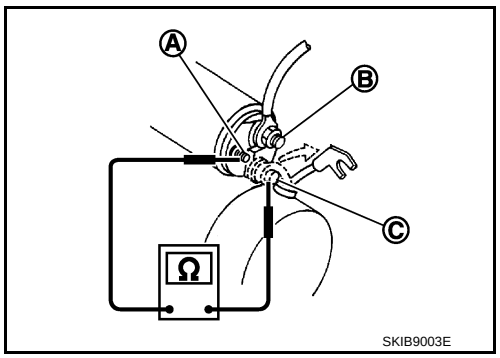
- Replace magnetic switch if continuity does not exist.



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

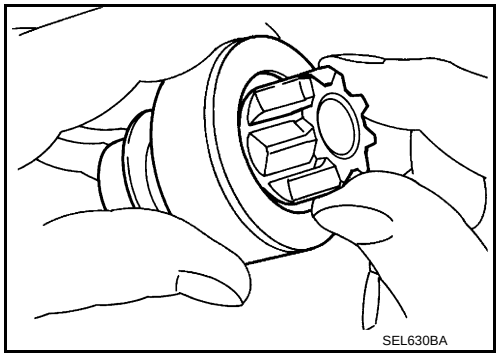
B : “B” terminal

- Replace magnetic switch if continuity does not exist.



Pinion/Clutch Check

1. Inspect pinion teeth.
   - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Inspect reduction gear teeth (If equipped).
   - Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)
3. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
   - Replace pinion assembly if it is locked or rotated in both directions or unusual resistance is evident.

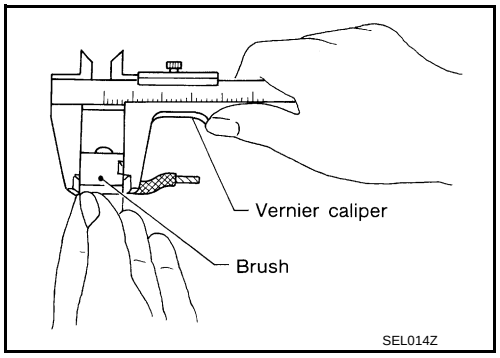


Brush Check

- Check wear of brush.

Minimum length of brush : **Refer to SDS STR-35, "Starter Motor".**

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

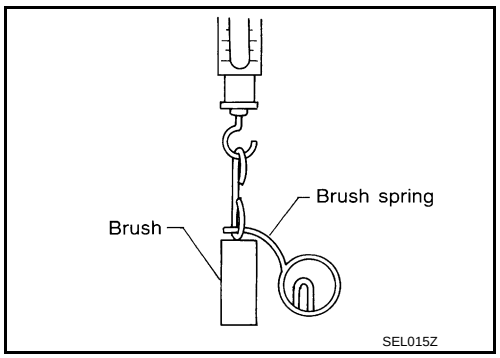


Brush Spring Check

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

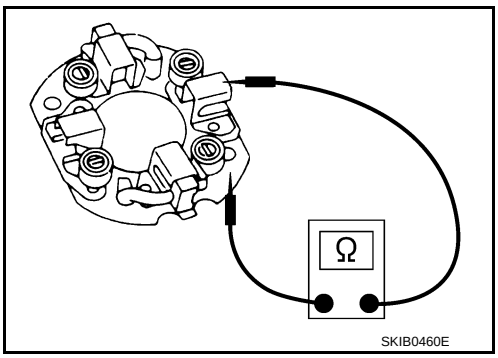
Spring tension (with new brush) : **Refer to SDS STR-35, "Starter Motor".**

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



Brush Holder Check

1. Perform insulation test between brush holder (positive side) and its base (negative side).
   • Replace brush holder assembly if continuity does not exist.
2. Check brush to see if it moves smoothly.
   • If brush holder is bent, replace it; if sliding surface is dirty, clean.

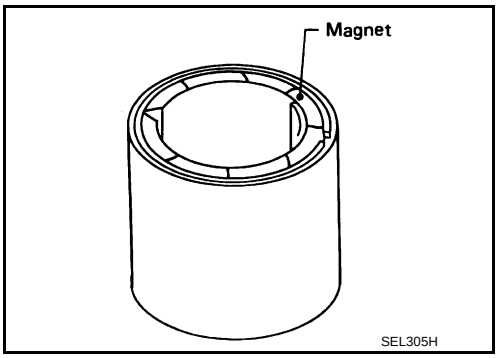


Yoke Check

Magnet is secured to yoke by bonding agent. Check magnet to see that it is secured to yoke and for any cracks. Replace malfunctioning parts as an assembly.

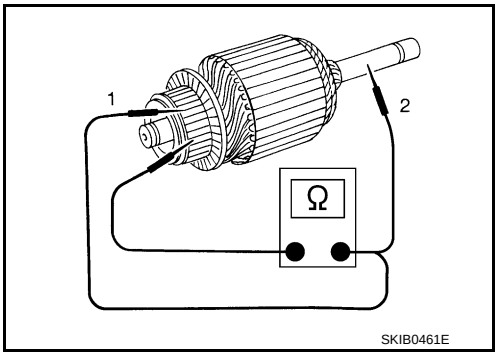
CAUTION:

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

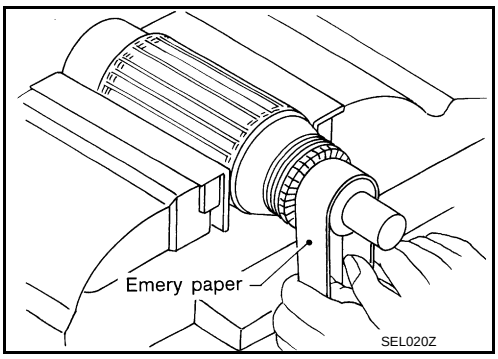


Armature Check

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



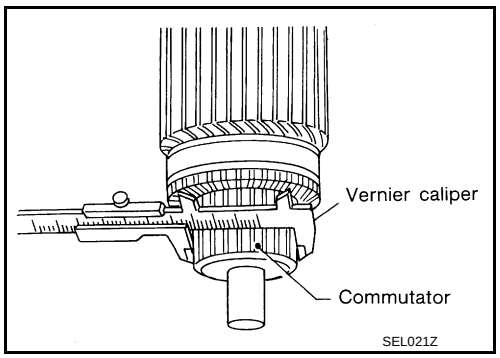
3. Check commutator surface.
   • Grind with No. 500 - 600 emery paper if it has a rough surface.



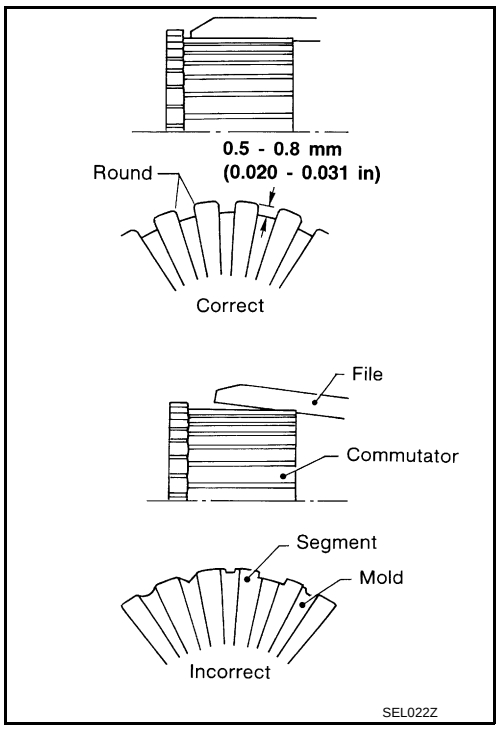
4. Check diameter of commutator.

Commutator minimum diameter : **Refer to SDS STR-35, "Starter Motor".**

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



5. Check depth of insulating mold from commutator surface.
   - Undercut to 0.5 to 0.8 mm (0.020 to 0.031 in) if the depth is 0.2 mm (0.008 in) or less.



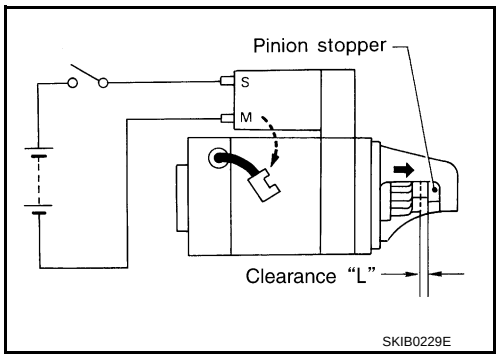
ADJUSTMENT

Pinion Protrusion Length Adjustment

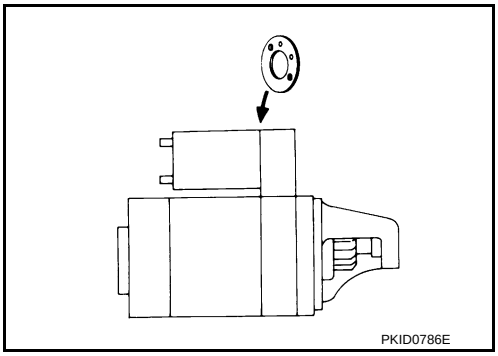
CLEARANCE

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

Clearance “L” : **Refer to SDS STR-35, "Starter Motor".**



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



SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Starter Motor

INFOID:0000000006530943

Engine			HR16DE	MR16DDT		K9K
Transmission			M/T, CVT	M/T	CVT	M/T
Type			M000T32172	S114 - 902	S114 - 955	—
			MITUBISHI make	HITACHI make	HITACHImake	—
			Reduction gear type			—
System voltage		[V]	12			—
No-load	Terminal voltage	[V]	11			—
	Current	[A]	Less than 95	Less than 110		—
	Revolution	[rpm]	More than 3000			—
Minimum diameter of commutator		[mm (in)]	28.8 (1.134)	28.0 (1.102)		—
Minimum length of brush		[mm (in)]	5.5	10.5		—
Brush spring tension		[N (kg, lb)]	17.7 (1.80, 400)	16.2 (1.65, 3.6)		—
Clearance between bearing metal and armature shaft		[mm (in)]	Less than 0.2 (0.008)			—
Clearance “L” between pinion front edge and pinion stopper		[mm (in)]	0.5 - 2.0 (0.020 - 0.079)	0.3 - 2.5 (0.012 - 0.095)		—