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SECTION STR

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STARTING SYSTEM

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DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

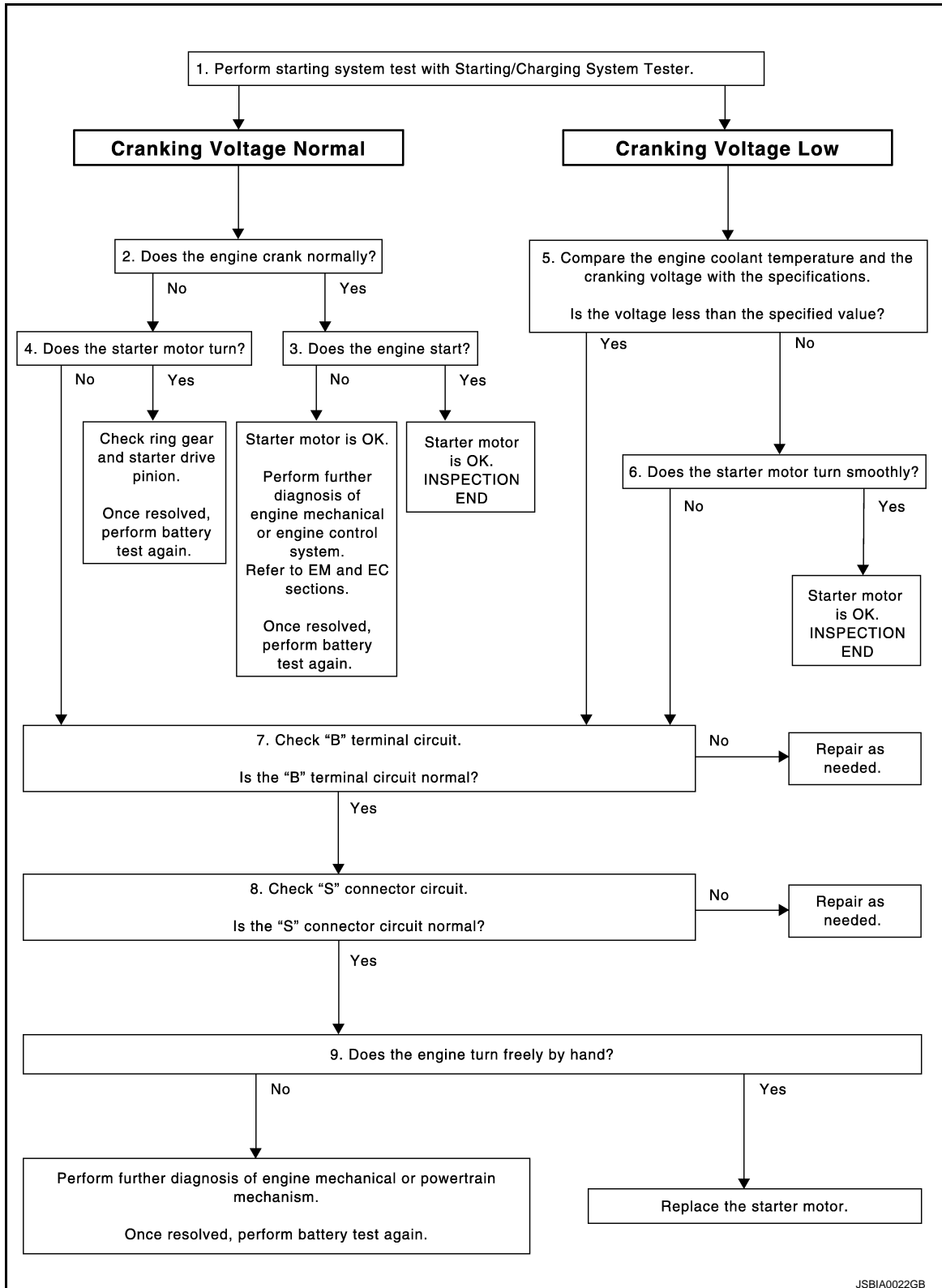
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:000000003841739

OVERALL SEQUENCE



JSBIA0022GB

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. 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-8, "Diagnosis Procedure"](#).

Is "B" terminal circuit normal?

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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-9. "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.

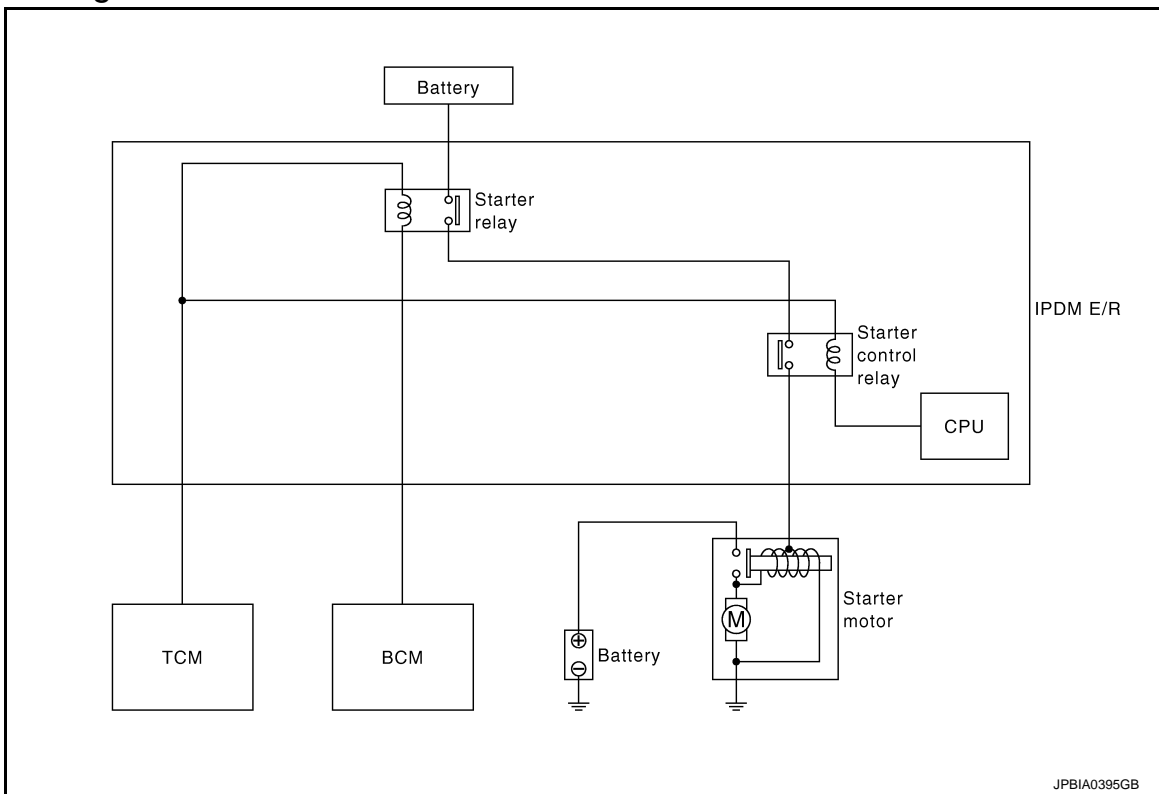
STARTING SYSTEM

< SYSTEM DESCRIPTION >

SYSTEM DESCRIPTION

STARTING SYSTEM

System Diagram



System Description

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.

VQ35HR

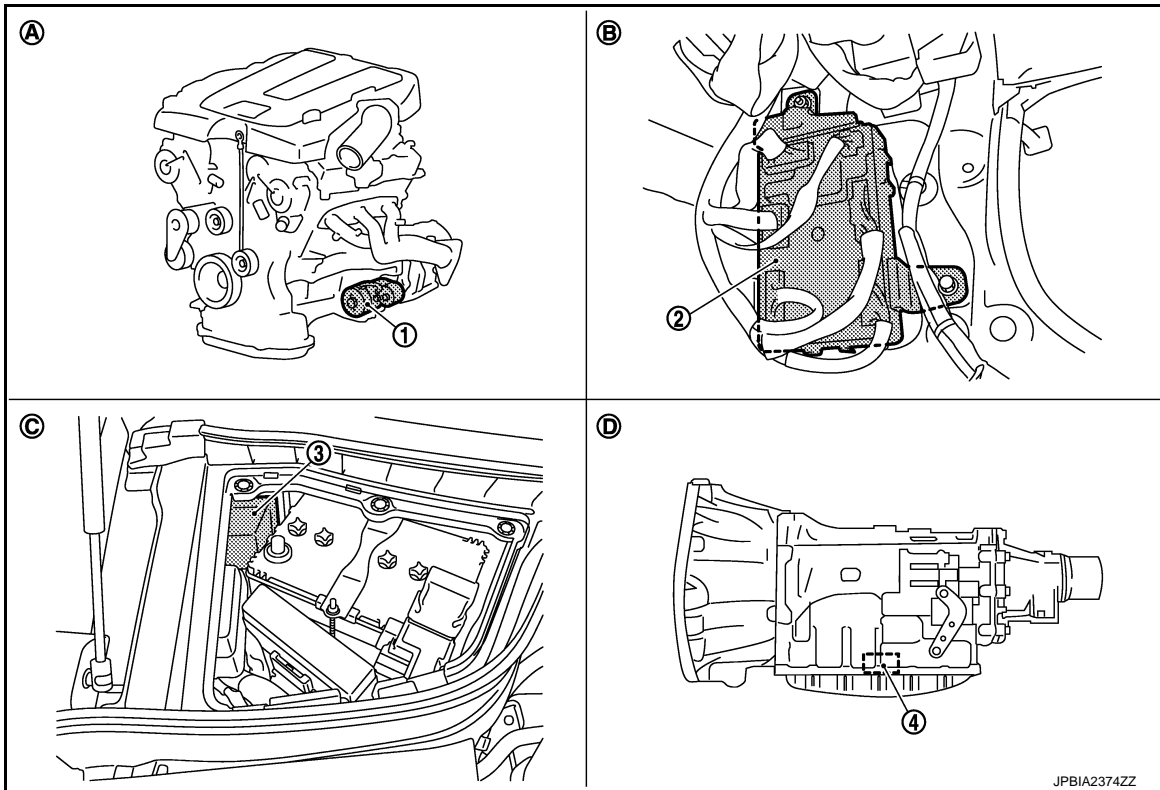
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STARTING SYSTEM

< SYSTEM DESCRIPTION >

VQ35HR : Component Parts Location

INFOID:000000003841742



1. Starter motor

2. BCM

3. IPDM E/R

4. TCM

A. Cylinder block (bank 2) side

B. Dash side lower (Passenger side)

C. Engine room dash panel (RH)

D. Inside of A/T (built into A/T)

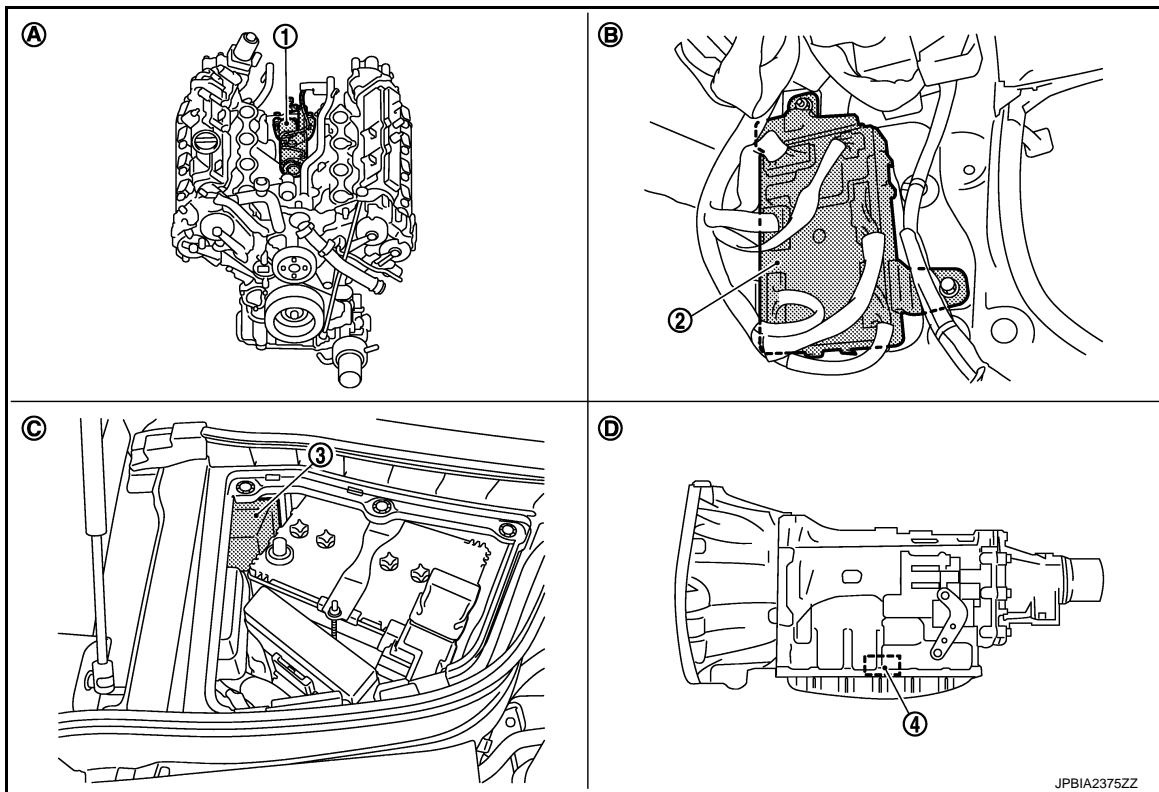
VK50VE

STARTING SYSTEM

< SYSTEM DESCRIPTION >

VK50VE : Component Parts Location

INFOID:000000003878957



- | | | |
|-----------------------------------|-------------------------------------|--------------------------------|
| 1. Starter motor | 2. BCM | 3. IPDM E/R |
| 4. TCM | | |
| A. Engine | B. Dash side lower (Passenger side) | C. Engine room dash panel (RH) |
| D. Inside of A/T (built into A/T) | | |

Component Description

INFOID:000000003841743

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

< DTC/CIRCUIT DIAGNOSIS >

DTC/CIRCUIT DIAGNOSIS

B TERMINAL CIRCUIT

Description

INFOID:000000003841744

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

Diagnosis Procedure

INFOID:000000003841745

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
E204 (VQ35HR) E206 (VK50VE)	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 A/T 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	E204 (VQ35HR) E206 (VK50VE)		

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.

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

< DTC/CIRCUIT DIAGNOSIS >

S CONNECTOR CIRCUIT

Description

INFOID:000000003841746

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.

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Diagnosis Procedure

INFOID:000000003841747

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.

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

Is the inspection result normal?

- YES >> "S" connector circuit is OK. Further inspection is necessary. Refer to [STR-2, "Work Flow"](#).
NO >> GO TO 2.

2. CHECK HARNESS CONTINUITY (OPEN CIRCUIT)

1. Disconnect IPDM E/R connector.
2. Check continuity between starter motor harness connector and IPDM E/R harness connector.

Starter motor harness connector		IPDM E/R harness connector		Continuity
Connector No.	Terminal No.	Connector No.	Terminal No.	
F52 (VQ35HR) F55 (VK50VE)	1	E7	80	Existed

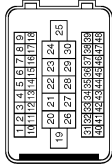
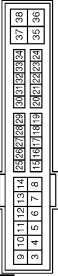

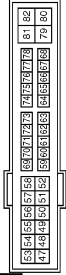
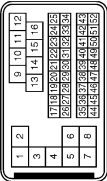
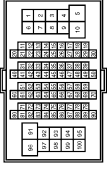


Is the inspection result normal?

- YES >> Further inspection is necessary. Refer to [STR-2, "Work Flow"](#).
NO >> Repair the harness.

STARTING SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

STARTING SYSTEM

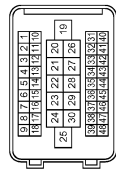
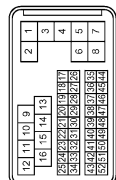
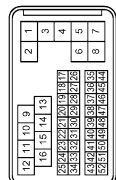
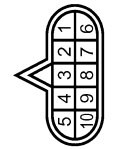
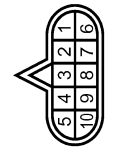
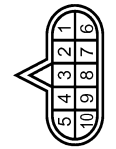






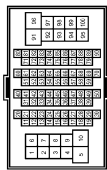
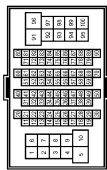
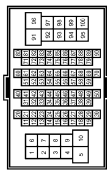
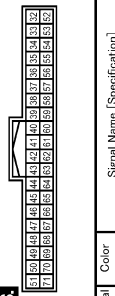
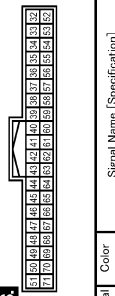
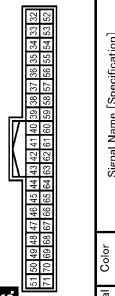
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Terminal No.	Color of Wire	Signal Name [Specification]																																																																																																																				
2	B/Y																																																																																																																					

JCBWM0711GB

STARTING SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

STARTING SYSTEM

Connector No. F1	WIRE TO WIRE	SAA38FB-RS10-SLZ2		Terminal No. 19	Color of Wire W	Signal Name [Specification]	—
Connector Name	WIRE TO WIRE	SAA38FB-RS9-SHZ8		Terminal No. 7	Color of Wire R	Signal Name [Specification]	—
Connector Type	WIRE TO WIRE	SAA38FB-RS8-SHZ8		Terminal No. 28	Color of Wire LG	Signal Name [Specification]	—
Connector No. F51	A-7 ASSEMBLY	RK10FG-DGY		Terminal No. 9	Color of Wire LG	Signal Name [Specification]	— [With VK engine] — [With VO engine]
Connector Name	A-7 ASSEMBLY	RK10FG-DGY		Terminal No. 9	Color of Wire GR	Signal Name [Specification]	— [With VK engine] — [With VO engine]
Connector Type	A-7 ASSEMBLY	RK10FG-DGY		Terminal No. 9	Color of Wire GR	Signal Name [Specification]	— [With VK engine] — [With VO engine]
Connector No. F52	STARTER MOTOR (WITH VO ENGINE)	X01MGY		Terminal No. 1	Color of Wire W	Signal Name [Specification]	—
Connector Name	STARTER MOTOR (WITH VO ENGINE)	X01MGY		Terminal No. 1	Color of Wire W	Signal Name [Specification]	—
Connector Type	STARTER MOTOR (WITH VO ENGINE)	X01MGY		Terminal No. 1	Color of Wire W	Signal Name [Specification]	—
Connector No. F55	STARTER MOTOR (WITH VK ENGINE)	X01FGY		Terminal No. 1	Color of Wire R	Signal Name [Specification]	—
Connector Name	STARTER MOTOR (WITH VK ENGINE)	X01FGY		Terminal No. 1	Color of Wire R	Signal Name [Specification]	—
Connector Type	STARTER MOTOR (WITH VK ENGINE)	X01FGY		Terminal No. 1	Color of Wire R	Signal Name [Specification]	—
Connector No. M6	WIRE TO WIRE	TH80MW-CS16-TM4		Terminal No. 38	Color of Wire R	Signal Name [Specification]	—
Connector Name	WIRE TO WIRE	TH80MW-CS16-TM4		Terminal No. 50	Color of Wire LG	Signal Name [Specification]	—
Connector Type	WIRE TO WIRE	TH80MW-CS16-TM4		Terminal No. 50	Color of Wire LG	Signal Name [Specification]	—
Connector No. M121	BCM (BODY CONTROL MODULE)	TH40FGY-NH		Terminal No. 52	Color of Wire LG	Signal Name [Specification]	STARTER RELAY CONT
Connector Name	BCM (BODY CONTROL MODULE)	TH40FGY-NH		Terminal No. 52	Color of Wire LG	Signal Name [Specification]	STARTER RELAY CONT
Connector Type	BCM (BODY CONTROL MODULE)	TH40FGY-NH		Terminal No. 52	Color of Wire LG	Signal Name [Specification]	STARTER RELAY CONT

JCBWM0712GB

STARTING SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

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STARTING SYSTEM		
Connector No.	M123	
Connector Name	BCM (BODY CONTROL MODULE)	
Connector Type	THRGFG-INI	
Terminal No.	140	Color of Wire
		R
		Signal Name [Specification]
		SHIFT N/P

JCBWM0713GB

STARTING SYSTEM

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS

STARTING SYSTEM

Symptom Table

INFOID:000000003841749

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:000000005187970

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 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.

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.

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PREPARATION

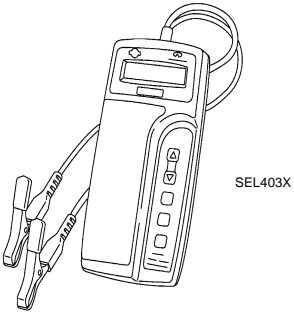
< PREPARATION >

PREPARATION

PREPARATION


Special Service Tools

INFOID:000000003841751

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:000000003841752

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

STARTER MOTOR

< REMOVAL AND INSTALLATION >

REMOVAL AND INSTALLATION

STARTER MOTOR

VQ35HR

VQ35HR : Exploded View

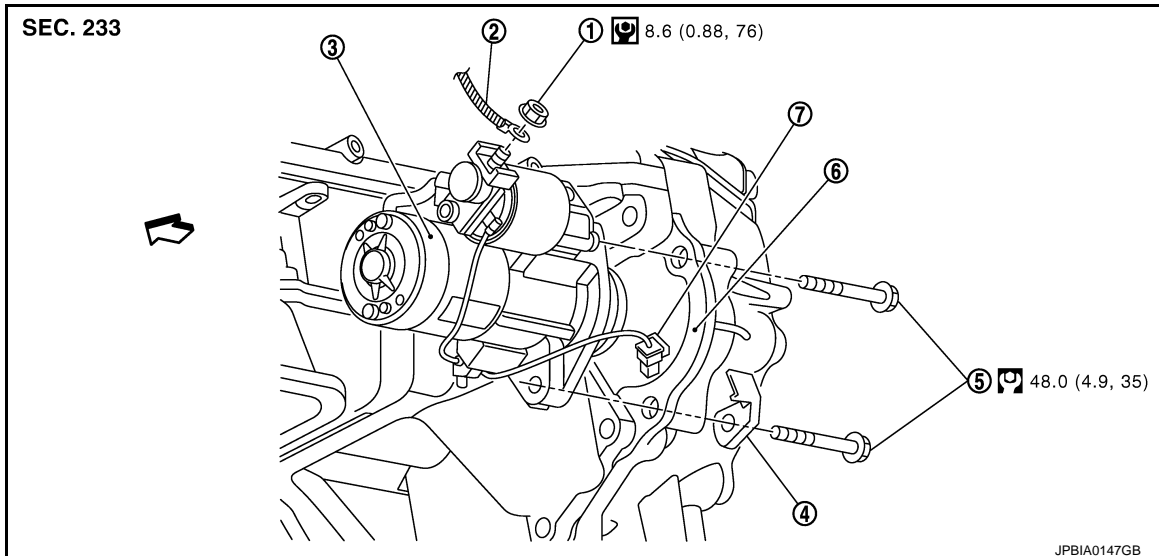
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|-------------------------|--------------------------------|----------------------|
| 1. "B" terminal nut | 2. "B" terminal harness | 3. Starter motor |
| 4. Harness clip bracket | 5. Starter motor mounting bolt | 6. Converter housing |
| 7. "S" connector | | |

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⇐: Engine front

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

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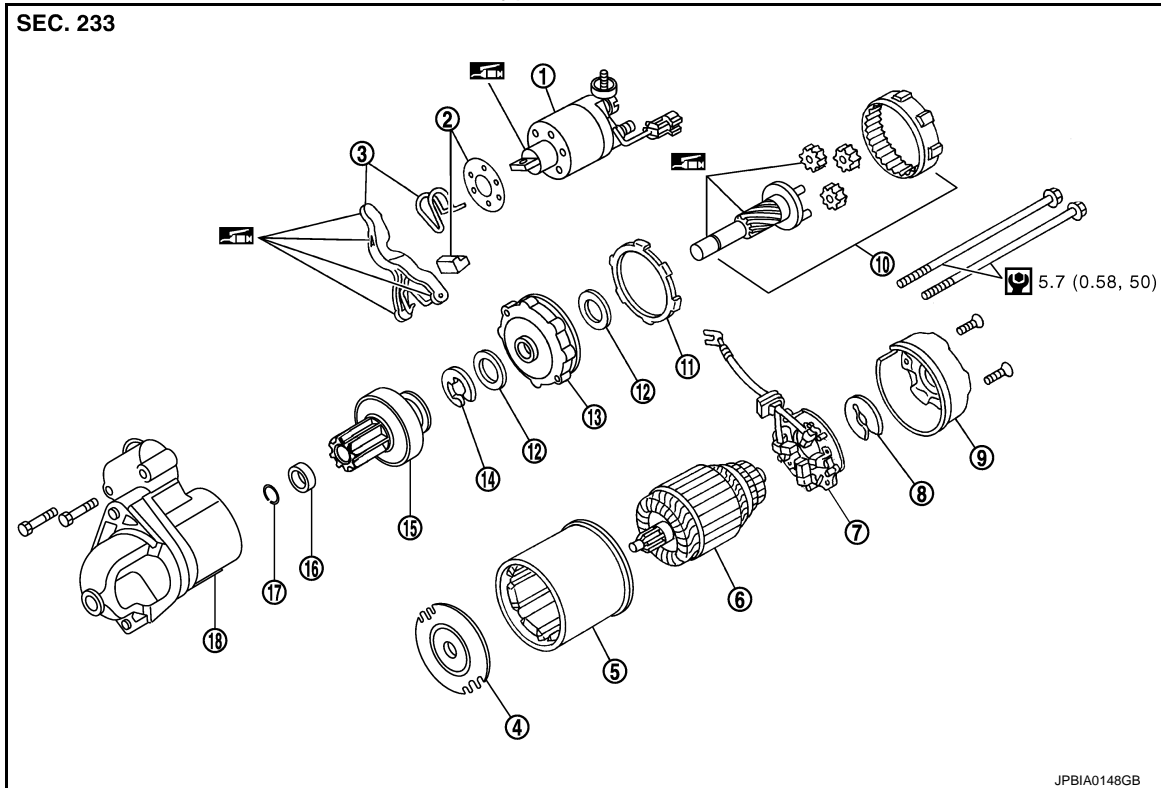
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STARTER MOTOR

< REMOVAL AND INSTALLATION >

Type: S114-927



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

 High-temperature grease point

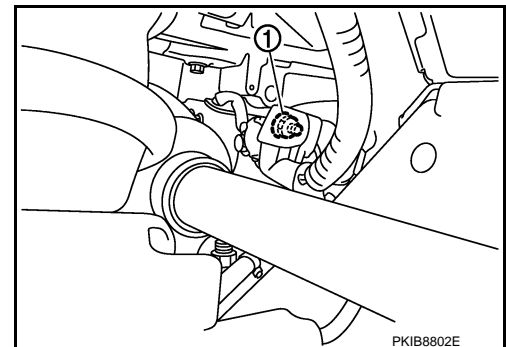
Refer to [GI-4, "Components"](#) for symbols not described on the above.

VQ35HR : Removal and Installation (2WD)

INFOID:000000003841754

Removal

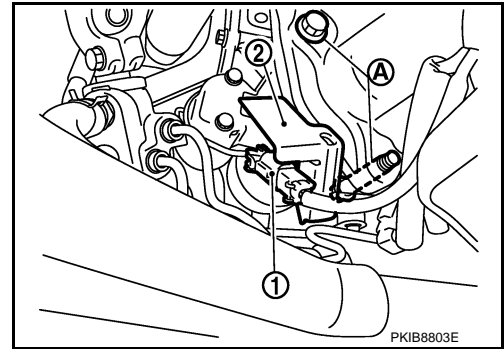
1. Disconnect the battery cable from the negative terminal.
2. Remove engine undercover using power tools.
3. Remove "B" terminal nut (1).



STARTER MOTOR

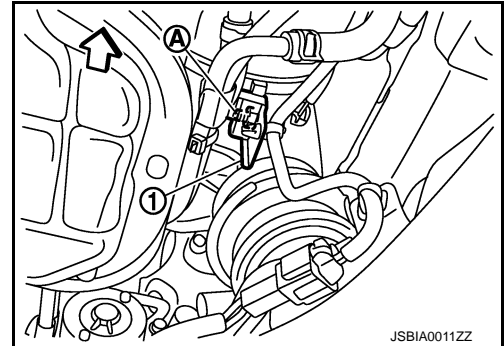
< REMOVAL AND INSTALLATION >

4. Disconnect "S" connector (1).
5. Remove starter motor mounting bolts (A) and harness bracket (2), using power tools.



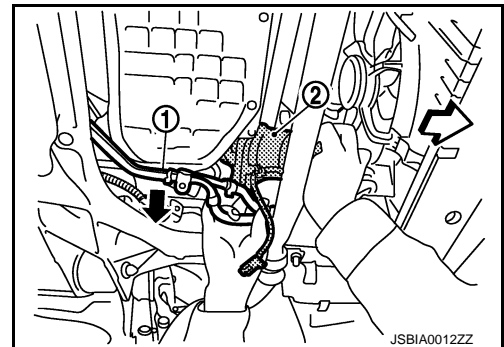
6. Remove compressor bracket bolts (A).
7. Remove compressor bracket (1).

↔ : Vehicle front



8. Remove A/T fluid cooler tube clip bolts and bracket. Refer to [TM-194, "2WD : Exploded View"](#).
9. Move A/T fluid cooler tube (1) downward.
10. Remove starter motor (2) forward from the vehicle.

↔ : Vehicle front



INSTALLATION

Install in the reverse order of removal.

CAUTION:

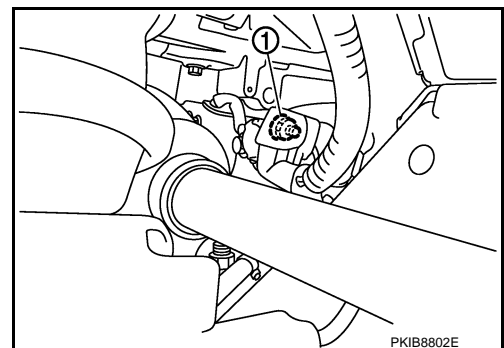
Be sure to tighten "B" terminal nut carefully.

VQ35HR : Removal and Installation (AWD)

INFOID:000000003884997

Removal

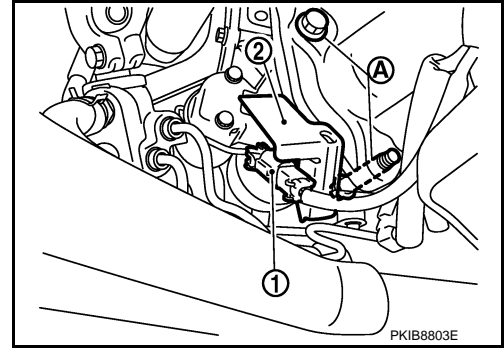
1. Disconnect the battery cable from the negative terminal.
2. Remove engine undercover, using power tools.
3. Remove "B" terminal nut (1).



STARTER MOTOR

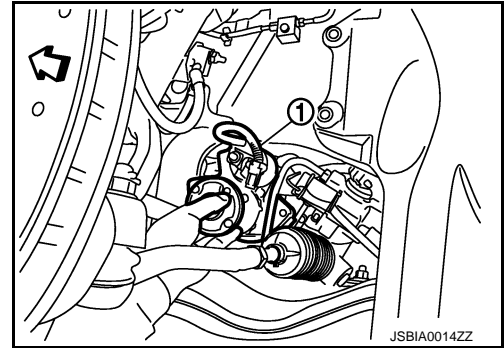
< REMOVAL AND INSTALLATION >

4. Disconnect "S" connector (1).
5. Remove starter motor mounting bolts (A) and harness bracket (2), using power tools.



6. Remove front drive shaft left side housing bolts. Refer to [FAX-26. "Exploded View"](#).
7. Move a front drive shaft left side forward.
8. Remove stater motor (1) to left side from the vehicle.

↶ : Vehicle front



INSTALLATION

Install in the reverse order of removal.

CAUTION:

Be sure to tighten "B" terminal nut carefully.

VQ35HR : Inspection

INFOID:000000003841755

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.

VK50VE

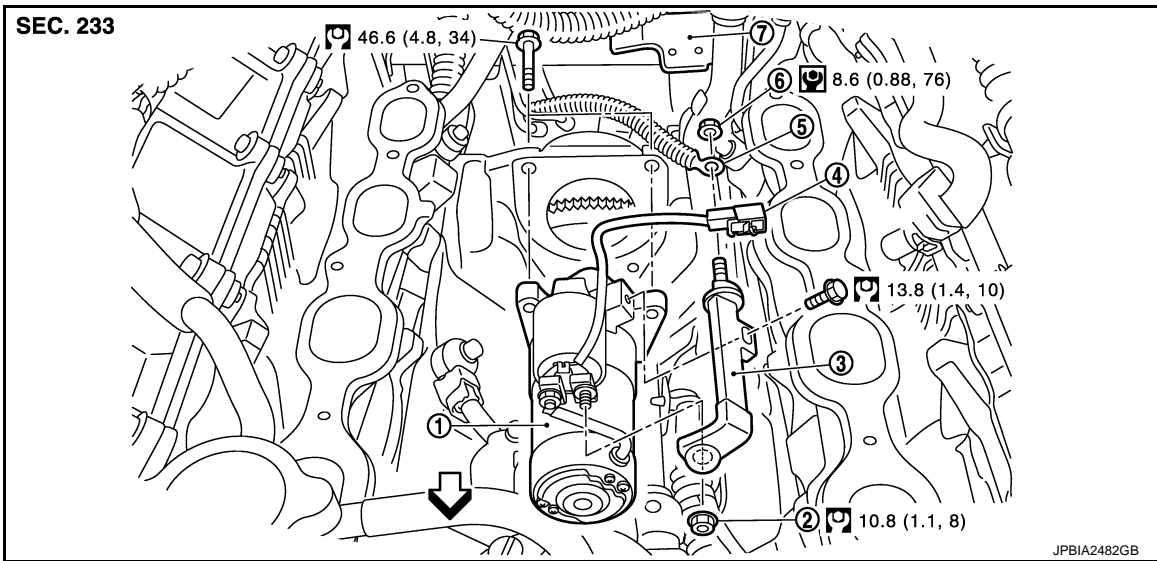
VK50VE : Exploded View

INFOID:000000003841886

REMOVAL

STARTER MOTOR

< REMOVAL AND INSTALLATION >



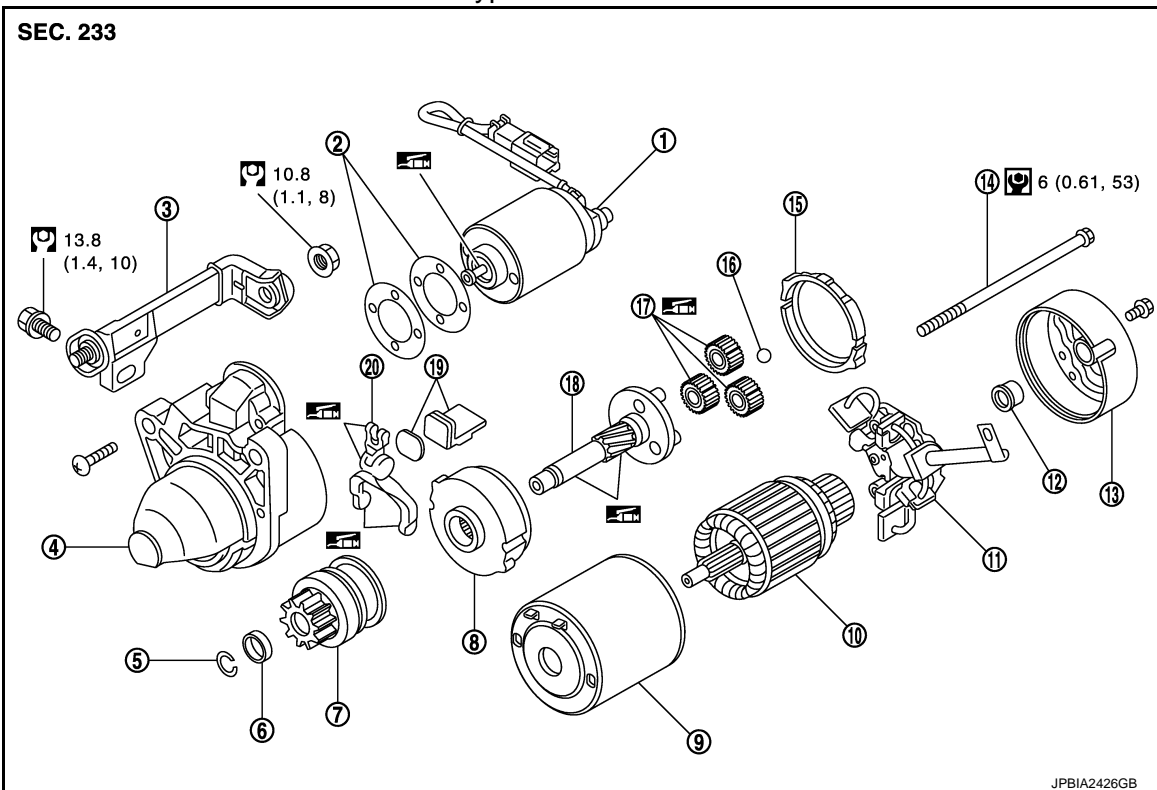
- | | | |
|--------------------------|-------------------------------|---------------------------|
| 1. Starter motor | 2. "B" terminal extension nut | 3. "B" terminal extension |
| 4. "S" connector | 5. "B" terminal harness | 6. "B" terminal nut |
| 7. "S" connector bracket | | |

⇐ 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 |

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STARTER MOTOR

< REMOVAL AND INSTALLATION >

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|--------------------|--------------------|----------------|
| 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.

VK50VE : Removal and Installation

INFOID:000000003841887

REMOVAL

1. Disconnect the battery cable from the negative terminal.
2. Remove engine cover, using power tools. Refer to [EM-174. "Exploded View"](#).
3. Remove intake manifold. Refer to [EM-179. "Exploded View"](#).
4. Remove "B" terminal nut.
5. Disconnect "S" connector.
6. Remove starter motor mounting bolts using power tools.
7. Remove starter motor upward from the vehicle.

INSTALLATION

Install in the reverse order of removal.

CAUTION:

Be sure to tighten "B" terminal nut carefully.

VK50VE : Inspection

INFOID:000000003841888

INSPECTION AFTER DISASSEMBLY

Pinion/Clutch Check

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

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Starter Motor

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STR

Applied model		VQ35HR	VK50VE
Type		S114-927	M001T30671
		HITACHI make	mitsubishi make
		Reduction gear type	
System voltage [V]		12	
No-load	Terminal voltage [V]	11	
	Current [A]	Less than 110	Less than 120
	Revolution [rpm]	More than 2,700	More than 3,220
Minimum diameter of commutator [mm. (in)]		28.0 (1.102)	28.8 (1.134)
Minimum length of brush [mm. (in)]		10.5 (0.413)	10.0 (0.394)
Brush spring tension [N (kg, lb.)]		16.2 (1.65, 3.6)	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)	Less than 0.2 (0.008)
Clearance between pinion front edge and pinion stopper [mm. (in)]		0.3 - 2.5 (0.012 – 0.098)	0.5 – 2.0 (0.02 – 0.079)