SECTION STR
STARTING SYSTEM

CONTENTS

PRECAUTION

PRECAUTIONS

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

INFOID:0000000006275515

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:

- **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 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.**

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:0000000006275516

NOTE:

- Before removing and installing any control units, first turn the push-button 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 push-button 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 push-button ignition switch from ACC position to ON position, then to LOCK position. (The steering wheel will lock when the push-button ignition switch is turned to LOCK position.)
6. Perform self-diagnosis check of all control units using CONSULT-III.

PREPARATION

PREPARATION

Special Service Tools

INFOID:0000000006275531

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:0000000006275532

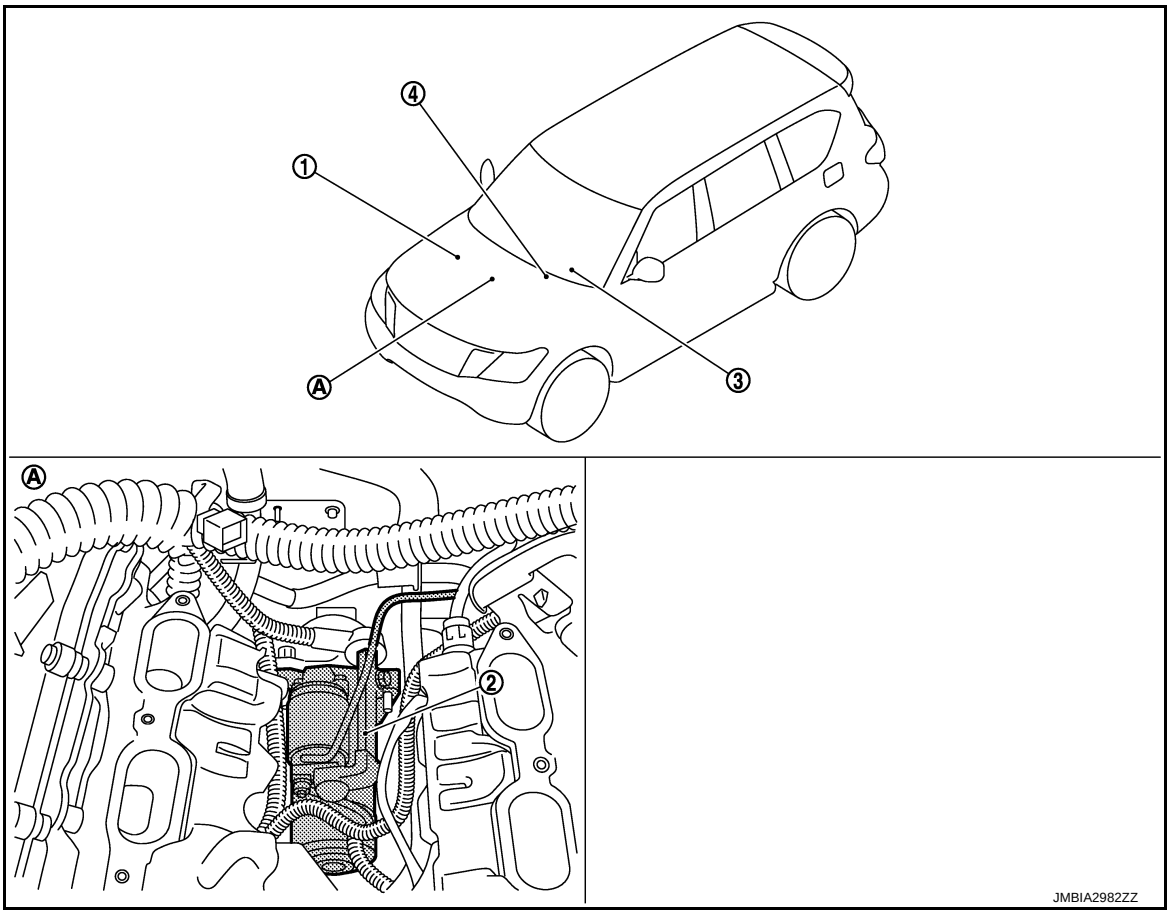
Tool name		Description
Power tool	 PIIB1407E	Loosening bolts, nuts and screws

SYSTEM DESCRIPTION

COMPONENT PARTS

Component Parts Location

INFOID:0000000006275518



1. IPDM E/R
   Refer to PCS-4, "Component Parts Location".
2. Starter motor
3. TCM
   Refer to TM-10, "A/T CONTROL SYSTEM : Component Parts Location".
4. BCM
   Refer to BCS-4, "BODY CONTROL SYSTEM : Component Parts Location".

A. Engine

Component Description

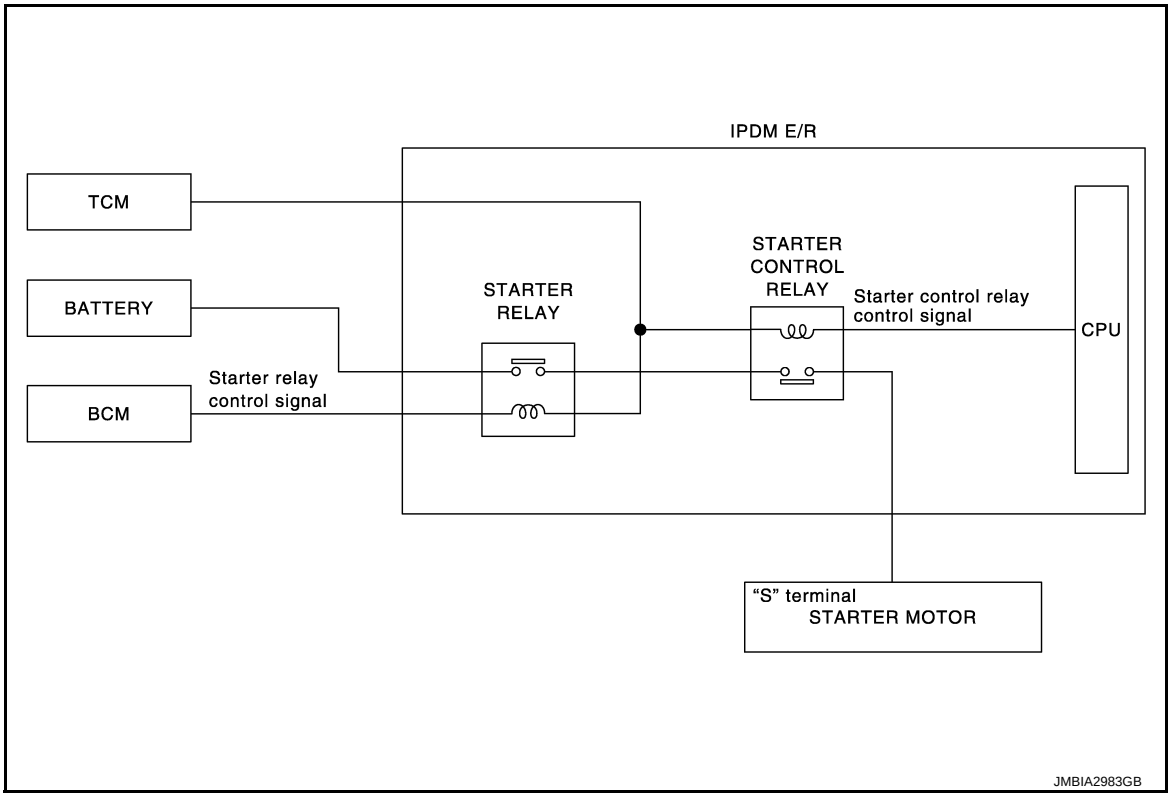
INFOID:0000000006275519

Component part	Description
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.
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.

SYSTEM

System Diagram

INFOID:0000000006275520



System Description

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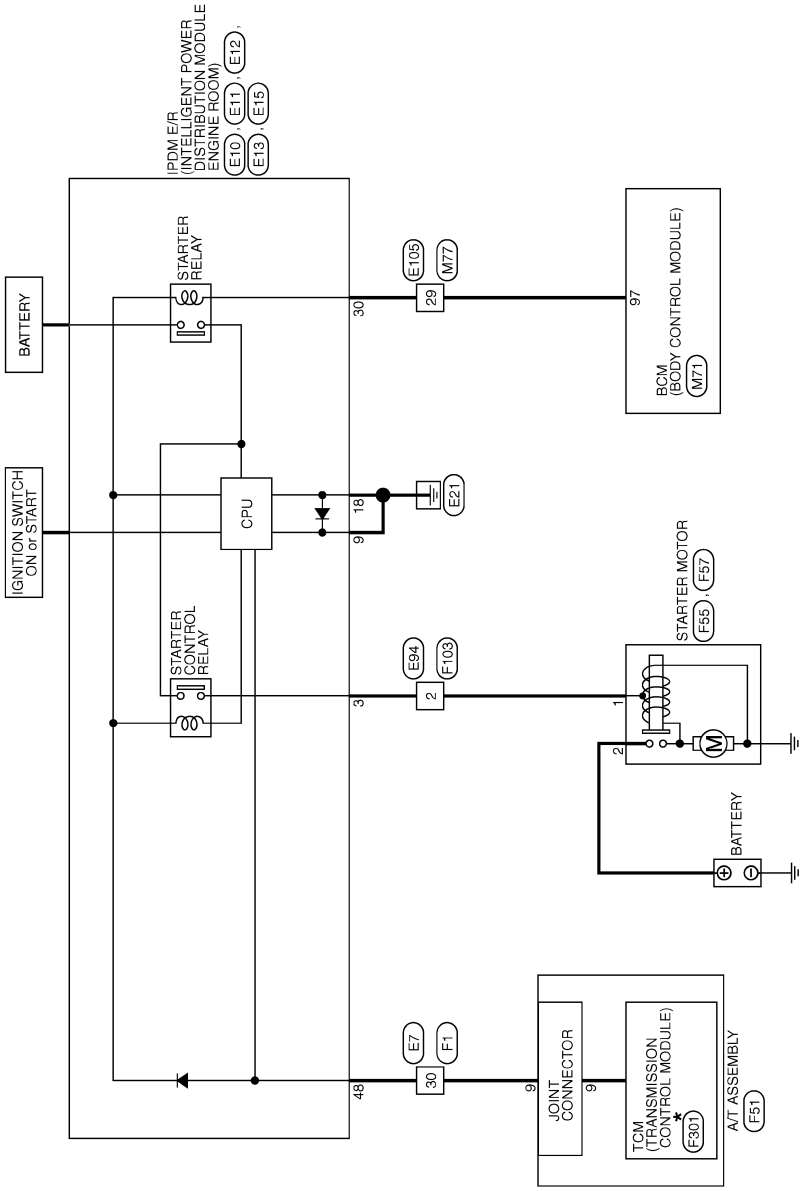
- When selector lever is P or N, power is supplied to starter relay and starter control relay by TCM. And BCM and IPDM E/R (CPU) detect selector lever P/N condition by the inputted signal.
- When starter operating condition is satisfied, IPDM E/R turns starter control relay ON by starter control relay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

WIRING DIAGRAM

STARTING SYSTEM

Wiring Diagram

INFOID:0000000006275522

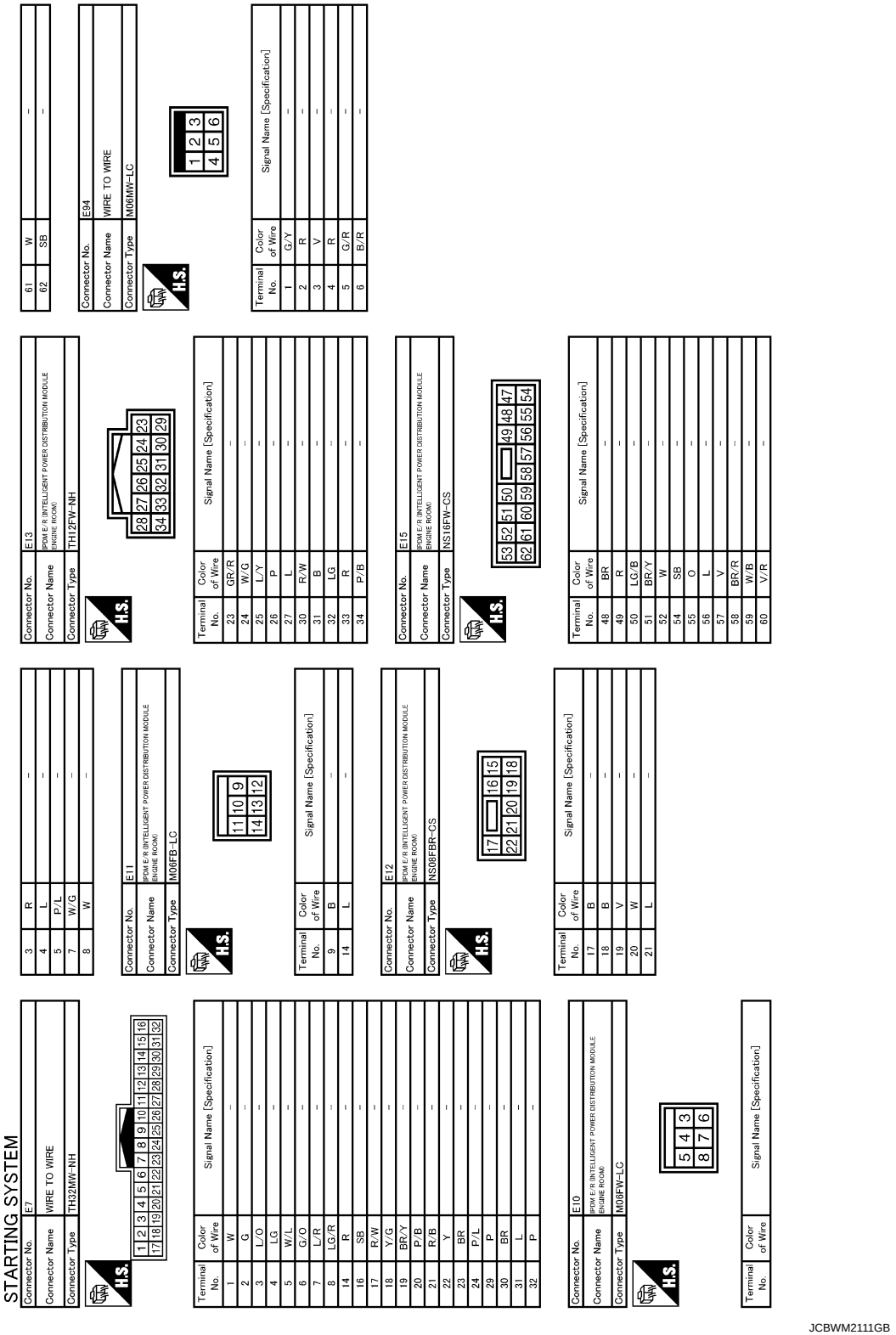


*: This connector is not shown in "Harness Layout".

2010/05/13

JCBWM2110GB

STARTING SYSTEM



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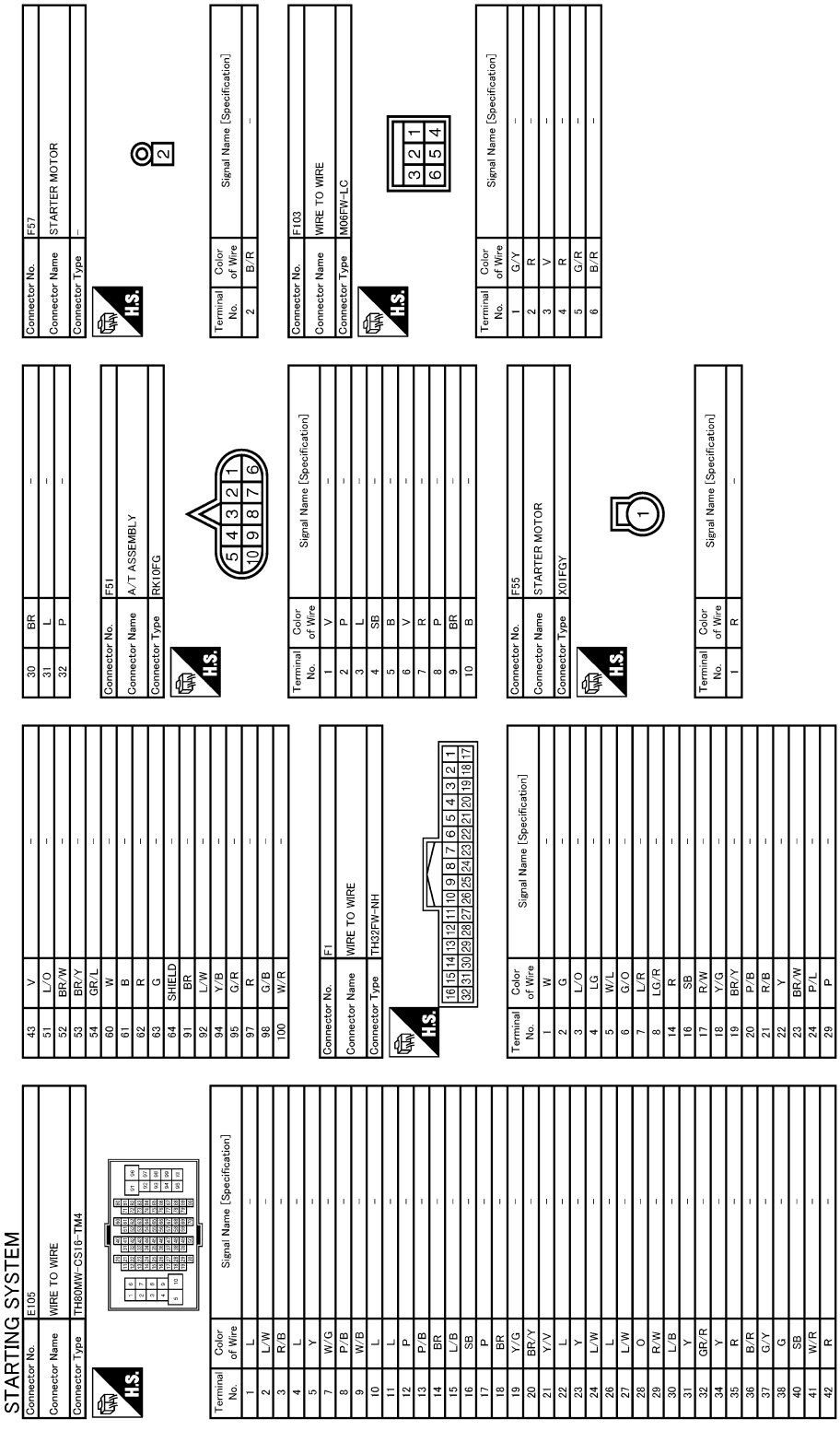

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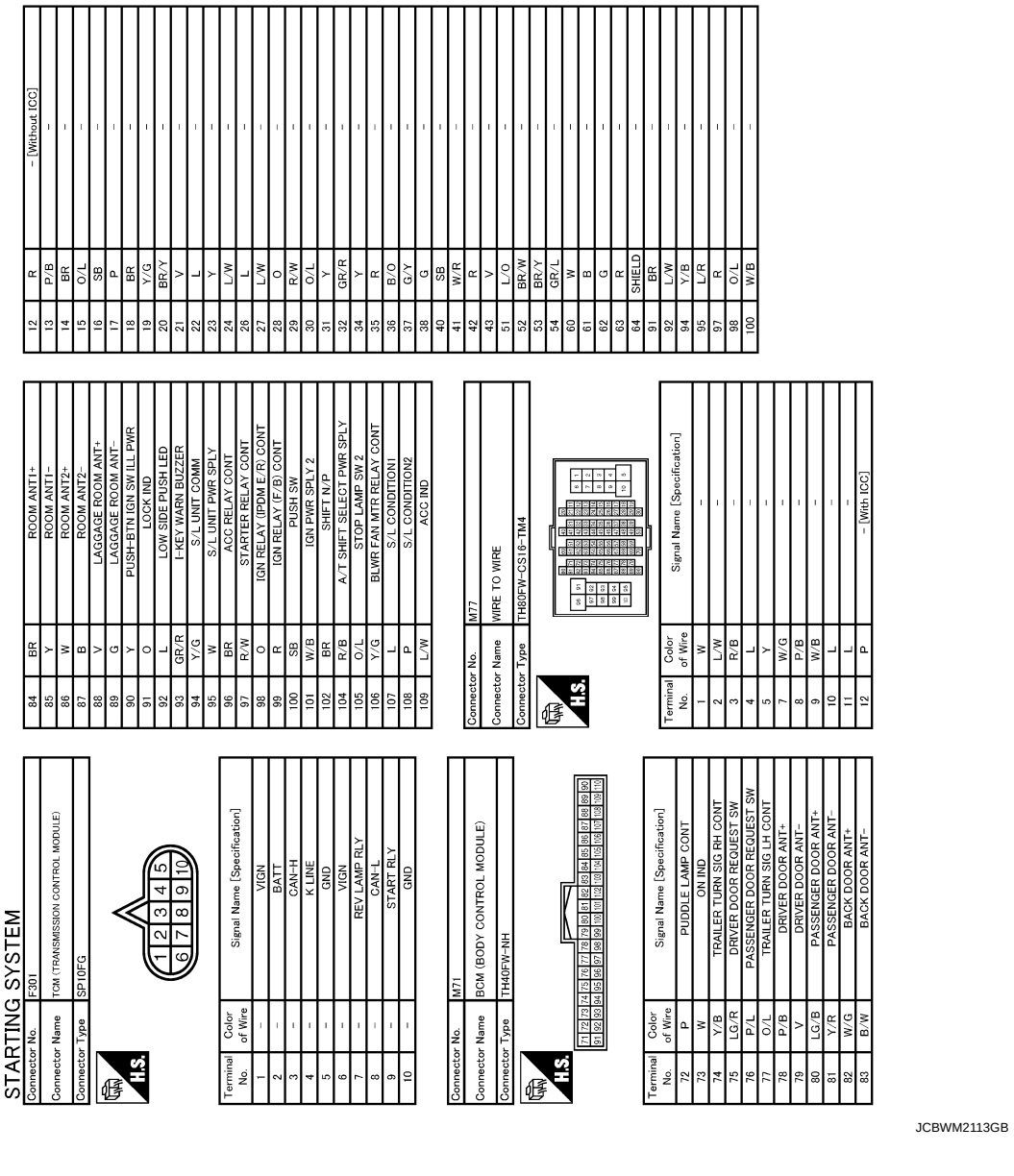

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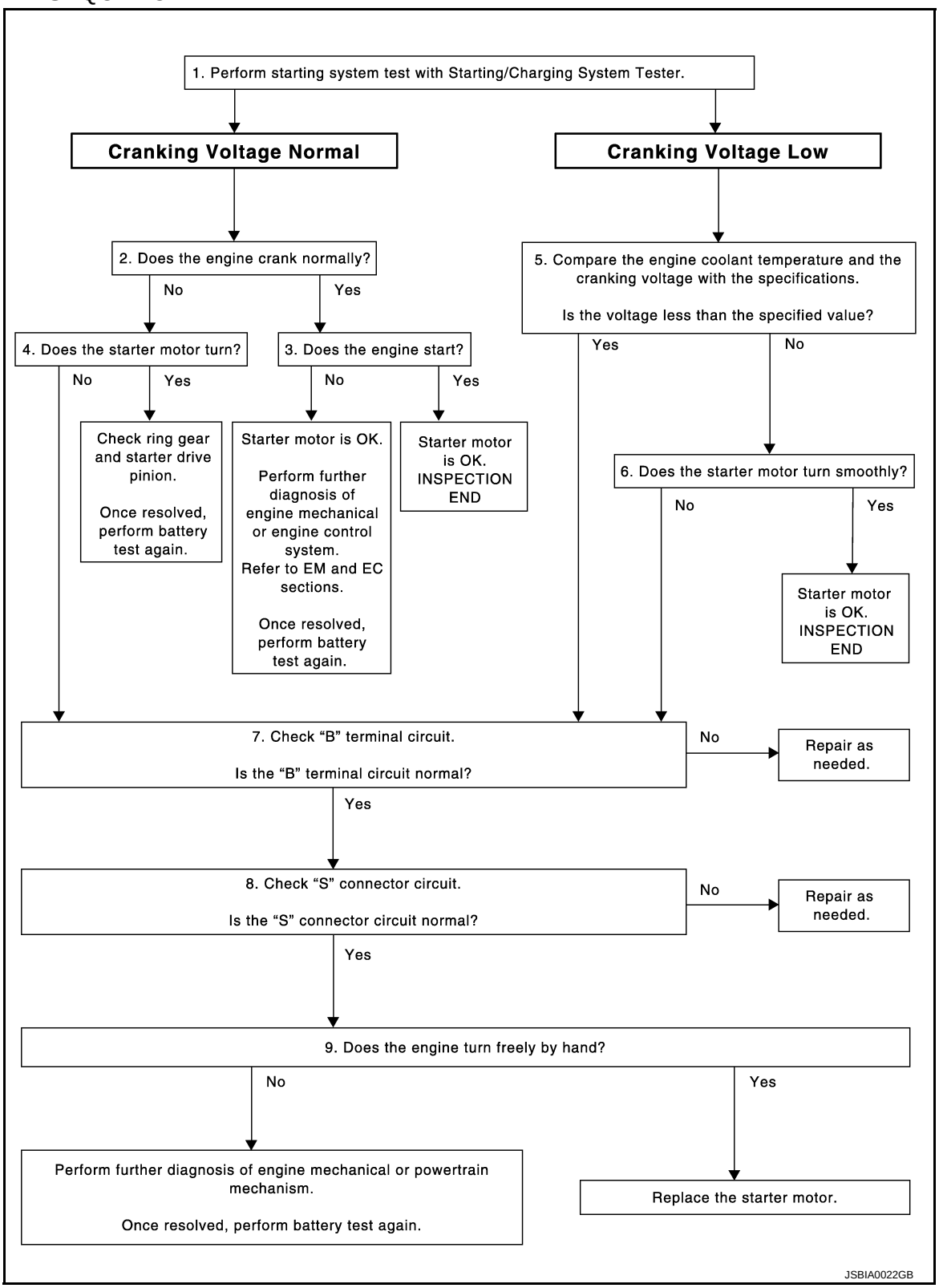
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:0000000006275533

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 >> 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-14, "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-15, "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.

DTC/CIRCUIT DIAGNOSIS

B TERMINAL CIRCUIT

Diagnosis Procedure

INFOID:0000000006275524

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.

(+)		(–)	Voltage
Starter motor “B” terminal			
F57	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.
2. Check voltage between battery positive terminal and starter motor “B” terminal.

(+)	(–)		Condition	Voltage (V) (Approx.)
	Starter motor “B” terminal			
Battery positive terminal	F57	2	When the ignition switch is in START position	Less than 0.5

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.
2. Check voltage between starter motor case and battery negative terminal.

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

Is the inspection result normal?

YES >> “B” terminal circuit is OK. Further inspection is necessary. Refer to STR-11, "Work Flow".
NO >> Check the starter motor case and ground for poor continuity.

S CONNECTOR CIRCUIT

Diagnosis Procedure

INFOID:0000000006275525

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.
4. Check voltage between starter motor harness connector and ground.

(+)		(–)	Condition	Voltage
Starter motor				
Connector	Terminal			
F55	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-11, "Work Flow".

NO >> GO TO 2.

2.CHECK HARNESS CONTINUITY (OPEN CIRCUIT)

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check continuity between starter motor harness connector and IPDM E/R harness connector.

Starter motor harness		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F55	1	E10	3	Existed

Is the inspection result normal?

YES >> Further inspection is necessary. Refer to SEC-48, "Work Flow".

NO >> Repair the harness or connector.

SYMPTOM DIAGNOSIS

STARTING SYSTEM

Symptom Table

INFOID:0000000006275526

Symptom	Reference
No normal cranking	Refer to STR-11, "Work Flow".
Starter motor does not rotate	

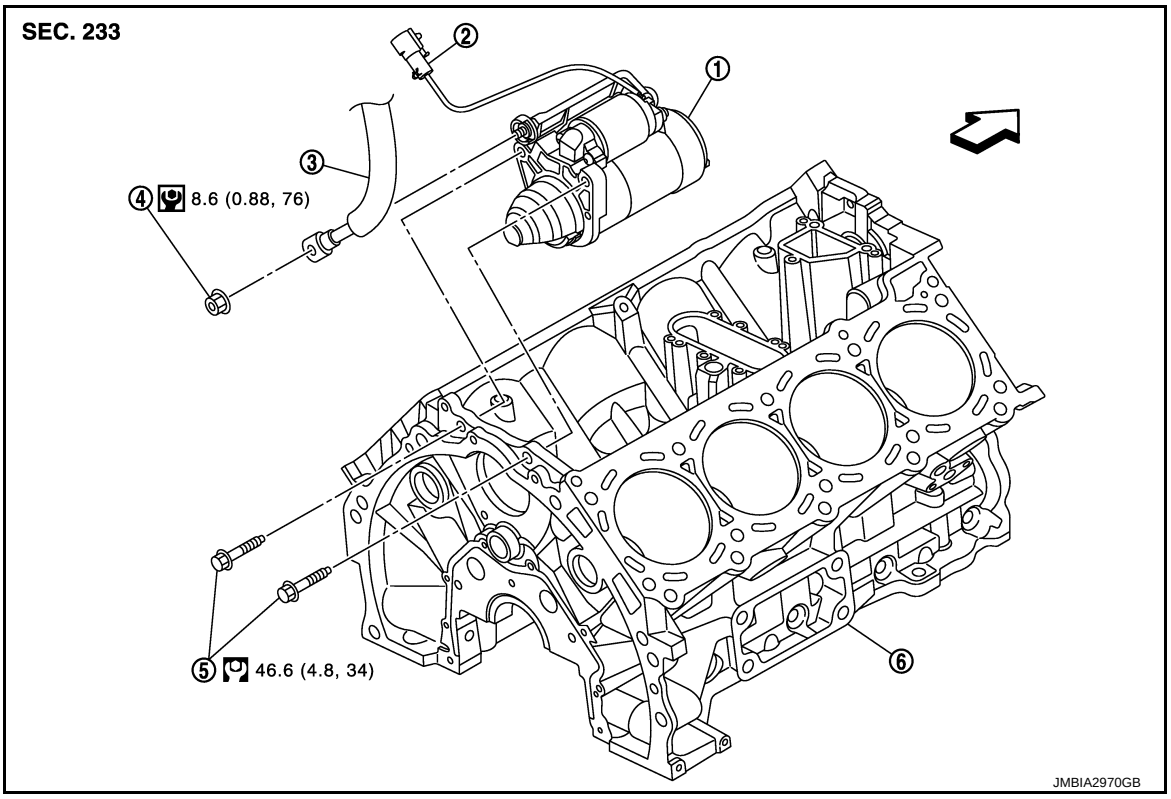
REMOVAL AND INSTALLATION

STARTER MOTOR

Exploded View

INFOID:0000000006275527

REMOVAL



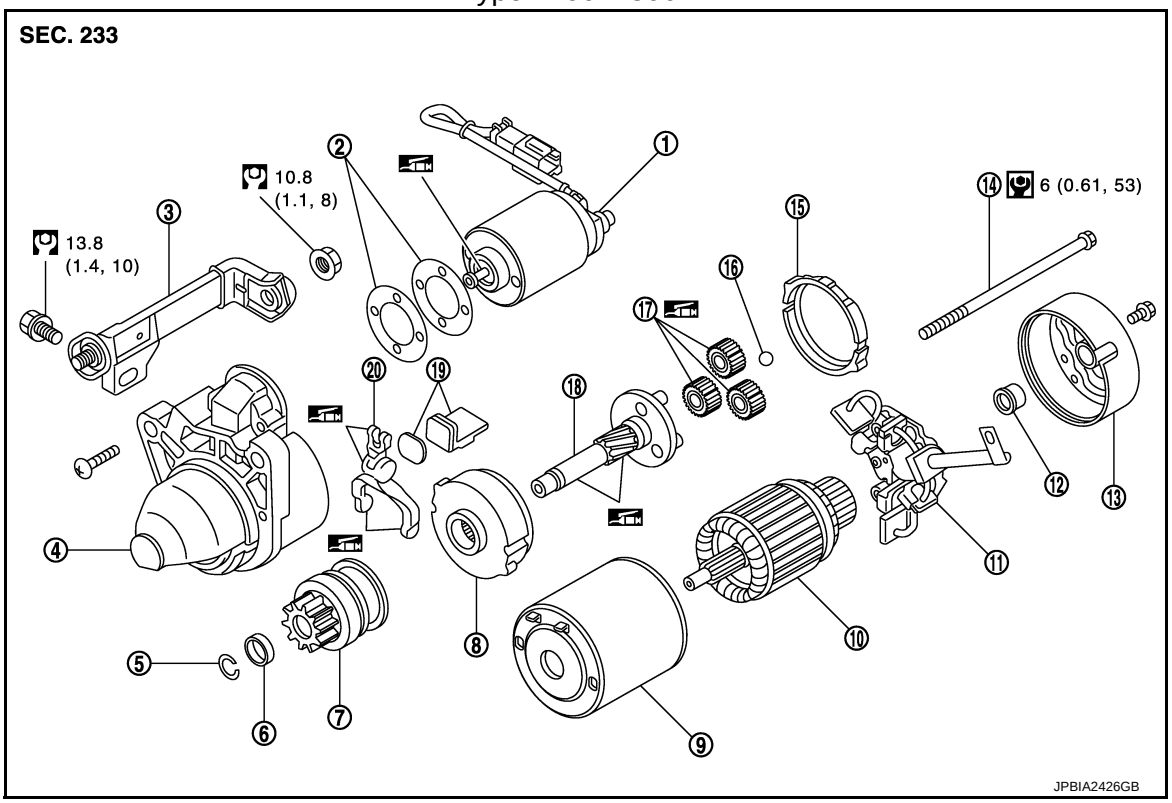
1. Starter motor
2. “S” connector
3. “B” terminal harness
4. “B” terminal nut
5. Starter motor mounting bolt
6. Cylinder block

⇦ : Engine front

Refer to GI-4, "Components" for symbols in the figure.

DISASSEMBLY

Type: M001T30671



1. Magnetic switch assembly	2. Adjusting plate	3. “B” terminal extension
4. Gear case assembly	5. Stopper ring	6. Stopper
7. Pinion assembly	8. Internal gear	9. Yoke assembly
10. Armature assembly	11. Brush holder assembly	12. Metal RR
13. Rear cover	14. Through bolt	15. Packing
16. Ball	17. Planetary gear	18. Gear shaft
19. Dust cover kit	20. Shift lever	

: High-temperature grease point

Refer to GI-4, "Components" for symbols not described on the above.

Removal and Installation

INFOID:0000000006275528

REMOVAL

1. Disconnect the battery cable from the negative terminal. Refer to PG-164, "Removal and Installation".
2. Remove engine cover. Refer to EM-25, "Removal and Installation".
3. Remove intake manifold. Refer to EM-30, "Removal and Installation".
4. Remove “B” terminal nut, and then “B” terminal harness.
5. Remove harness clip of “S” connector from heater pipe.
6. Disconnect “S” connector.
7. Remove starter motor mounting bolts.
8. Remove starter motor upward from the vehicle.

INSTALLATION

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

CAUTION:

Be careful to tighten “B” terminal nut carefully.

Inspection

INFOID:0000000006275534

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:0000000006275530

Type			M001T30671
			MITSUBISHI make
			Reduction gear type
System voltage		[V]	12
No-load	Terminal voltage	[V]	11
	Current	[A]	Less than 120
	Revolution	[rpm]	More than 3,220
Minimum diameter of commutator		[mm. (in)]	28.8 (1.134)
Minimum length of brush		[mm. (in)]	10.0 (0.394)
Brush spring tension		[N (kg, lb.)]	23.4 – 31.6 (2.4, 5.3 – 3.2, 7.1)
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 (0.02 – 0.079)