

FUEL SYSTEM

	Page
PRECAUTIONS	5-2
TROUBLESHOOTING	5-2
FUEL PUMP	5-2
FUEL TANK	5-5

PRECAUTIONS

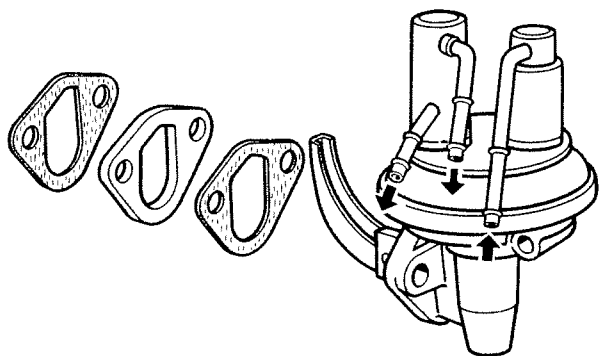
1. Before working on the fuel system, disconnect the negative cable from the battery.
2. When working on the fuel system, do not smoke or work near any fire hazard.
3. Keep gasoline off rubber or leather parts.

TROUBLESHOOTING

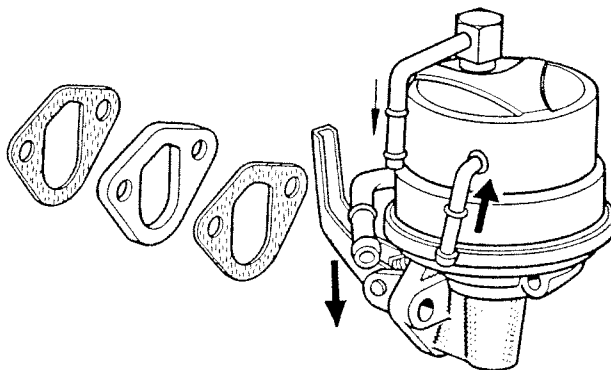
Problem	Possible cause	Remedy	Page
Insufficient fuel supply to carburetor	Fuel filter clogged	Replace fuel filter	2-20
	Fuel pump faulty	Replace fuel pump	5-3
	Fuel line clogged	Check fuel line	2-22
	Fuel line bent or kinked	Replace fuel line	

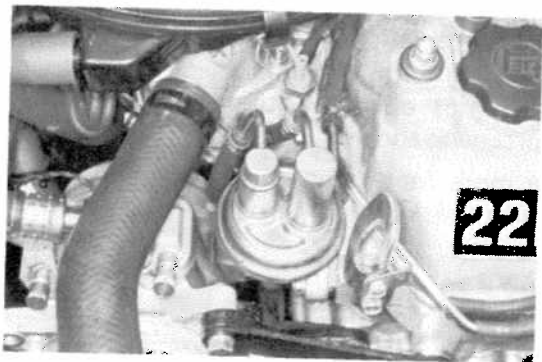
FUEL PUMP

TYPE I



TYPE II





REMOVAL OF FUEL PUMP

1. DRAIN RADIATOR

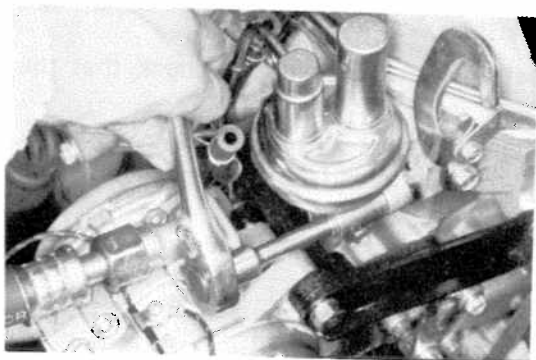
Open the radiator drain cock and allow coolant to drain into a suitable container.

2. DISCONNECT UPPER RADIATOR HOSE

3. DISCONNECT THREE FUEL HOSES FROM FUEL PUMP

4. REMOVE FUEL PUMP

Remove two bolts, fuel pump and gasket.

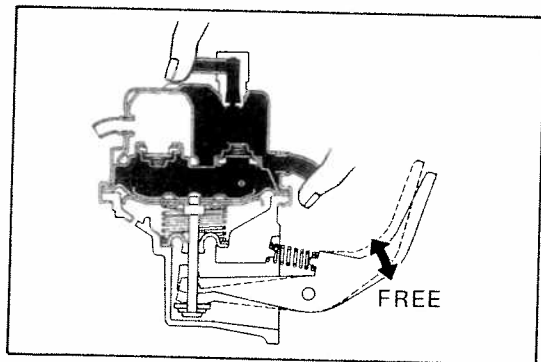
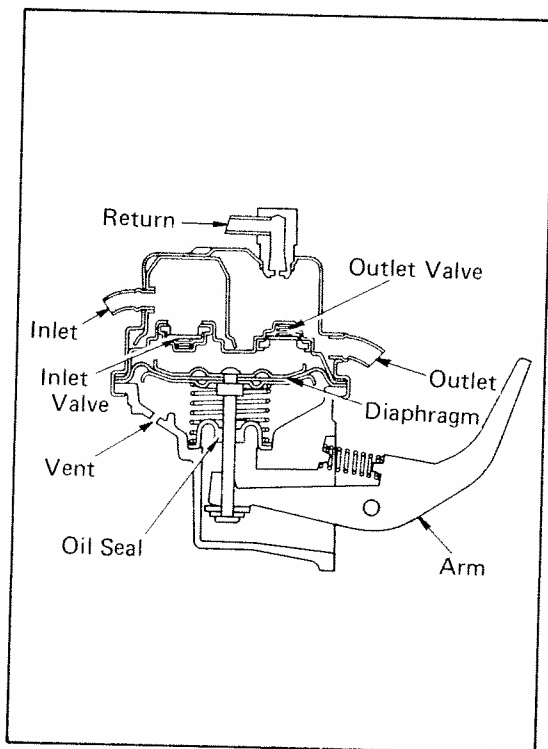


INSPECTION OF FUEL PUMP (Airtight Test)

PRECHECKS

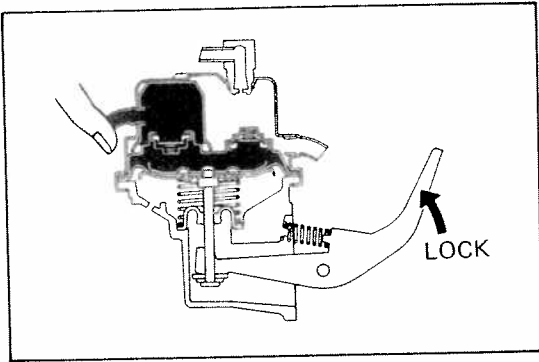
Before performing the following checks on the fuel pump.

- (1) Run some fuel through the pump to insure that the check valves seal tightly (a dry check valve may not seal properly).
- (2) Without blocking off any pipes, operate the pump lever and check the amount of force necessary for operation and the amount of arm play. This same amount of force should be used in the checks.



1. CHECK INLET VALVE

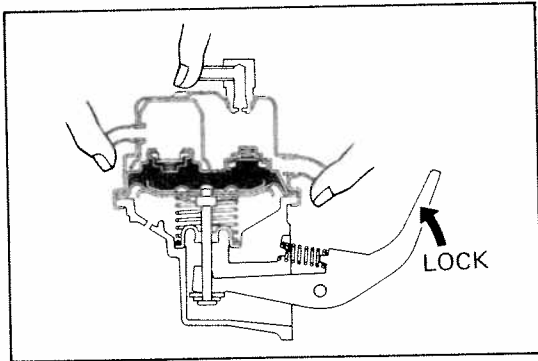
Block off the outlet pipes with your finger and check that there is an increase in lever arm play and that the lever arm moves freely (lost motion — no reaction force).



2. CHECK OUTLET VALVE

Block off the inlet pipe with your finger and check that the arm locks (does not operate with same amount of force used in the precheck above).

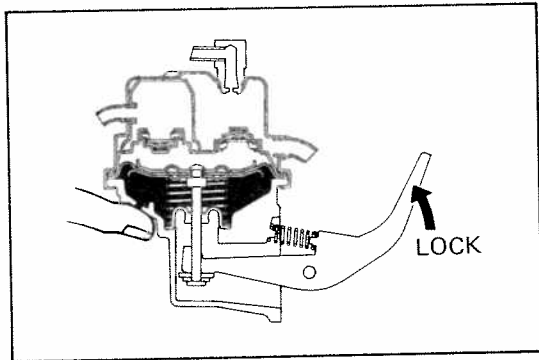
NOTE: Never use more force than that used in the pre-check. This applies to checks 3 and 4 also).



3. CHECK DIAPHRAGM

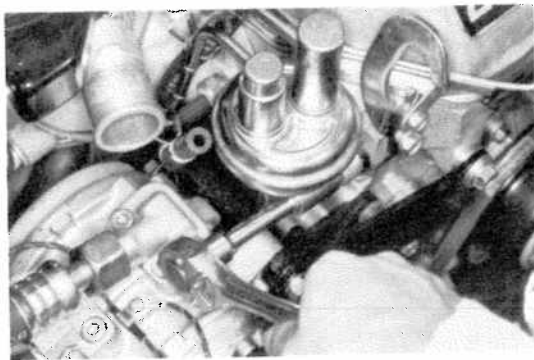
Block off the inlet and outlet pipes and check that the pump arm locks.

NOTE: If all three of these checks are not as specified, the caulking (sealing) of the body and upper casing is defective.



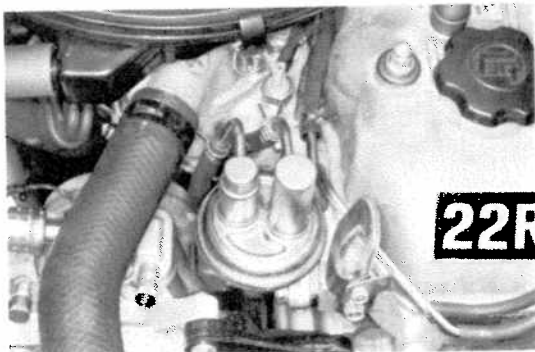
4. CHECK OIL SEAL

Block off the vent hole with your finger and check that the pump arm locks.



INSTALLATION OF FUEL PUMP

1. INSTALL FUEL PUMP WITH NEW GASKET
2. INSTALL TWO BOLTS



3. CONNECT THREE FUEL HOSES TO FUEL PUMP
4. CONNECT UPPER RADIATOR HOSE
5. FILL RADIATOR

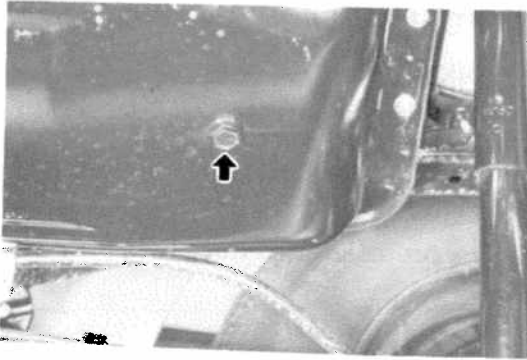
Close the radiator drain cock and fill with a good brand of ethylene-glycol coolant.

6. START ENGINE AND CHECK FOR LEAKS

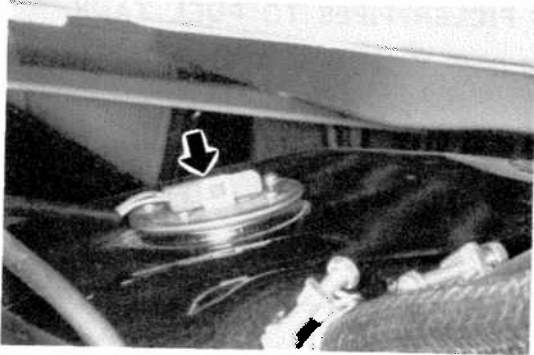
FUEL TANK

REMOVAL OF FUEL TANK

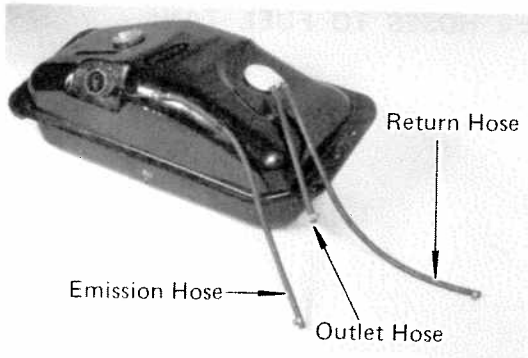
1. REMOVE DRAIN PLUG AND DRAIN FUEL TANK INTO SUITABLE CONTAINER



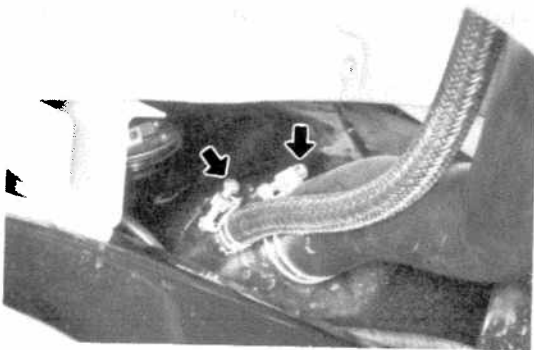
2. DISCONNECT CONNECTOR FROM FUEL SENDING UNIT



3. DISCONNECT THREE HOSES FROM FUEL PIPES
Plug the outlet hose to prevent gas from draining out of fuel tank.

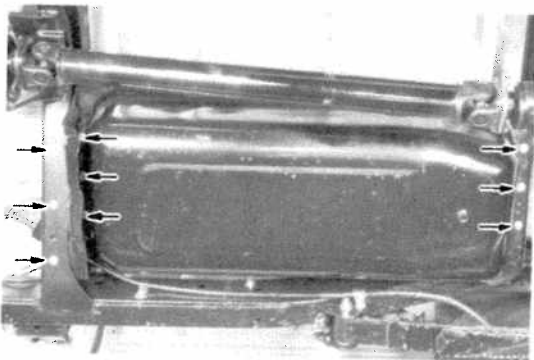


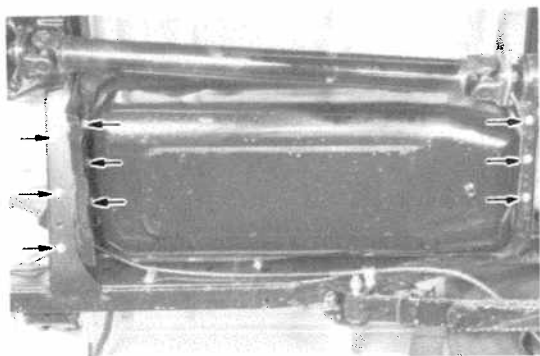
4. DISCONNECT TWO FILLER PIPES FROM FUEL TANK



5. REMOVE FUEL TANK

- (a) Remove the fuel tank protector.
- (b) Remove six bolts from fuel tank, and carefully lower fuel tank.





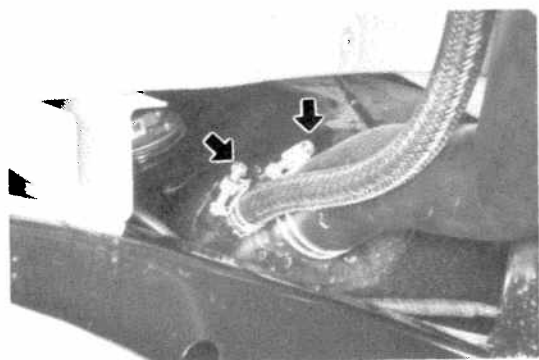
INSTALLATION OF FUEL TANK

1. INSTALL FUEL TANK

- (a) Place fuel tank in installed position and secure with six bolts. Torque the bolts.

Torque: 150 – 220 kg-cm (11 – 16 ft-lb)

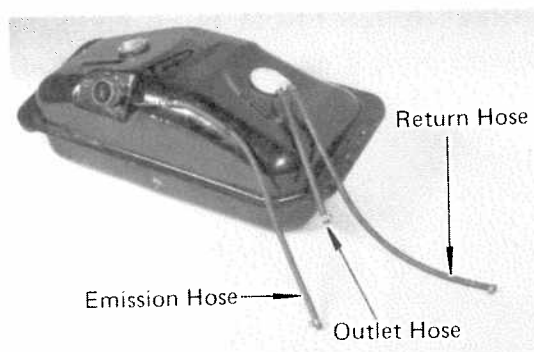
- (b) Install the fuel tank protector with three bolts.



2. CONNECT TWO FILLER PIPES TO FUEL TANK

Connect two filler pipes to tank with clamps. Torque the clamps.

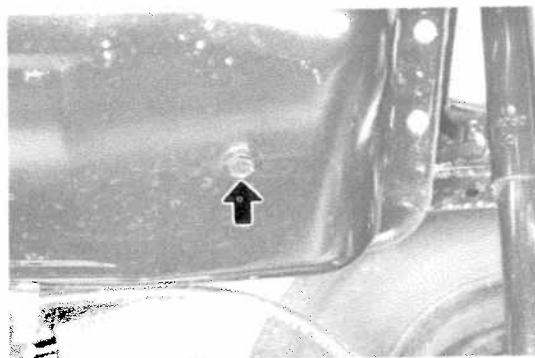
Torque: 15 – 25 kg-cm (14 – 21 in.-lb)



3. CONNECT THREE HOSES TO FUEL TANK



4. CONNECT CONNECTOR TO FUEL SENDING UNIT



5. INSTALL DRAIN PLUG

Torque the plug.

Torque: 30 – 100 kg-cm (27 – 86 in.-lb)

6. ADD GASOLINE, AND CHECK FOR LEAKS

COOLING SYSTEM

	Page
TROUBLESHOOTING	6-2
SPECIAL TOOLS AND TEST EQUIPMENT	6-2
WATER PUMP	6-3
THERMOSTAT	6-5
RADIATOR	6-5

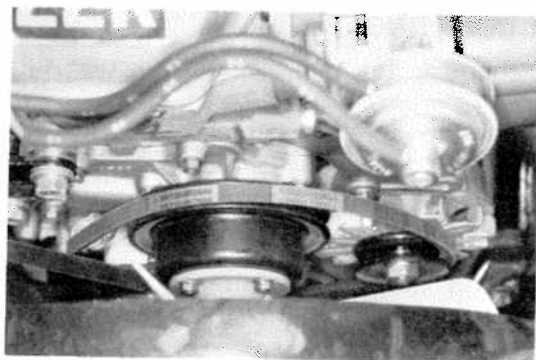
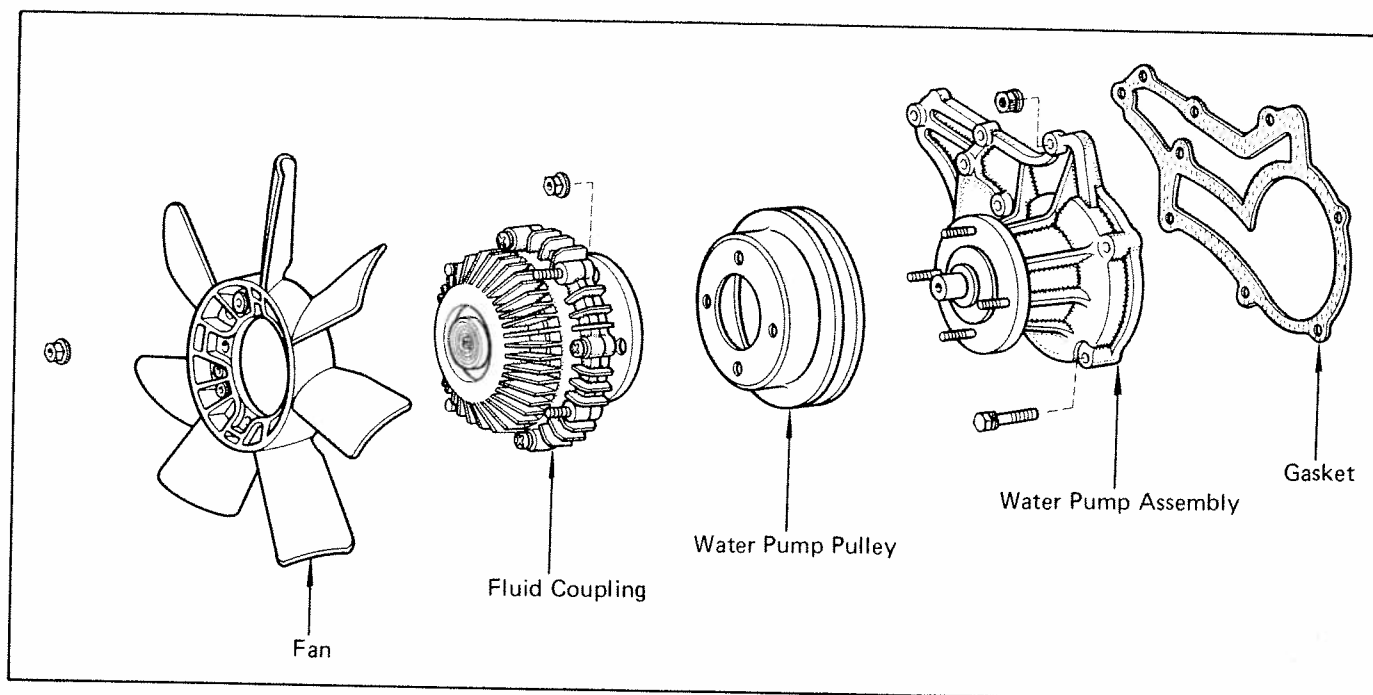
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine overheats	Fan belt loose or missing	Adjust or replace belt	4-43
	Dirt, leaves or insects on radiator or condenser	Clean radiator or condenser	
	Hoses, water pump, thermostat housing, radiator, heater, core plugs or head gasket leakage	Repair as necessary	
	Thermostat faulty	Check thermostat	6-5
	Ignition timing retarded	Set timing	3-17
	Fluid coupling faulty	Replace fluid coupling	6-3
	Radiator hose plugged or rotted	Replace hose	6-3
	Water pump faulty	Replace water pump	
	Radiator plugged or cap faulty	Check radiator	6-5
	Cylinder head or block cracked or plugged	Repair as necessary	

SPECIAL TOOLS AND TEST EQUIPMENT

Tool	SST No.	Use
Pressure tester	Commercial	To test cooling system

WATER PUMP



REMOVAL OF WATER PUMP

1. DRAIN RADIATOR

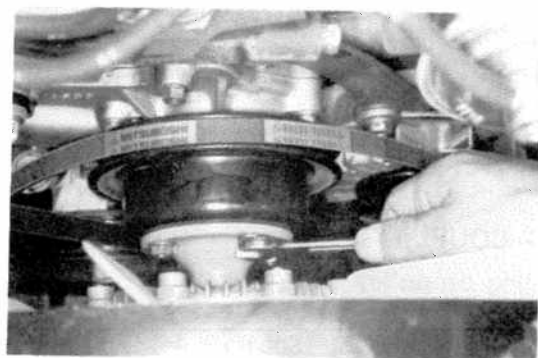
Open radiator and engine drain cocks. Allow coolant to drain into a suitable container.

2. LOOSEN FAN BELT

Loosen alternator pivot and adjusting bolts. Swing the alternator toward the engine.

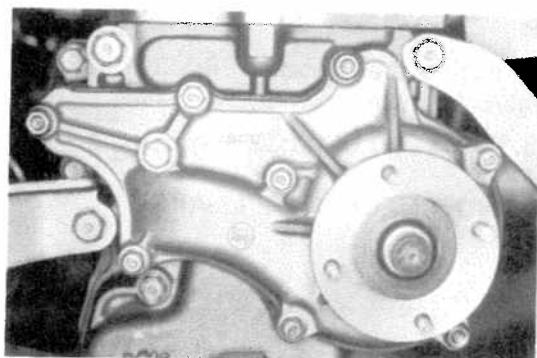
3. REMOVE FLUID COUPLING, FAN AND WATER PUMP PULLEY

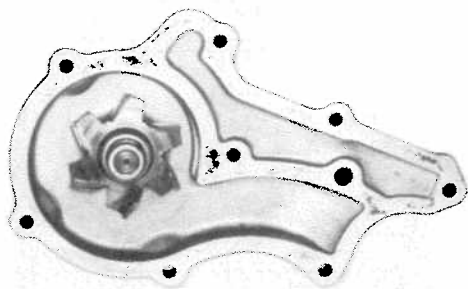
- (a) Remove four nuts from the fluid coupling flange.
- (b) Remove the fluid coupling, water pump pulley and fan belt.
- (c) Remove the fan from the fluid coupling.



4. REMOVE WATER PUMP

Remove six bolts, three nuts, water pump and gasket.

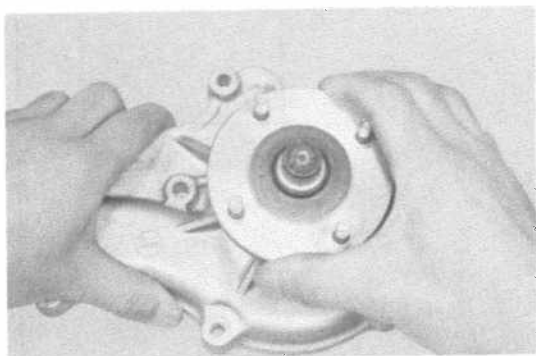




INSPECTION OF WATER PUMP

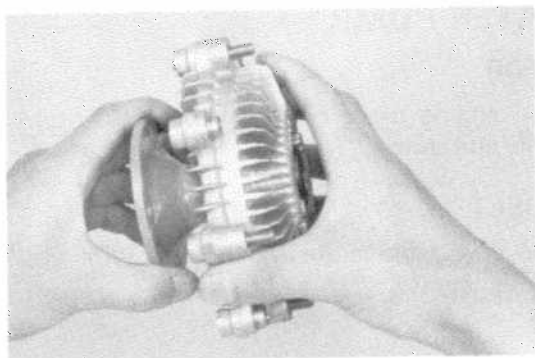
1. INSPECT WATER PUMP BODY AND TIMING CHAIN COVER

Check the water pump body and timing chain cover for cracks and damaged gasket surfaces. Replace as necessary.



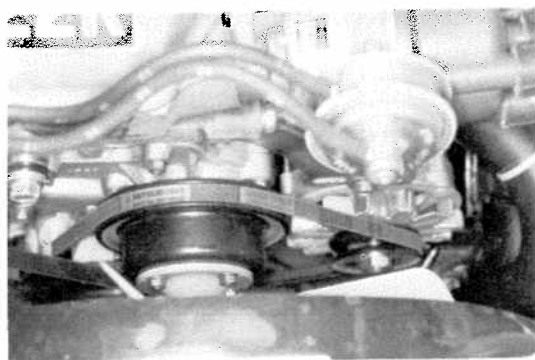
2. INSPECT WATER PUMP BEARING

Check that water pump bearing operation is not rough or noisy.



3. INSPECT FLUID COUPLING

Check the fluid coupling for damage and silicone oil leakage.



INSTALLATION OF WATER PUMP

1. INSTALL WATER PUMP OVER NEW GASKET

Install water pump on new gasket with six bolts and three nuts.

2. INSTALL FAN BELT AND PULLEY

- (a) Check fan belt for cracks or damage.
- (b) Place fan belt on pulley and place pulley on bolts of water pump.

3. INSTALL FAN ON FLUID COUPLING

4. INSTALL FLUID COUPLING

Install fluid coupling on pulley with four nuts.

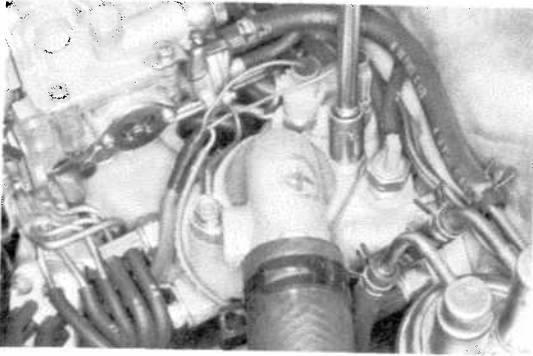
5. ADJUST FAN BELT TENSION (See page 4-43)

6. FILL RADIATOR

Close radiator and engine drain cocks. Fill with a good brand of ethylene-glycol coolant.

Total capacity: 8.4 liters (8.9 US qts, 7.4 Imp.qts)

7. START ENGINE AND CHECK FOR LEAKS



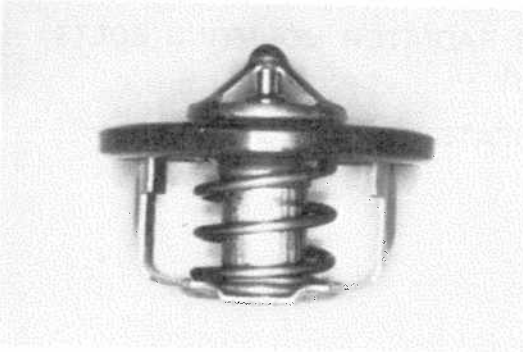
THERMOSTAT

REMOVAL OF THERMOSTAT

1. REMOVE WATER OUTLET

Remove two bolts and water outlet from intake manifold.

2. REMOVE THERMOSTAT AND GASKET



INSPECTION OF THERMOSTAT

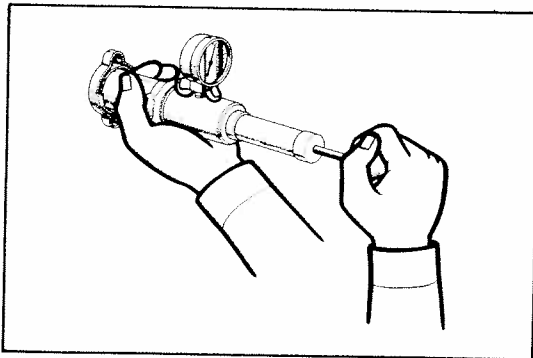
- Immerse the thermostat in water and heat it gradually.
- Check that the valve starts to open at 88°C (190°F) and opens more than 8 mm (0.31 in.) at 100°C (212°F).
- Check that valve spring is tight when thermostat is fully closed.

INSTALLATION OF THERMOSTAT

1. PLACE THERMOSTAT IN INTAKE MANIFOLD

2. INSTALL WATER OUTLET

Install water outlet on new gasket with two bolts.



RADIATOR

INSPECTION OF RADIATOR

1. CHECK RADIATOR CAP

Using pressure tester, pump tester until relief valve opens. Check that valve opens between 0.75 kg/cm^2 (10.7 psi) and 1.05 kg/cm^2 (14.9 psi).

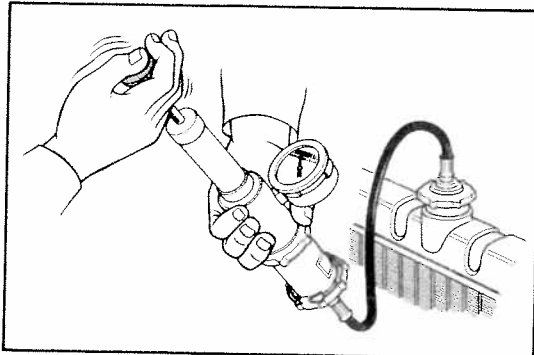
Check that pressure gauge does not drop rapidly when pressure on cap is below 0.6 kg/cm^2 (8.5 psi).

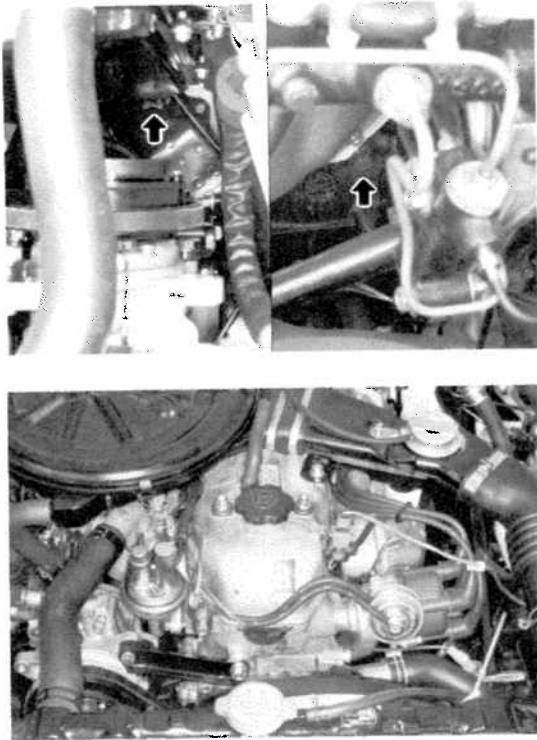
If either check is not within limits, replace cap.

2. CHECK COOLING SYSTEM FOR LEAKS

Attach pressure tester to the radiator and pump tester to 0.9 kg/cm^2 (12.8 psi). Check that pressure does not drop.

If the pressure drops, check for leaks from hoses, radiator or water pump. If no external leaks are found, check heater core, block and intake manifold.





REMOVAL OF RADIATOR

1. **DRAIN RADIATOR AND ENGINE**
Open radiator drain cock and engine drain cock (located on the left rear of engine block). Drain fluid into a suitable container.
2. **DISCONNECT TWO RADIATOR HOSES**
3. **DISCONNECT COOLANT RESERVOIR TUBE**
4. **REMOVE FOUR SHROUD MOUNTING BOLTS**
5. **REMOVE FOUR RADIATOR MOUNTING BOLTS AND RADIATOR**
6. **DISCONNECT HEATER OUTLET HOSE FROM RADIATOR**

INSTALLATION OF RADIATOR

1. **CONNECT HEATER OUTLET HOSE TO RADIATOR**
2. **INSTALL RADIATOR**
Place radiator in installed position and install four mounting bolts.
3. **INSTALL FOUR SHROUD MOUNTING BOLTS**
4. **CONNECT TWO RADIATOR HOSES**
Check hoses for cracks or damage.
5. **CONNECT COOLANT RESERVOIR TUBE**
6. **FILL RADIATOR**
Close radiator and engine drain cocks. Fill with a good brand of ethylene-glycol coolant.
Total capacity: 8.4 liters (8.9 US qts, 7.4 Imp. qts)
7. **START ENGINE AND CHECK FOR LEAKS**

STARTING SYSTEM

	Page
TROUBLESHOOTING	7-2
SPECIAL TOOLS AND TEST EQUIPMENT	7-2
STARTING SYSTEM CIRCUIT	7-2
REDUCTION TYPE STARTER	7-3

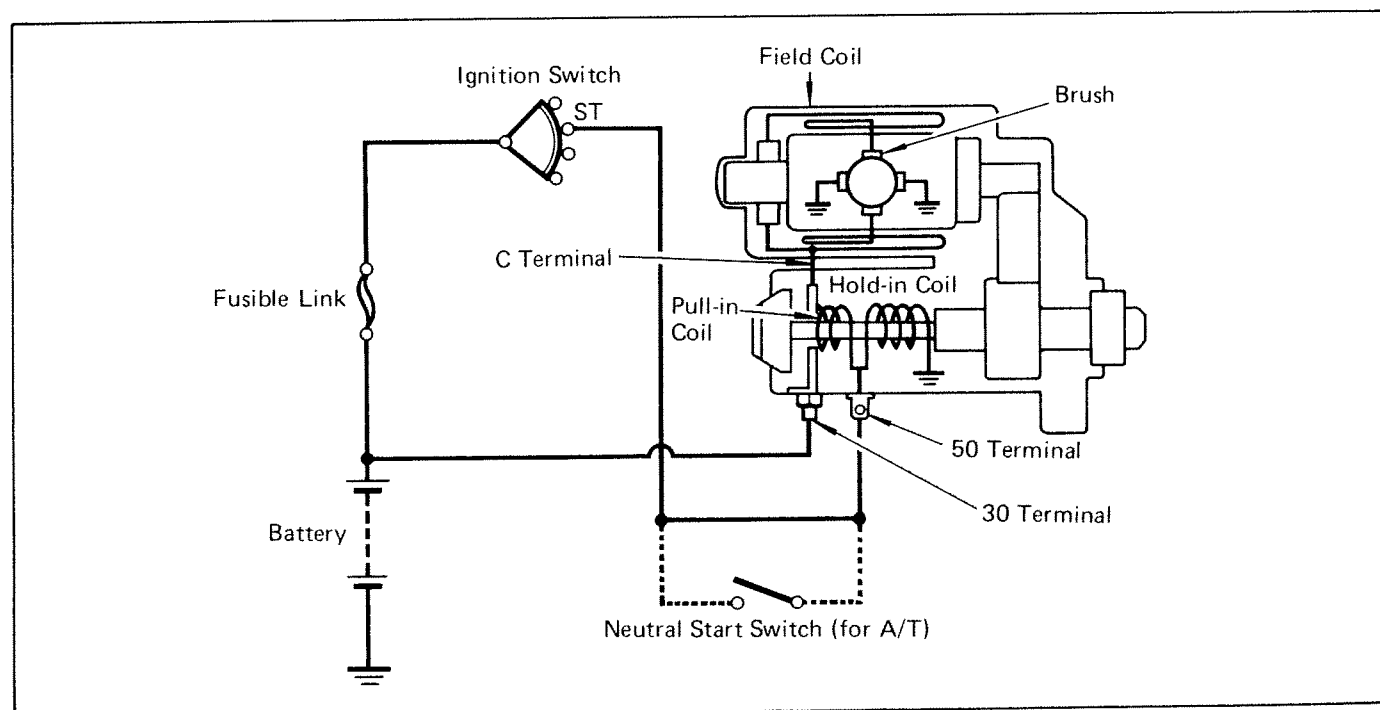
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not crank	Battery charge low	Check battery specific gravity Charge or replace battery	8-4
	Battery cables loose, corroded or worn	Repair or replace cables	
	Neutral start switch faulty (auto. trans.)	Replace switch	7-4 17-7
	Fusible link blown	Replace fusible link	
	Starter faulty	Repair starter	
Engine cranks slowly	Ignition switch faulty	Replace ignition switch	8-4
	Battery charge low	Check battery specific gravity Charge or replace battery	
	Battery cables loose, corroded or worn	Repair or replace cables	
Starter keeps running	Starter faulty	Repair starter	7-4 17-7
	Ignition switch faulty	Replace ignition switch	
	Short in wiring	Repair wiring	
Starter spins — engine will not crank	Pinion gear teeth broken or faulty starter	Repair starter	7-4
	Flywheel teeth broken	Replace flywheel	

SPECIAL TOOLS AND TEST EQUIPMENT

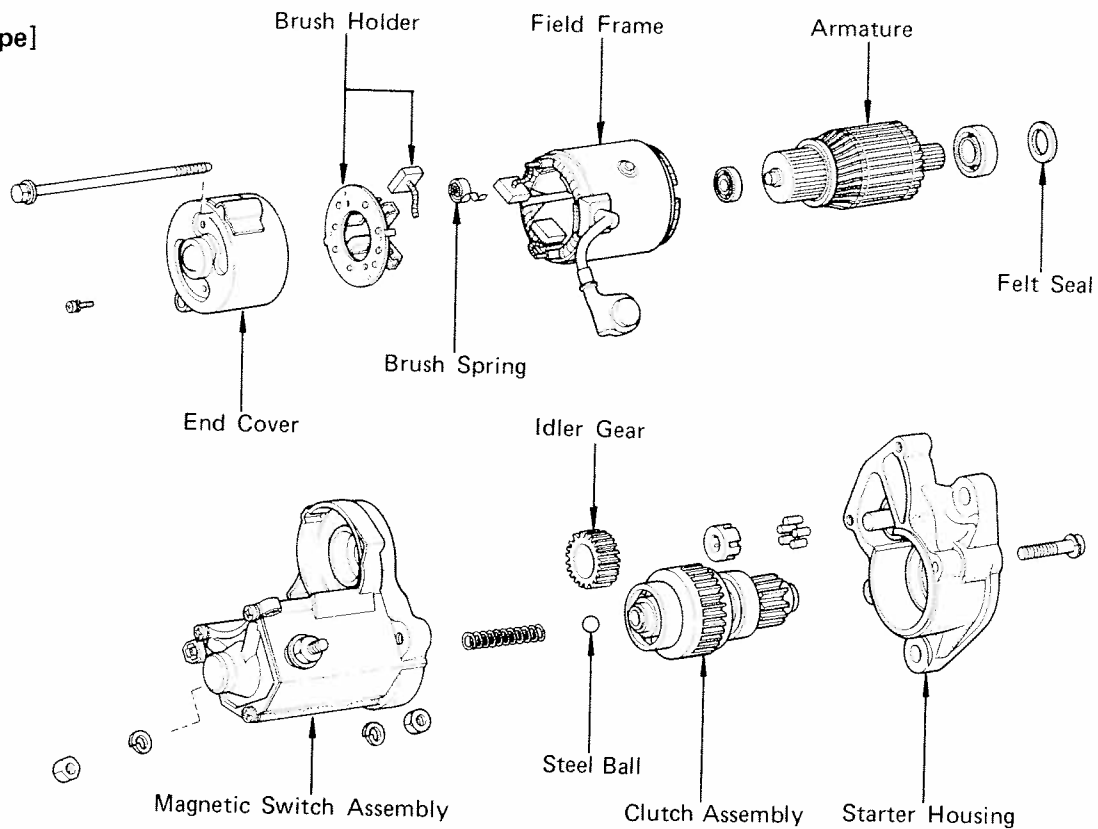
Tool	SST No.	Use
Voltmeter/ohmmeter/ammeter	Commercial	To check starter performance

STARTING SYSTEM CIRCUIT

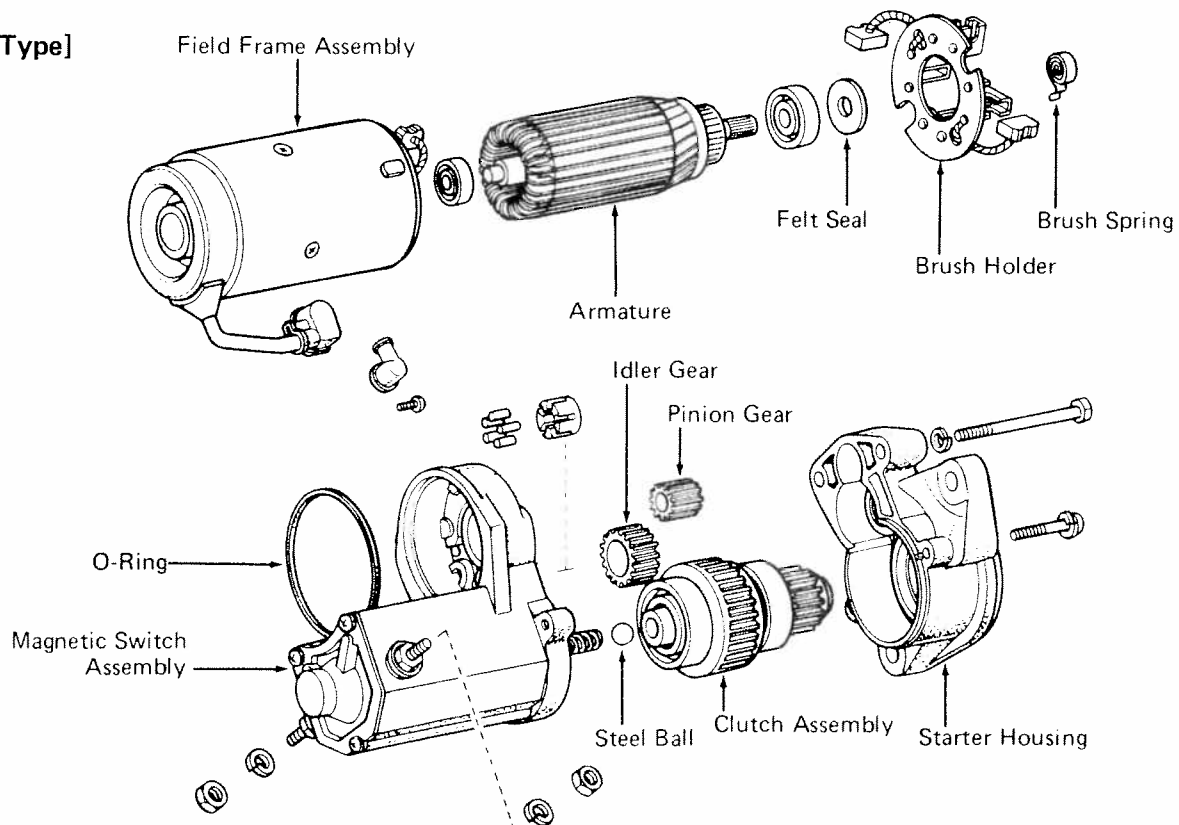


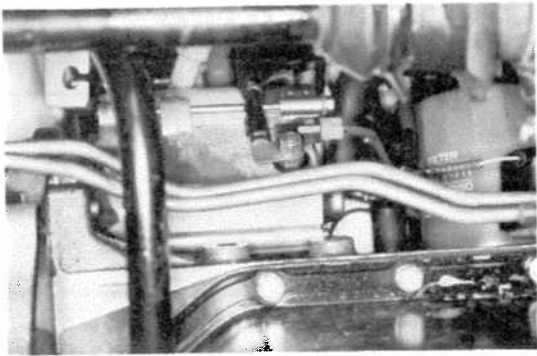
REDUCTION TYPE STARTER

[1.0 kw Type]



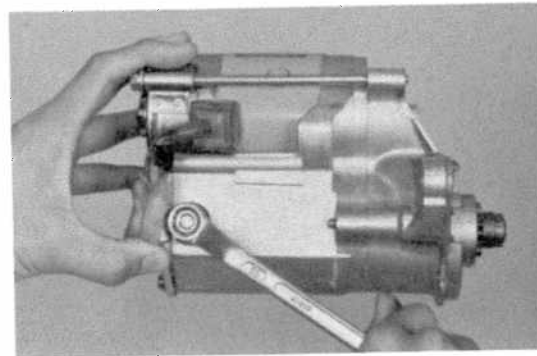
[1.4 kw Type]





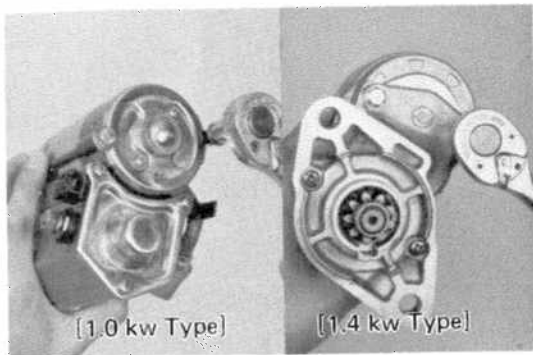
REMOVAL OF REDUCTION TYPE STARTER

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
2. **DISCONNECT TWO WIRES FROM STARTER**
Remove the nut and disconnect the battery cable from the magnetic switch on the starter motor. Disconnect the other wire from the terminal.
3. **REMOVE STARTER MOTOR**
Remove the two bolts, and remove the starter motor from the flywheel bellhousing.



DIASSEMBLY OF REDUCTION TYPE STARTER

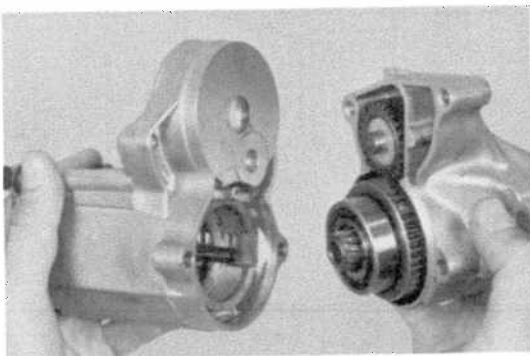
1. **REMOVE FIELD FRAME WITH ARMATURE FROM MAGNETIC SWITCH**
 - (a) Disconnect the lead wire from the magnetic switch terminal.
 - (b) Remove the two bolts. Pull out the field frame with armature from the magnetic switch.
 - (c) Remove the felt seal and O-ring (1.4 kw type only).



2. **REMOVE STARTER HOUSING FROM MAGNETIC SWITCH ASSEMBLY**

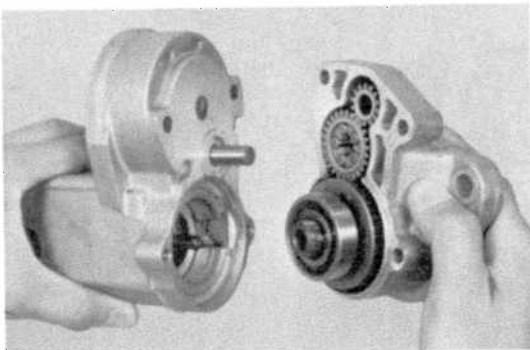
[1.0 kw type]

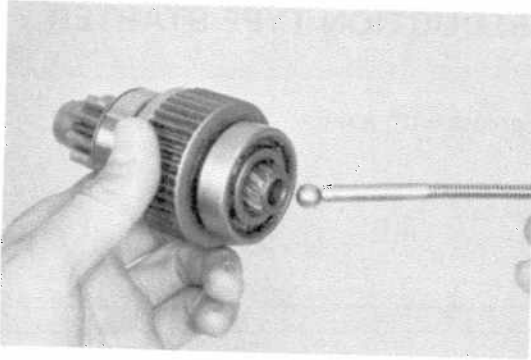
Remove the two screws and remove the starter housing with the idler gear and clutch.



[1.4 kw type]

Remove the two screws and remove the starter housing with the pinion gear, idler gear and clutch.

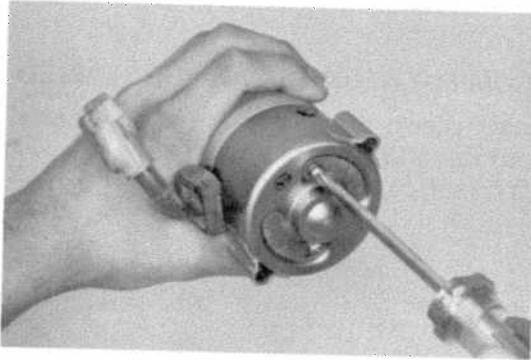




3. REMOVE CLUTCH ASSEMBLY AND GEARS FROM MAGNETIC SWITCH ASSEMBLY

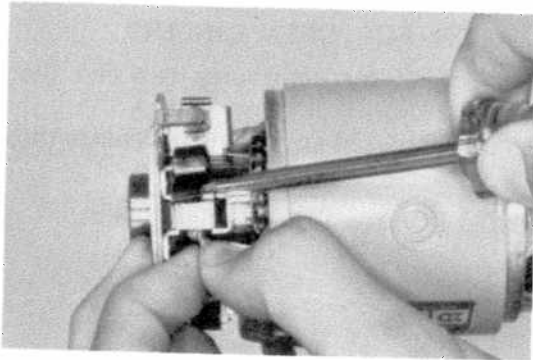
4. REMOVE STEEL BALL

Using a magnet, remove the steel ball from the clutch shaft hole.



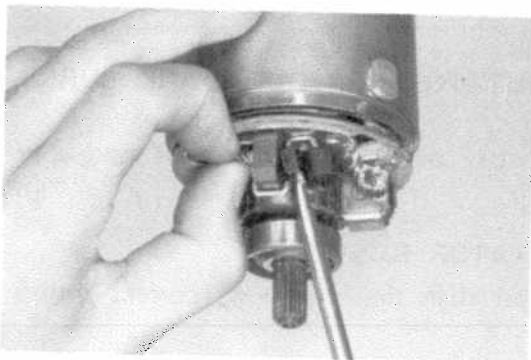
5. REMOVE BRUSHES AND BRUSH HOLDER
[1.0 kw type]

- (a) Remove the two screws and pull off the end cover from the field frame.



- (b) Using a screwdriver or steel wire, separate the brush and brush spring, and remove the brush from the brush holder.

- (c) Pull the brush holder off the armature.



- [1.4 kw type]

- (a) Using a screwdriver, separate the brush and brush spring and remove the brush from the brush holder.

- (b) Pull the brush holder off the armature.

6. REMOVE ARMATURE FROM FIELD FRAME

INSPECTION OF REDUCTION TYPE STARTER

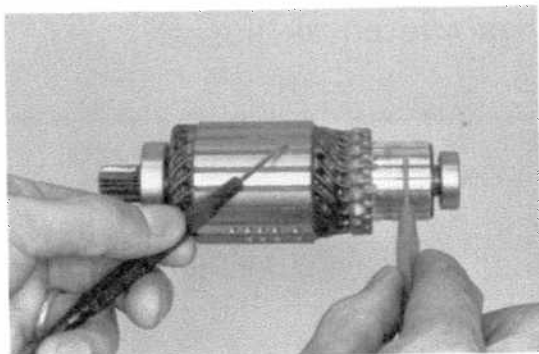
CLEAN ALL PARTS

Wipe off dirt and grease with a rag.

Armature Coil

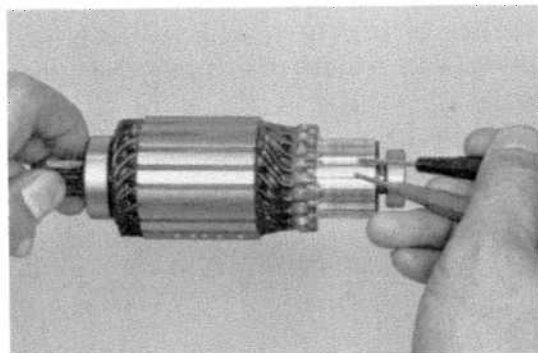
1. CHECK THAT COMMUTATOR IS NOT GROUNDED

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core. If there is continuity, replace the armature.



2. CHECK COMMUTATOR FOR OPEN CIRCUIT

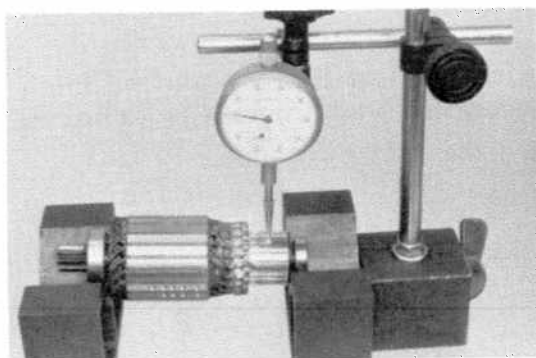
Using an ohmmeter, check for continuity between the segments of the commutator. If there is no continuity between any segment, replace the armature.



Commutator

1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, correct with sandpaper (No. 400) or a lathe.



2. CHECK COMMUTATOR RUNOUT

If runout is greater than the maximum, correct with a lathe.

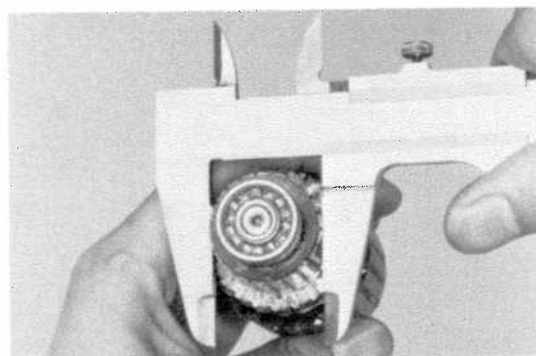
Maximum runout: 0.05 mm (0.0020 in.)

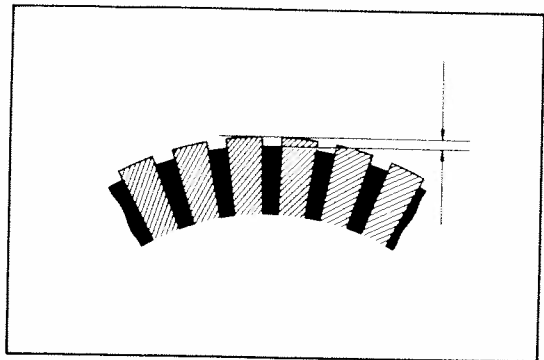
3. MEASURE DIAMETER OF COMMUTATOR

If the diameter of the commutator is less than the minimum, replace the armature.

Standard diameter: 30 mm (1.18 in.)

Minimum diameter: 29 mm (1.14 in.)





4. CHECK SEGMENT MICA

Check that the segment mica is clean and free of foreign particles.

If the mica depth is less than the minimum, correct with a hacksaw blade.

Standard mica depth: 0.45 – 0.75 mm
(0.0177 – 0.0295 in.)

Minimum mica depth: 0.2 mm (0.008 in.)

Field Coil

1. CHECK FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check for continuity between the lead wire and field coil brush lead.

If there is no continuity, replace the field coil.

2. CHECK THAT FIELD COIL IS NOT GRAOUNDED

Using an ohmmeter, check for continuity between the field coil end and field frame.

If there is continuity, repair or replace the field coil.

Brushes

MEASURE BRUSH LENGTH

If length is less than minimum, replace the brush and dress with emery cloth.

Standard length: 1.0 kw 13.5 mm (0.531 in.)

1.4 kw 14.5 mm (0.571 in.)

Minimum length: 10 mm (0.39 in.)

Brush Holder

CHECK INSULATION OF BRUSH HOLDER

Using an ohmmeter, check for continuity between ⊕ and ⊖ brush holders.

If there is continuity, repair or replace the brush holder.



Clutch and Gears

1. INSPECT GEAR TEETH

Inspect the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage. Replace if damaged. If damaged, also inspect the flywheel ring gear for wear or damage.

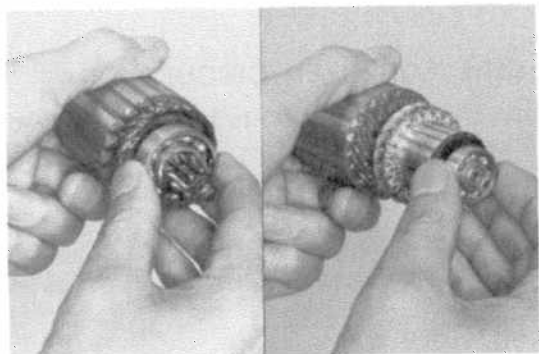
2. CHECK PINION

Rotate the pinion clockwise and check that it turns freely. Try to rotate the pinion counterclockwise and check that it locks.

Bearings

1. CHECK BEARINGS

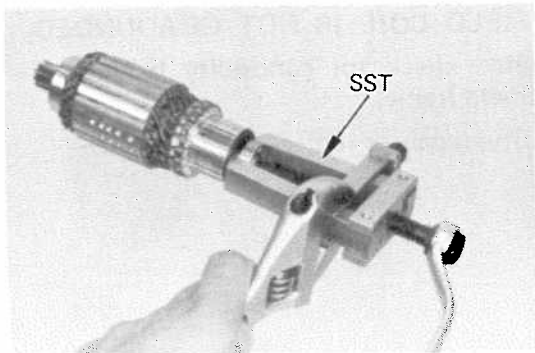
Turn each bearing by hand while applying force inward. If resistance is felt or if the bearing sticks, replace the bearing.



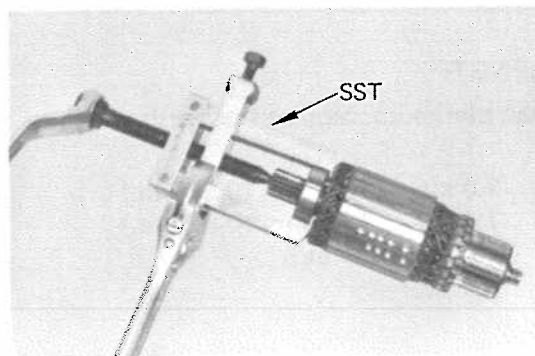
2. IF NECESSARY, REPLACE BEARINGS

(a) Using a bearing puller*, remove the bearing from the armature shaft.

*SST 09286-46011 or Commercial puller



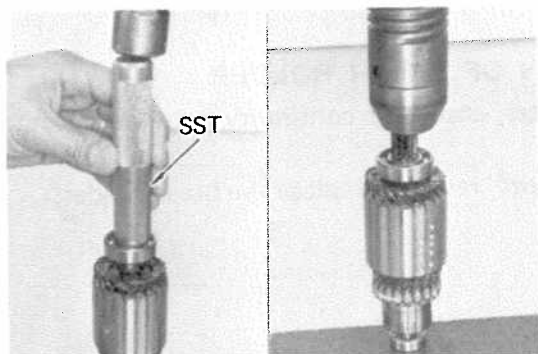
(b) Using a bearing puller, remove the other bearing from the opposite side.



(c) Using a bearing driver* and hammer, tap the front bearing onto the shaft.

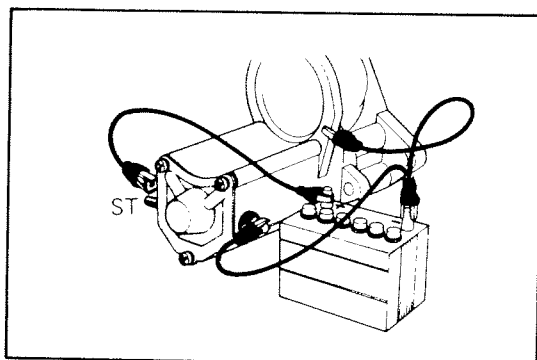
*SST 09285-76010 or Commercial driver

(d) Using a press, install the rear bearing onto the shaft.



Magnetic Switch

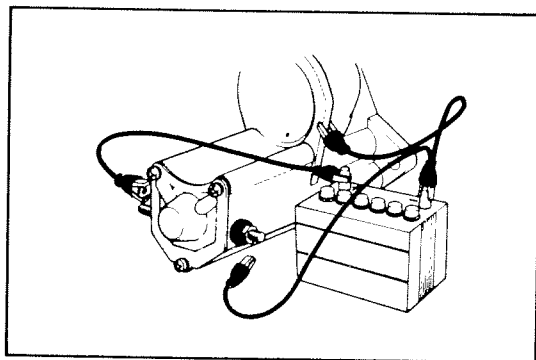
CAUTION: These tests must be performed quickly (within 3 — 5 seconds) to prevent the coil from burning out.



1. PERFORM PULL-IN TEST

Connect the battery to the magnetic switch as shown. Check that the plunger moves outward.

If the plunger does not move, replace the magnetic switch.



2. PERFORM HOLD-IN TEST

While connected as above with the plunger out, disconnect the negative lead from the main terminal. Check that the plunger remains out.

If the plunger returns inward, replace the magnetic switch.

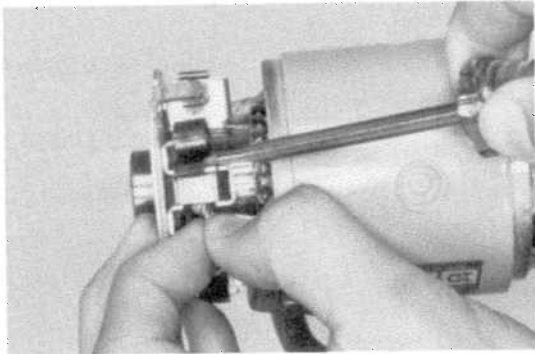
ASSEMBLY OF REDUCTION TYPE STARTER

(See illustration on page 7-3)

NOTE: Use high-temperature grease to lubricate bearings and gears when assembling the starter.

1. PLACE ARMATURE INTO FIELD FRAME

Apply grease to the armature rear bearing and insert armature into the field frame.

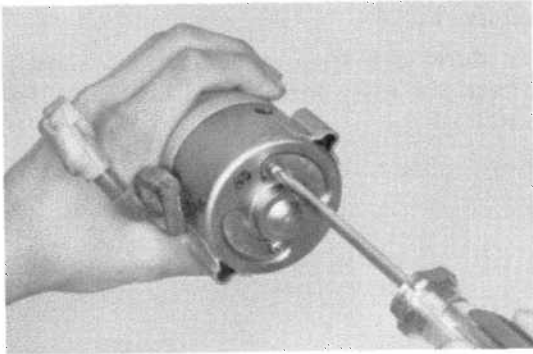


2. INSTALL BRUSH HOLDER AND BRUSHES

[1.0 kw type]

- (a) Place the brush holder over the armature shaft.
- (b) Using a screwdriver, hold the brush spring back and install the brush into the brush holder. Install four brushes.

NOTE: Make sure that the ⊕ lead wires are not grounded.



- (c) Install the end cover to the field frame.

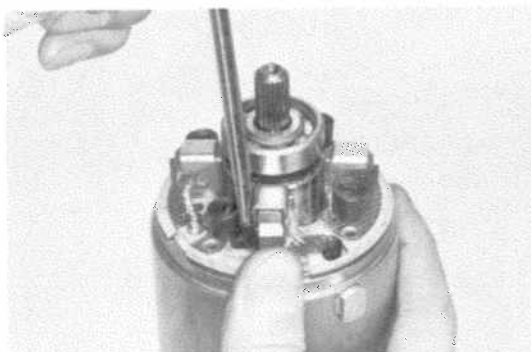


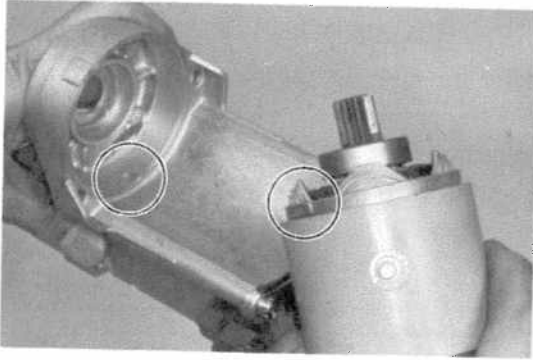
[1.4 kw type]

- (a) Place the brush holder over the armature shaft and align the tab on the holder with the notch in the field frame.

- (b) Using a screwdriver, hold the brush spring back and install the brush into the brush holder. Install four brushes.

NOTE: Make sure that the ⊕ lead wires are not grounded.

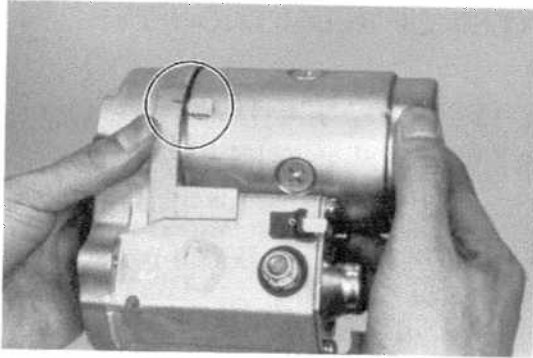




3. INSTALL FIELD FRAME WITH ARMATURE IN MAGNETIC SWITCH

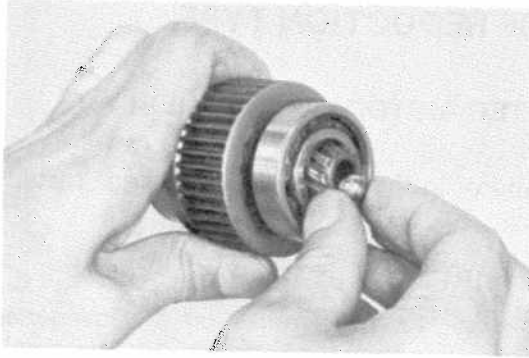
[1.0 kw type]

- (a) Place the felt seal on the armature shaft.
- (b) Match the protrusion of the field frame with the magnetic switch.



[1.4 kw type]

- (a) Place the felt seal on the armature shaft and the O-ring on the field frame.
- (b) Hold the field frame so that the coil lead wire is toward the magnetic switch. Install the field frame with the armature in the magnetic switch and align the bolt anchor on the field frame with the mark on the switch.



4. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

Apply grease to the ball and place into the clutch shaft hole.



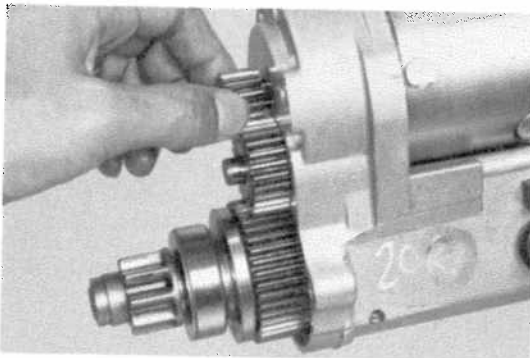
5. INSTALL GEARS AND CLUTCH ASSEMBLY

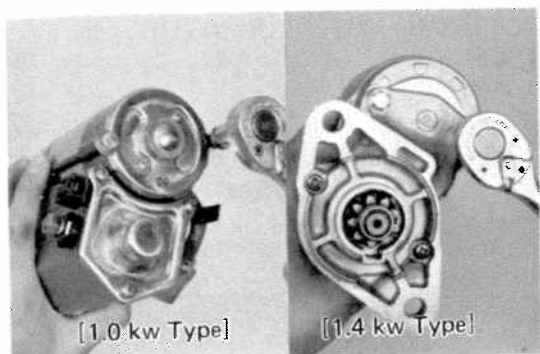
[1.0 kw type]

- (a) Apply grease to the idler gear and clutch assembly.
- (b) Place the clutch assembly and idler gear in the starter housing.

[1.4 kw type]

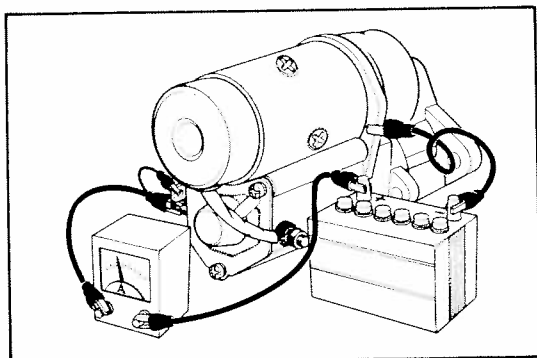
- (a) Place the clutch assembly in the magnetic switch.
- (b) Install the pinion and idler gears as shown, making sure that the gears mesh.
- (c) Apply grease to the gears.





6. INSTALL STARTER HOUSING

- (a) Place the starter housing on the magnetic switch and install two screws.
- (b) Install two through bolts.
- (c) Connect the coil lead to the terminal on the magnetic switch.

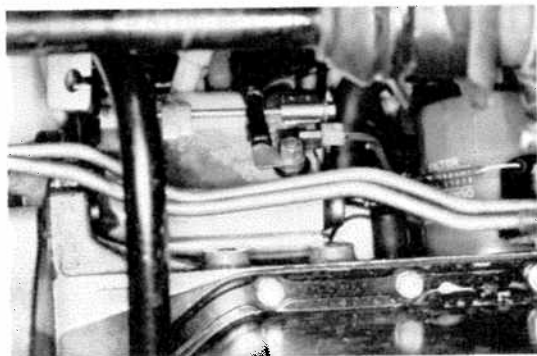


PERFORMANCE TEST OF REDUCTION TYPE STARTER

PERFORM ON-LOAD PERFORMANCE TEST

- (a) Connect the battery and ammeter to the starter as shown.
- (b) Check that the starter rotates smoothly and steady with the pinion moving out. Check that the ammeter reads the specified current.

Specified current: Less than 90 A



INSTALLATION OF REDUCTION TYPE STARTER

1. INSTALL STARTER MOTOR IN FLYWHEEL BELLHOUSING

Place the starter motor in the flywheel bellhousing. Install the two bolts.

2. CONNECT TWO WIRES TO STARTER

Connect the connector to the terminal on the magnetic switch. Connect the cable from the battery to the terminal on the switch, and install the nut.

3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

Check that the car starts.

CHARGING SYSTEM

	Page
PRECAUTIONS	8-2
TROUBLESHOOTING	8-2
SPECIAL TOOLS AND TEST EQUIPMENT	8-2
CHARGING CIRCUIT	8-3
ON-VEHICLE INSPECTION	8-4
ALTERNATOR	8-7
ALTERNATOR REGULATOR	8-16
TEST OF CHARGE LIGHT RELAY	8-18

PRECAUTIONS

1. Check that battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
3. Do not perform tests with a high voltage insulation resistance tester.
4. Never disconnect the battery when the engine is running.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Discharge warning light does not light with ignition "ON" and engine off	Fuse blown	Check "GAUGES" and "ENGINE" fuses	
	Light burned out	Replace light	
	Wiring connection loose	Tighten loose connections	
	Alternator voltage regulator faulty	Regulator	8-16
	Charge light relay faulty*	Check relay	8-18
	IC regulator faulty*	Replace IC regulator	8-5
Discharge warning light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	Adjust or replace drive belt	8-4
	Battery cables loose, corroded or worn	Repair or replace cables	
	Fuse blown	Check "ENGINE" fuse	
	Fusible link blown	Replace fusible link	
	Alternator voltage regulator, charge light relay*, IC regulator* or alternator faulty	Check charging system	8-4
	Wiring faulty	Repair wiring	

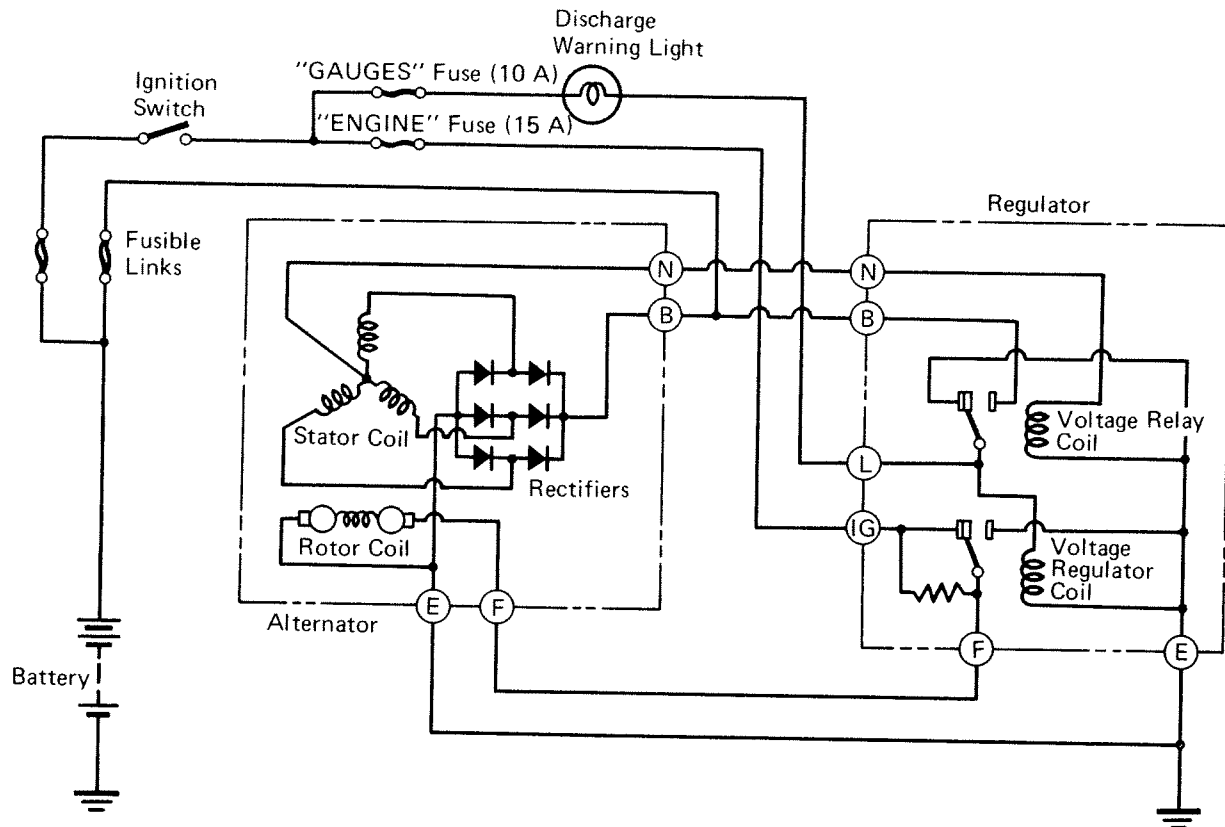
*IC Regulator Type only

SPECIAL TOOLS AND TEST EQUIPMENT

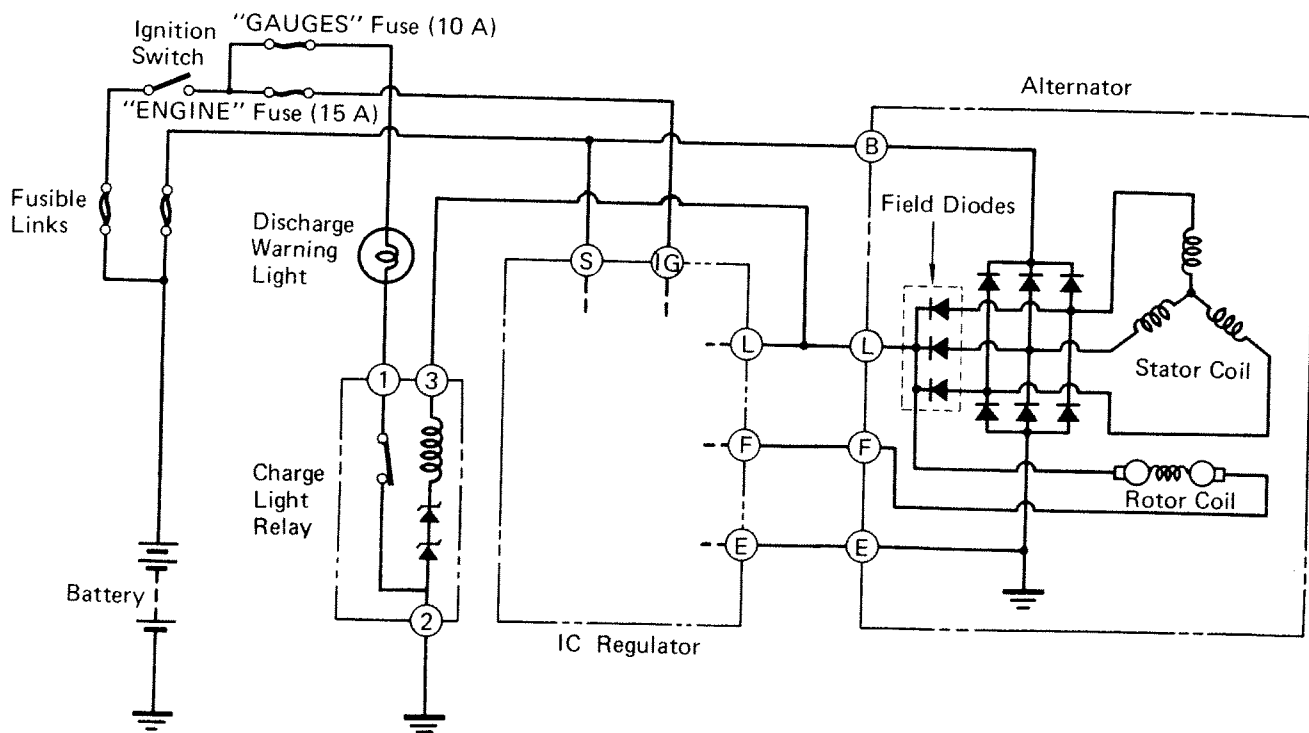
Tool	SST No.	Use
Battery/alternator tester	Commercial	To test charging circuit
Voltmeter/ohmmeter/ammeter	Commercial	To test charging circuit
Bearing pulley	09286-46011 or Commercial	To remove rear bearing

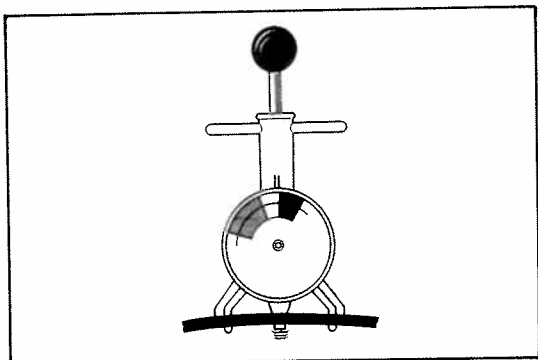
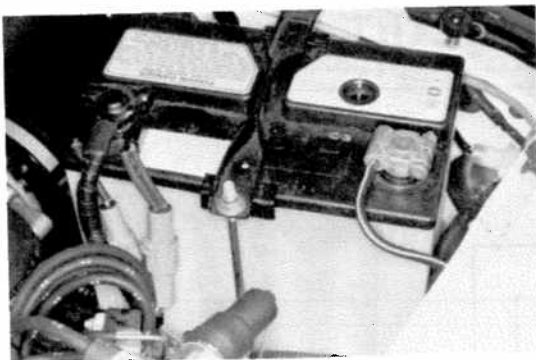
CHARGING CIRCUIT

TIRRILL REGULATOR TYPE



IC REGULATOR TYPE





ON-VEHICLE INSPECTION

1. CHECK BATTERY SPECIFIC GRAVITY

Check the specific gravity of each cell.

Standard specific gravity: 1.25 – 1.27 at 20°C (68°F)

2. CHECK BATTERY TERMINALS AND FUSIBLE LINK

(a) Check that the battery terminals are not loose or corroded.

(b) Check the fusible link for continuity.

3. CHECK DRIVE BELT TENSION

Drive belt tension:

New belt 125 ± 25 lb

Used belt 80 ± 20 lb

(w/ Borroughs belt tension gauge No. BT-33-73F)

4. CHECK FUSES FOR CONTINUITY

"ENGINE" fuse (15A)

"GAUGES" fuse (7.5A)

5. VISUALLY CHECK ALTERNATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

(b) Check that there are no abnormal noises from the alternator while the engine is running.

6. CHECK DISCHARGE WARNING LIGHT CIRCUIT

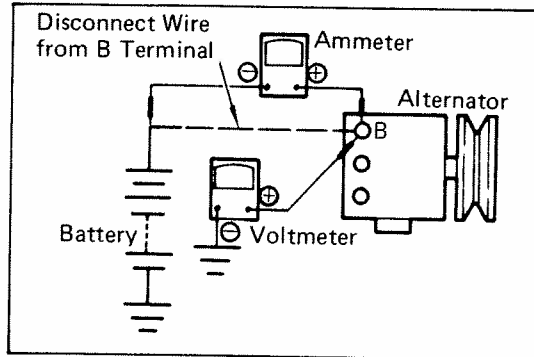
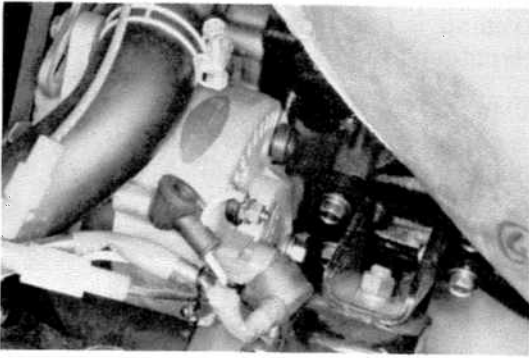
(a) Warm-up the engine and then turn it off.

(b) Turn off all accessories.

(c) Turn the ignition switch to ON. Check that the discharge warning light is lit.

(d) Start the engine. Check that the light goes out.

If the light does not come on and go off as specified, troubleshoot the warning light circuit.



7. CHECK CHARGING CIRCUIT WITHOUT LOAD

NOTE: If a battery/alternator tester is available, connect the tester to the charging circuit per manufacturer's instructions.

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:

- Disconnect the wire from B terminal of the alternator and connect the wire to the negative terminal of ammeter.
- Connect the test lead from the positive terminal of the ammeter to the B terminal of the alternator.
- Connect the positive lead of the voltmeter to the B terminal of the alternator.
- Connect the negative lead of the voltmeter to ground.

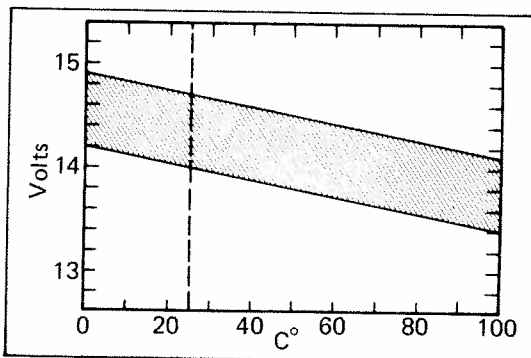
(b) Check the charging circuit as follows:

TIRRILL Regulator Type

With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: **Less than 10A**

Standard voltage: **13.8 – 14.8 volts**



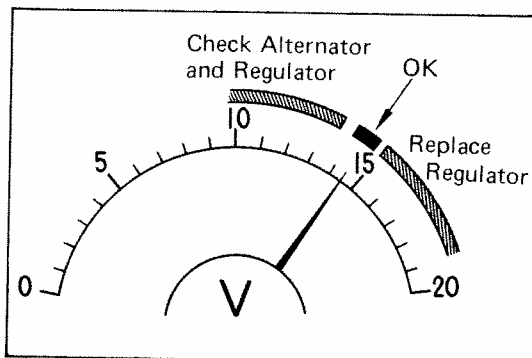
IC Regulator Type

With the engine running at 2,000 rpm, check the reading on the ammeter and voltmeter.

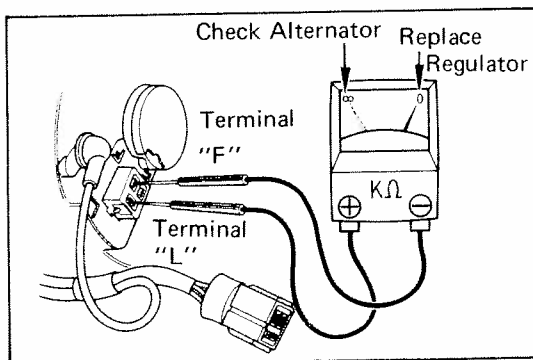
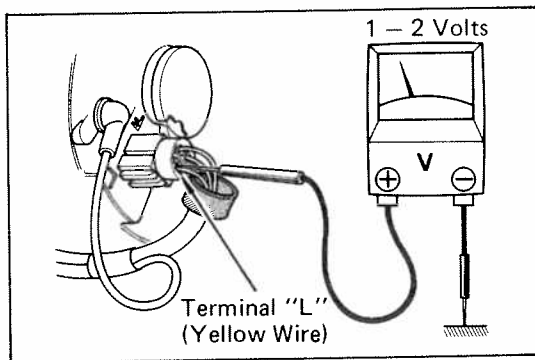
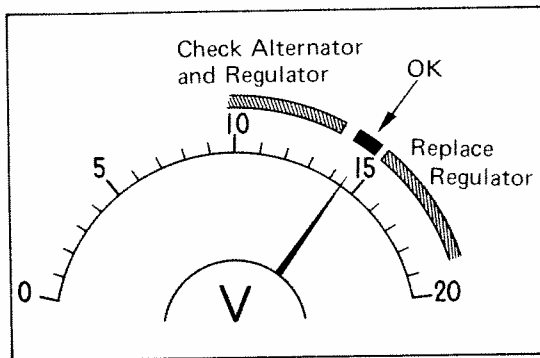
Standard amperage: **Less than 10A**

Standard voltage: **14.0 – 14.7 volts (25°C or 77°F)**

NOTE: If the temperature is not 25°C (77°F), find the voltage limits in the chart for the correct temperature.



If the voltage reading is greater than 15.0 volts, replace the IC regulator.



If the voltage reading is less than 13.5 volts, check the regulator and alternator as follows:

- Turn off the engine.
- Disconnect the connector from the IC regulator.
- Turn the ignition switch to ON.
- Check the voltage reading at the red wire terminal as shown.
If no voltage, check the "ENGINE" fuse and/or ignition switch.
- Connect the connector to the IC regulator.

- Check the voltage reading at the alternator "L" terminal.
If the voltage reading is 1 – 2 volts, check the alternator. (See page 8-7)

If same as battery voltage, turn ignition switch OFF and disconnect the connector from the alternator. Check that there is continuity between alternator terminals "L" and "F".

No continuity — Check the alternator. (See page 8-7)

Continuity — Replace the IC regulator.

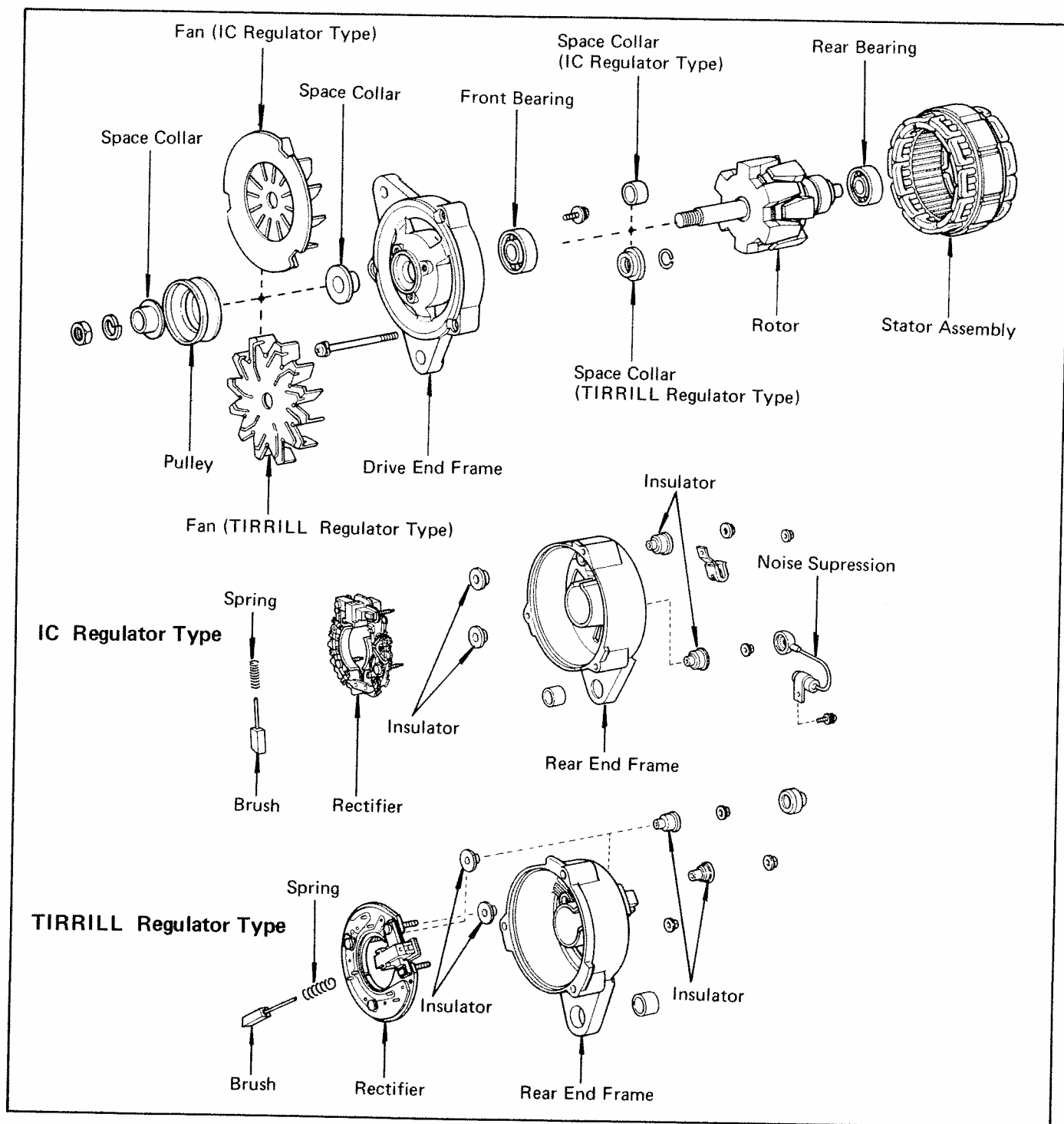
8. CHECK CHARGING CIRCUIT WITH LOAD

- With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater fan control switch to HI position.
- Check the reading on the ammeter.

Standard amperage: More than 20A

If the ammeter reading is less than 20A, repair the alternator. (See page 8-7)

ALTERNATOR



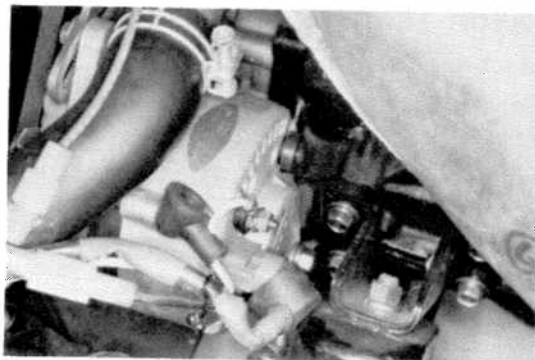
REMOVAL OF ALTERNATOR

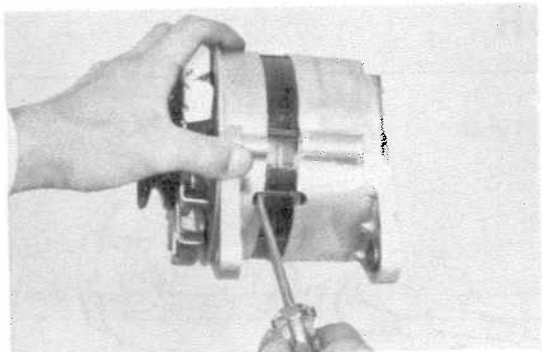
1. DISCONNECT WIRING FROM ALTERNATOR

- Disconnect the connector from the alternator.
- Remove the nut and the wire from the alternator.

2. REMOVE ALTERNATOR

- Remove the pivot and adjusting bolts.
- Remove the drive belt from the pulley, and remove the alternator.





DISASSEMBLY OF ALTERNATOR

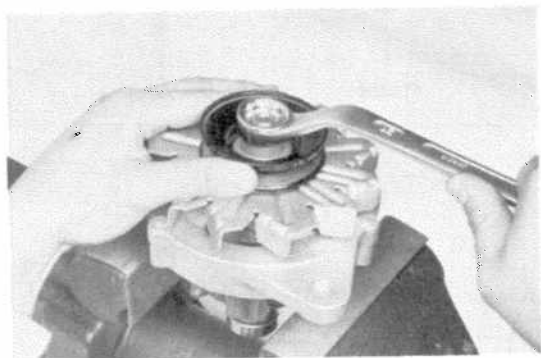
(See illustration on page 8-7)

1. REMOVE DRIVE END FRAME FROM STATOR

- (a) Remove three through bolts.

CAUTION: Do not pry coil wires.

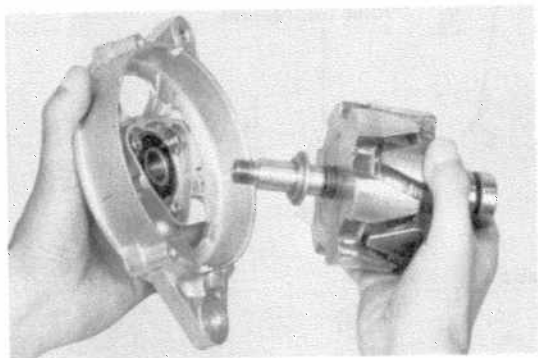
- (b) Pry the drive end frame from the stator.



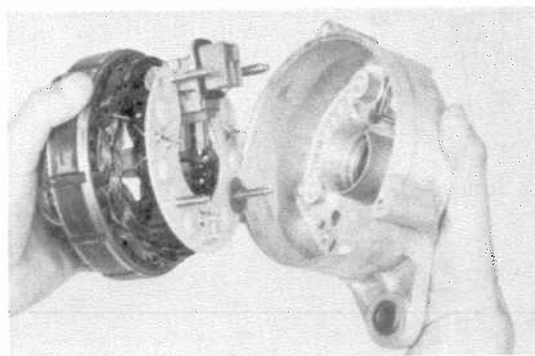
2. REMOVE PULLEY AND FAN

- (a) Clamp the rotor in a soft jaw vise.

- (b) Remove the pulley nut spring washer, space collar, pulley, fan and space collar.



3. REMOVE ROTOR FROM DRIVE END FRAME



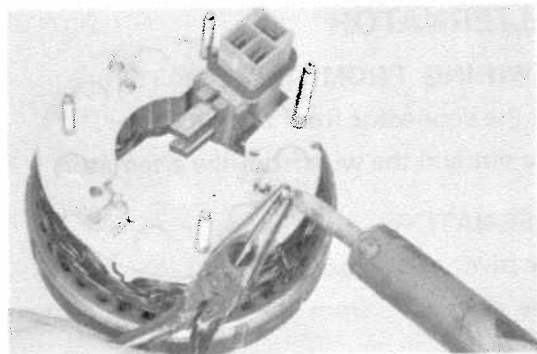
4. REMOVE REAR END FRAME FROM STATOR AND RECTIFIER HOLDER

- (a) Remove four nuts and terminal insulators.

- (b) Remove the noise suppression condenser. (IC Regulator Type)

- (c) Remove the rear end frame from the stator.

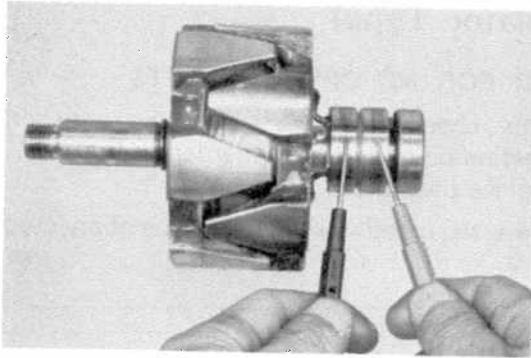
- (d) Remove the insulators from the rectifier holder studs.



5. UNSOLDER STATOR LEADS FROM RECTIFIER

CAUTION: Protect rectifiers from heat.

Hold the rectifier terminal with long nose pliers, and unsolder the leads.



INSPECTION OF ALTERNATOR Rotor

1. CHECK ROTOR FOR NO OPEN CIRCUITS

Using an ohmmeter, check for continuity between the slip rings.

Standard resistance:

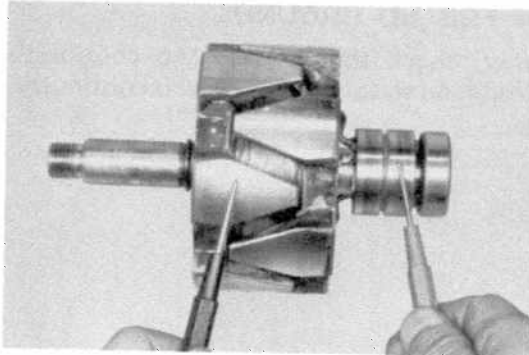
TIRRILL Regulator Type 3.9 — 4.1 ohms

IC Regulator Type 2.8 — 3.0 ohms

If there is no continuity, replace the rotor.

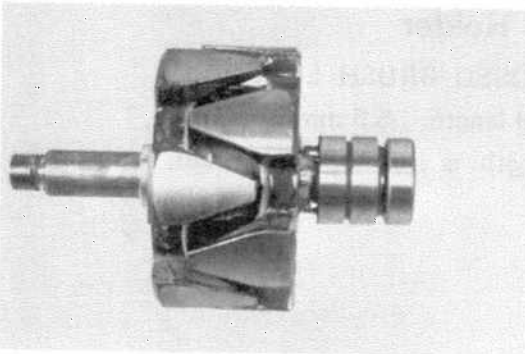
2. CHECK ROTOR FOR NO GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and the rotor. If there is continuity, replace the rotor.



3. INSPECT SLIP RINGS

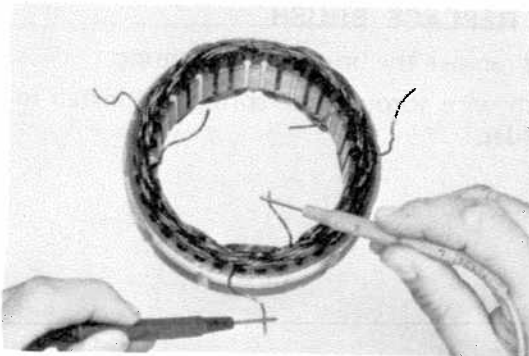
Check that the slip rings are not rough or scored. If the rings are rough or scored, replace the rotor.



Stator (TIRRILL Regulator Type)

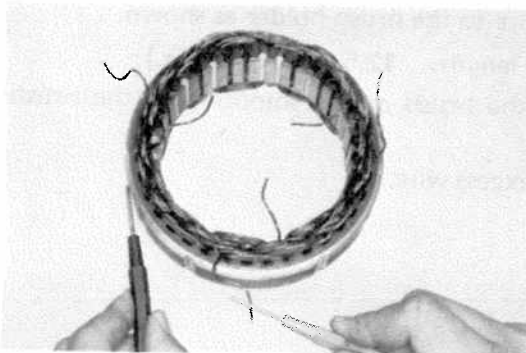
1. CHECK STATOR FOR NO OPEN CIRCUITS

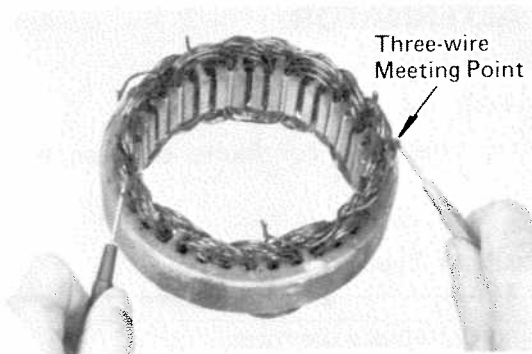
Using an ohmmeter, check that there is continuity between the two leads near each other. If there is no continuity, replace the stator.



2. CHECK STATOR FOR NO GROUND

Using an ohmmeter, check that there is no continuity between the coil leads and stator core. If there is continuity, replace the stator.



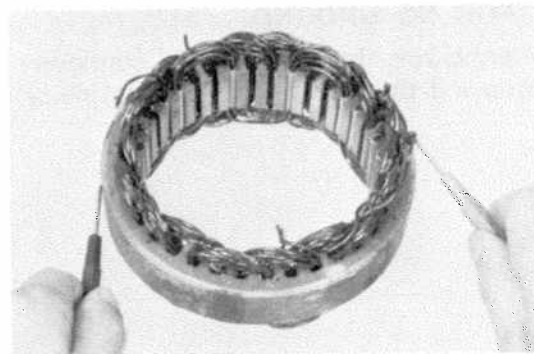


Stator (IC Regulator Type)

1. CHECK STATOR FOR NO OPEN CIRCUITS

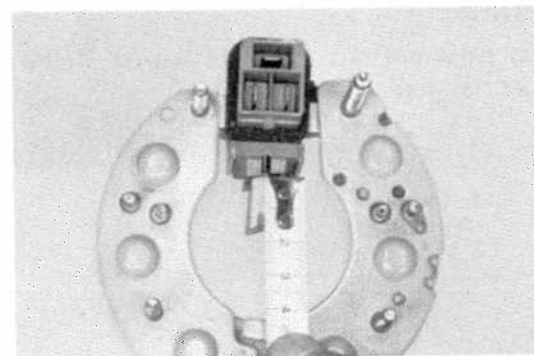
Using an ohmmeter, check that there is continuity between the three-wire meeting point and the other leads. If there is no continuity, replace the stator.

NOTE: At this time, the meeting wires should be connected with solder.



2. CHECK STATOR FOR NO GROUNDS

Using an ohmmeter, check that there is no continuity between the coil leads and stator core. If there is continuity, replace the stator.

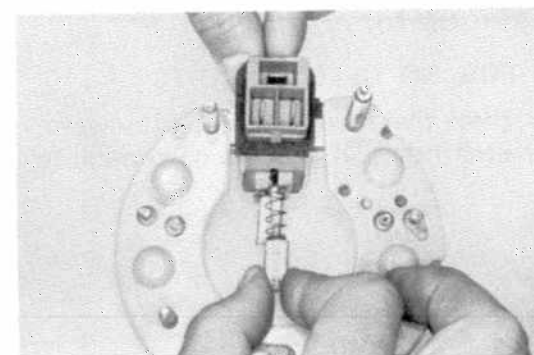


Brush and Brush Holder

1. MEASURE EXPOSED BRUSH LENGTH

Minimum exposed length: 5.5 mm (0.217 in.)

If the brush length is less than minimum, replace the brush.



2. IF NECESSARY REPLACE BRUSH

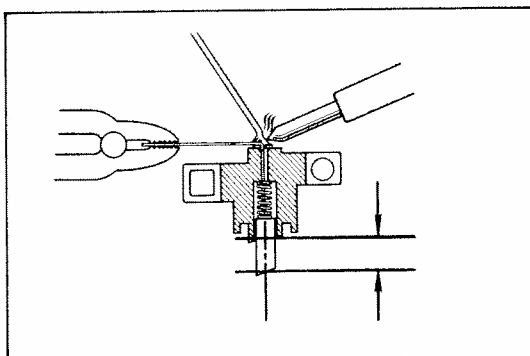
- (a) Unsolder and remove the brush and the spring.
- (b) Put the brush wire through the spring and install in the brush holder.

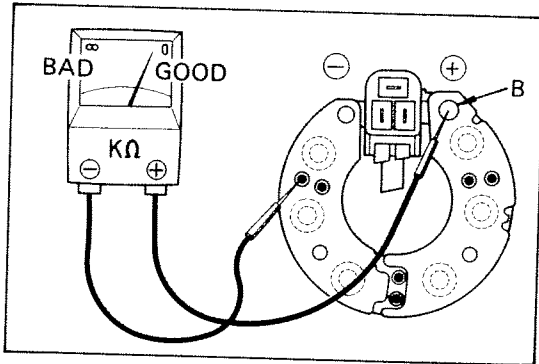
- (c) Solder the wire to the brush holder as shown.

Standard exposed length: 12.5 mm (0.492 in.)

- (d) Check that the brush moves smoothly in the brush holder.

- (e) Cut off the excess wire.



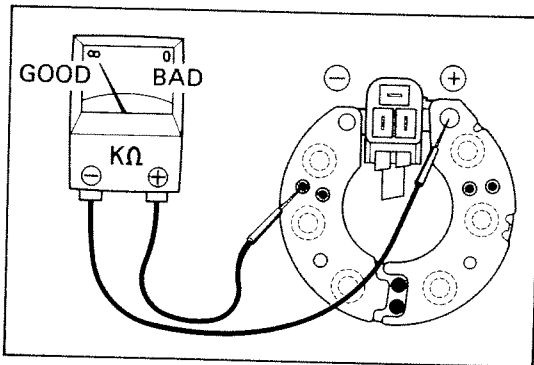


Rectifier Assembly (TIRRILL Regulator Type)

1. CHECK POSITIVE RECTIFIER

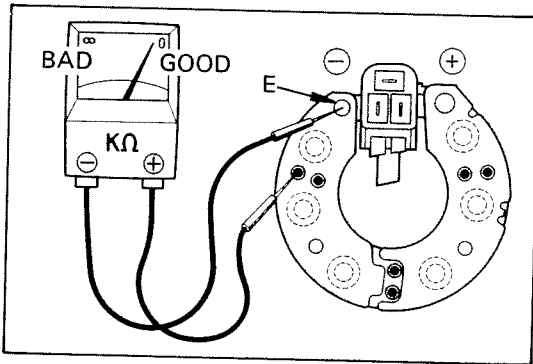
- (a) Using an ohmmeter, connect the \oplus lead to bolt B and the \ominus lead to each outer lead, and check for continuity.

If there is no continuity, replace the rectifier assembly with brush.



- (b) Reverse the test leads of the ohmmeter and check for continuity.

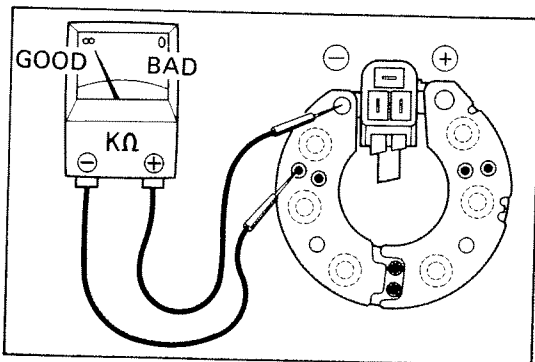
If there is continuity, replace the rectifier assembly with brush.



2. CHECK NEGATIVE RECTIFIER

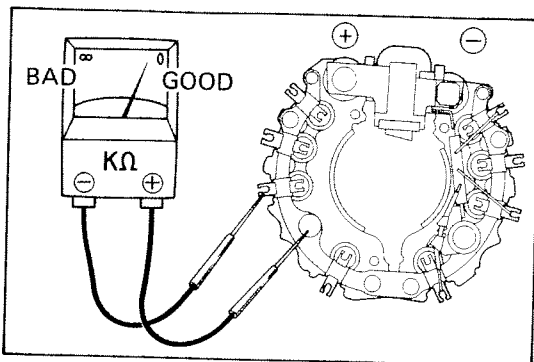
- (a) Using an ohmmeter, connect the \ominus lead to bolt E and the \oplus lead to each outer lead, and check for continuity.

If there is no continuity, replace the rectifier assembly with brush.



- (b) Reverse the test leads of the ohmmeter and check for continuity.

If there is continuity, replace the rectifier assembly with brush.

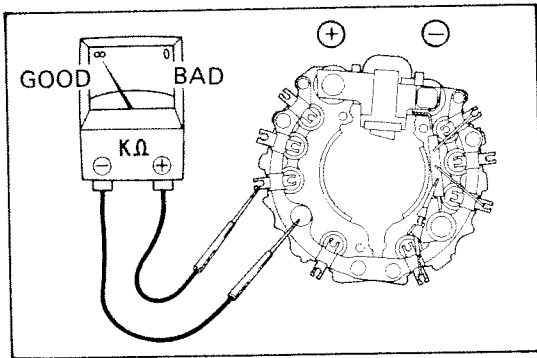


Rectifier Assembly (IC Regulator Type)

1. CHECK POSITIVE RECTIFIER

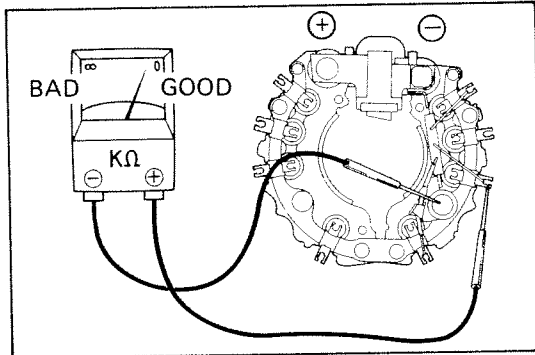
- (a) Using an ohmmeter, connect the \oplus lead to the rectifier holder and the \ominus lead to each rectifier terminal, and check for continuity.

If there is no continuity, replace the rectifier assembly with brush.



- (b) Reverse the test leads of the ohmmeter and check for continuity.

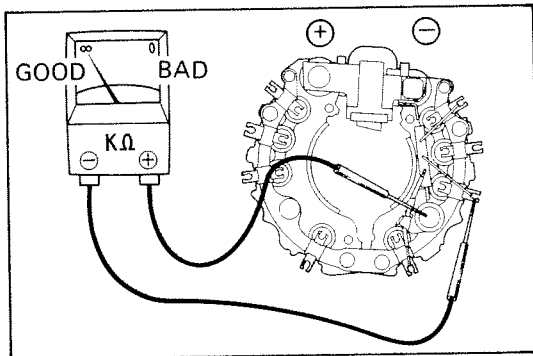
If there is continuity, replace the rectifier assembly with brush.



2. CHECK NEGATIVE RECTIFIER

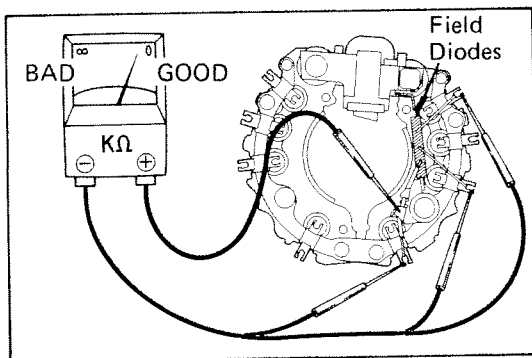
- (a) Using an ohmmeter, connect the \oplus lead to each rectifier terminal and the \ominus lead to the rectifier holder, and check for continuity.

If there is no continuity, replace the rectifier assembly with brush.



- (b) Reverse the test leads of the ohmmeter and check for continuity.

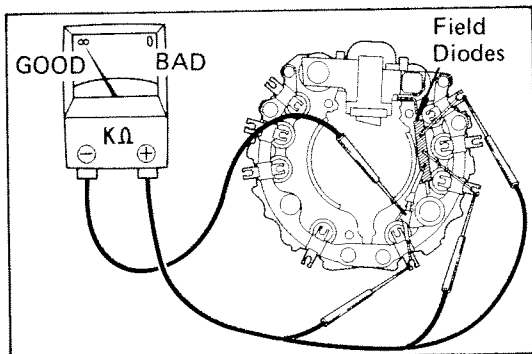
If there is continuity, replace the rectifier assembly with brush.



3. CHECK FIELD DIODES

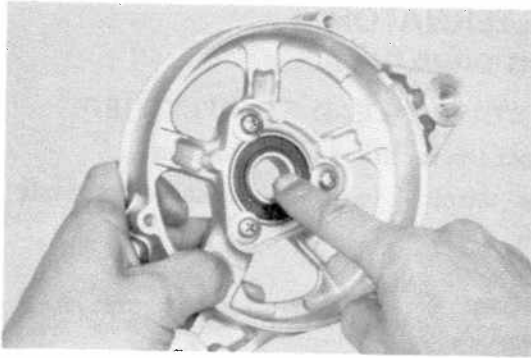
- (a) Using an ohmmeter, connect the \oplus lead to the ④ lead of the field diodes and the \ominus lead to the ①, ② and ③ leads of the field diodes.

If there is no continuity, replace the rectifier assembly with brush.



- (b) Reverse the test leads of the ohmmeter and check for continuity.

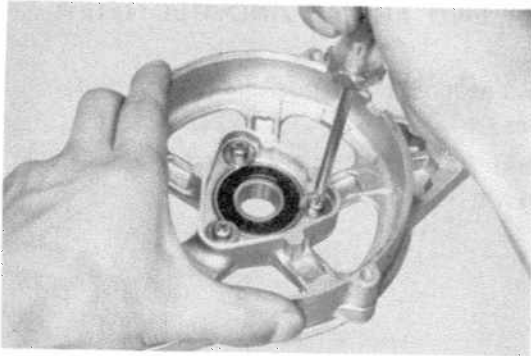
If there is continuity, replace the rectifier assembly with brush.



Bearings

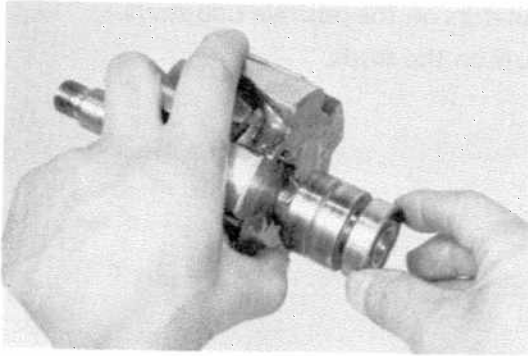
1. INSPECT FRONT BEARING

Check that the front bearing is not rough or worn. Replace if necessary.



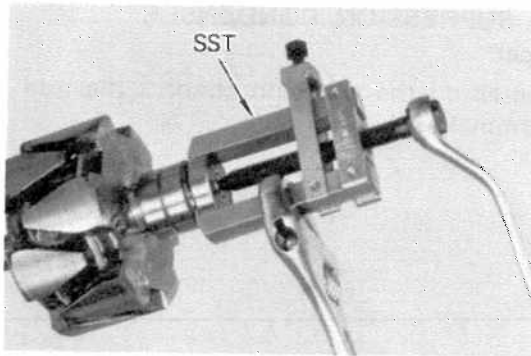
2. IF NECESSARY, REPLACE FRONT BEARING

Remove three screws and front bearing.



3. INSPECT REAR BEARING

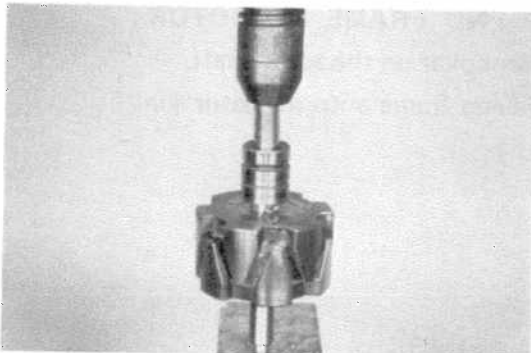
Check that the rear bearing is not rough or worn. Replace if necessary.



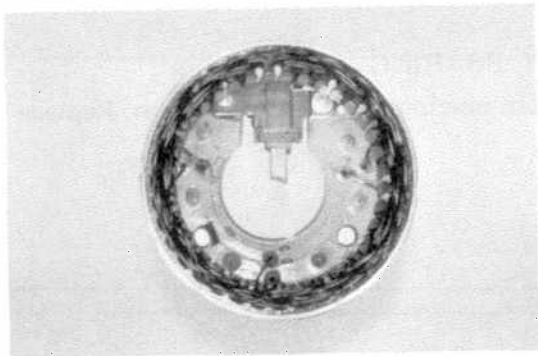
4. IF NECESSARY, REPLACE REAR BEARING

(a) Using puller*, remove rear bearing from the rotor shaft.

*SST 09286-46011 or Commercial puller



(b) Using a press, install the rear bearing onto the rotor shaft.

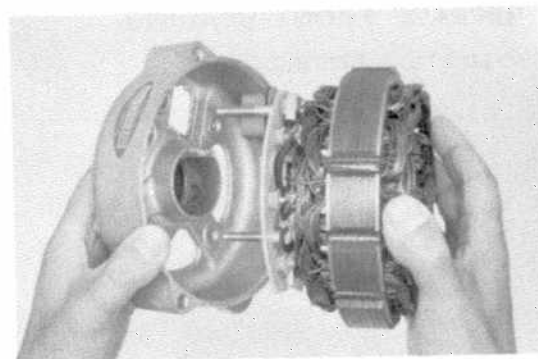


ASSEMBLY OF ALTERNATOR (See illustration on page 8-7)

1. SOLDER EACH STATOR LEAD TO RECTIFIER

CAUTION: Protect the rectifiers from the heat.

Hold the rectifier terminal with long nose pliers while soldering the leads.

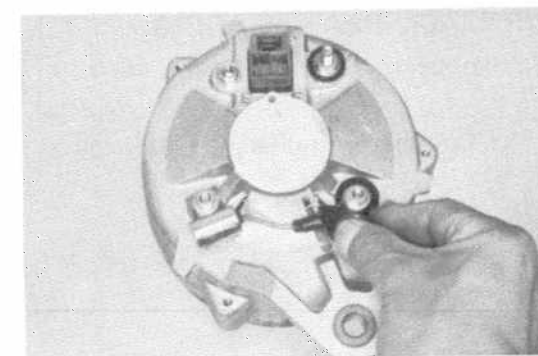


2. ASSEMBLE REAR END FRAME AND RECTIFIER HOLDER

- (a) Place two insulators on the positive side of the rectifier holder.
- (b) Install rear end frame on the rectifier holder. Check that the wires are not touching the case.

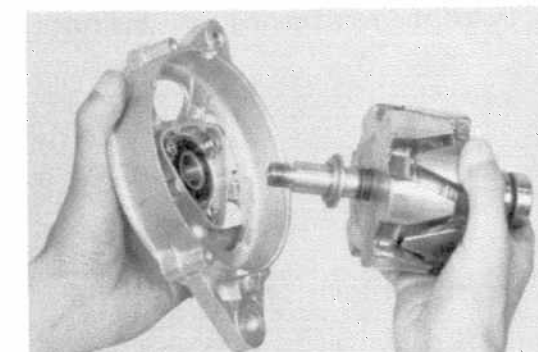


- (c) Place two insulators on the positive side studs.
- (d) Install four nuts on the studs.



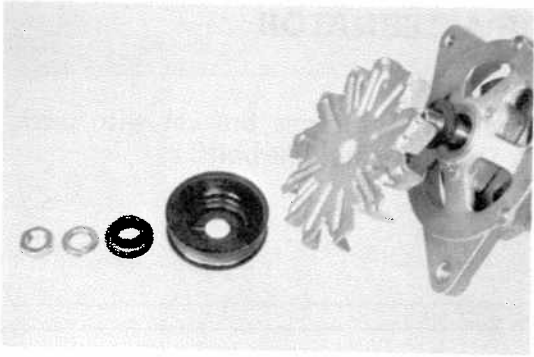
3. INSTALL NOISE SUPPRESSION CONDENSER (IC Regulator Type)

Mount the condenser on the stud and connect the lead wire to the "B" terminal of the alternator.



4. INSTALL DRIVE END FRAME ON ROTOR

- (a) Slide the spacer collar on the rotor shaft.
- (b) Slide the drive end frame onto the rotor shaft.

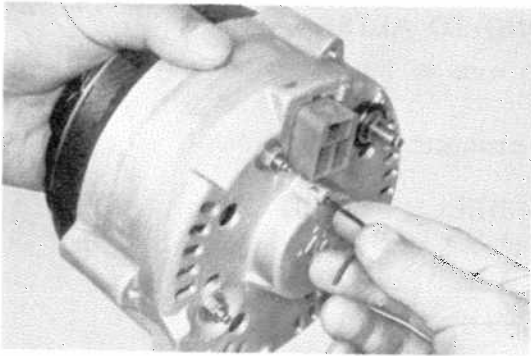
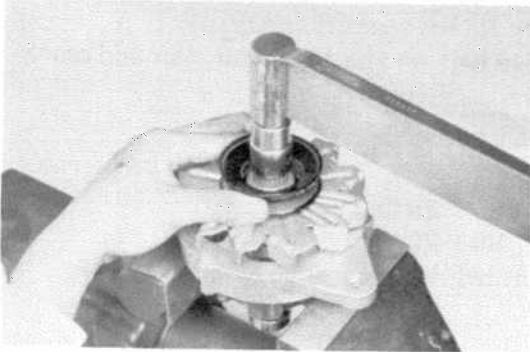


5. INSTALL FAN AND PULLEY

- (a) Place the rotor in a soft jaw vise.
- (b) Slide the spacer, fan, pulley and spacer collar on the rotor shaft.

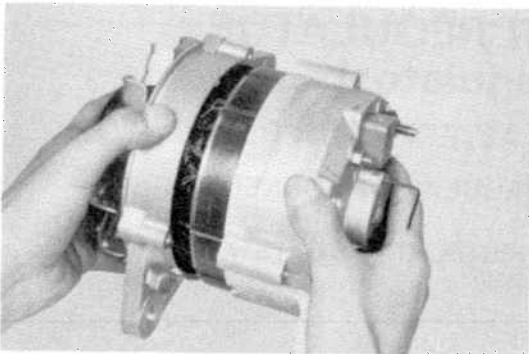
- (c) Tighten the nut.

Torque: 500 – 650 kg-cm (37 – 47 ft-lb)

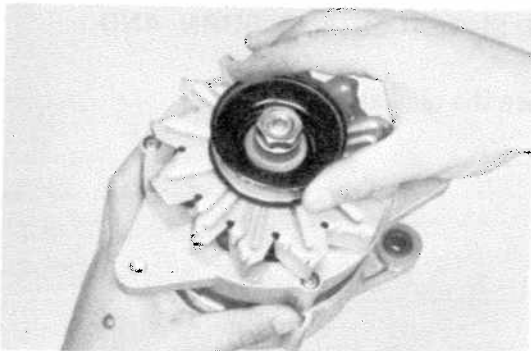


6. ASSEMBLE DRIVE END FRAME AND RECTIFIER END FRAME

- (a) Bend the rectifier lead wires back to clear the rotor.
- (b) Using a curved tool, push the brushes in as far as they will go and hold them in place by inserting a stiff wire through the access hole in the end frame.



- (c) Install the drive end frame onto the rectifier end frame by inserting the rear bearing on the rotor shaft into the rear end frame.
- (d) Install three through bolts.
- (e) Remove the wire from the access hole.

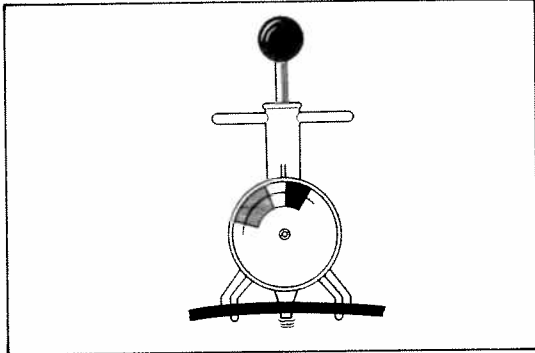


- (f) Make sure the rotor rotates smoothly.

INSTALLATION OF ALTERNATOR

1. INSTALL ALTERNATOR

Mount the alternator on the engine bracket with pivot and adjusting bolts. Do not tighten the bolts.



2. INSTALL DRIVE BELT

- (a) Place the drive belt on the alternator, fan and crankshaft pulleys.
- (b) Adjust the belt tension.

Drive belt tension:

New belt 125 ± 25 lb

Used belt 80 ± 20 lb

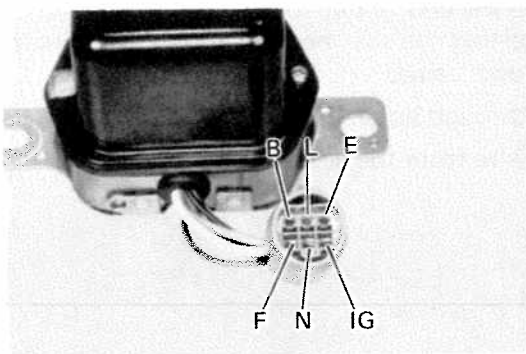
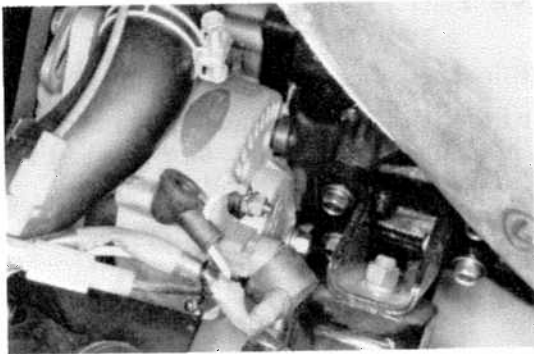
(w/ Borroughs belt tension gauge No. BT-33-73F)

3. CONNECT WIRING TO ALTERNATOR

- (a) Connect the wire to the alternator and install the nut.
- (b) Connect the connector to the alternator.

4. PERFORM ON-VEHICLE INSPECTION

(See steps 6 through 8, page 8-4)



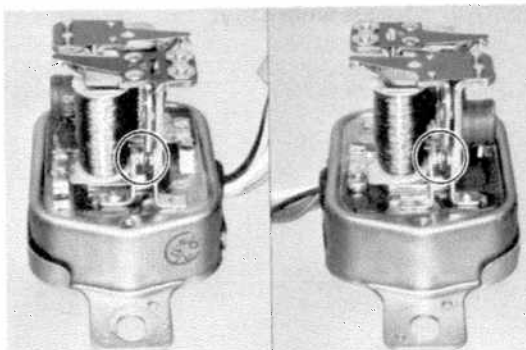
ALTERNATOR REGULATOR (TIRRILL Regulator)

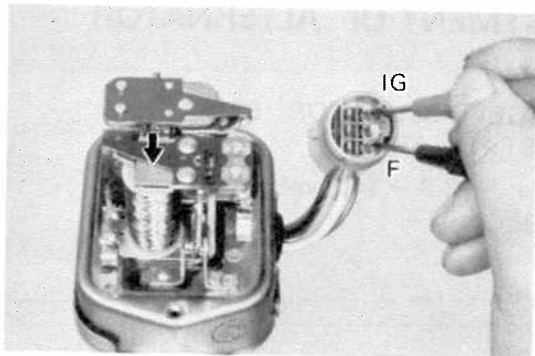
INSPECTION OF ALTERNATOR REGULATOR

1. DISCONNECT REGULATOR CONNECTOR
2. REMOVE TWO MOUNTING BOLTS AND REGULATOR

3. INSPECT POINT SURFACES FOR BURN AND DAMAGE

If defective, replace the regulator.





4. MEASURE RESISTANCE BETWEEN TERMINALS

- (a) Using an ohmmeter, measure the resistance between terminals IG and F.

Resistance (Voltage regulator):

At rest	0 ohm
Pulled in	Approx. 11 ohms

- (b) Using an ohmmeter, measure the resistance between terminals L and E.

Resistance (Voltage relay):

At rest	0 ohm
Pulled in	Approx. 100 ohms

- (c) Using an ohmmeter, measure the resistance between terminals B and E.

Resistance (Voltage relay):

At rest	infinity
Pulled in	Approx. 100 ohms

- (d) Using an ohmmeter, measure the resistance between terminals B and L.

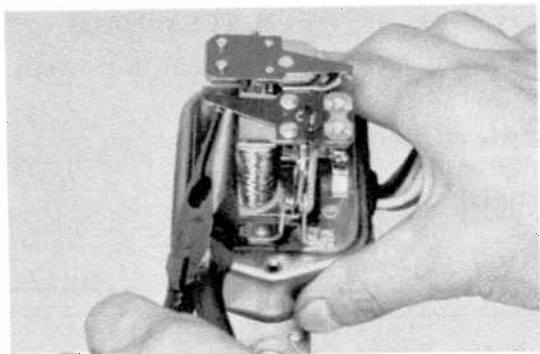
Resistance (Voltage relay):

At rest	infinity
Pulled in	0 ohm

- (e) Using an ohmmeter, measure the resistance between terminals N and E.

Resistance: Approx. 23 ohms

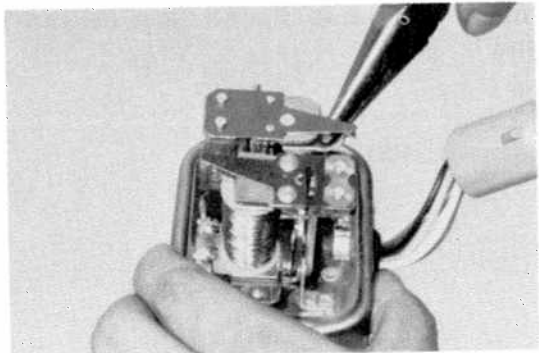
If any of the above checks are not correct, replace the alternator regulator.



VOLTAGE ADJUSTMENT OF ALTERNATOR REGULATOR

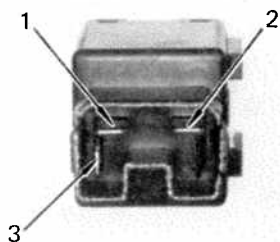
TO ADJUST VOLTAGE REGULATOR, BEND
REGULATOR ADJUSTING ARM

Regulating voltage: 13.8 – 14.8 volts



TO ADJUST VOLTAGE RELAY, BEND
RELAY ADJUSTING ARM

Relay actuating voltage: 4.5 – 5.8 volts



TEST OF CHARGE LIGHT RELAY (IC Regulator Type)

1. DISCONNECT RELAY CONNECTOR
2. REMOVE MOUNTING BOLT AND RELAY
3. CHECK RELAY FOR CONTINUITY
 - (a) Using an ohmmeter, check that there is continuity between the 1 and 2 terminals.
If there is no continuity, replace the relay.
 - (b) Connect a positive \oplus lead from the battery to the 3 terminal of the relay. Connect a negative \ominus lead to terminal 2. Using an ohmmeter, check for continuity between 1 and 2 terminals.
If there is continuity, replace the relay.
4. INSTALL RELAY