

Engine Electrical System

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Engine Electrical System

General

GENERAL

STARTER MOTOR SPECIFICATION

Items	Specification
Type	Electronic soft engaged
Rated output	24V- 5.5KW
Rotation direction	Clockwise from pinion side
Number of pinion teeth	11
Number of ring gear	133
Input angle of pinion	14.5°
Center distance between ring gear and pinion	217±0.1 mm

STARTER MOTOR OUTPUT

No-load test	Terminal voltage	23.5 V
	Max. current	120 A
	Min. RPM	3,400 RPM
	Magnetic switch operating voltage	Below 16 V
Load test	Terminal voltage	16 V
	Terminal current	600 A
	Min. rotation force	42.5 Nm
	Min. RPM	900 RPM
Characteristics of assurance output	Terminal voltage	9 V
	Max. current	1,140 A
	Min. rotation force	98 Nm

PRE-HEATING SYSTEM

Items		Specification
Air heater	Capacity	2.1 kW
	Rated voltage, amperage	22V 95A ± 10%
	Temperature increase	It takes 19 sec. to reach 800°C when DC 22V is applied.
		The temperature should be 1010°C at 30 sec. after DC 22V is applied.
	Isolation resistance	1MΩ or higher when measuring with a megger tester at room temperature

General

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VACUUM PUMP

Items		Specification	
Type		Vane pump type	
Discharge amount		90cc/rev.	
Oil in use		SAE 10W-40, CI-4	
Feed pressure		3~3.5 kg/cm ² (at 8,000 rpm)	
Vacuum characteristics	Revolution	1,500 rpm	3,000 rpm
	Time	20 sec.	20 sec.
	Vacuum pressure	520 mmHg	590 mmHg

ALTERNATOR SPECIFICATION(Truck)

Items		Specification
Alternator (55A)	Type	Three-phase alternator
	Rated output	24V, 55A
	Rated RPM	5,000 rpm
	RPM in use	8,000 rpm
	Regulator type	Regulator built-in IC
	Regulator adjusting voltage(at 20°C)	28.5 ± 0.5 V

SERVICE STANDARD(Truck)

Items	Specification			Limit	Remedy
Alternator output characteristics [at hot]	Voltage	Output current	Revolution	70% or higher	Replace
	27V	20A	1,500 rpm		
		55A	5,000 rpm		
IC regulator adjusting voltage (5000 rpm, below 5A)	28~29V			-	Replace

ALTERNATOR SPECIFICATION(Bus)

Items	Specification
Type	Three-phase alternator
Rated output	24V, 80A
Rated RPM	5,000 rpm
RPM in use	14,000 rpm
Regulator type	Regulator built-in IC
Regulator adjusting voltage(at 25°C)	28 ± 0.5 V

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Engine Electrical System

ALTERNATOR OUTPUT(Bus)

Output characteristics (27V)	Output current(A)		Revolution (rpm)
	At cold	At hot	
	50	40 or higher	1,500
	95	80 or higher	5,000

TROUBLESHOOTING

Charging system

Symptom	Possible cause	Remedy
Charge warning lamp is not turned on when ignition switch is ON state.	Fuse is broken.	Replace the fuse.
	Bulb is broken.	Replace the bulb.
	Loose wiring connection	Retighten the loose connection
	Wrong connection of L-S terminals	Check and replace wiring or replace the voltage regulator
Charge warning lamp does not turn off even after the engine is started.(When battery needs to be charged frequently)	Drive belt is loose or worn.	Replace the drive belt.
	Fuse is broken.	Replace the fuse.
	Fusible link is broken.	Replace the fusible link.
	Voltage regulator or alternator is defective.	Replace the alternator.
	Wiring is defective.	Repair or replace the wiring.
	Battery cable is corroded or worn.	Repair or replace the battery cable.
Battery is overcharged.	Voltage regulator is defective. (Charge warning lamp turns on.)	Replace the voltage regulator.
	Voltage sensing wiring is defective.	Replace the wiring.
Battery is discharged.	Drive belt is loose or worn.	Replace the drive belt.
	Wiring connector is loose or circuit is short.	Retighten the loose connection or repair the wiring.
	Fusible link is short.	Replace fusible link.
	Poor grounding	Repair.
	Voltage regulator is defective.(Charge warning lamp turns on.)	Check the alternator.
	Battery is exhausted.	Check the battery.

General

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PRE-HEATER SYSTEM

Symptoms	Possible cause	Remedy
Engine does not start when the coolant temperature is below 0°C.	Wiring connection is loose or wiring is defective. Coolant sensor is defective. Air heater is defective. Pre-heater control unit is defective.	Repair the wiring or tighten the connection. Replace the coolant sensor. Replace the air heater. Replace the unit.
If engine stops after 1st explosion or idle is unstable when the coolant temperature is below 0°C.	Connection is loose or wiring is defective Air heater is defective. Pre-heater plug relay is defective. Pre-heater control unit is defective.	Correct or tighten wiring or connection. Replace air heater. Replace the relay. Replace the unit.
Pre-heating indicator remains off.	Lamp is short. Connection is loose or wiring is cracked. Wiring is short. Pre-heater control unit is defective.	Replace the lamp. Replace wiring or tighten connection. Repair or replace the wiring. Replace the unit.

STARTER SYSTEM

Symptoms	Possible cause	Remedy
Engine does not crank.	Defective battery, excessive discharge Wiring fault of starter motor Wiring fault of starter motor relay Wiring fault of magnetic switch Wiring fault of starter switch Wiring fault of battery Defective magnetic switch Defective starter motor relay Wear or damage of brush Defective motor Defective starter switch	Charge or replace. Repair or replace. Repair or replace. Repair or replace. Repair or replace. Repair or replace. Repair or replace. Repair or replace. Repair or replace. Repair or replace. Repair or replace.
Starter motor operates but engine does not start.	Pinion gear is out of mesh with ring gear. Battery voltage is low. Ring gear, pinion wear or damage Defective heater relay Contact pressure of brush is low. Defective overrunning clutch Battery cable is corroded or worn.	Repair or replace. Charge or replace. Repair or replace. Repair or replace. Repair or replace. Repair or replace. Repair or replace.
Starter motor keeps rotating.	Defective starter switch Defective magnetic switch	Repair or replace. Repair or replace.

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Engine Electrical System

Charging system

Alternator(Truck)

OUTLINE

ALTERNATOR

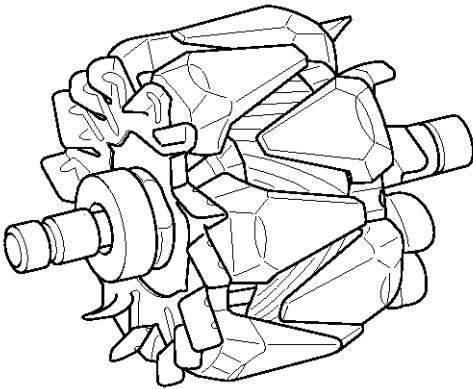
Alternator is of a built-in type with an IC regulator. A brush holder is installed in the rear bracket.

When IC regulator fails, regulator assembly should be replaced because the voltage cannot be controlled.

ROTOR

When the rotor is driven by the rotation of the pulley, the current flows from the brush to rotor coil through slip ring.

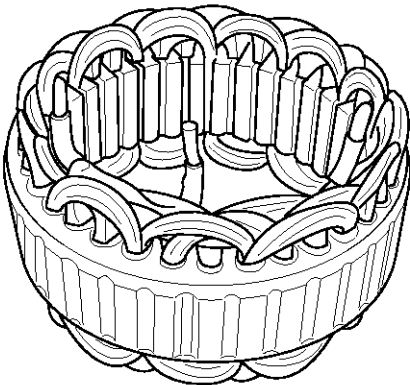
Then, rotor core becomes an electromagnet.



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STATOR

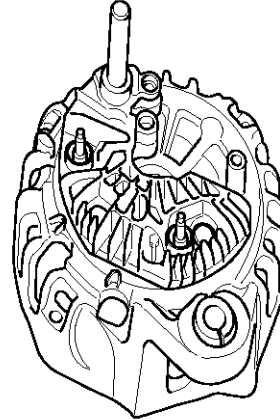
Stator core forms the magnetic flux path together with rotor core. The magnetic flux in the stator core is affected by the passage of the rotor core field so that electricity is generated as each rotor core rotates.



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RECTIFIER ASSEMBLY

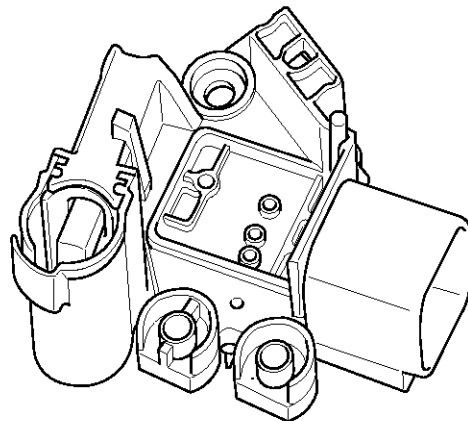
Commutator comprises of 3 pairs of diodes(6 in total), positive heat sink and rear bracket(negative heat sink role) .It converts alternating current generated by the alternator into direct current.



SDFEE7503D

REGULATOR

Regulator assembly comprises of IC regulator, brush and brush spring. It stabilizes the output varying according to the engine rpm.

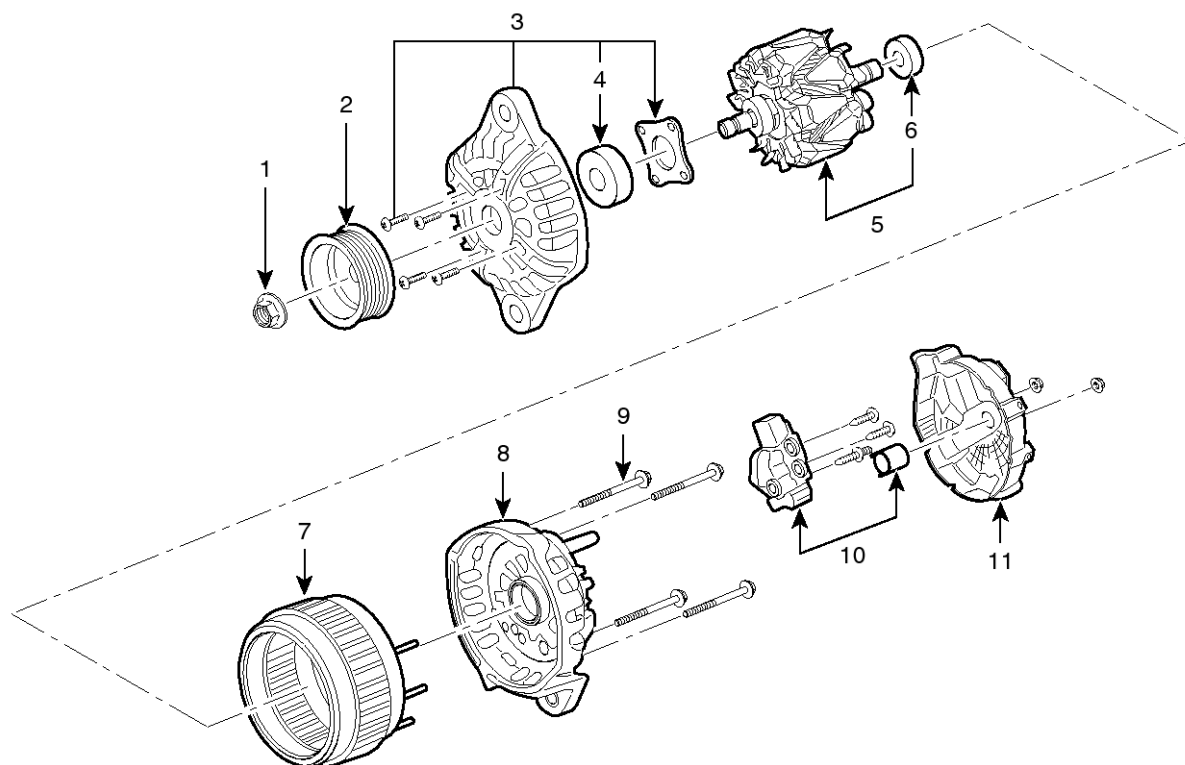


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Charging system

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COMPONENTS



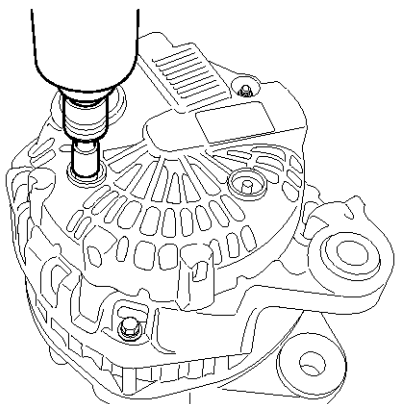
1. Hexagon nut
2. Pulley
3. Front bracket assembly
4. Front bearing
5. Rotor assembly
6. Rear bearing
7. Stator
8. Rectifier assembly
9. Through bolt
10. Regulator assembly
11. Cover

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Engine Electrical System

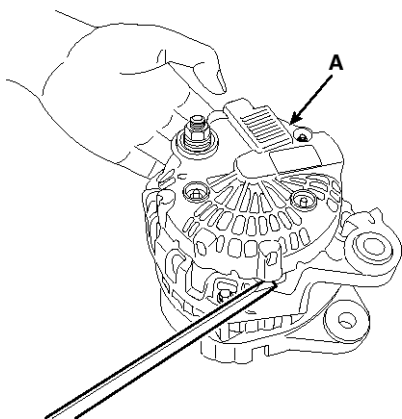
DISASSEMBLY

1. Remove two nuts mounted on rear cover using a screwdriver.



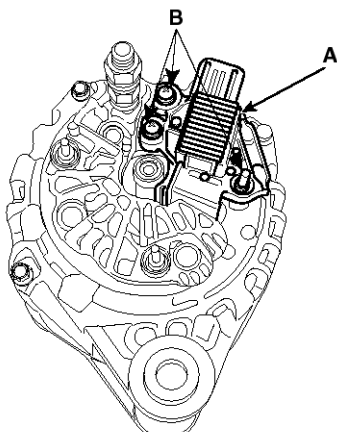
SDFEE7506D

2. Separate cover (A) using a screwdriver.



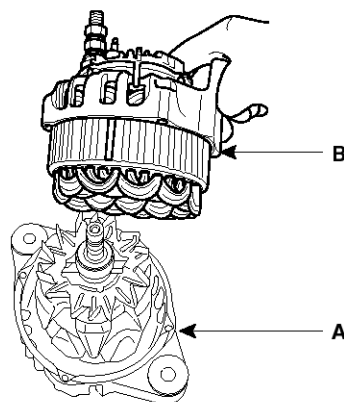
SDFEE7507D

3. Loosen the mounting bolts(B) and then separate regulator assembly(A).



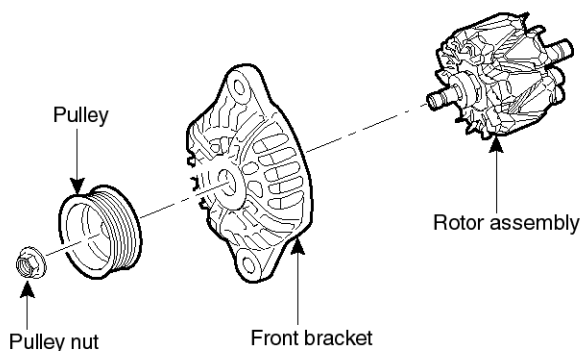
SDGEE9046L

4. Remove the four through bolts and separate the front assembly (A) and the rear assembly(B).



SDGEE9047L

5. Using an air tool, loosen the pulley nut and separate rotor assembly and pulley from the front bracket.



SDGEE9048L

Reassembly

Reassembly is the reverse order of the disassembly.

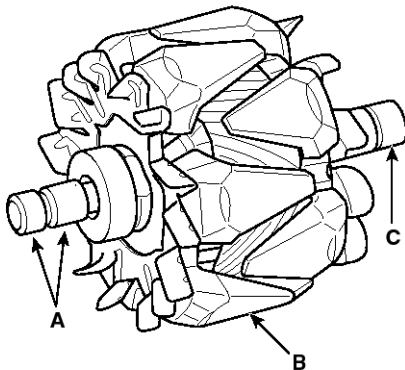
Charging system

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INSPECTION

ROTOR INSPECTION

1. Check for continuity between slip rings (A). Replace the rotor if there is no continuity.

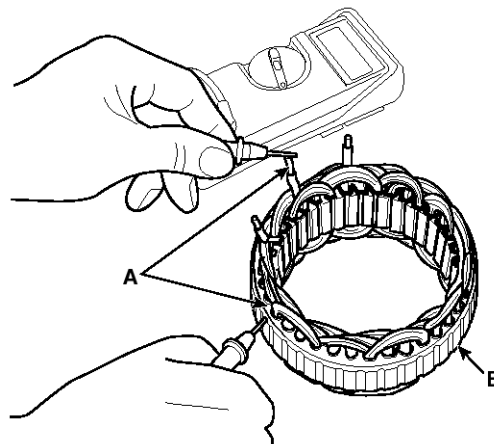


SDFEE7002D

2. Check for the non-continuity between slip ring (A) and rotor (B), and between slip ring (A) and shaft (C). Replace the rotor if there is continuity each other.

STATOR INSPECTION

1. Check for continuity between lead wires (A).
Replace the stator if there is no continuity.



SDFEE7512D

2. Check for continuity between lead wire (A) and coil (B). Replace the stator if there is continuity.

BRUSH INSPECTION

1. Replace the brush if it is worn exceeding to the limit.

REGULATOR INSPECTION

Replace the regulator if brush is worn and does not contact with slip ring of rotor.

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Engine Electrical System

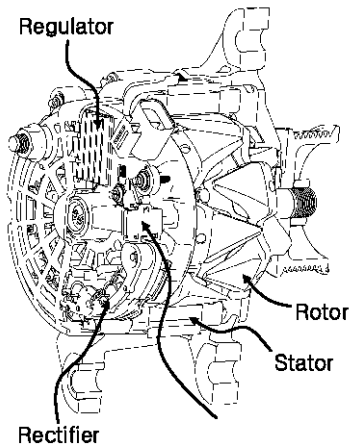
Alternator(Bus)

OUTVIEW

ALTERNATOR

The alternator is the engine component of the charging system that receives mechanical rotation force from the engine and generates the electrical energy. It supplies the electrical load to the vehicle and charges the battery of the vehicle.

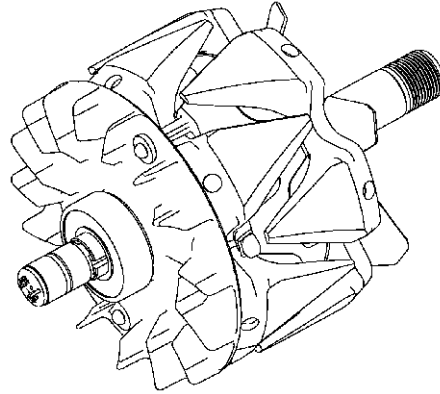
The main components consist of the rotor, the stator, the rectifier and the regulator. The rotor generates the magnetic field when the current is applied to the field coil through the carbon brush. The stator generates the induced voltage by the magnetic field of the rotor. The rectifier rectifies the generated alternating current electricity to the direct current. The regulator regulates the voltage generated.



SDGEE9026L

1. Rotor

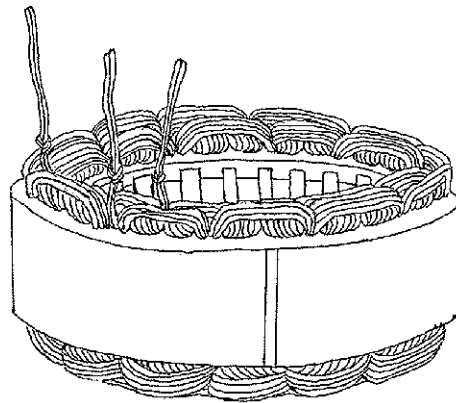
The rotor is rotated by the alternator pulley and the rotator core will be the electromagnet when the current is applied to the slip ring from the carbon brush.



SDFEE7004D-1

2. Stator

The cores of the rotor and the stator form the passage of the magnetic field and the voltage is generated to the copper wire wound to the stator core.



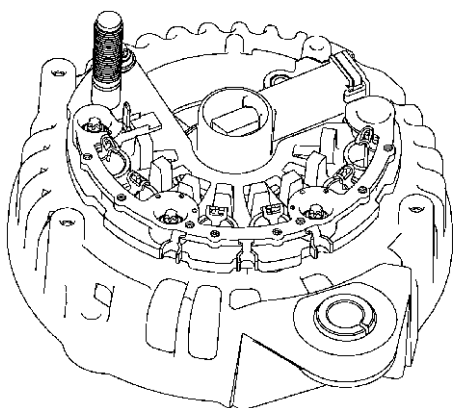
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Charging system

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3. Rectifier

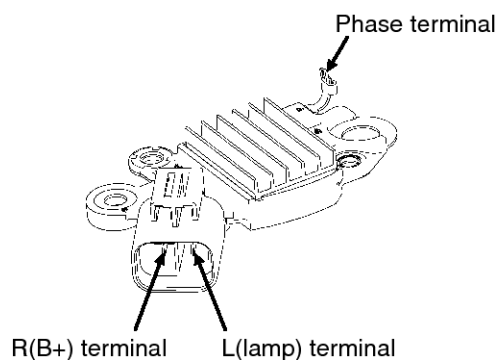
The rectifier consists of the positive radiating plate and the rear bracket(positive radiating plate role) and rectifies the alternating current electricity generated at the stator to the direct current. The three anode diodes and the positive diode are assembled to the positive radiating plate. The three cathod diodes and the negative diode are assembled to the rear bracket.



SDFEE7006D

4. Regulator

The regulator regulates the voltage generated from the alternator depending on temperature characteristics and controls the rated current of the field coil.

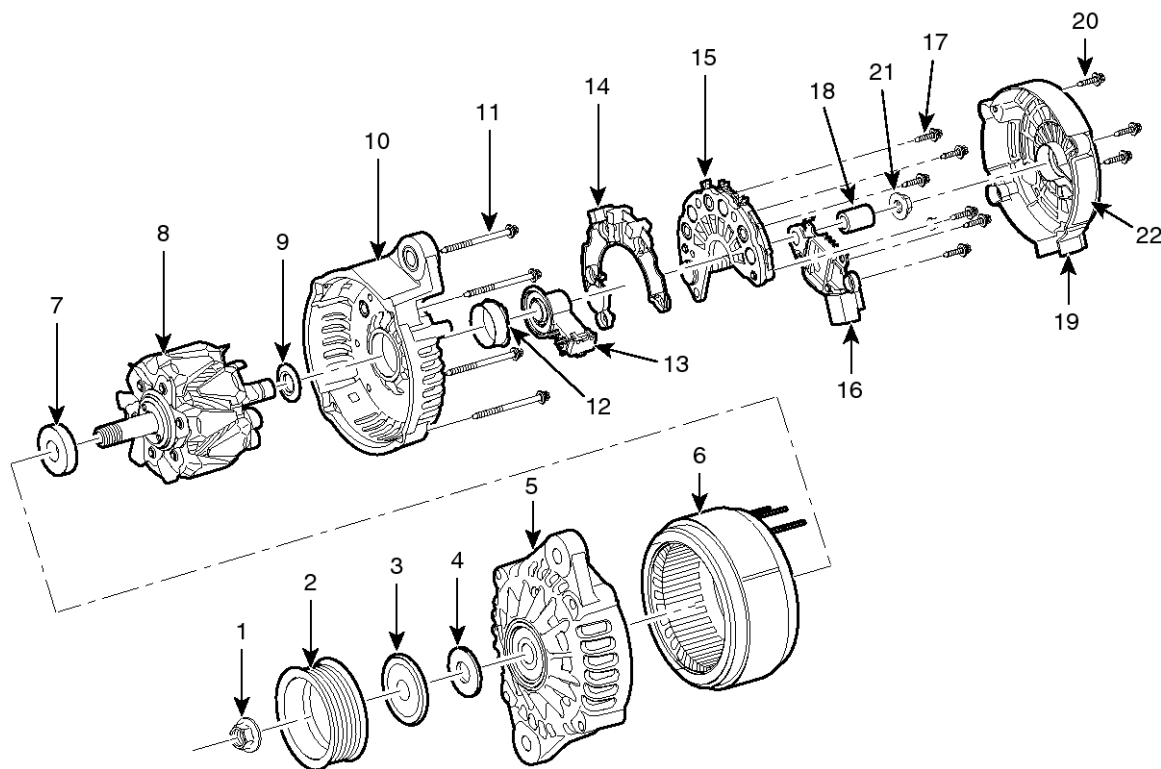


SDGEE9027L

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Engine Electrical System

COMPONENTS



1. Pulley nut
2. Pulley
3. Slinger
4. Space
5. Front bracket
6. Stator
7. Space
8. Rotor
9. Bearing shield
10. Rear bracket
11. Through bolt
12. Bearing retainer
13. Brush holder
14. Insulator
15. Rectifier
16. Voltage regulator
17. Screw
18. Battery terminal space
19. Rear cover
20. Screw
21. Battery nut
22. Label

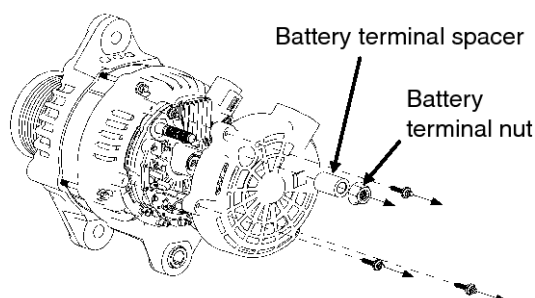
Charging system

EE-13

DISASSEMBLY

1. Removal of the rear cover

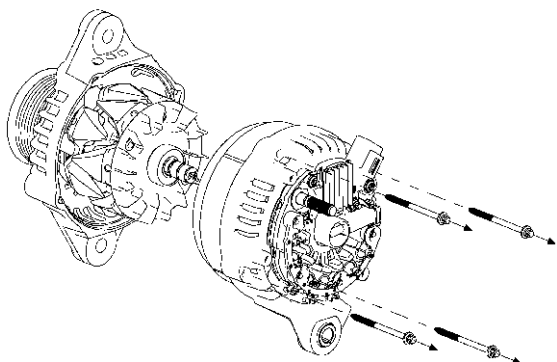
Remove the alternator battery terminal nut and the battery terminal spacer and remove the rear cover after loosening the three screws which secures the rear cover by using motor tool.



SDGEE9028L

2. Separation of front and rear assembly of alternator

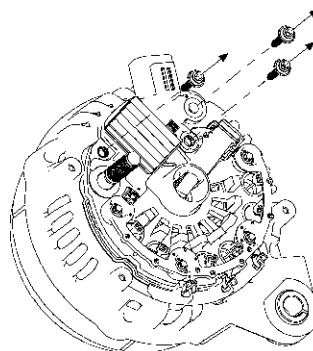
Remove the four through bolts and separate the front bracket assembly and the rear bracket assembly.



SDFEE7009D

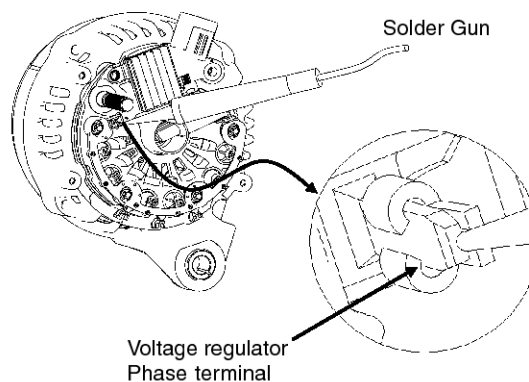
3. Removal of regulator

- 1) Remove the three screws which secure the regulator and the brush holder.

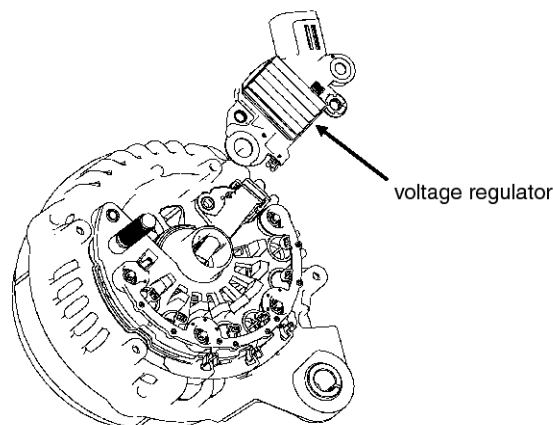


SDFEE7010D

- 2) Detach the regulator by melting the soldering at the phase terminal part of the regulator with a soldering gun.



SDGEE9029L



SDGEE9030L

EE-14

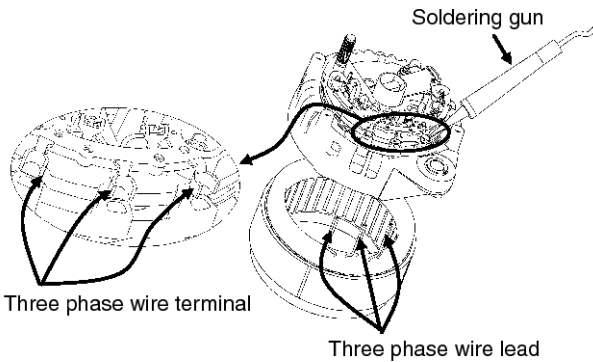
Engine Electrical System

⚠ CAUTION

- Use a socket wrench suitable for the screw head when removing the screw.
- Be careful not to remove the four screws assembled to the rectifier because the rectifier can not separate from the rear bracket.
- Be careful not to remove the brush holder by force because it can not separate from the rear bracket.
- Prevent damage to the diode and the plastic mold due to excessive heat when doing soldering or removing soldering.

4. Removal of stator

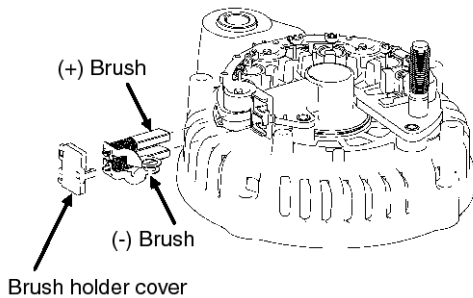
Remove the stator by melting three soldering points of the three phase wire terminal of the rectifier and the wire lead coil of the stator with a soldering gun.



SDGEE9031L

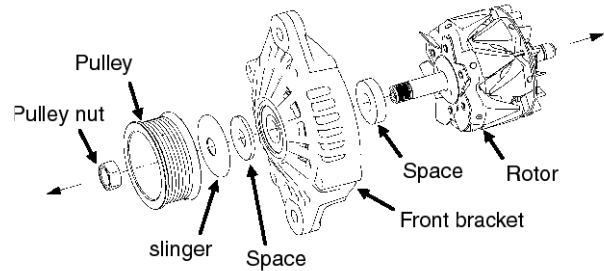
5. Removal of brush

Remove the brush cover with being careful not to break the hooker of the brush cover and separate the brush from the brush holder.



6. Removal of rotor and pulley

Remove the pulley nut by using an air tool with the pulley secured from the separated front bracket part and remove the rotator and the pulley from the front bracket.

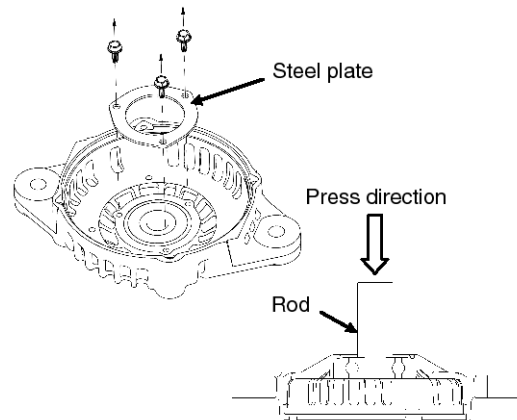


SDGEE9032L

SDGEE9033L

7. Removal of front bearing

Remove the three screws and the steel plate which secure bearing and remove the bearing by pushing it out gradually with the rod sustained at the hand press as shown in the illustration.



SDGEE9034L

Charging system

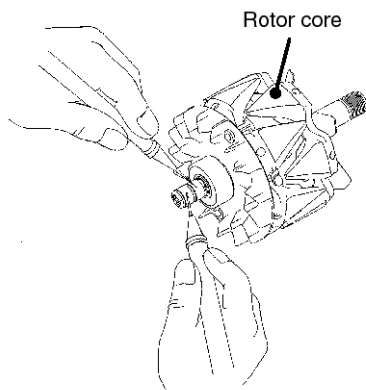
EE-15

INSPECTION

1. Rotor

- 1) Check the continuity at both ends of the slip ring to confirm the disconnection of the field coil of the rotor inside.

And replace the rotor when it is infinite.

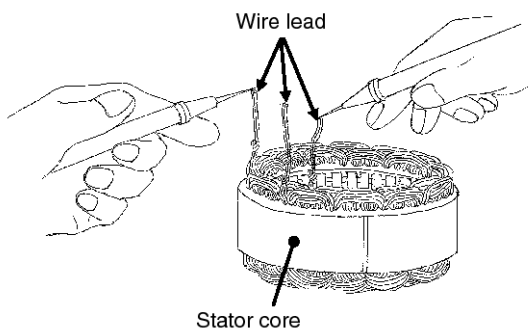


SDGEE9035L

- 2) Check electrical ground between the coil and the core through the slip ring and replace the rotor when the ground is found.

2. Stator

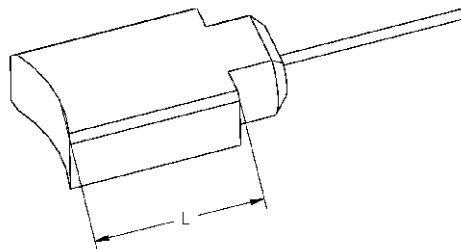
- 1) Check the continuity between each stator lead wire and replace the stator when the disconnection is found.
- 2) Check the continuity between each lead wire and the core and replace the stator when the continuity is found.



SDGEE9036L

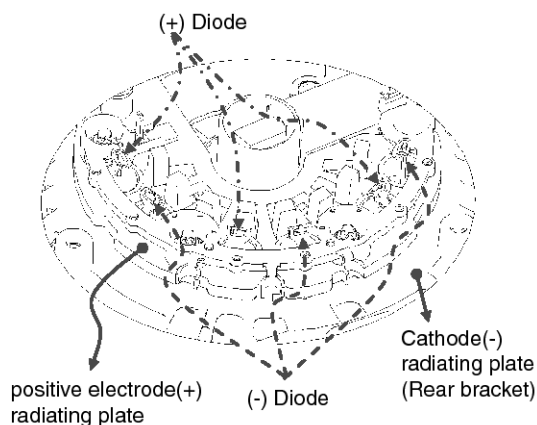
3. Brush

Disconnect the brush from the brush holder and check the length. Replace the brush if the length "L" is below 9.0mm.



SDFEE7019D

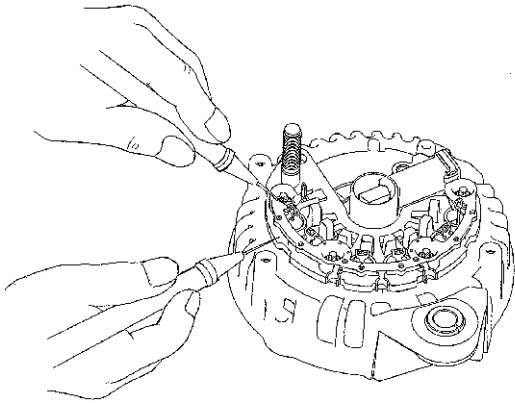
4. Rectifier



SDGEE9037L

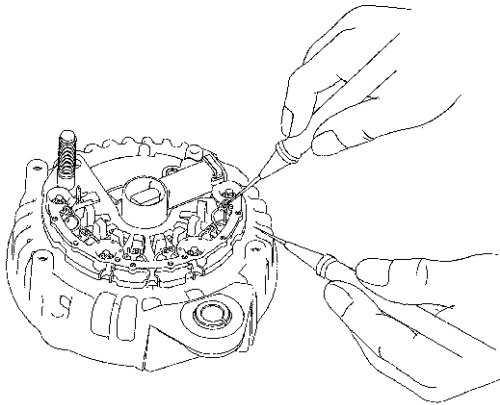
EE-16

Connect an ohmmeter between each (+) diode and (+) radiating plate and check the continuity with a diode tester. Replace the rectifier and the rear bracket as the diode is defective if the resistance is infinite or zero.



SDFEE7021D

Connect an ohmmeter between each (-) diode and (-) radiating plate and check the continuity with a diode tester. Replace the rectifier and the rear bracket as the diode is defective if the resistance is infinite or zero.



SDFEE7022D

Engine Electrical System

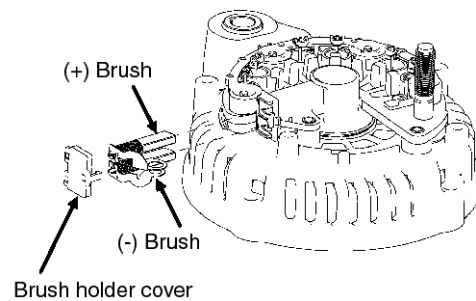
ASSEMBLY

Tightening torque

Items	Tightening torque (Kgf.m)
Pulley nut	8.2 ~ 11.2
Through bolt (4 places)	0.4 ~ 0.44
Screw (10 places)	0.22 ~ 0.28
Battery terminal nut	2.0 ~ 3.5

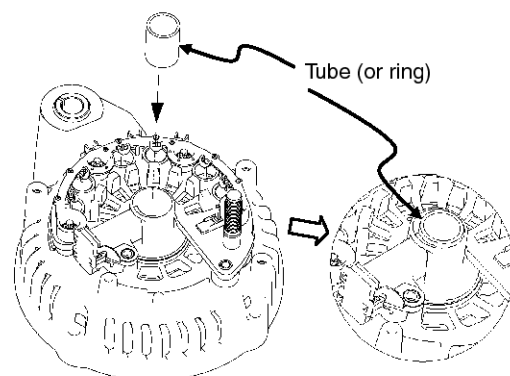
1. Assembly of brush

Insert the brush into the brush holder and assemble the brush cover.



SDGEE9032L

And push the brush in the brush holder and insert a tube (ID 16mm, OD 19mm, 24mm long) or a ring into the brush holder.



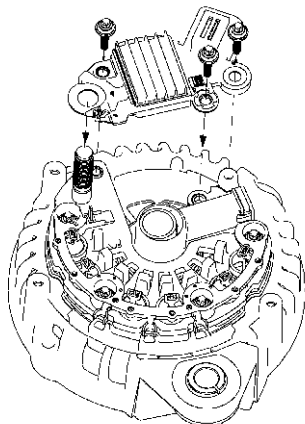
SDGEE9038L

Charging system

EE-17

2. Assembly of voltage regulator

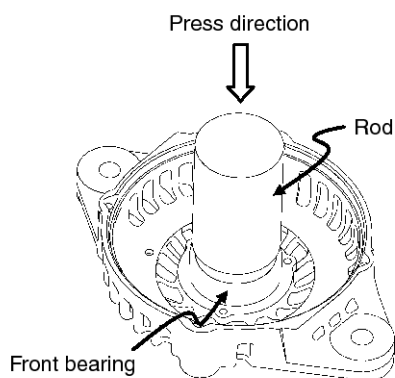
Connect the voltage regulator in the correct direction and tighten it with the screw.



SDFEE7025D

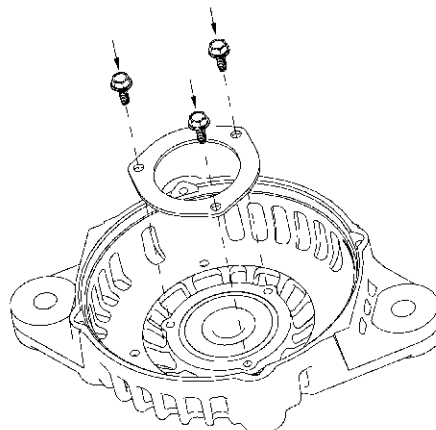
3. Assembly of front bearing and steel plate

Place the rod as shown in the illustration on the bearing wheel and press-fit the bearing gradually to the bearing bore of the front bearing bracket using a hand press.



SDGEE9039L

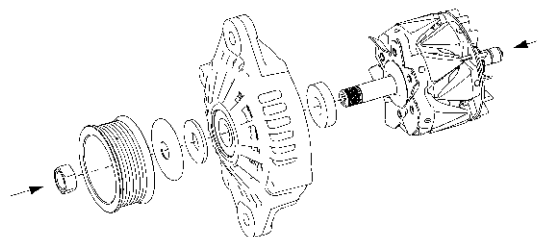
Assemble the steel plate and the three screws to secure the bearing.



SDFEE7027D

4. Assembly of front bracket

Tighten temporarily the rotor, the space, the bracket assembly, the space, the slinger, the pulley and the pulley nut as shown in the illustration.

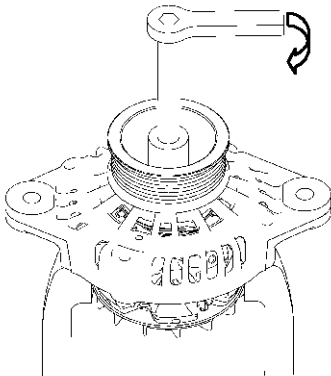


SDFEE7028D

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Engine Electrical System

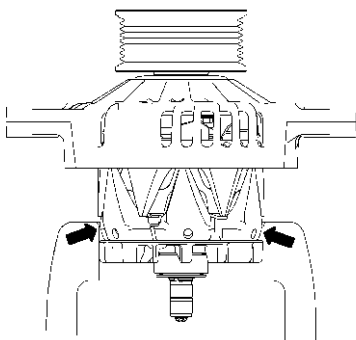
Secure the rotor to the vise as shown in the illustration and tighten the pulley nut to the specified torque of 8.2 to 11.2 kgf.m.



SDFEE7029D

CAUTION

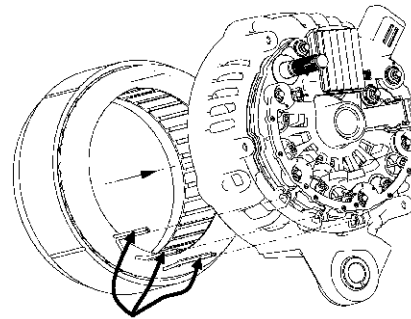
Secure the rotor to the vise as shown in the illustration when securing it and be careful not to cause damage to the cooling fan and the rotor core.



SDFEE7030D

5. Assembly of stator

Insert the stator into the rear bracket after coinciding with the positions of the wire lead and the wire terminal of the rectifier.

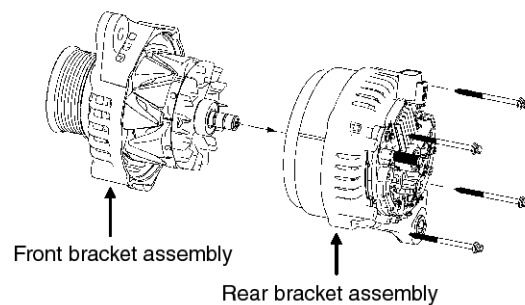


Wire lead

SDGEE9041L

6. Assembly of front and rear bracket assembly

Attach the front and the rear bracket assembly and tighten four through bolts.



Front bracket assembly

Rear bracket assembly

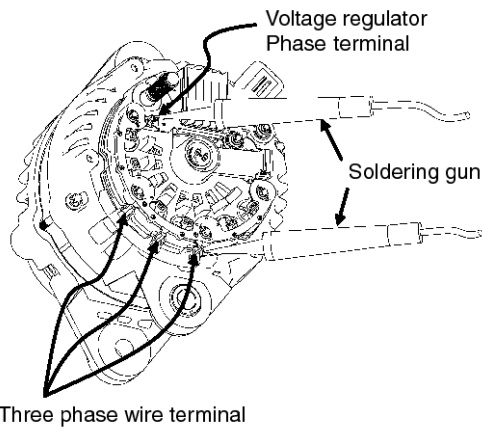
SDGEE9040L

Charging system

EE-19

7. Soldering of three phase wire terminal and voltage regulator phase terminal

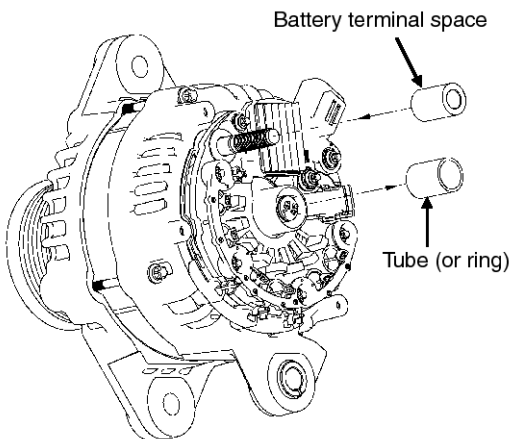
Solder the wire lead of the stator and three points of the rectifier terminal, and the phase terminal of voltage regulator and one point of phase terminal of the rectifier.



SDGEE9042L

8. Removal of brush tube and tightening battery terminal space

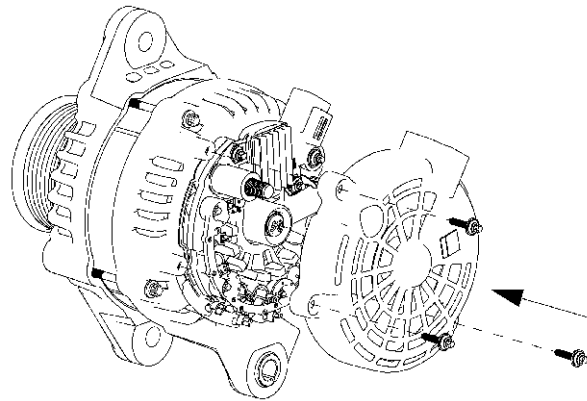
Remove the tube used to assemble the rotor and insert the battery terminal space into the battery terminal.



SDGEE9043L

9. Assembly of rear cover

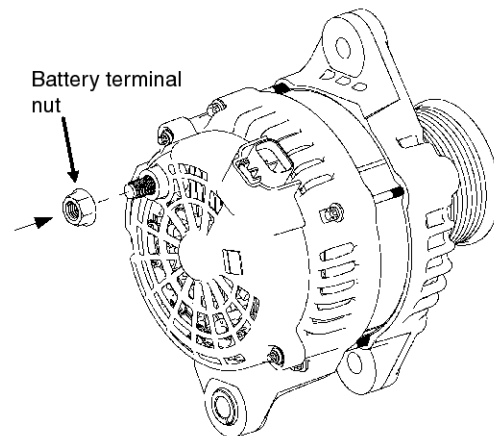
Attach the rear cover correctly and tighten three screws.



SDFEE7035D

10. Tightening the battery terminal nut

After tightening the nut by hands, tighten the nuts to the specified torque when installing to the engine.



SDGEE9044L

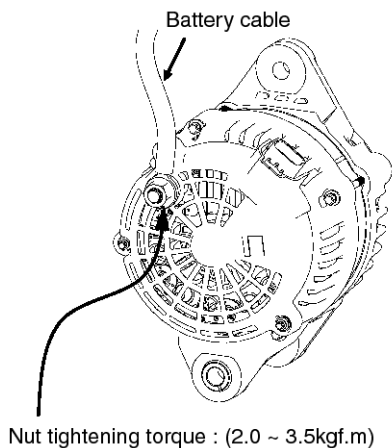
EE-20

Engine Electrical System

INSTALLATION

CAUTION

Be sure to tighten the nut to the specified torque when installing the battery cable. Do not tighten the nut with a torque of 4.5 kgf.m or higher since the alternator battery terminal may be broken.



SDGEE9045L

Starting System

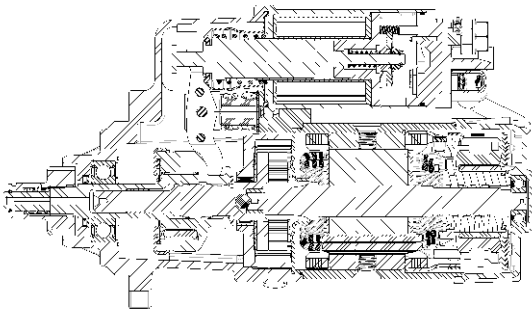
EE-21

Starting System

OUTLINE

STARTER MOTOR

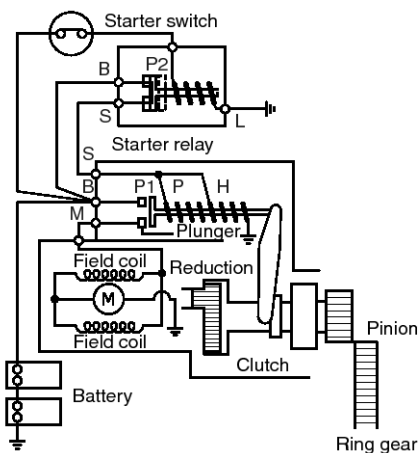
The starter motor is the system which converts electrical energy of battery into mechanical rotation energy to supply more than minimum rpm of crankshaft required by the starting of the internal combustion engine. Classifying the starter motor, it is composed of such parts as electrical motor part which turning force occurs, drive part which transmits power to the ring gear, the magnetic switch part which moves the pinion into the ring gear and sends current to electrical motor.



SDFEE7038D

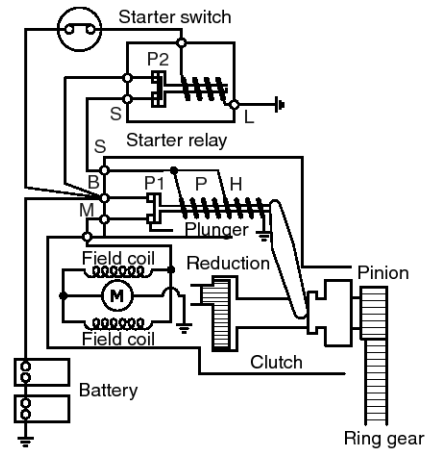
OPERATION

1. When all circuits are connected, the pinion is not in mesh with the ring gear if starter switch is opened.



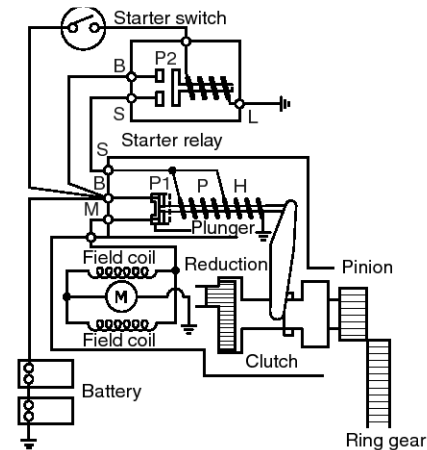
SDGEE9018L

2. When the starter switch is closed, current flows to the starter relay and "B"(battery terminal) and "S"(switch terminal) of the starter relay are connected and current begins to flow to the starter plunger.



SDGEE9019L

3. If current flows to the starter plunger, not only the plunger but also the lever is pulled. Therefore, the pinion moves to the ring gear side. As "B"(battery terminal) and "M"(motor terminal) of magnet meet from the specific engaged distance, current flows to the starter motor and the pinion rotates the ring gear.



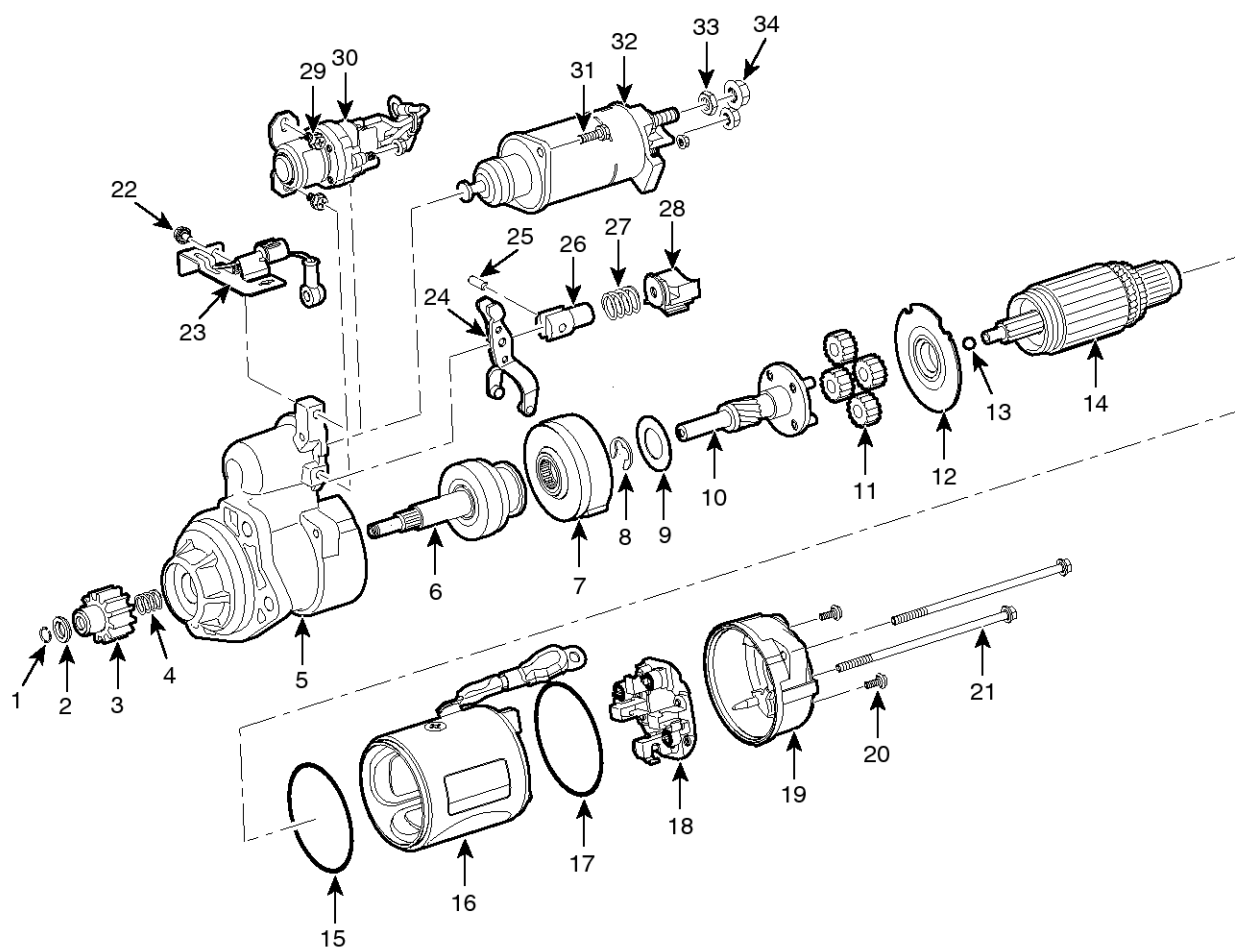
SDGEE9020L

EE-22

Engine Electrical System

Starter motor

COMPONENTS



1. Hog ring
2. Pinion retainer
3. Pinion
4. Pinion spring
5. Housing assembly
6. Clutch and output shaft assembly
7. Gear support assembly
8. Retainer
9. Washer
10. Drive shaft assembly
11. Planetary gear assembly
12. Dust cover
13. Ball
14. Armature assembly
15. O-ring
16. Frame field assembly
17. O-ring

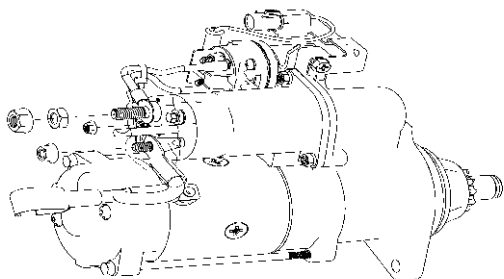
18. Brush holder assembly
19. CE housing
20. CE screw
21. Through bolt
22. Bolt
23. Plate and connector assembly
24. Shift lever assembly
25. Shift lever pin
26. Shift lever plug
27. Outer jump spring
28. Spring retainer assembly
29. Bolt
30. IMS assembly
31. Solenoid screw
32. Solenoid assembly
33. Nut
34. Nut

Starting System

EE-23

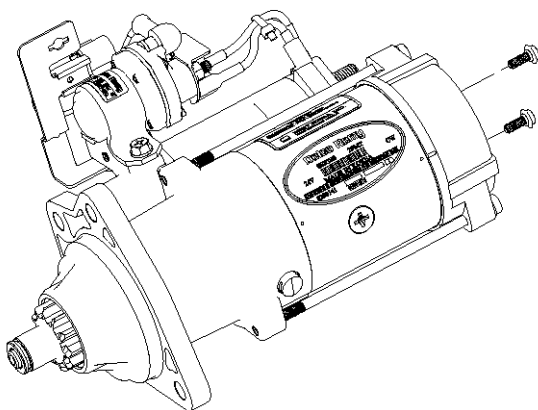
DISASSEMBLY

1. Disconnect each nut from the magnet switch assembly.



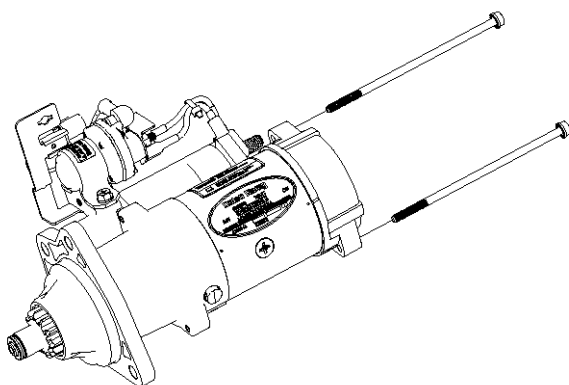
SDFEE7039D

2. Remove the screw from the rear bracket.



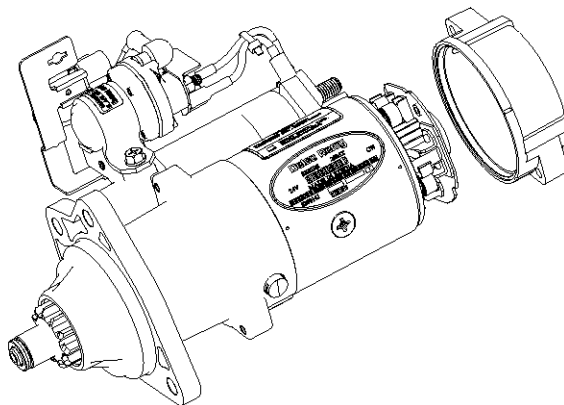
SDFEE7040D

3. Remove the through bolt from the rear bracket.



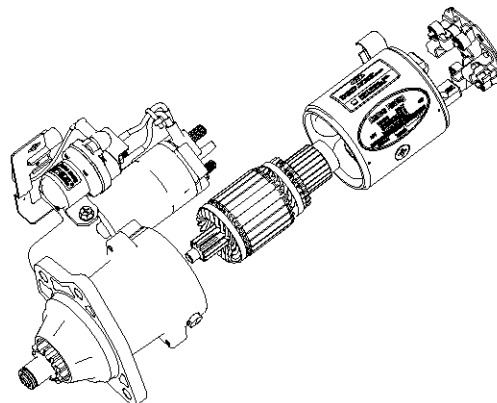
SDFEE7041D

4. Remove the rear bracket.



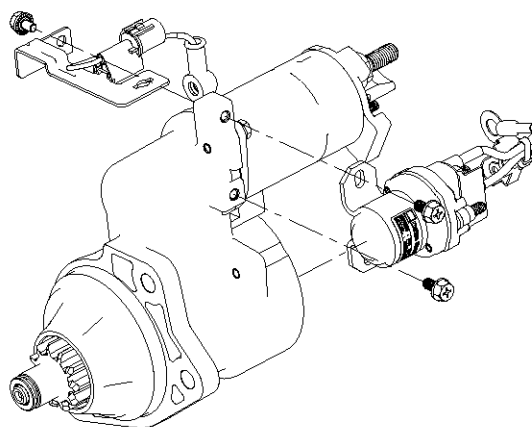
SDFEE7042D

5. Remove the yoke assembly, the brush holder assembly and the armature.



SDFEE7043D

6. Remove the mounting screw of the starter motor relay.

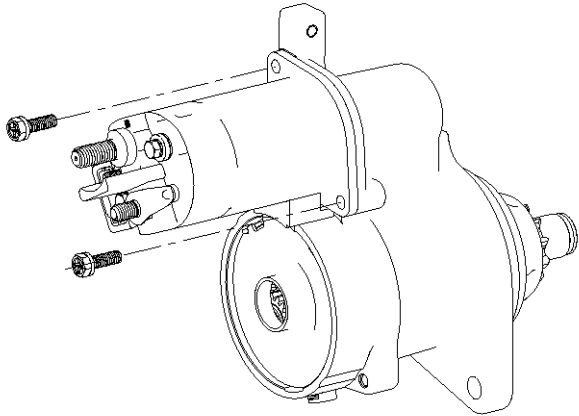


SDFEE7044D

EE-24

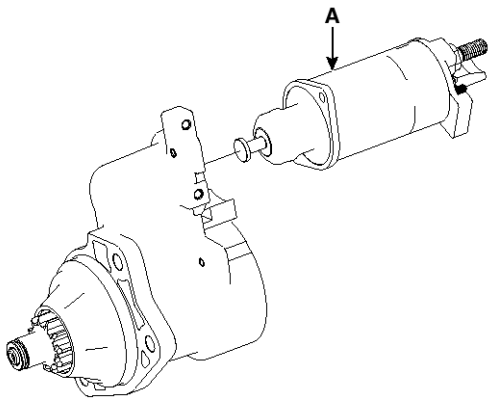
Engine Electrical System

7. Remove the mounting screw of the magnet switch.



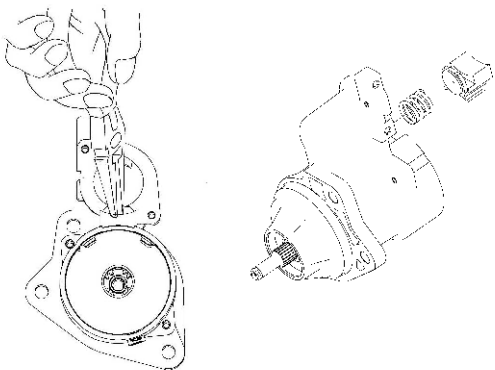
SDFEE7045D

8. Remove the magnet switch (A).



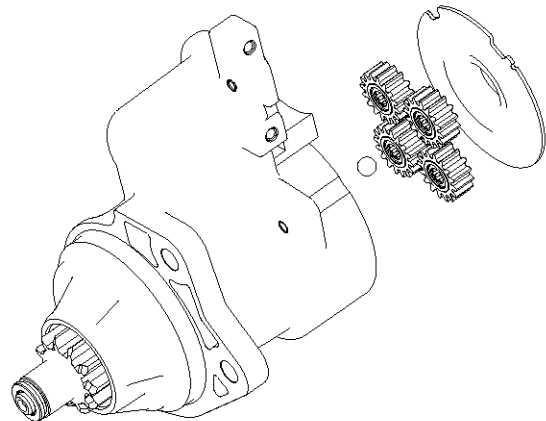
SDFEE7046D

9. Remove the plug using a long nose plier.



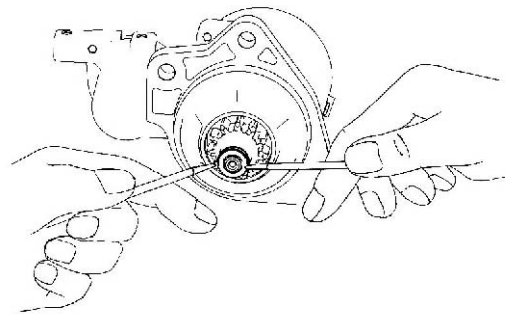
SDFEE7047D

10. Remove the ball, the small gear and the shield.



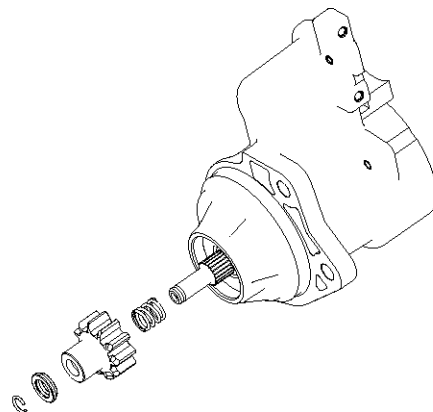
SDFEE7048D

11. Remove the hog-ring with an awl.



SDFEE7049D

12. Remove the pinion, the spring and the retainer.

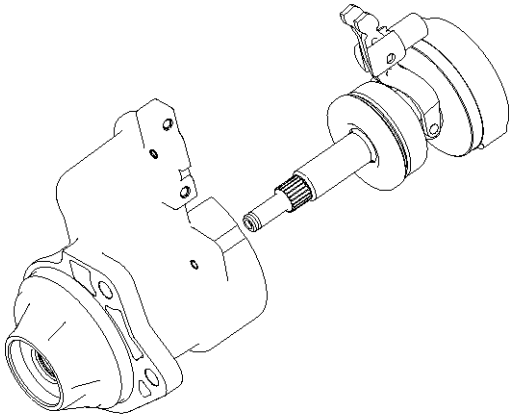


SDFEE7050D

Starting System

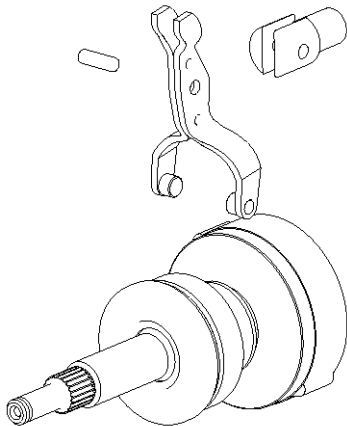
EE-25

13.Remove the shaft assembly and the lever.



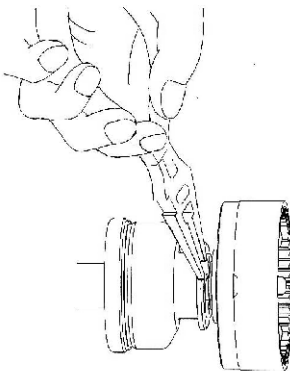
SDFEE7051D

14.Remove the lever pin.



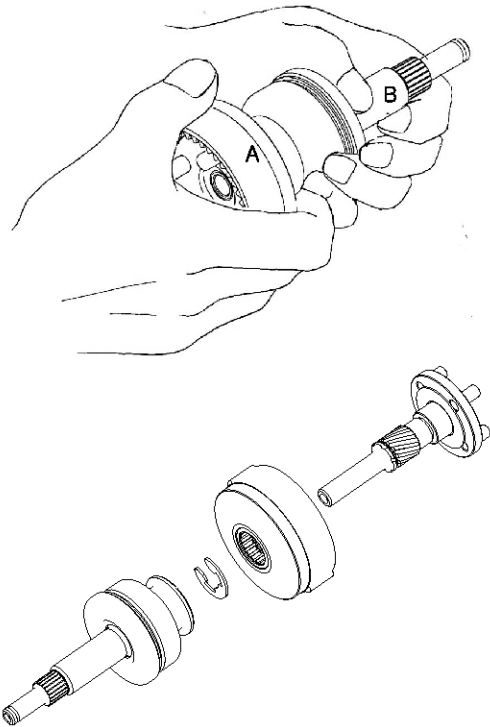
SDFEE7052D

15.Remove the C-ring with a long nose plier.



SDFEE7053D

16.While the holding (A), turn 1/2 pitch of (B) to separate.



SDFEE7054D

REASSEMBLY

Assembly is the reverse order of disassembly.

EE-26

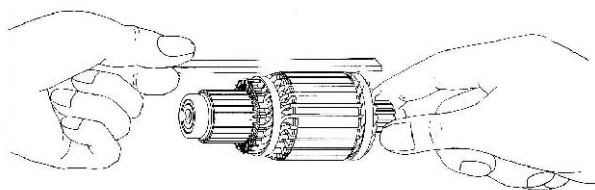
Engine Electrical System

INSPECTION

ARMATURE CHECK

1. Coil short test

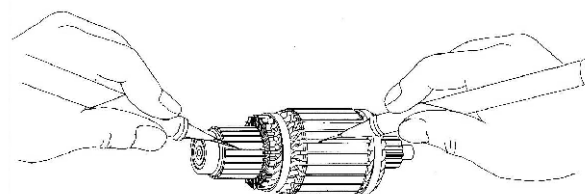
- Place the armature on a growler tester. Hold a piece of iron in parallel with the armature.
- Slowly turn armature by hand. If the iron piece is attracted or vibrated, which means there is a short circuit. Then, replace the armature.



SDFEE7055D

2. Coil ground test

Check for continuity between the commutator and shaft (or core). If there is continuity at the place where coil is grounded, replace the armature.

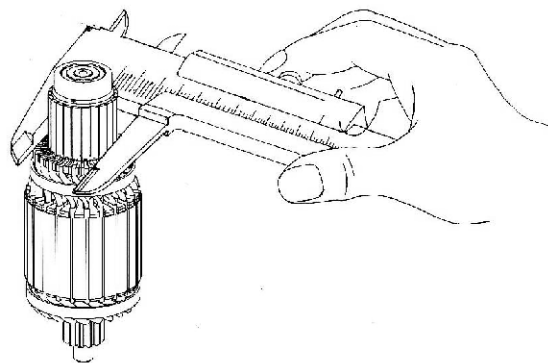


SDFEE7056D

3. Measure outer diameter of armature commutator.

If the measured value is less than limit, replace the armature.

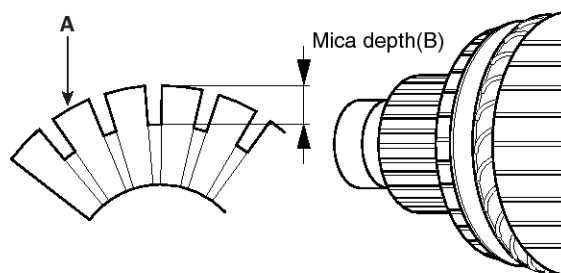
* Limit value : $\varnothing 35.0\text{mm}$



SDFEE7057D

4. Measure under cut (B) between segment (A). If out of reference value, correct it.

* Reference value : 0.7 ~ 0.9 mm



SDGEE9022L

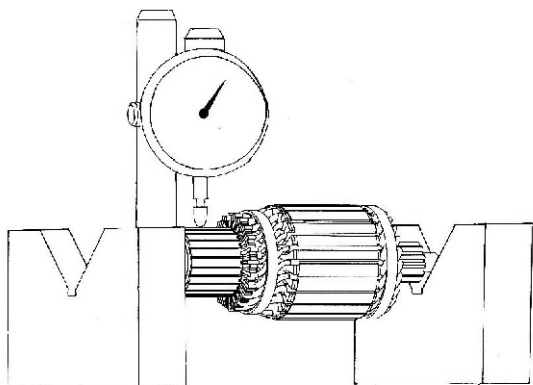
Starting System

EE-27

5. Commutator check

- a. Place the armature on 2 V-blocks. Measure the run-out of commutator using a dial indicator.
- b. If the run-out exceeds the limit, repair it as far as outer diameter does not exceed the service limit.
- c. Repair the irregular wear on the commutator surface by grinding with sand paper (No. 300~500).

* Commutator run-out : 0.06 mm

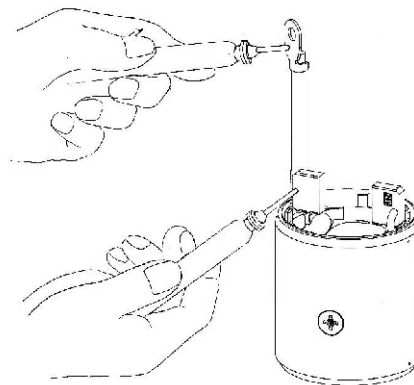


SDFEE7058D

FIELD COIL CHECK

1. Coil open test

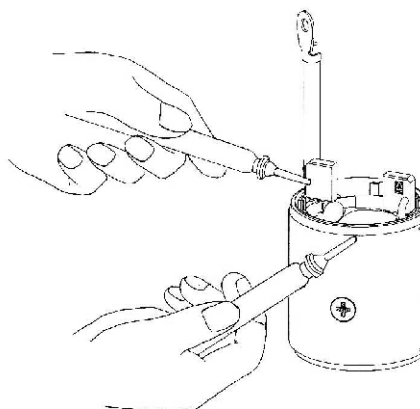
Check for continuity between the terminal lead and the brush (+). If there is no continuity, the circuit is opened. Then, replace the yoke assembly.



SDFEE7059D

2. Coil short test

Check for continuity between the yoke and the brush (+). If there is continuity, the circuit is grounded. Then, replace the yoke assembly.



SDFEE7060D

EE-28

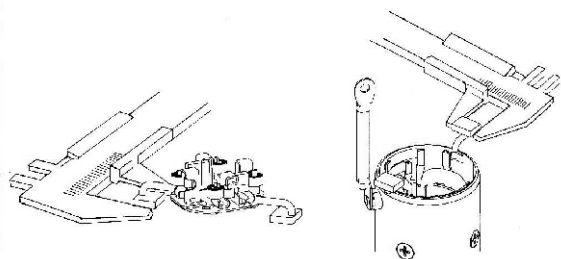
Engine Electrical System

BRUSH AND BRUSH HOLDER ASSEMBLY

1. Measure the brush wear, and replace if it is less than the limit.

When replacing the brush, take care not to damage brush.

* Brush wear service limit : 12.0 mm

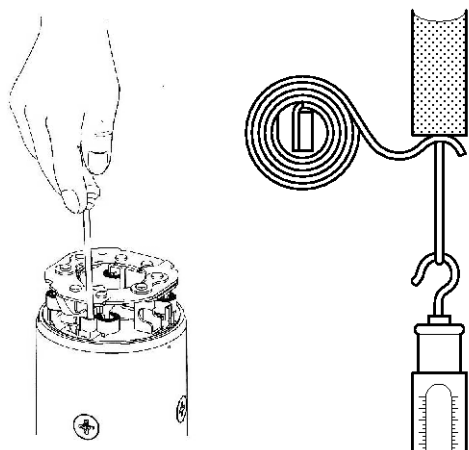


SDFEE7061D

2. Measure the installed load of the brush spring.

If the measured spring pressure is less than the limit, replace the spring.

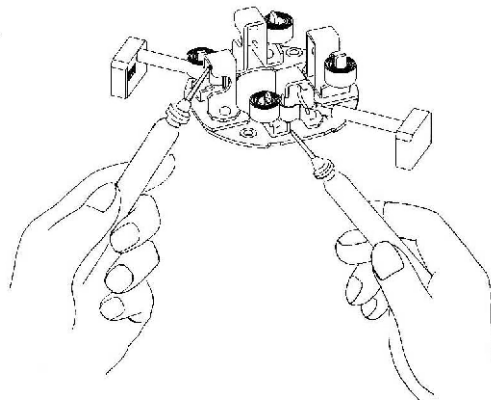
* Reference value : 20 ~ 24 N(2.1~2.4kgf)



SDFEE7062D

3. Brush holder assembly insulation test

Check for continuity between brush holder (+) and brush holder plate (-). If there is continuity, replace the brush holder assembly.



SDFEE7063D

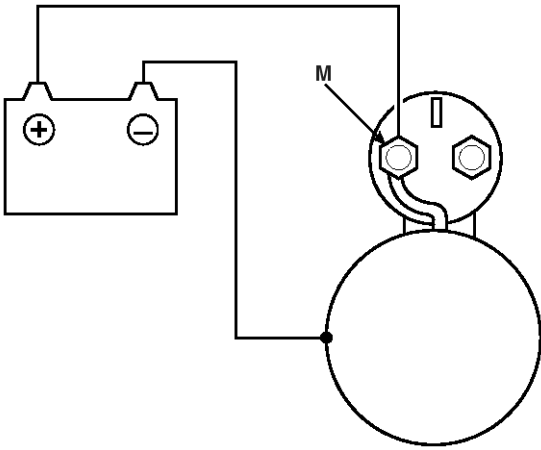
Starting System

EE-29

MOTOR INSPECTION

ELECTRIC MOTOR OPERATION TEST

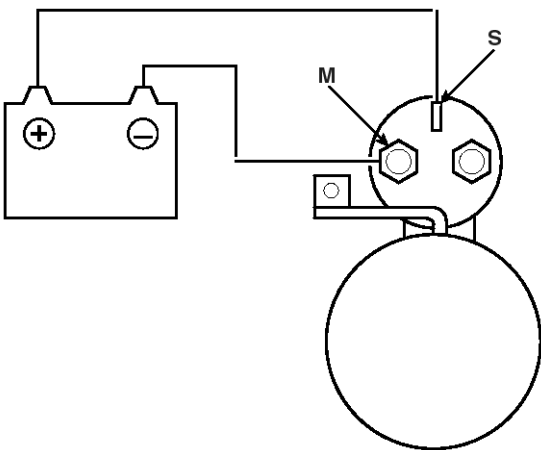
1. Connect battery between terminal "M" of magnetic switch and motor body.
2. It is normal if the electric motor operates. Check the internal parts if the electric motor does not operate.
◆ Do not try to connect continually longer than 10 seconds.



SDFEE7064D

Pull-in coil test in the magnetic switch

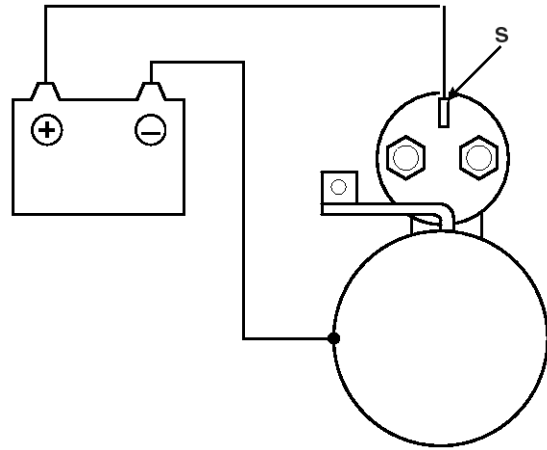
1. Pull-in coil is normal if the plunger goes in and then the pinion comes out when the battery is connected between terminal "S" and "M" of magnetic switch.
2. If it does not come out, replace the magnetic switch. Disconnect connector from terminal "M" for the test.
◆ Do not try to connect continually longer than 10 seconds.



SDFEE7065D

Holding coil support Test in the magnetic switch

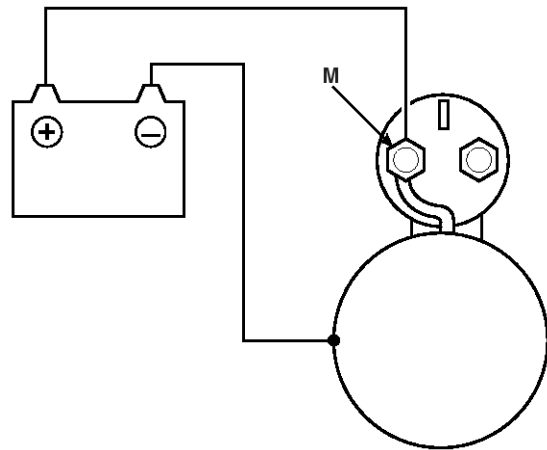
1. Pull out the pinion to 34mm by hand with battery connected between terminal "S" of magnetic switch and body. If pinion returns when it is released, holding coil is normally functioning.
◆ Do not try to connect continually longer than 10 seconds.



SDFEE7066D

Magnetic switch return test

1. Pull out the pinion to 34mm by hand with battery connected between terminal "M" of magnetic switch and body. If pinion returns immediately when it is released, both coils are normally functioning.
◆ Do not try to connect continually longer than 10 seconds.



SDFEE7064D

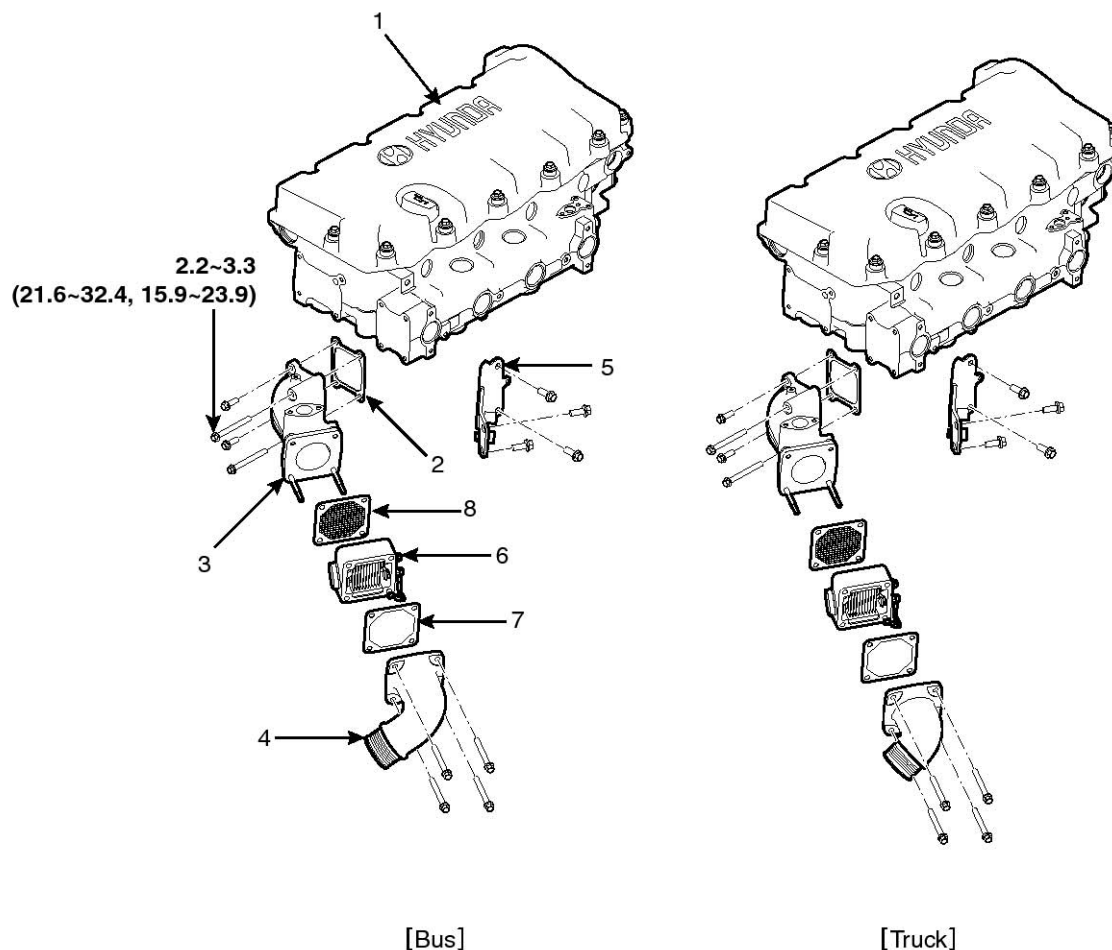
EE-30

Engine Electrical System

Preheating System

Intake Air Heater

COMPONENTS



Tightening torque : **kgf.m (N.m, lb-ft)**

1. Cylinder head
2. Coupler intake gasket
3. Intake couple
4. Pipe air heater
5. Intake bracket
6. Air heater assembly
7. Heater gasket
8. Heater gasket(MESH)

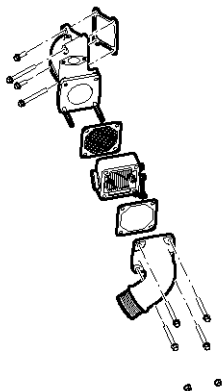
Preheating System

EE-31

REPLACEMENT

AIR HEATER ASSEMBLY

1. Disconnect air heater ground cable and cable connected with air heater relay.
2. Remove air heater mounting bolts(four) and then remove air heater assembly with the gasket.

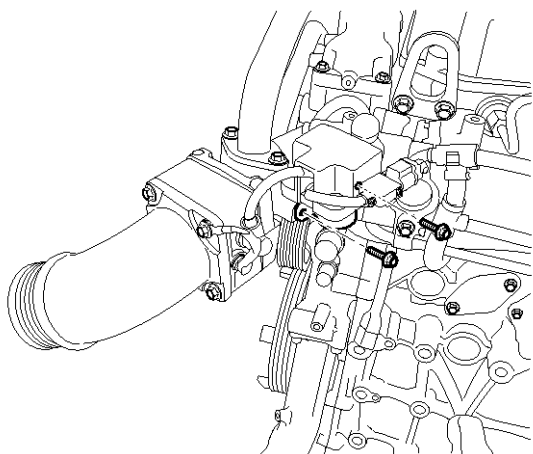


SDFEE7101D

3. Installation is in the reverse of removal.

AIR HEATER RELAY

1. Disconnect air heater relay connector and cable.
2. Disconnect air heater relay mounting bolts(two) and then remove air heater relay.



SDFEE7102D

3. Installation is in the reverse of removal.

INSPECTION

1. Check the cable connected to air heater for damage.
2. Check the air heater ground cable for damage.