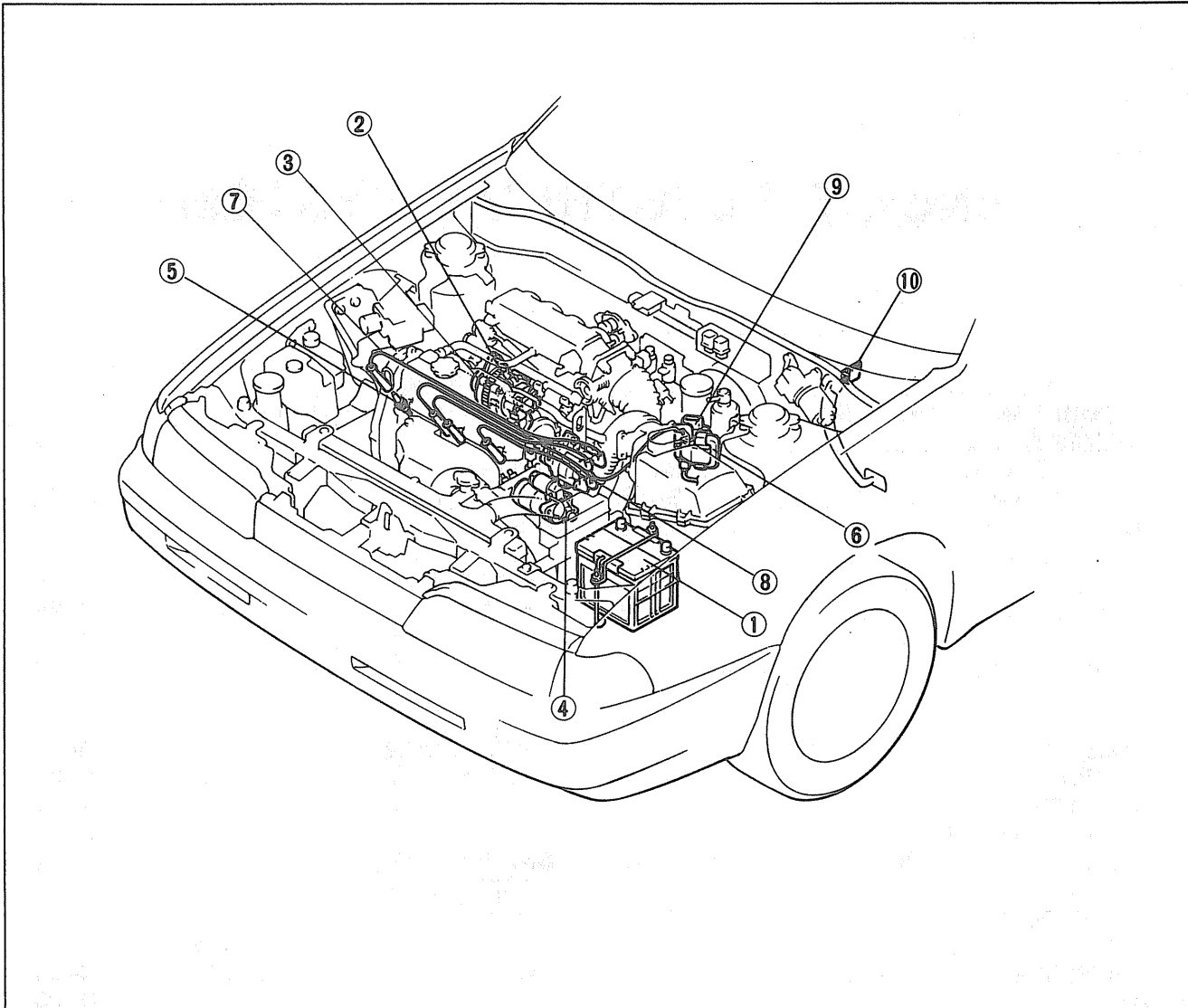


# ENGINE ELECTRICAL SYSTEM

<b>INDEX</b> .....	G- 2	CHECKING OPERATION .....	G-24
<b>OUTLINE</b> .....	G- 3	INSTALLATION .....	G-25
SPECIFICATIONS .....	G- 3	<b>SPARK PLUGS</b> .....	G-26
<b>TROUBLESHOOTING GUIDE</b> .....	G- 4	REMOVAL / INSTALLATION .....	G-26
<b>BATTERY</b> .....	G- 5	INSPECTION .....	G-26
INSPECTION .....	G- 5	<b>IGNITION COIL</b> .....	G-27
RECHARGE .....	G- 6	INSPECTION .....	G-27
<b>ALTERNATOR</b> .....	G- 7	<b>HIGH-TENSION LEAD</b> .....	G-27
CHARGING SYSTEM .....	G- 7	INSPECTION .....	G-27
SELF-DIAGNOSIS SYSTEM .....	G- 8	<b>DISTRIBUTOR</b> .....	G-28
TROUBLESHOOTING .....	G- 8	SPARK TEST .....	G-28
REMOVAL .....	G-11	IGNITION TIMING .....	G-28
DISASSEMBLY .....	G-11	SPARK CONTROL .....	G-29
INSPECTION .....	G-14	REMOVAL .....	G-29
ASSEMBLY .....	G-15	DISASSEMBLY .....	G-30
INSTALLATION .....	G-16	INSPECTION .....	G-31
V-BELT TENSION .....	G-16	ASSEMBLY .....	G-31
<b>STARTER</b> .....	G-17	INSTALLATION .....	G-32
STARTING SYSTEM .....	G-17	H.E.I. TROUBLESHOOTING .....	G-33
ON-VEHICLE INSPECTION .....	G-17	<b>IGNITER (TURBO)</b> .....	G-34
REMOVAL .....	G-18	PREPARATION .....	G-34
DISASSEMBLY .....	G-18	INSPECTION .....	G-34
INSPECTION .....	G-20	<b>STARTER INTERLOCK SYSTEM</b>	
ASSEMBLY .....	G-23	(MTX) .....	G-35
		INTERLOCK SWITCH .....	G-35

## INDEX



06U0GX-002

- |                            |           |                              |           |
|----------------------------|-----------|------------------------------|-----------|
| 1. Battery                 |           | 5. Spark plug                |           |
| Inspection.....            | page G- 5 | Removal / Installation.....  | page G-26 |
| Recharge .....             | page G- 6 | Inspection.....              | page G-26 |
| 2. Alternator              |           | 6. Ignition coil             |           |
| Troubleshooting .....      | page G- 8 | Inspection.....              | page G-27 |
| Removal .....              | page G-11 | 7. High-tension lead         |           |
| Disassembly .....          | page G-11 | Inspection.....              | page G-27 |
| Inspection.....            | page G-14 | 8. Distributor               |           |
| Assembly.....              | page G-15 | Spark test.....              | page G-28 |
| Installation .....         | page G-16 | Ignition timing.....         | page G-28 |
| 3. V-belt                  |           | Spark control.....           | page G-29 |
| Adjustment .....           | page G-16 | Removal .....                | page G-29 |
| 4. Starter                 |           | Disassembly .....            | page G-30 |
| On-vehicle inspection..... | page G-17 | Inspection.....              | page G-31 |
| Removal .....              | page G-18 | Assembly.....                | page G-31 |
| Disassembly .....          | page G-18 | Installation .....           | page G-32 |
| Inspection.....            | page G-20 | H.E.I. troubleshooting ..... | page G-33 |
| Assembly.....              | page G-23 | 9. Igniter (Turbo)           |           |
| Checking operation.....    | page G-24 | Inspection.....              | page G-34 |
| Installation .....         | page G-25 | 10. Interlock switch (MTX)   |           |
|                            |           | Inspection.....              | page G-35 |

OUTLINE

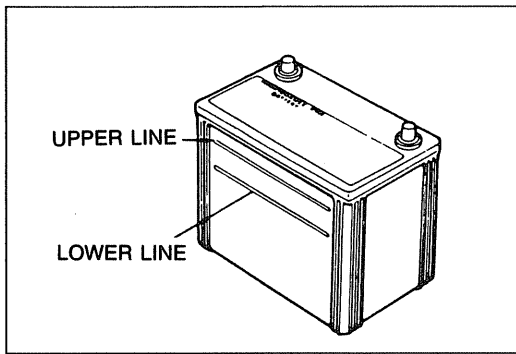
SPECIFICATIONS

Item		Model	Non-Turbo	Turbo
Battery	Voltage	V	12, Negative ground	
	Type and capacity (20 hour rate)		50D20L (50Ah), 55D23L (60Ah)	
Dark current		mA	Less than 20	
Alternator	Type		A.C.	
	Output	V-A	12-70	12-70 (MTX), 12-80 (ATX)
	Regulator type		Transistorized (built-in IC regulator)	
	Regulated voltage	V	14.1—14.7	
	Brush length	Standard	21.5 (0.846)	
	mm (in)	Minimum	8.0 (0.315)	
Drive belt tension mm (in)/98N (10 kg, 22 lb)	New		6—8 (0.24—0.31)	
	Used		7—9 (0.27—0.35)	
Starter	Type		Coaxial reduction	
	Output	V-kW	12-1.4	
	Brush length	Standard	17.5 (0.689)	
		mm (in)	Minimum	10.0 (0.394)
Ignition Timing		BTDC $6 \pm 1^\circ$ (Vacuum hoses disconnected)	BTDC $9 \pm 1^\circ$ (Test connector grounded)	
Distributor	Type		Fully transistorized (HEI)	Electronic spark advance (ESA)
	Centrifugal spark advance (Crank angle/Engine speed)	degree/rpm	-2—2 /1,200 12—16/2,400 12—16/3,500 16—20/4,500	Engine control unit controls spark advance
	Vacuum spark advance (Crank angle/Vacuum force)	degree/mmHg (inHg)	[A chamber] -2—2/110 (4.3) 18—22/275 (10.8)	
			[B chamber] -2—2/110 (4.3) -4—-8/200 (7.9)	
Spark plug	Type		NGK: ZFR5F-11 ZFR6F-11 ZFR7F-11 Nippon Denso: KJ16CR-11 KJ20CR-11 KJ22CR-11	
	Plug gap	mm (in)	1.0—1.1 (0.039—0.043)	
Firing order			1—3—4—2	

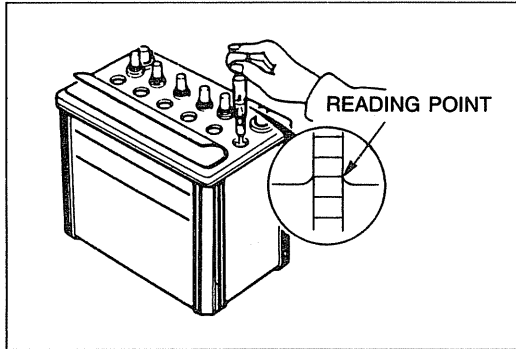
06U0GX-003

## TROUBLESHOOTING GUIDE

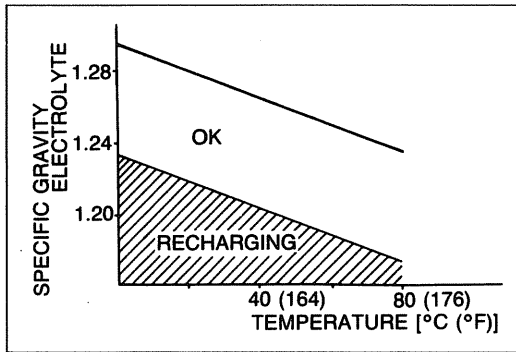
Problem	Probable Cause	Remedy	Page
<b>Starter does not turn at all, or turns too slow to start engine</b>	Battery and related parts		
	Poor contact of battery terminal(s)	Clean and tighten	G- 5
	Poor grounding of negative cable	Clean and repair	G- 5
	Voltage drop caused by discharged battery	Recharge	G- 5
	Insufficient voltage caused by battery malfunction	Replace	G- 5
	Ignition switch and related parts		
	Poor contact of ignition switch	Replace	Section T
	Loose ignition switch wiring or connector	Repair	
	Broken wire between ignition switch and magnetic switch	Repair or replace	
	Magnetic switch and related parts		
	Loose wiring and/or connectors	Repair	G-21
	Burnt magnetic switch contact plate or improper contact	Replace	G-21
	Broken wire in magnetic switch pull-in coil	Replace	G-21
	Broken wire in magnetic switch holding coil	Replace	G-21
	Starter motor and related parts		
	Poor contact of brushes	Adjust contact or replace	G-22
Fatigued brush spring	Replace	G-23	
Commutator malfunction	Repair	G-21	
Grounded armature	Replace	G-20	
Worn parts	Replace	G-20	
Starter interlock switch			
Short circuit of interlock system	Replace	G-35	
<b>Starting problem</b>	Insufficient battery capacity	Recharge	G- 5
	Malfunction of spark plug(s)	Clean, adjust or replace	G-26
	Loose primary wiring	Tighten	G-27
	Damaged distributor cap or rotor	Replace	G-31
	Ignition coil malfunction	Replace	G-27
Igniter malfunction	Replace	G-34	
<b>Starter turns but engine does not turn</b>	Tip of overrunning clutch pinion worn	Replace	G-22
	Weakened overrunning clutch drive spring	Replace	G-22
	Worn overrunning clutch	Replace	G-22
	Binding on spline	Replace	G-22
	Worn brushing	Replace	G-22
<b>Starter motor turns continuously (does not stop)</b>	Sticking contact plate of magnetic switch	Replace	G-21
	Layer shorting of coil of magnetic switch	Replace	G-21
	Ignition switch does not return	Replace	Section T
<b>Misfiring of engine</b>	Dirty, damaged or worn spark plug(s)	Clean or replace	G-26
	Malfunction of wiring or poor wiring contact	Replace	Section T
	Damaged distributor cap	Replace	G-31
<b>Discharging of battery</b>	Loose V-belt	Adjust	G-16
	Grounded or broken stator coil	Replace	G-14
	Broken rotor coil	Replace	G-14
	Poor contact of brush and slip ring	Clean or replace	G-15
	Malfunction of rectifier	Replace	G-15
	Malfunction of IC regulator	Replace	
	Insufficient or unsuitable battery electrolyte	Adjust	G- 5
	Malfunction of battery electrode (internal short circuit)	Replace	G- 5
	Poor contact of battery terminal(s)	Clean and tighten	G- 5
	Excessive electric load	Check power consumption	G- 5
<b>Overcharging of battery</b>	IC regulator malfunction	Replace	
<b>Poor acceleration</b>	Mis-adjusted ignition timing	Adjust	G-28
	Distributor malfunction	Repair or replace	G-28
<b>Knocking</b>	Mis-adjusted ignition timing	Adjust	G-28
	Distributor malfunction	Repair or replace	G-31



53G05X-005



96U05X-003



**BATTERY**

**INSPECTION**

**Terminal and Cable**

1. Check the tightness of the terminals to ensure good electrical connections. Clean the terminals and coat them with grease after tightening the terminal.
2. Inspect for corroded or frayed battery cables.
3. Check the rubber protector on the positive terminal for proper coverage.

**Electrolyte Level**

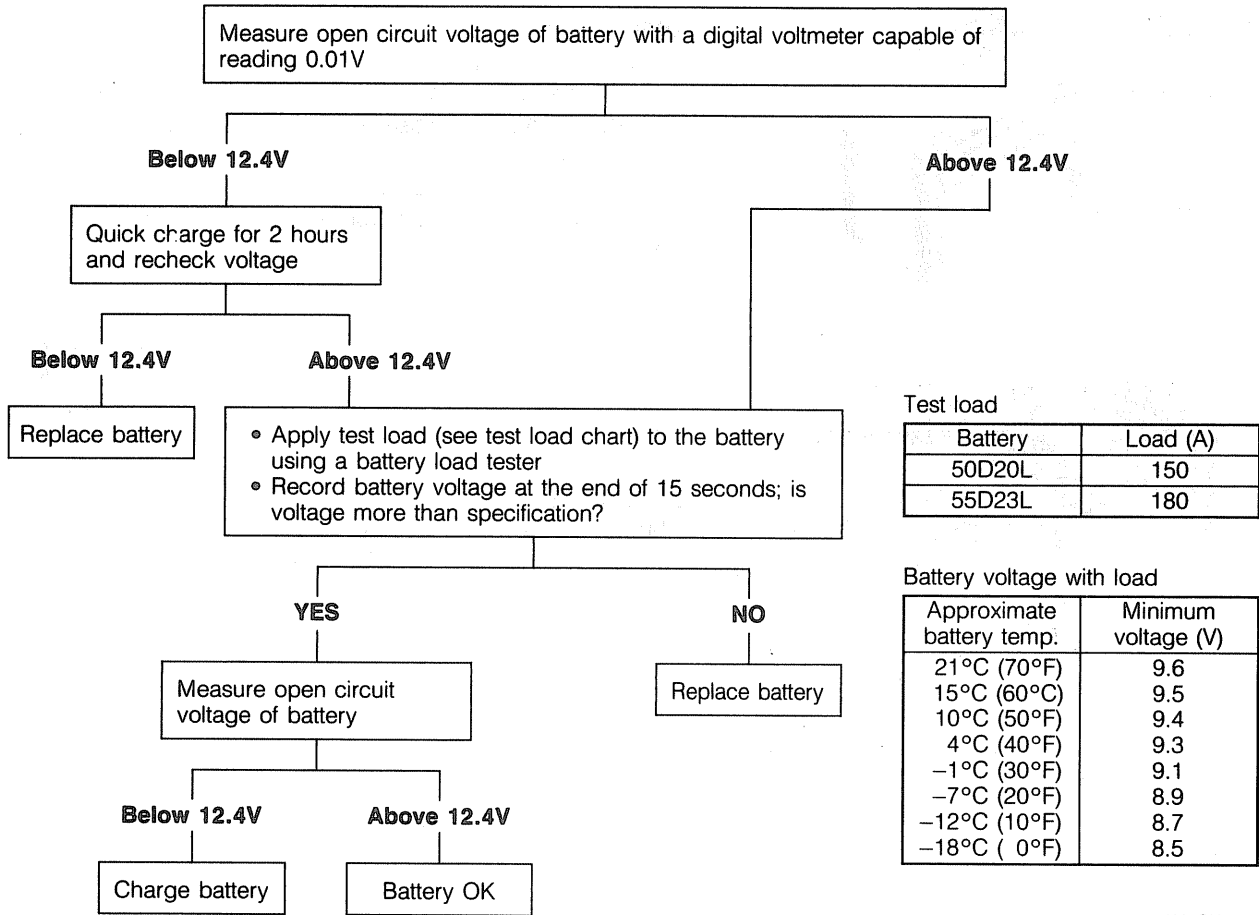
1. Check whether or not the electrolyte level lies between the "UPPER LEVEL" and the "LOWER LEVEL" lines.
2. If low, add distilled water to the "UPPER LEVEL" line. Do not overfill.

**Specific Gravity**

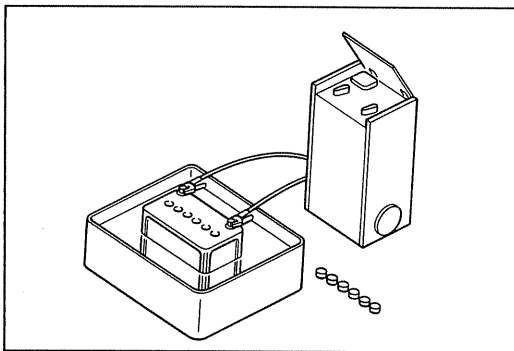
1. Measure the specific gravity with a hydrometer.
2. If the specific gravity reading is less than specified, recharge the battery.

**G**

Battery discharge test



13U0GX-011



06U0GX-026

RECHARGE

Battery	Slow charge (A)	Quick charge (A)
50D20L	Under 5	Max. 20
55D23L	Under 6	

Slow Charging

It is not necessary to remove the vent caps to perform a slow charge.

Quick Charging

Warning

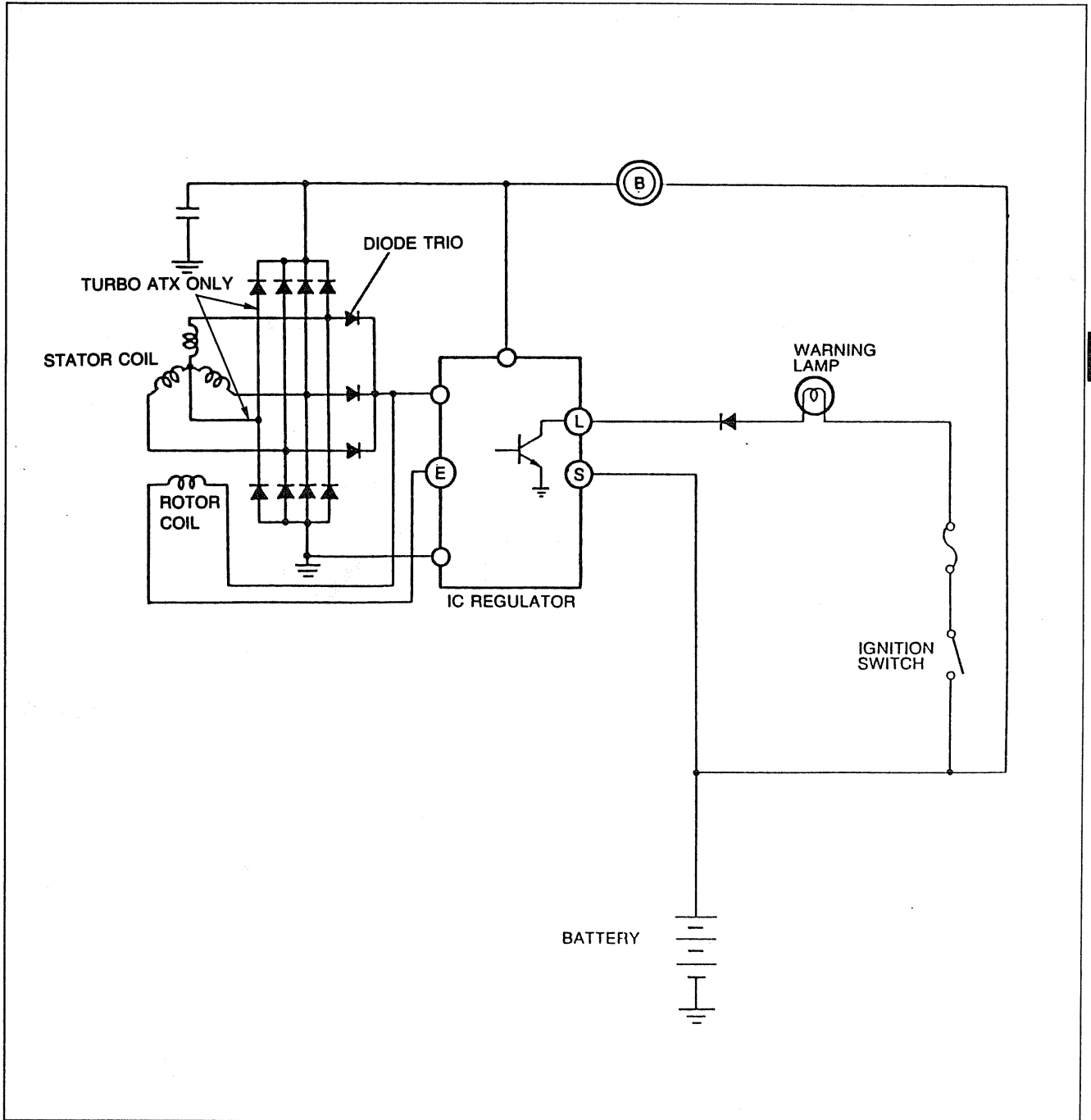
- Before performing maintenance or recharging the battery, turn off all accessories and stop the engine.
- The negative battery cable must be removed first and installed last.
- Set the battery in water when quick charging to prevent overheating the battery.

Remove the battery from the vehicle and remove the vent caps to perform a quick charge.

16U0GX-008

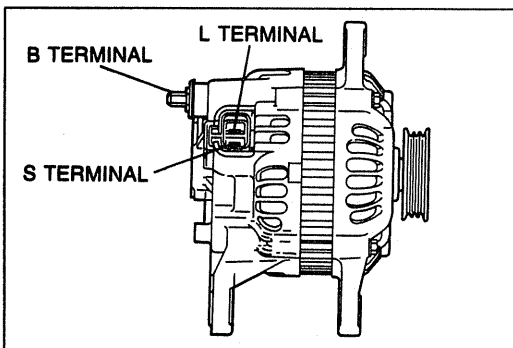
ALTERNATOR

CHARGING SYSTEM



G

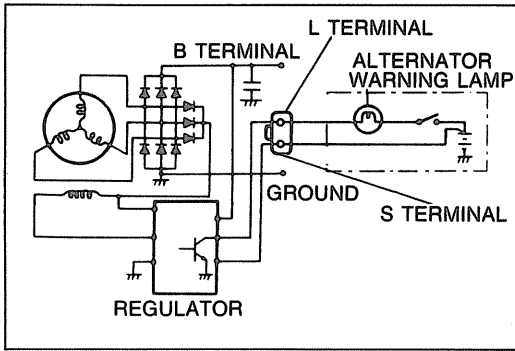
06U0GX-006



86U05X-008

**Caution**

- Be sure the battery connections are not reversed, because this will damage the rectifier.
- Do not use high-voltage testers such as a megger, because they will damage the rectifier.
- Remember that battery voltage is always applied to the alternator B terminal.
- Do not ground the L terminal while the engine is running.
- Do not start the engine while the connector is disconnected from the L and S terminals.



9MU0GX-057

**SELF-DIAGNOSIS SYSTEM**

The alternator has a self-diagnostic function to warn of the following problems in the charging system.

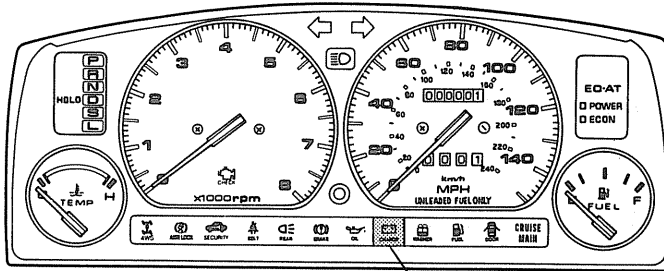
If a problem arises, the alternator warning lamp illuminates.

1. S circuit open
2. No voltage output
3. Field circuit open
4. B circuit open
5. Voltage output too high

**TROUBLESHOOTING**

**Preliminary Check**

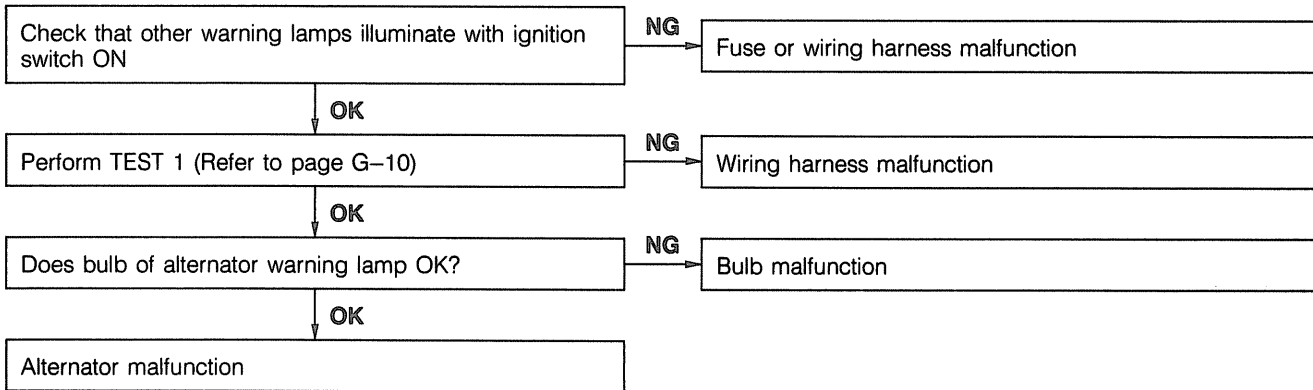
1. Turn the ignition switch ON, and check that the alternator warning lamp illuminates.
2. Start the engine, and check that the alternator warning lamp goes off.



ALTERNATOR WARNING LAMP

9MU0GX-011

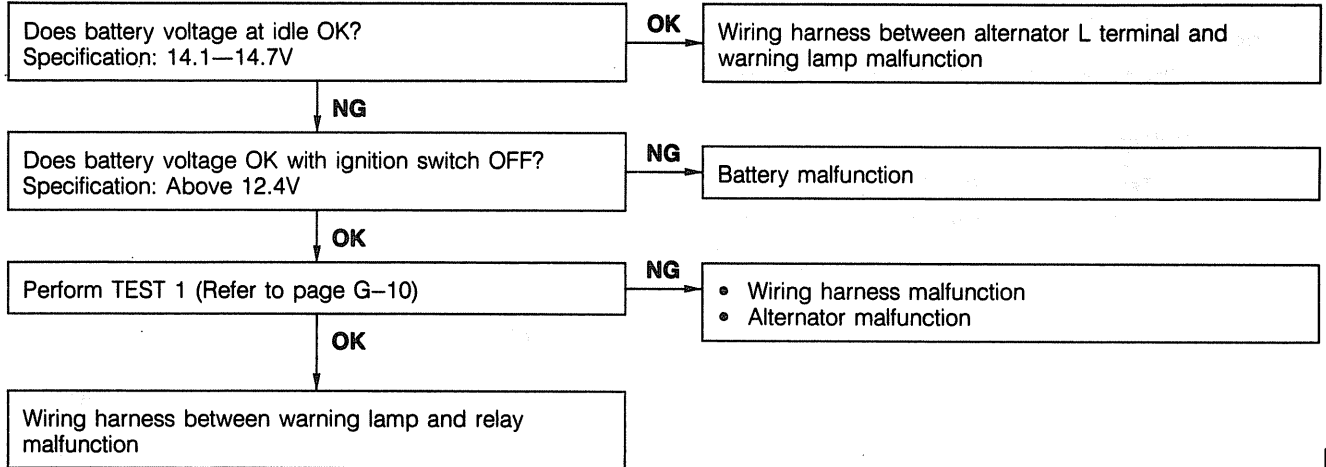
**1. Alternator warning lamp will not illuminate**



06U0GX-007



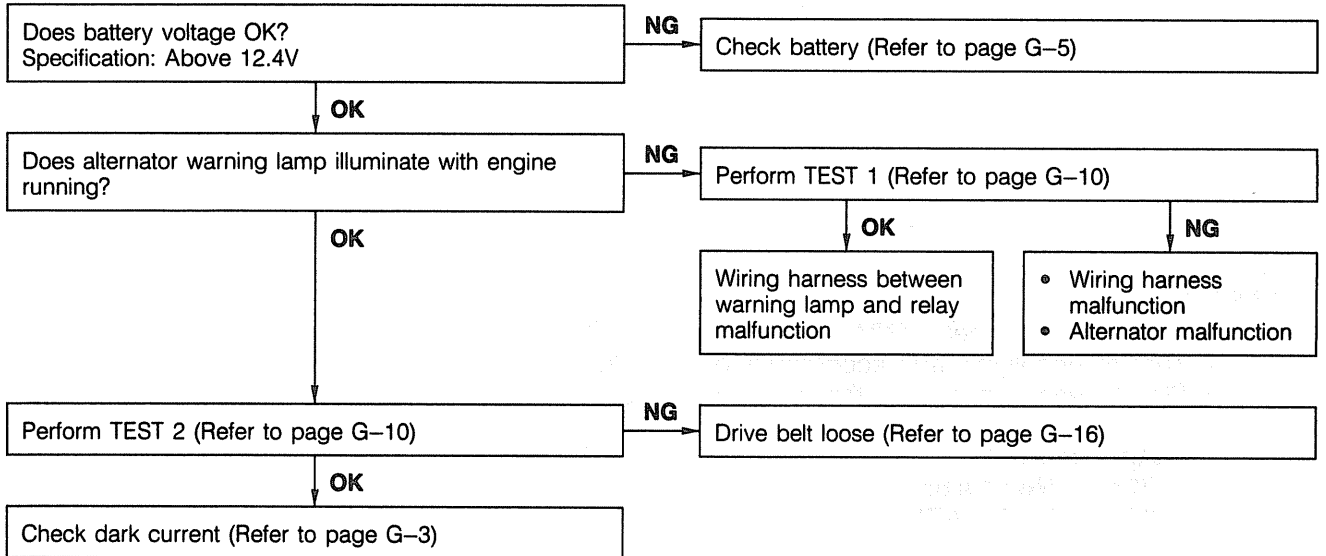
## 2. Alternator warning lamp illuminates when engine running



06U0GX-008



## 3. Battery discharged



16U0GX-009

**Warning**

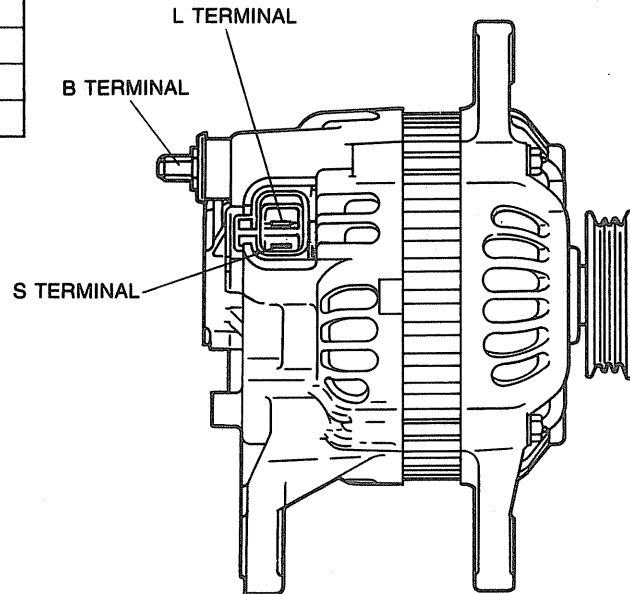
- Disconnect the negative battery terminal before disconnecting or connecting terminal B.

**TEST 1**

1. Check that the voltages at the alternator terminals are correct.

**Voltage**

Terminal	Ign: ON	Idle
B	Approx. 12V	14.1—14.7V
L	Approx. 1V	14.1—14.7V
S	Approx. 12V	14.1—14.7V



9MU0GX-016

**TEST 2**

1. Connect an ammeter (**80A min.**) between the terminal B wire and terminal B.
2. Turn all headlights and accessories on and depress the brake pedal.
3. Start the engine and check that output current is more than the specification at **2,500—3,000 rpm**.

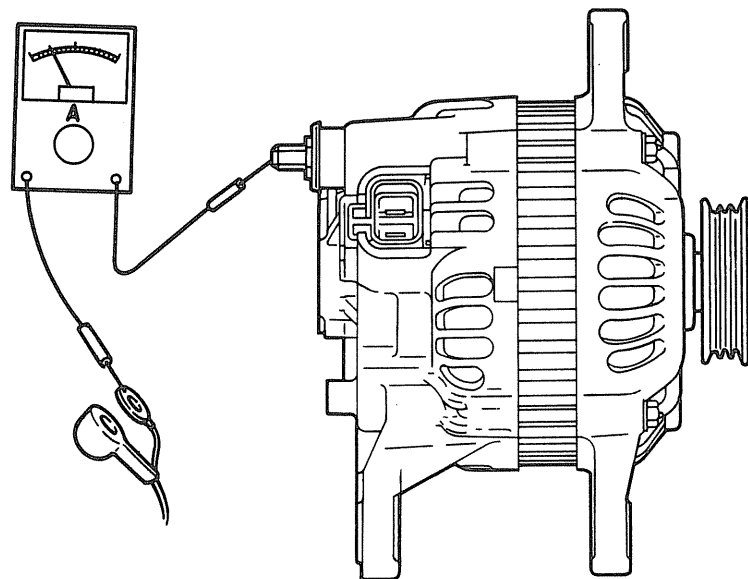
**Output current**

70A.... Non-turbo, Turbo MTX

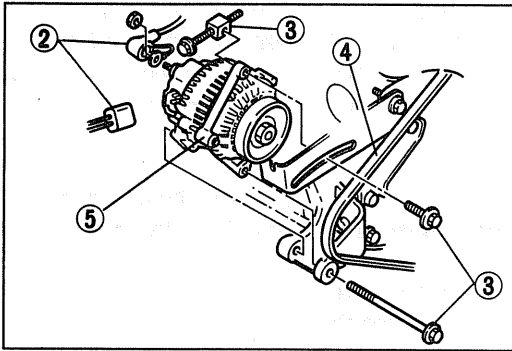
80A.... Turbo ATX

**Caution**

- Do not ground terminal B.



06U0GX-010



16U0GX-002

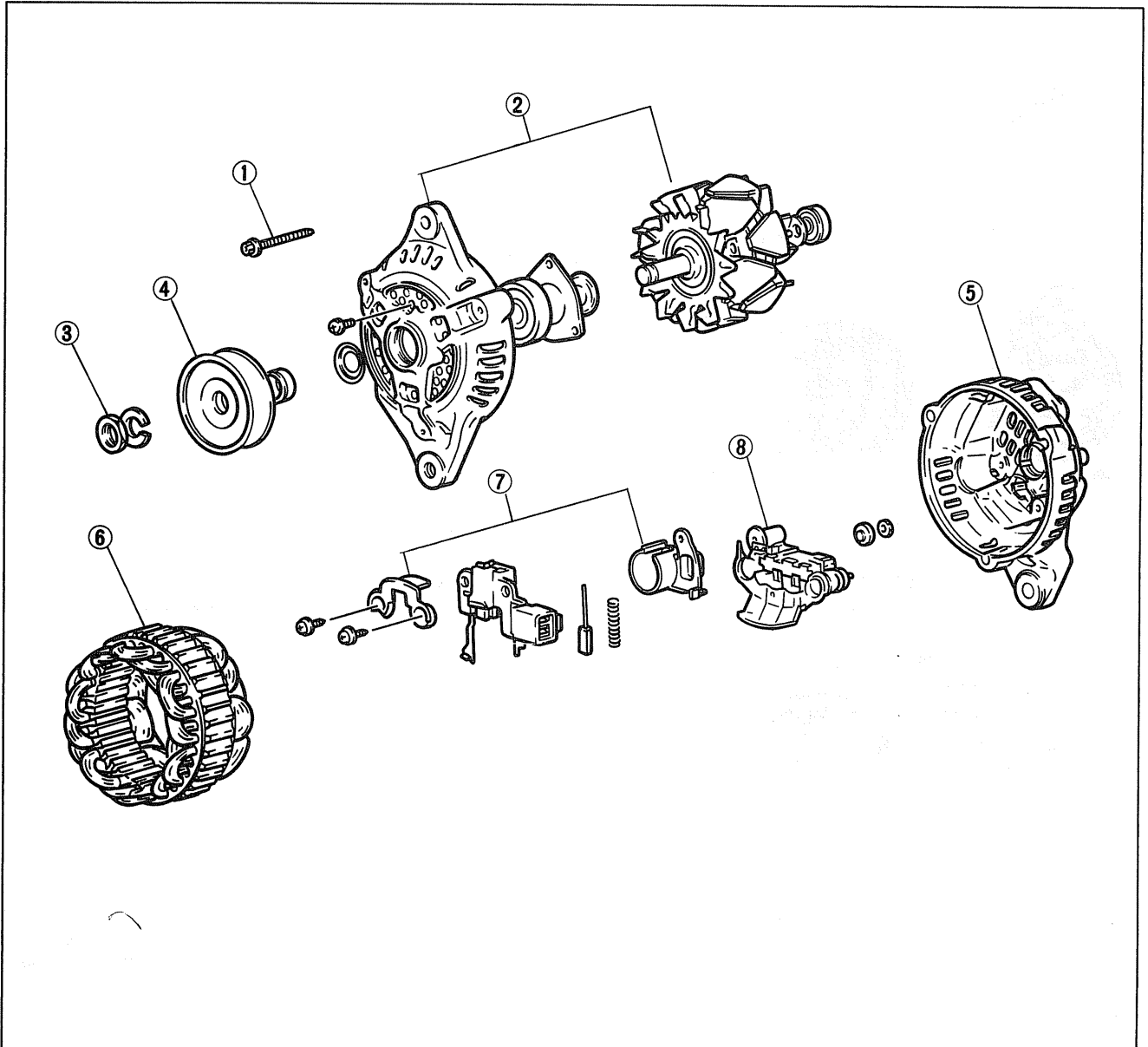
## REMOVAL

Remove in the order shown in the figure.

1. Disconnect the negative battery terminal.
2. Disconnect the wire and connector from the alternator.
3. Remove the bolts.
4. Remove the drive belt.
5. Remove the alternator.

## DISASSEMBLY

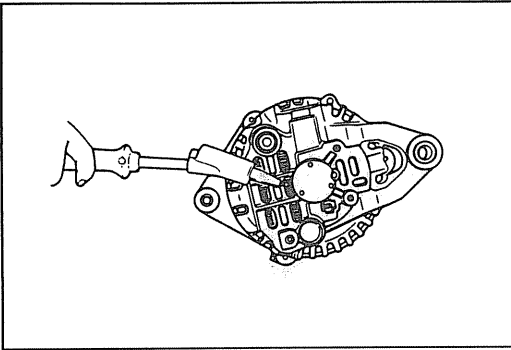
Disassemble in the order shown in the figure.



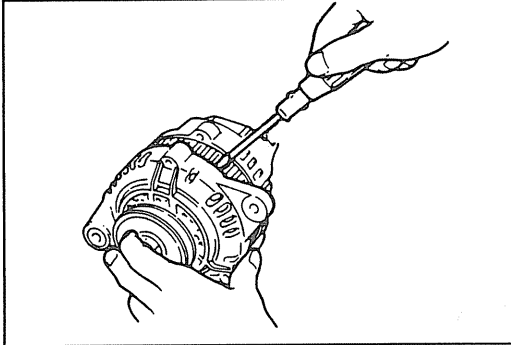
16U0GX-003

1. Bolt
2. Front bracket and rotor
3. Locknut
4. Pulley

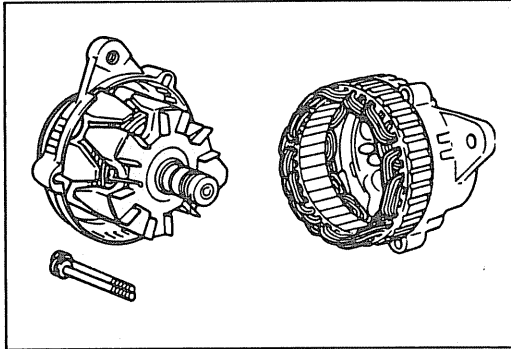
5. Rear bracket
6. Stator
7. Brush holder assembly
8. Rectifier



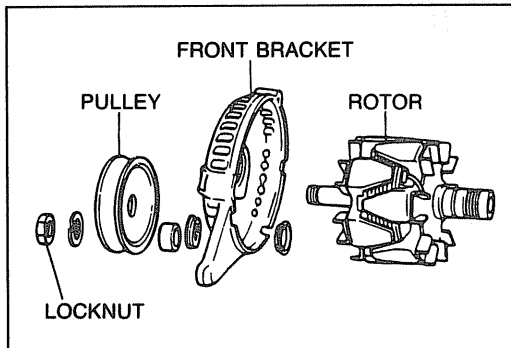
16U0GX-010



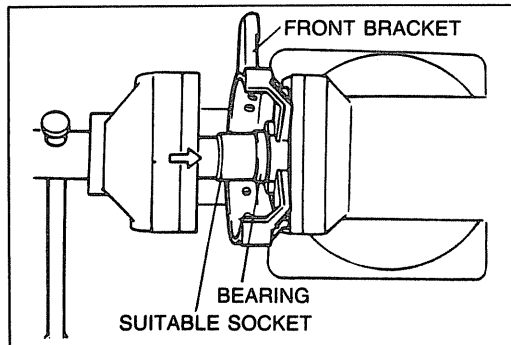
63U05X-999



06U0GX-029



86U05X-021



86U05X-076

1. Place a soldering iron (200W) on the bearing box for **3 or 4 minutes** to heat it to about **50—60°C (122—140°F)**. Pull out the three bolts, and then insert a screwdriver between the stator and front bracket and separate them.

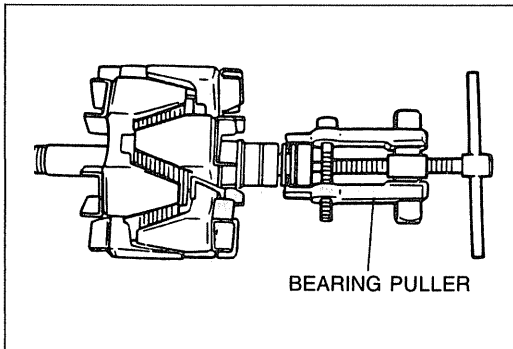
**Note**

- If the bearing box is not heated, the bearing cannot be pulled out because the rear bearing and rear bracket fit together very tightly.
- Be careful not to force the screwdriver in too far. The stator may be scratched.

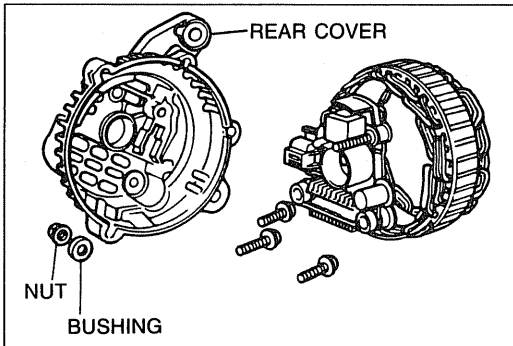
2. Separate the rear and front sections.

3. Place the rotor in a vise and loosen the pulley nut, then disassemble the pulley, rotor, and front bracket.

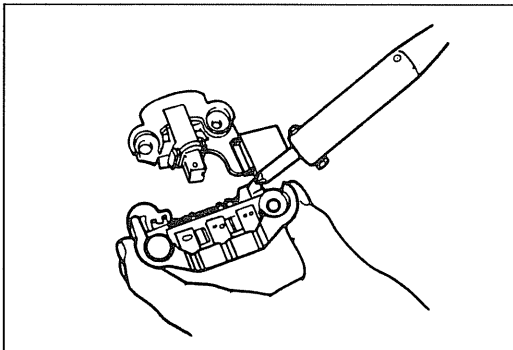
4. Replace the front bearing  
Using a socket which exactly fits on the outer race of the bearing, carefully press in the bearing. Use a hand press or a vise.



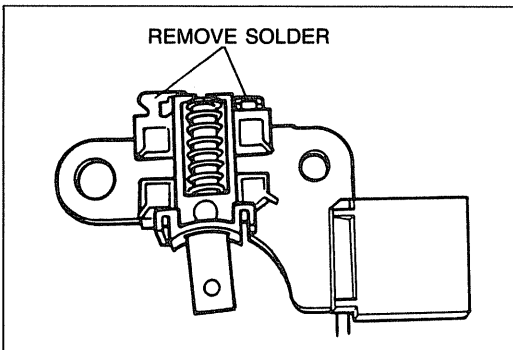
86U05X-086



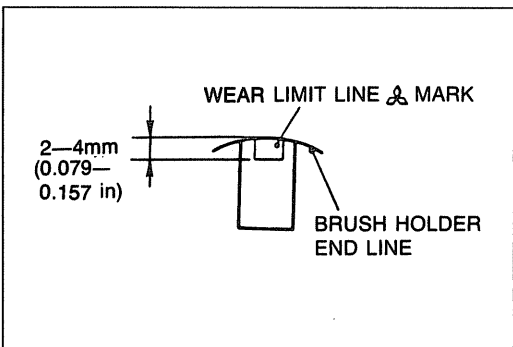
86U05X-077



86U05X-087



86U05X-088



06U0GX-030

5. Replace the rear bearing  
The bearing can be pulled off by using a bearing puller. When it is pressed on, press it on so that the groove at the bearing circumference is at the slip ring side.
6. Remove the nut of the B terminal and the insulation bushing.
7. Remove the rectifier holding screws and the brush holder holding screw.
8. Separate the rear bracket and the stator.

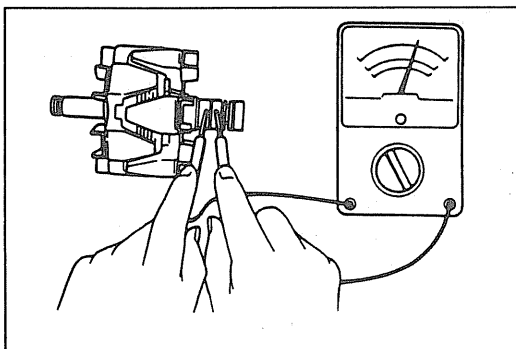
9. Use a soldering iron to remove the solder from the rectifier and the stator leads, and then remove the IC regulator.

### Caution

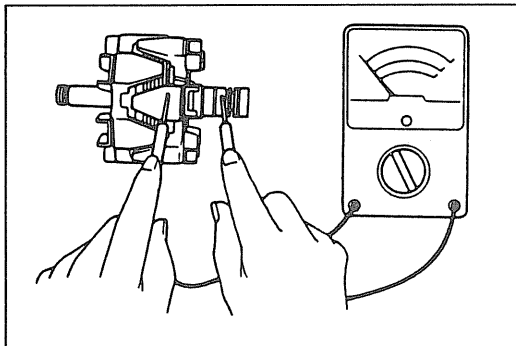
- **Disconnect quickly, use the soldering iron no more than about 5 seconds because the rectifier may be damaged if it is overheated.**

10. Replace the brushes  
Remove the solder from the pigtail, and then remove the brush.

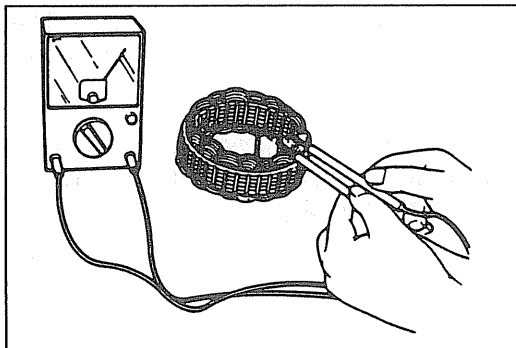
11. When soldering the brush, solder the pigtail so that the wear limit line of the brush projects **2—4mm (0.079—0.157 in)** out from the end of the brush holder.



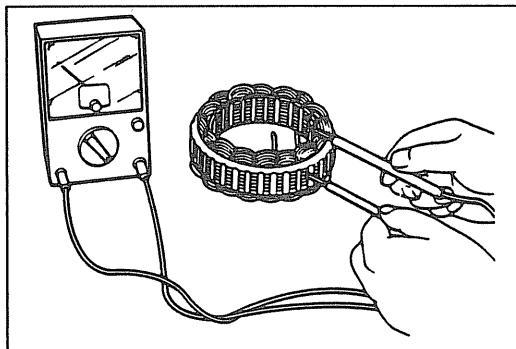
06U0GX-031



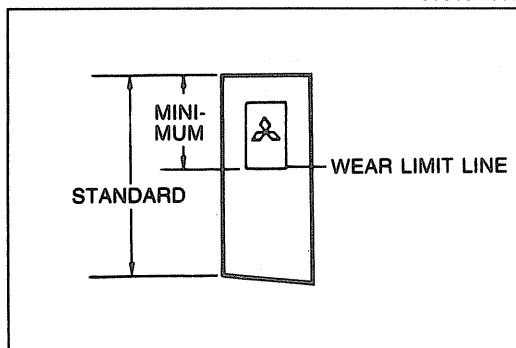
06U0GX-012



86U05X-081



86U05X-082



06U0GX-032

## INSPECTION

### Rotor

1. Wiring damage
  - (1) Check the resistance between the slip rings using an ohmmeter.

**Specification: 3.5—4.5Ω [at 20°C (68°F)]**

- (2) If it is not within specification, replace the rotor

2. Ground of the field coil
  - (1) Check for continuity between the slip ring and the core using an ohmmeter.
  - (2) Replace the rotor if there is continuity.
3. Slip ring surface
 

If the slip ring surface is rough, use a fine sandpaper to repair it.

### Stator

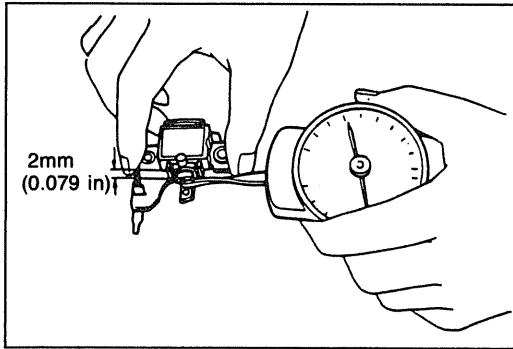
1. Wiring damage
  - (1) Check for continuity between the stator coil leads using an ohmmeter.
  - (2) Replace the stator if there is no continuity.

2. Ground of the stator coil
  - (1) Check for continuity between the stator coil leads and the core using a circuit tester.
  - (2) Replace the stator if there is continuity.

### Brush

If the brushes are worn almost to or beyond the limit, replace them.

**Standard: 21.5mm (0.846 in)**  
**Minimum: 8.0mm (0.315 in)**



06U0GX-033

### Brush Spring

1. Measure the force of the brush spring using a spring pressure gauge.
2. Replace the spring if necessary.

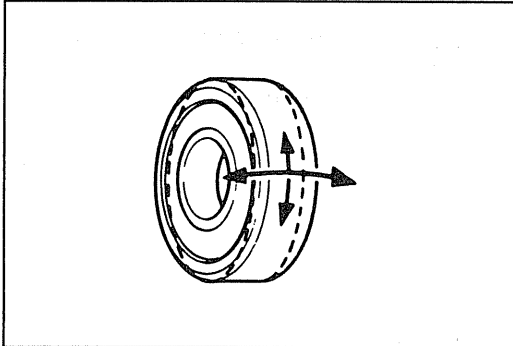
#### Standard force:

3.1—4.3 N (320—440 g, 11.3—15.5 oz)

Minimum: 1.6—2.4 N (160—240 g, 5.6—8.5 oz)

#### Note

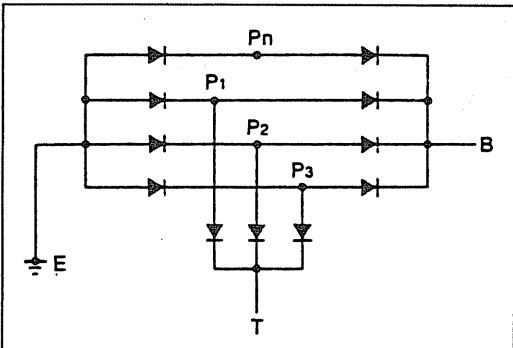
- Read the spring pressure gauge at the brush tip projection of 2mm (0.079 in).



86U05X-023

### Bearing

1. Check for abnormal noise, looseness, or insufficient lubrication.
2. Replace the bearing(s) if there is any abnormality.



06U0GX-039

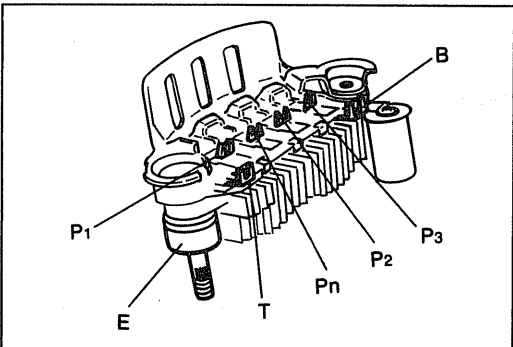
### Rectifier

1. Check for continuity of the diodes using an ohmmeter.

#### Note

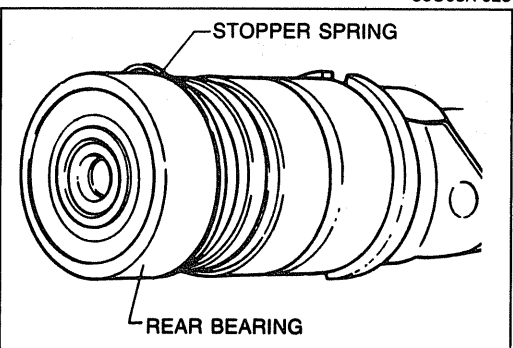
- Pn terminal is only for turbo ATX models.

Negative (Black)	Positive (Red)	Continuity
E	Pn, P1, P2, P3	Yes
B		No
L		No
Pn, P1, P2, P3	E	No
	B	Yes
P1, P2, P3	T	Yes
Pn		No



86U05X-025

2. Replace the rectifier.



16U0GX-004

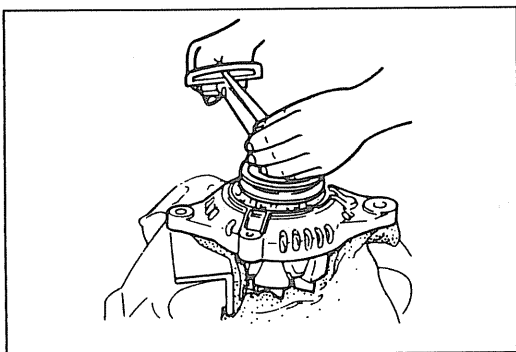
### ASSEMBLY

Assemble in the reverse order of disassembly, referring to **Assembly Note**.

#### Assembly Note

##### Stopper spring installation

1. Fit the stopper spring into the eccentric groove of the rear bearing circumference.
2. Check that the protruding part of the spring is fitted into the deepest part of the groove.



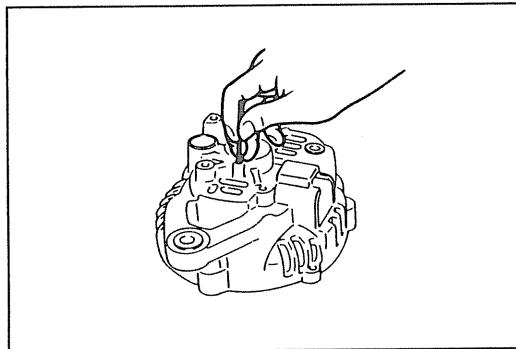
06U0GX-034

**Front bracket and rotor**

When assembling the front bracket and rotor, tighten the lock nut to the specified torque.

**Tightening torque:**

**59—98 N·m (6—10 m·kg, 43—72 ft·lb)**



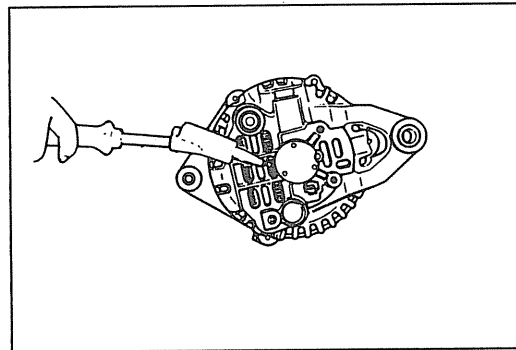
86U05X-028

**Brush lifting**

1. Before assembly, use a finger to hold the brushes into the brush holder; then pass a wire ( $\phi 2\text{mm}$ , 40—50mm,  $\phi 0.08$  in, 1.6—2.0 in) through the hole shown in the figure.
2. Secure the brushes in position.

**Note**

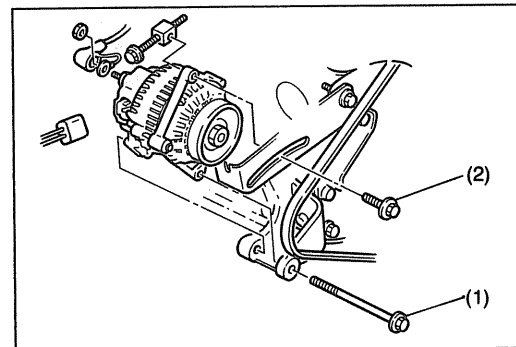
- Be sure to remove the wire after assembly is complete.



4BG05X-054

**Rear bearing installation**

1. Heat the rear bracket.
2. Press the rear bearing into the rear bracket.
3. Check that the rotor turns easily.



06U0GX-035

**INSTALLATION****Note**

- When installing the alternator, tighten the bolts to the specified torque.

Install in the reverse order of removal.

**Tightening torque**

**Bolt (1): 37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)**

**Bolt (2): 19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)**

**V-BELT TENSION****Adjustment**

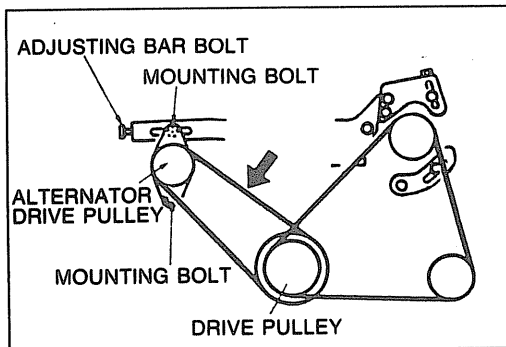
1. Loosen the alternator mounting bolt and adjusting bar bolt.
2. Adjust the alternator to set to the specified deflection when pushing the V-belt with a force of 98 N (10 kg, 22 lb).

**Specified deflection**

**New : 6—8mm (0.24—0.31 in)**

**Used : 7—9mm (0.27—0.35 in)**

3. Tighten the bolts and recheck the tension.

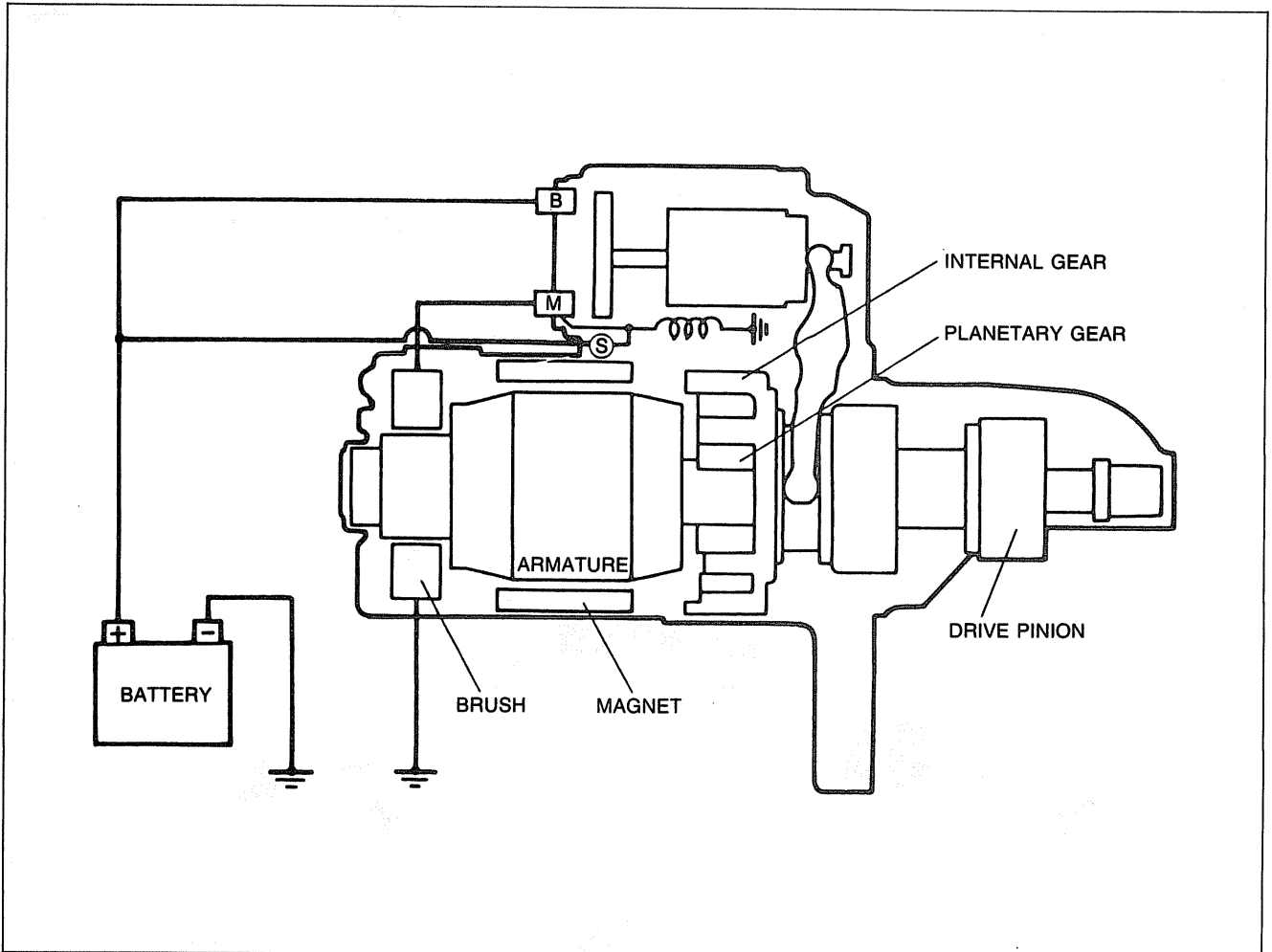


86U05X-029

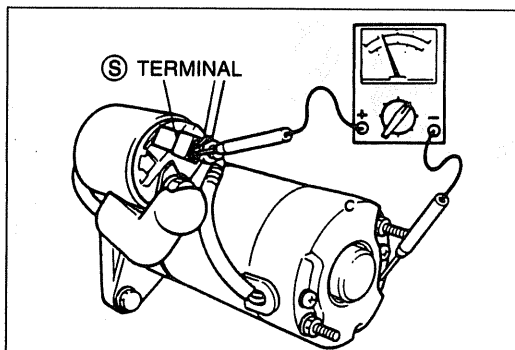


## STARTER

## STARTING SYSTEM



86U05X-030



86U05X-031

**ON-VEHICLE INSPECTION**

Charge the battery fully before starting the following inspection.

1. Turn the ignition switch to the start position.
2. Check that the starter motor operates.
3. If the starter does not operate, check the voltage between S terminal and ground using a voltmeter.
4. If the voltage is **8V or more**, the starter is malfunction.
5. If **less than 8V**, the wiring harness is malfunction.

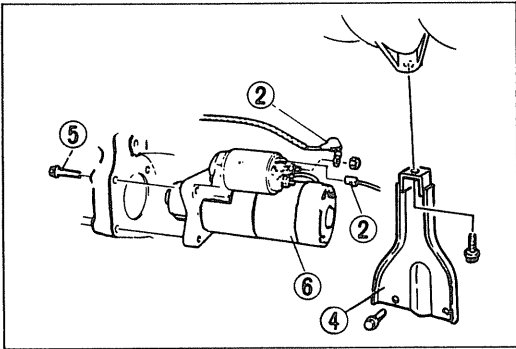
**Caution**

- If the magnetic switch is hot, it may not function even though the voltage is standard voltage or more.

**Note**

- The cranking speed is greatly affected by the viscosity of the engine oil.

## STARTER



86U05X-032

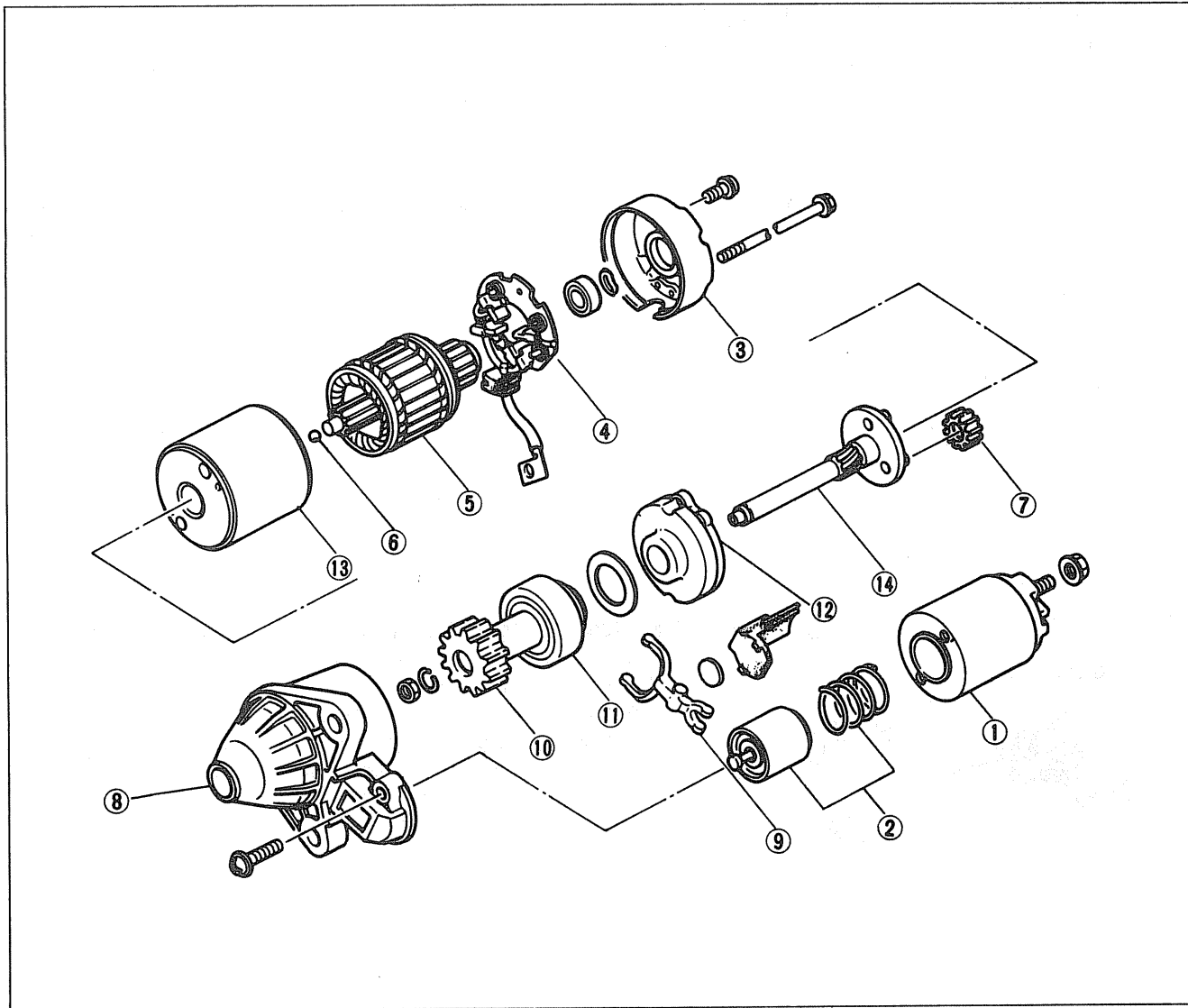
## REMOVAL

1. Disconnect the negative battery cable.
2. Disconnect the wiring from the starter.
3. Raise the front of the vehicle and support it with safety stands.
4. Remove the intake manifold bracket.
5. Remove the starter bolts.
6. Draw out the starter from lower side of the vehicle.

## Note

- Remove the lowest starter bolt last.

## DISASSEMBLY

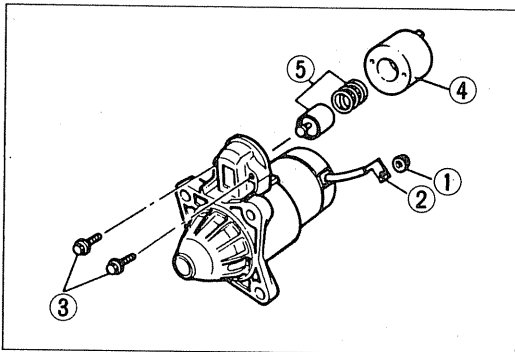


86U05X-083

- |                          |                              |                        |
|--------------------------|------------------------------|------------------------|
| 1. Magnetic switch       | 6. Ball                      | 11. Overrunning clutch |
| 2. Plunger and spring    | 7. Planetary gear            | 12. Internal gear      |
| 3. Rear housing          | 8. Drive housing front cover | 13. Yoke assembly      |
| 4. Brush holder assembly | 9. Lever                     | 14. Gear shaft         |
| 5. Armature              | 10. Drive pinion             |                        |

## Caution

- Do not strike the yoke with a hammer, drop it or put it in a vise when disassembling the starter.

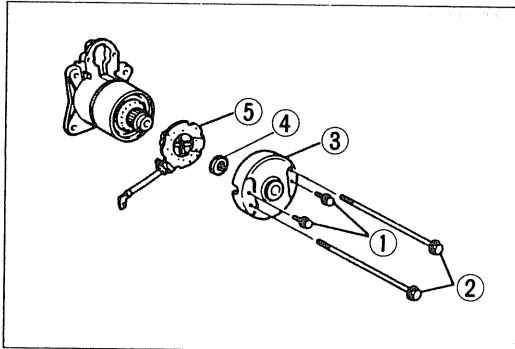


86U05X-033

### Magnetic Switch

Remove the following parts:

- (1) M terminal nut
- (2) Wire
- (3) Switch installation screws
- (4) Magnetic switch
- (5) Plunger and plunger spring



7BU05X-034

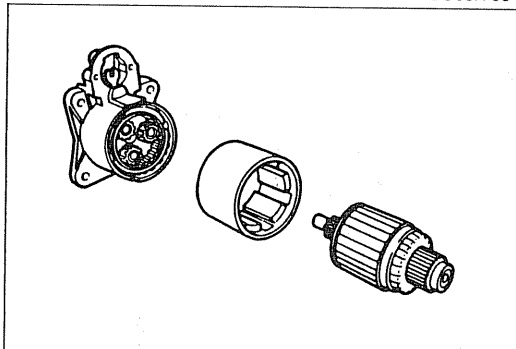
### Rear Bracket and Brush Holder

Remove the following parts:

- (1) Brush holder installation screws
- (2) Through bolts
- (3) Rear cover
- (4) Wave washer
- (5) Brush holder assembly

### Note

- Put an aligning mark on the yoke and rear bracket for reassembly before removing the rear bracket.



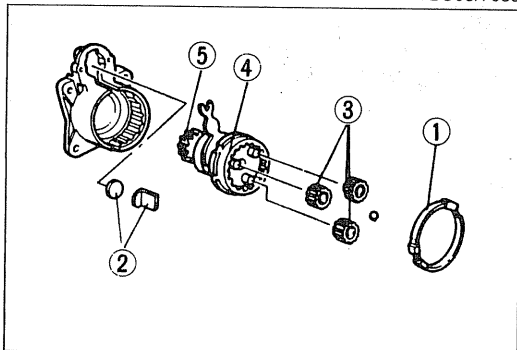
7BU05X-035

### Yoke and Armature

Remove the armature and yoke.)

### Note

- Put an aligning mark on the yoke and front bracket for reassembly before removing the front bracket.



7BU05X-110

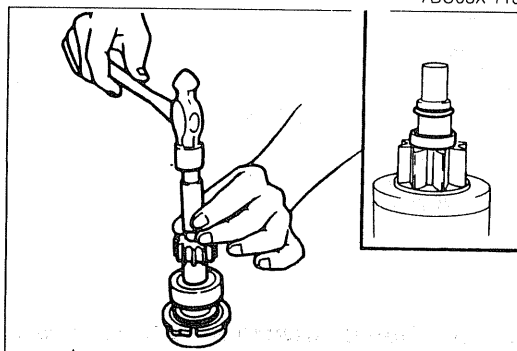
### Overrunning Clutch, Planetary Gears, and Internal Gear

Remove the following parts:

- (1) Gasket
- (2) Plate
- (3) Planetary gears
- (4) Internal gear
- (5) Drive pinion

### Note

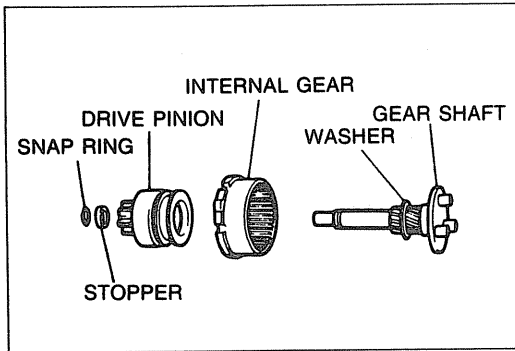
- Do not lose the ball.



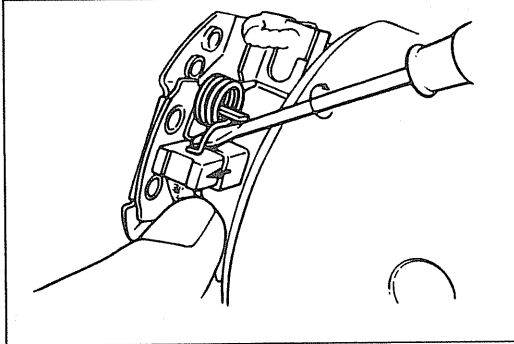
86U05X-034

### Overrunning Clutch Stopper

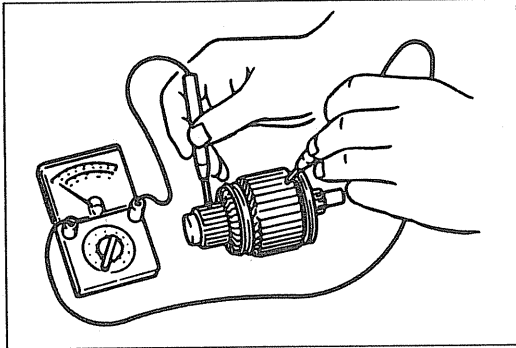
1. Remove the overrunning clutch stopper using a pipe.



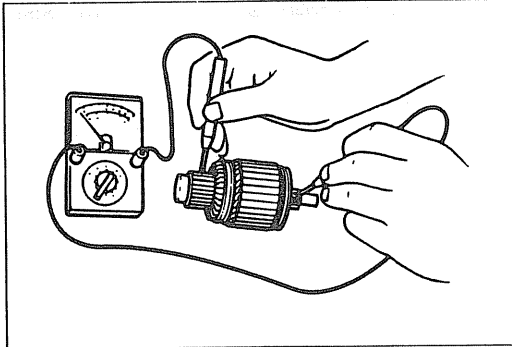
7BU05X-037



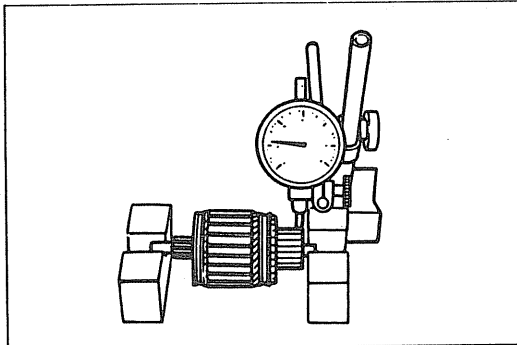
7BU05X-038



67U05X-048



67U05X-049



7BU05X-039

2. Disassemble the drive pinion, internal gear and washer from the gear shaft.

### Brush and Brush Holder

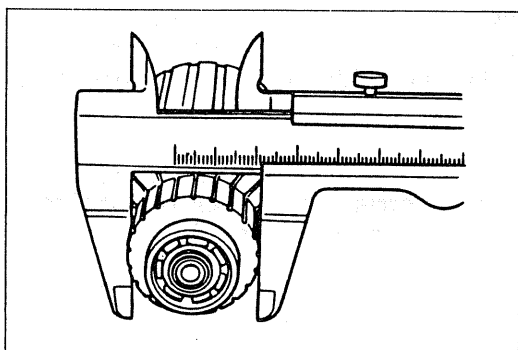
Remove the brush from the brush holder using a flat-tip screwdriver.

### INSPECTION

#### Armature

1. Ground of armature coil  
Check for continuity between the commutator and the core using a circuit tester. Replace the armature if there is continuity.
2. Insulation of armature coil  
Check for continuity between the commutator and the shaft using a circuit tester. Replace the armature if there is continuity.
3. Runout of commutator
  - (1) Place the armature on V blocks, and measure the runout using a dial gauge.
  - (2) If the runout is excessive, replace the armature.

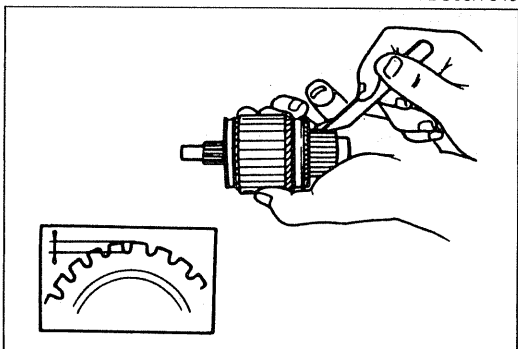
**Runout : 0.05mm (0.002 in)**  
**Maximum: 0.1mm (0.004 in)**



7BU05X-040

4. Outer diameter of commutator  
Replace the armature if the outer diameter of the commutator is less than the grind limit.
5. Roughness of commutator surface  
Repair using a lathe or fine sandpaper if it is rough; wipe it with a rag if it is dirty.

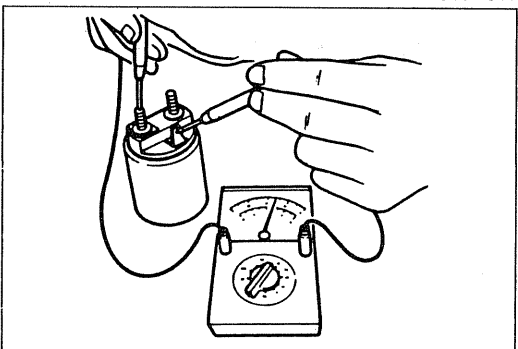
**Grind limit: 28.8mm (1.13 in)**



7BU05X-041

6. Segments groove depth  
If the depth of the groove is less than standard, undercut the grooves to the standard depth.

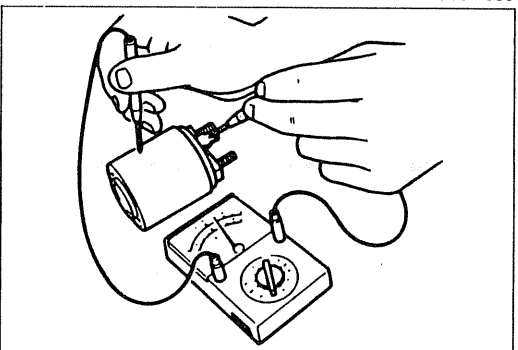
**Standard depth: 0.5—0.8mm (0.02—0.03 in)**  
**Minimum depth: 0.2mm (0.008 in)**



67U05X-053

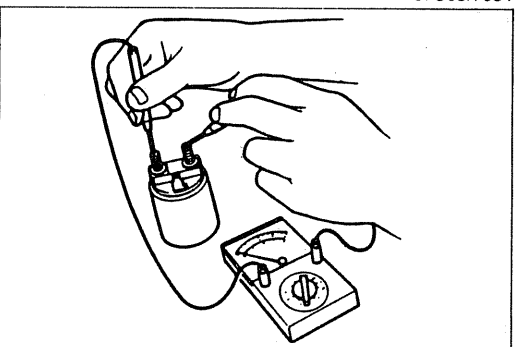
### Magnetic Switch

1. Wiring damage (S terminal — M terminal)  
Check for continuity between the S terminal and the M terminal using a circuit tester. Replace the magnetic switch if there is no continuity.



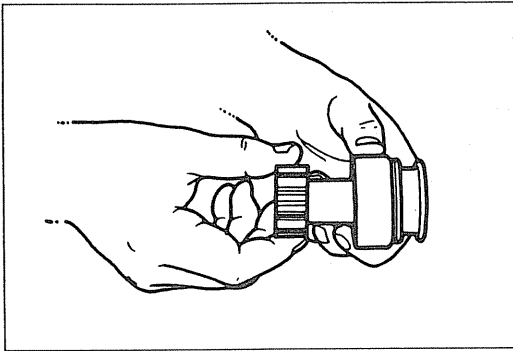
67U05X-054

2. Wiring damage (S terminal — body)  
Check for continuity between S terminal and body using a circuit tester.  
Replace the magnetic switch if there is no continuity.



67U05X-055

3. Ground of magnetic switch  
Check for continuity between M and B terminals using a circuit tester. Replace the magnetic switch if there is continuity.



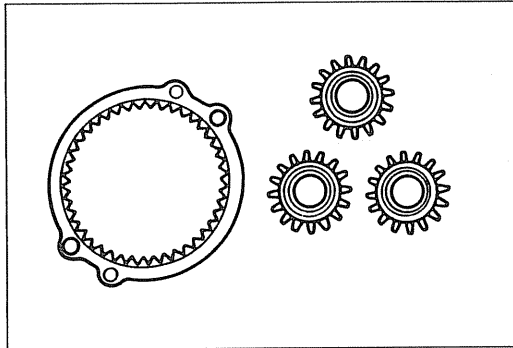
86U05X-035

**Overrunning Clutch**

Turn the pinion shaft by hand and hold the overrunning clutch. Replace the overrunning clutch if the pinion turns in both directions or in neither direction.

**Note**

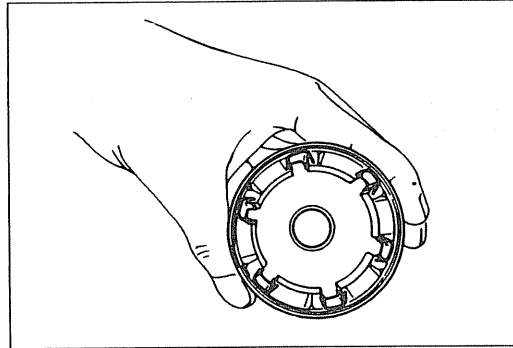
- Do not wash the overrunning clutch with solvent; it is packed with grease and sealed.



67U05X-057

**Internal Gear and Planetary Gears**

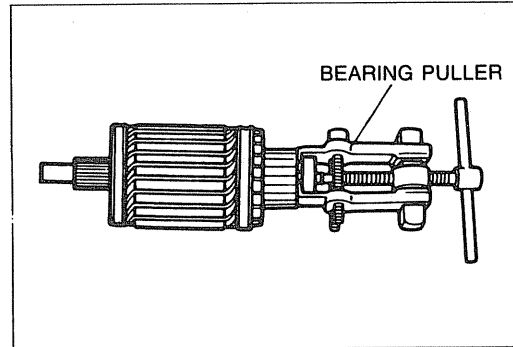
1. Internal gear  
Check for wear or damage. Replace if necessary.
2. Planetary gears  
Check for wear or damage. Replace if necessary.



67U05X-058

**Yoke**

Check for damage. Replace if necessary.



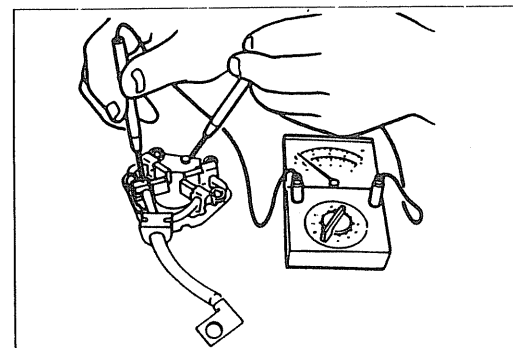
67U05X-059

**Bearing**

Check for abnormal noise, looseness, binding. Replace the bearing if there is any problem.

**Note**

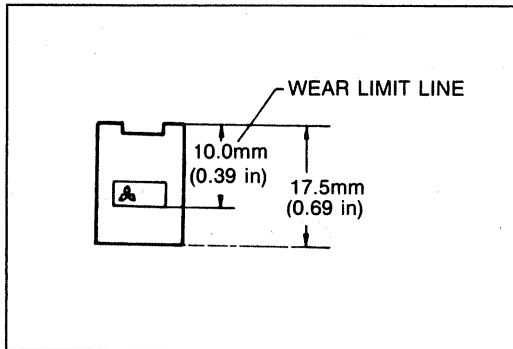
- Use a bearing puller to remove the bearings.



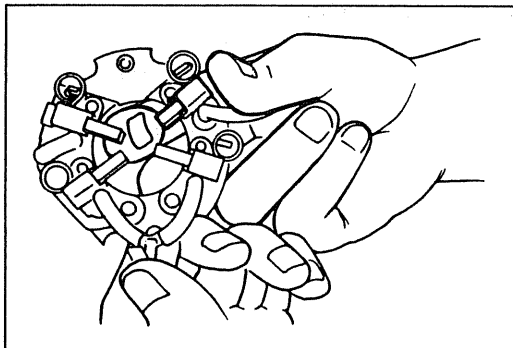
67U05X-060

**Brush and Brush Holder**

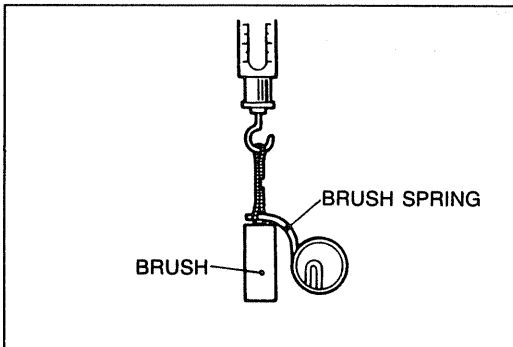
1. Insulation of brush holder  
Check for continuity between the insulated brush and the plate using a circuit tester. Replace the brush holder if there is continuity.



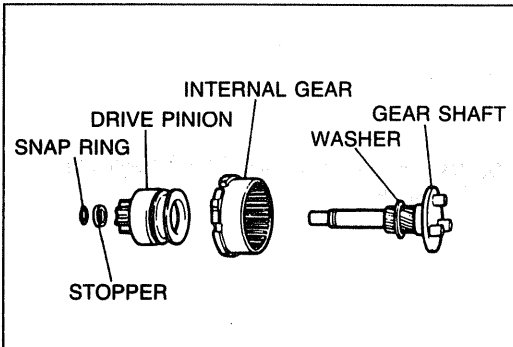
7BU05X-043



67U05X-062



86U05X-036



16U0GX-005

## 2. Brush

Replace the brushes if they are worn beyond the wear limit, or if the wear is near the limit.

**Wear limit : 10.0mm (0.394 in)**

**New brush: 17.5mm (0.689 in)**

## 3. Brush holder

Check that the brush slides smoothly inside the brush holder.

## 4. Brush spring

(1) Measure the force of the brush spring using a spring balance.

(2) Replace the brush spring if the force is below specification.

**Specification: 7 N (0.7 kg, 1.5 lb)**

### Note

- The force is measured at the moment the brush spring separates from the brush.
- The force must be 18—24 N (1.8—2.4 kg, 4.0—5.3 lb) for a new brush spring.

## ASSEMBLY

Assemble in the reverse order of disassembly, referring to **Assembly Note**.

### Assembly Note

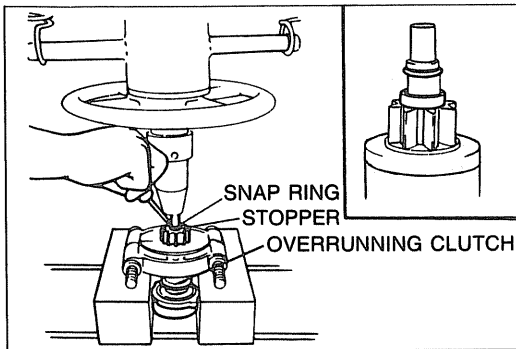
#### Lubricate

During assembly lubricate the following points:

1. Gear of armature shaft
2. Internal gear and planetary gears
3. Plunger circumference
4. Lever
5. Ball
6. Gear shaft spline
7. Front bracket housing

### Installation of Overrunning Clutch

1. Install the washer, internal gear, drive pinion stopper, and the snap ring on the gear shaft.

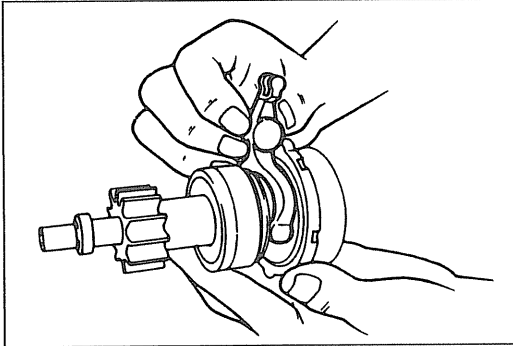


7BU05X-046

2. Press the stopper and the snap ring into position as shown in the figure.

#### Installation of lever

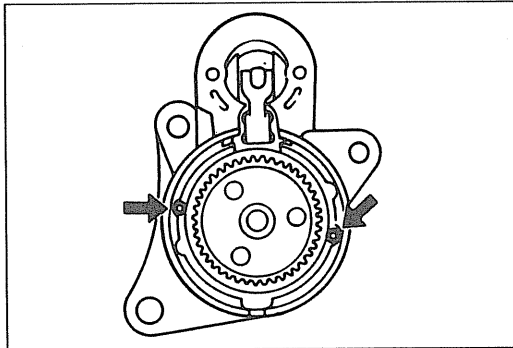
Check the lever faces in the correct direction.



7BU05X-047

#### Installation of Brush Holder

Install the brush holder assembly and rear cover and align the through bolts.



7BU05X-048

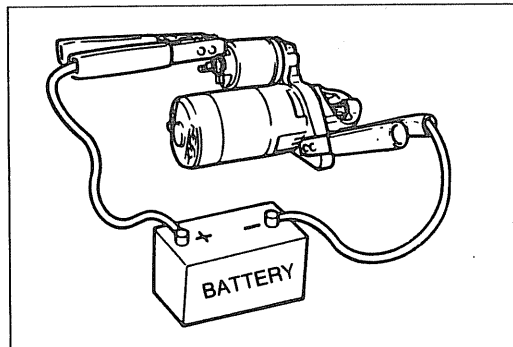
#### CHECKING OPERATION

##### Magnetic Switch

Make the following tests:

##### Pull-out test

1. Check that the pinion is pulled out when 12V is connected to the S terminal and the body is grounded.

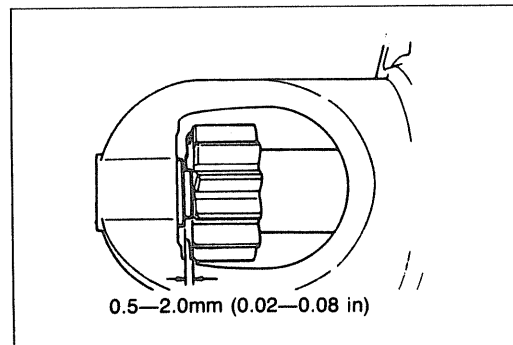


86U05X-038

2. Measure the pinion gap while the pinion is pulled out.

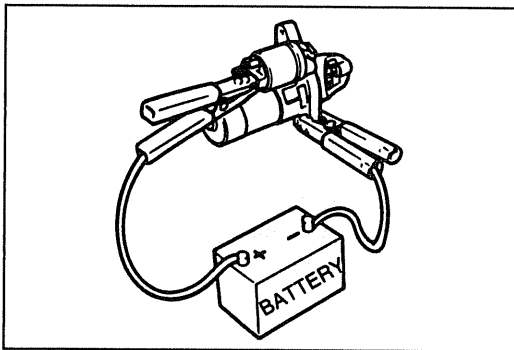
**Specification: 0.5—2.0mm (0.02—0.08 in)**

3. Adjust the pinion gap with an adjust washer (drive housing front cover—magnetic switch) if it is not within specification.

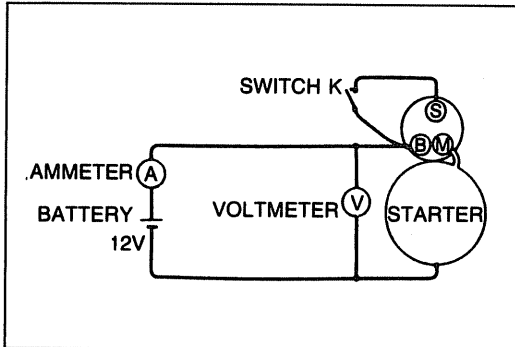


7BU05X-050





86U05X-039



86U05X-040

### Return test

1. Disconnect the motor wire from the M terminal, and then connect the battery power to the M terminal and ground the body.
2. Pull out the overrunning clutch with a flat-tip screwdriver. Check that the overrunning clutch returns to its original position when released.

### No-load Test

1. After adjusting the pinion gap, form a test circuit with a voltmeter and an ammeter.

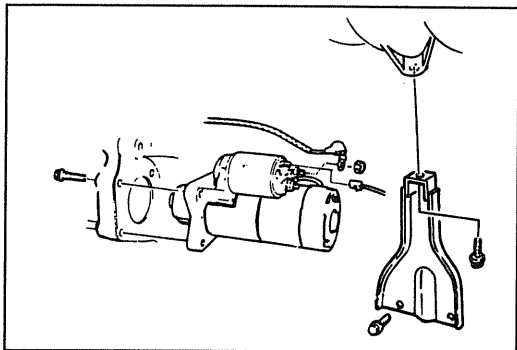
### Note

- Use heavy gauge wires and tighten each terminal fully.

2. Close switch K to run the starter.
3. Check for the following:

Voltage	(V)	11.0
Current	(A)	90 max.
Gear shaft speed	(rpm)	3,000 min.

4. If any abnormality is noted, check for the cause according to "Inspection".



06U0GX-036

### INSTALLATION

Install in the reverse order of removal.

### Note

- When installing the starter, tighten the bolts to the specified torque.

### Tightening torque

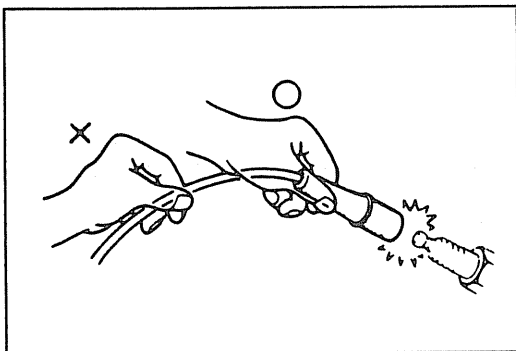
**Bolts: 37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)**

**B terminal:**

**10—12 N·m (100—120 cm·kg, 87—104 in·lb)**

**Intake manifold bracket bolts:**

**37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)**



06U0GX-016

## SPARK PLUGS

### REMOVAL / INSTALLATION

Note the following points:

1. When the spark plug lead is to be pulled off, be sure to pull the boot itself, not the wire.
2. Apply anti-seize compound or molybdenum-based lubricant to the spark plug threads before installing.
3. Tighten the spark plugs to the specified torque.

**Tightening torque:**

**15—23 N·m (1.5—2.3 m·kg, 11—17 ft·lb)**

### INSPECTION

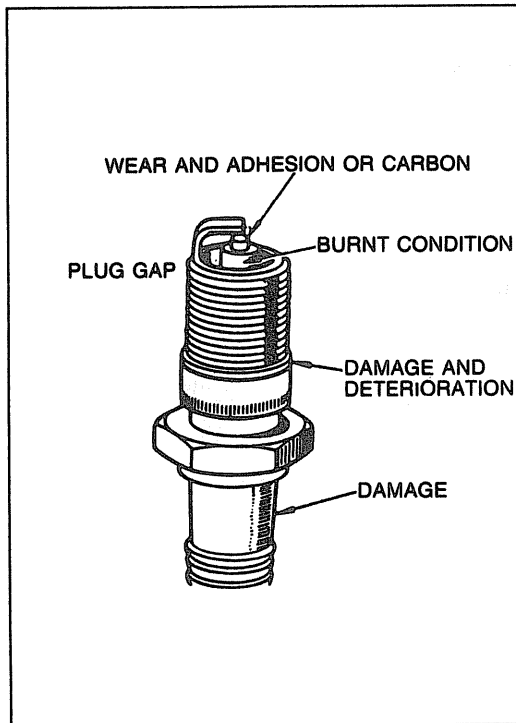
Check the following points. If a problem is found, replace the spark plug.

1. Damaged insulation
2. Worn electrodes
3. Carbon deposits

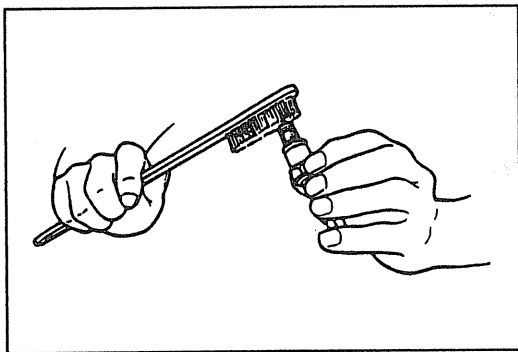
If cleaning is necessary, use a plug cleaner or a wire brush. Clean the upper insulator also.

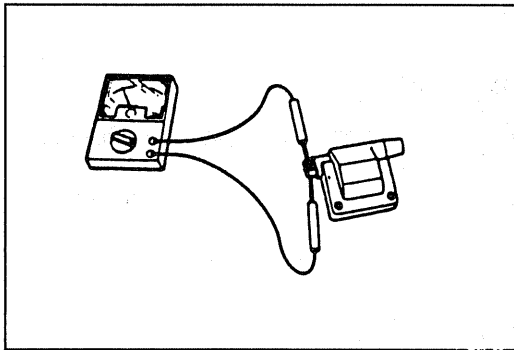
4. Damaged gasket.

**Plug gap: 1.0—1.1mm (0.039—0.043 in)**



86U05X-043





06U0GX-017

## IGNITION COIL

### INSPECTION

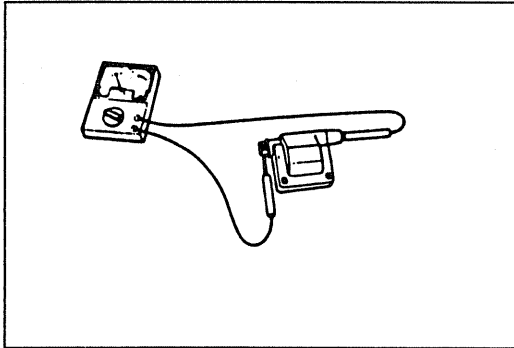
#### Primary Coil

Use an ohmmeter and check for resistance in the primary coil. If it is not within the specification, replace the coil.

#### Primary coil resistance (at 20°C [68°F])

**Turbo : 0.72—0.88Ω**

**Non-Turbo: 0.77—0.95Ω**



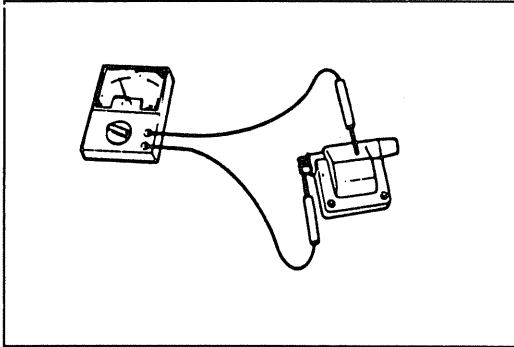
06U0GX-018

#### Secondary Coil

Use a ohmmeter to measure the resistance of the secondary coil. If it is not within specification, replace the coil.

#### Secondary coil resistance: (at 20°C [68°F])

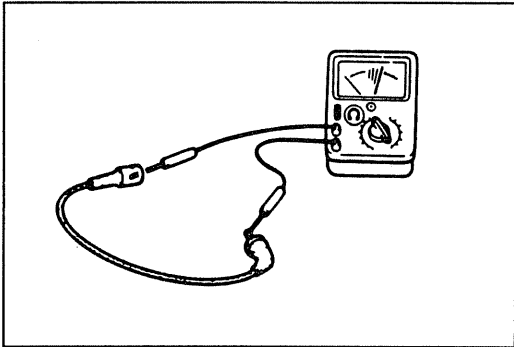
**10.3—13.9 kΩ**



86U05X-046

#### Insulation of Case

Use a **500V megger** tester to measure the insulation resistance between the primary terminal and the case. The standard reading is **10 mΩ or more**.



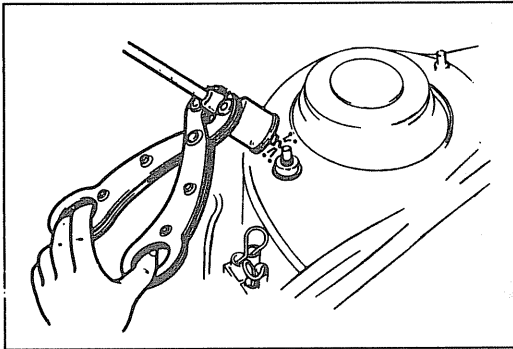
86U05X-047

## HIGH-TENSION LEAD

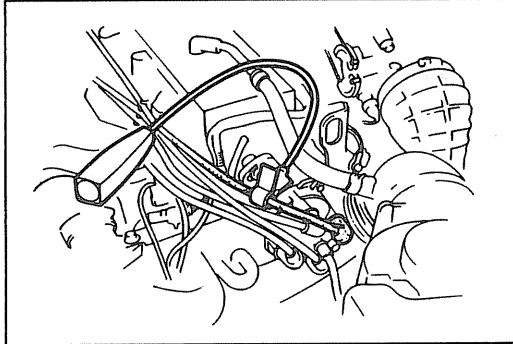
### INSPECTION

Measure the resistance using an ohmmeter.

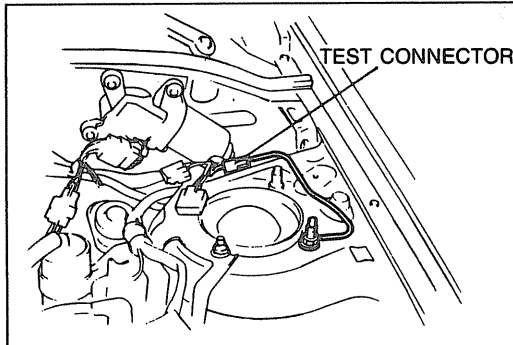
**Resistance: 16 kΩ per 1 m (3.28 ft)**



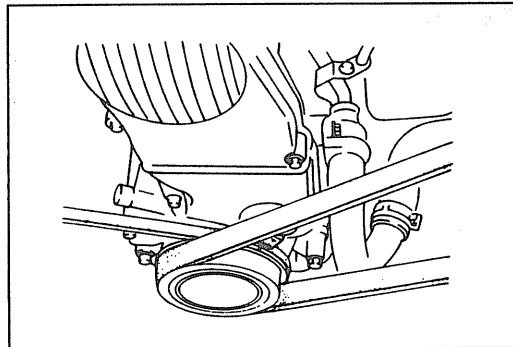
7BU05X-075



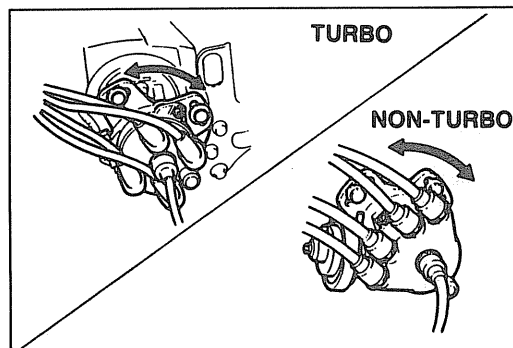
86U05X-048



06U0GX-019



86U05X-050



06U0GX-037

## DISTRIBUTOR

### SPARK TEST

1. Disconnect the distributor lead from the distributor.
2. Hold it with insulated pliers **approx. 5—10mm (0.20—0.39 in)** from a ground.
3. Crank the engine and check that a strong blue spark is visible.
4. If there is no spark, the ignition coil or pick-up coil may be bad.  
Check once again after replacing the ignition coil or pick-up coil.

### IGNITION TIMING

1. Warm up the engine to the normal operating temperature.
2. Turn all electric loads OFF.
3. Connect a tachometer and timing light to the engine.

4. Connect a jumper wire between the test connector and ground.
5. Check the idle speed. Set to the specified speed if necessary. (Refer to Section F1 or F2.)

**Idle speed: 750 ± 25 rpm**

6. Check that the timing mark (Yellow) on the crankshaft pulley and the mark on the timing belt cover are aligned.

### Ignition timing

**Turbo: 9 ± 1°**

**(Test connector grounded)**

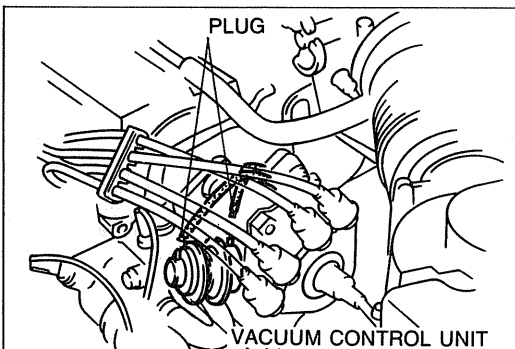
**Non-Turbo: 6 ± 1°**

**(Vacuum hoses disconnected and plugged)**

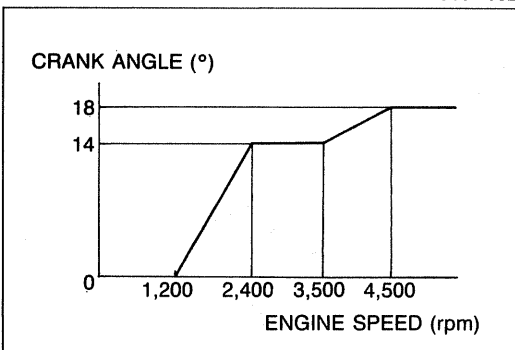
7. If the mark is not aligned, loosen the distributor lock bolt, and turn the distributor housing to make the adjustment.
8. Reconnect the vacuum hoses, or disconnect the jumper wire from the test connector.
9. Tighten the distributor lock bolt to specified torque.

### Tightening torque:

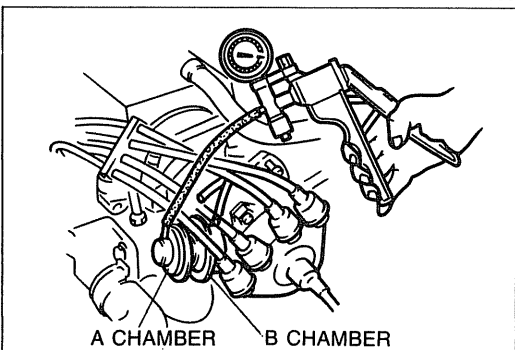
**19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)**



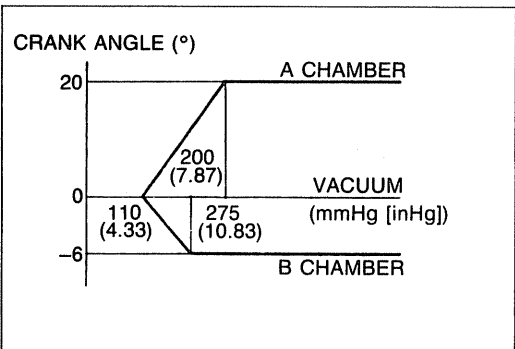
86U05X-052



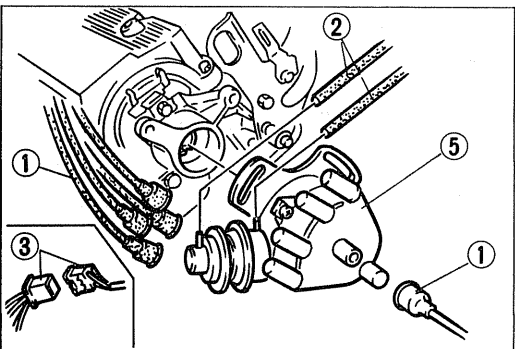
86U05X-053



86U05X-054



86U05X-055



86U05X-056

**SPARK CONTROL (Non-Turbo)**

**Centrifugal Advance**

1. Warm up the engine to the normal operating temperature.
2. Check that the idle speed and initial ignition timing are correct.
3. Disconnect the vacuum hoses from the vacuum control unit and plug them.

4. While gradually increasing the engine speed, use a timing light to check the advance on the pulley.

Excess advance..... weak governor spring (If the governor spring is broken, the advance will rise very high)

Insufficient advance.. governor weight or cam malfunction

**Vacuum Advance**

1. Warm up the engine to the normal operating temperature.
2. Check that the idle speed and ignition timing are correct.
3. Disconnect the vacuum hoses from the vacuum control unit, and plug them.
4. Connect a vacuum pump to the vacuum control unit.

5. Apply vacuum and check the advance with the timing light.

**REMOVAL**

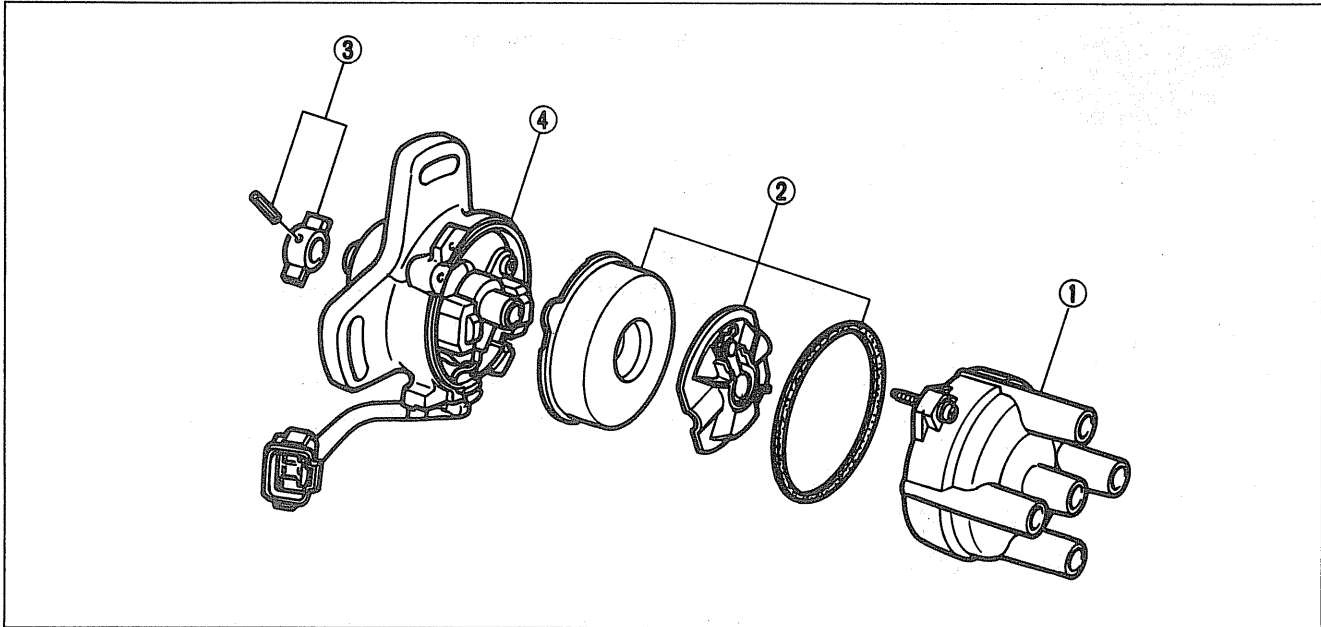
1. Remove the high-tension leads.
2. Disconnect the vacuum hoses and wiring. (Non-Turbo)
3. Disconnect the coupler. (Turbo)
4. Loosen the distributor lock bolts.
5. Remove the distributor.

**Note**

- Do not turn the crankshaft after the distributor has been removed.

**DISASSEMBLY**

Disassemble in the order shown in the figure.

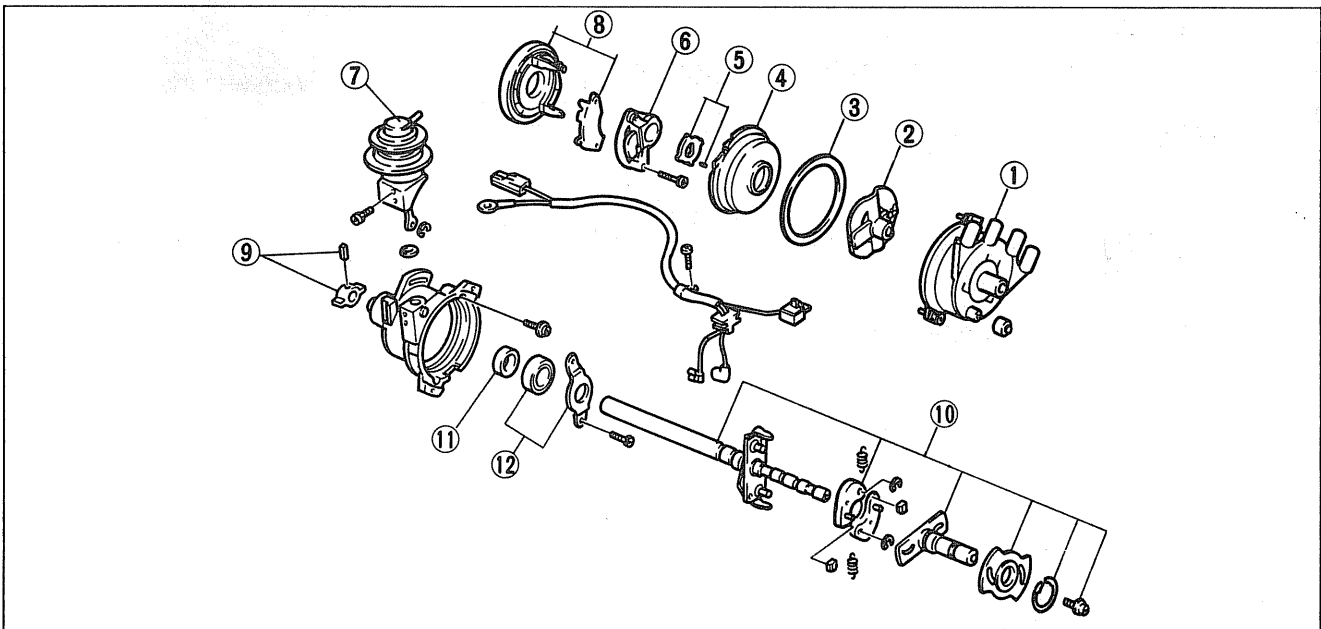
**Turbo Engine**

86U05X-057

- |                      |                    |
|----------------------|--------------------|
| 1. Cap               | 3. Coupling set    |
| 2. Distributor rotor | 4. Distributor set |

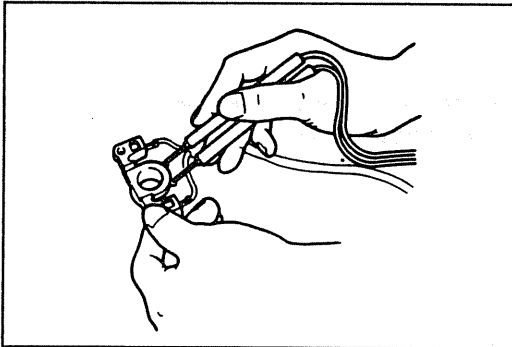
**Caution**

- Do not disassemble the distributor set.

**Non-Turbo Engine**

86U05X-058

- |           |                              |                  |
|-----------|------------------------------|------------------|
| 1. Cap    | 5. Signal rotor and pin      | 9. Coupling set  |
| 2. Rotor  | 6. Pick-up coil with igniter | 10. Governor set |
| 3. Gasket | 7. Vacuum control unit       | 11. Oil seal     |
| 4. Cover  | 8. Breaker                   | 12. Bearing      |



16U0GX-006

### INSPECTION

#### Pick-up Coil with Igniter (Non-Turbo)

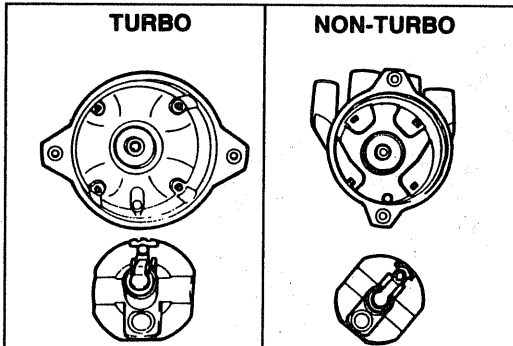
1. Connect an ohmmeter to the pick-up coil.
2. Measure the resistance.

**Resistance: 900—1,200Ω**

3. If it is not within specification, replace it.

#### Pick-up Coil (Turbo)

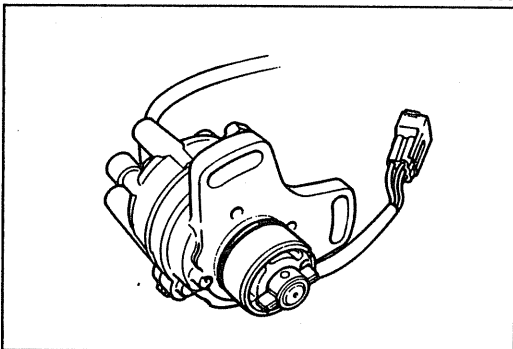
Refer to Section F2.



86U05X-060

### Cap and Rotor

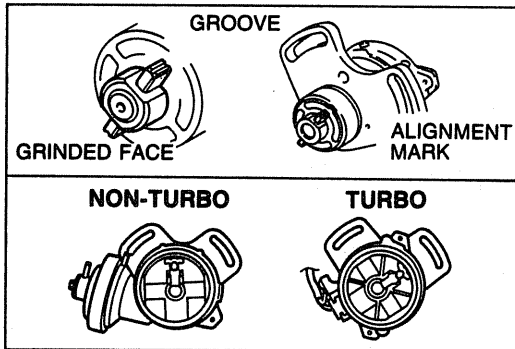
1. Check for corrosion, damage, and cracks.
2. Replace if necessary.



86U05X-061

### Distributor Shaft, O-ring, and Oil Seal

1. Check for damage to the distributor shaft, O-ring, and oil seal.



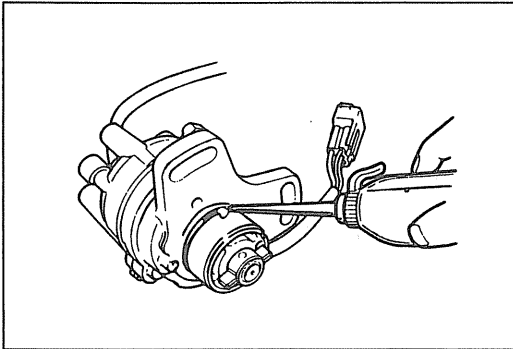
16U0GX-007

### ASSEMBLY

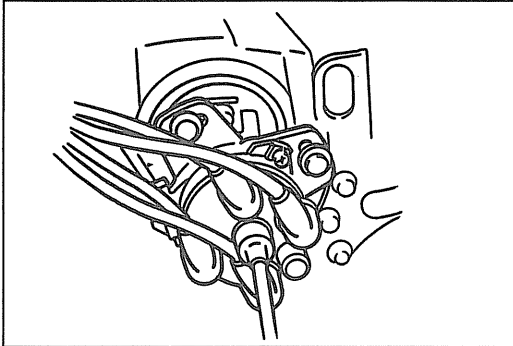
Assemble in the reverse order of disassembly, referring to **Assembly Note**.

#### Assembly Note

Align the coupling set blade with the alignment mark and check that the rotor is aligned as shown in the illustration.



06U0GX-022



06U0GX-038

**INSTALLATION****Note**

- After installing the distributor, adjust the ignition timing. (Refer to page G-28.)

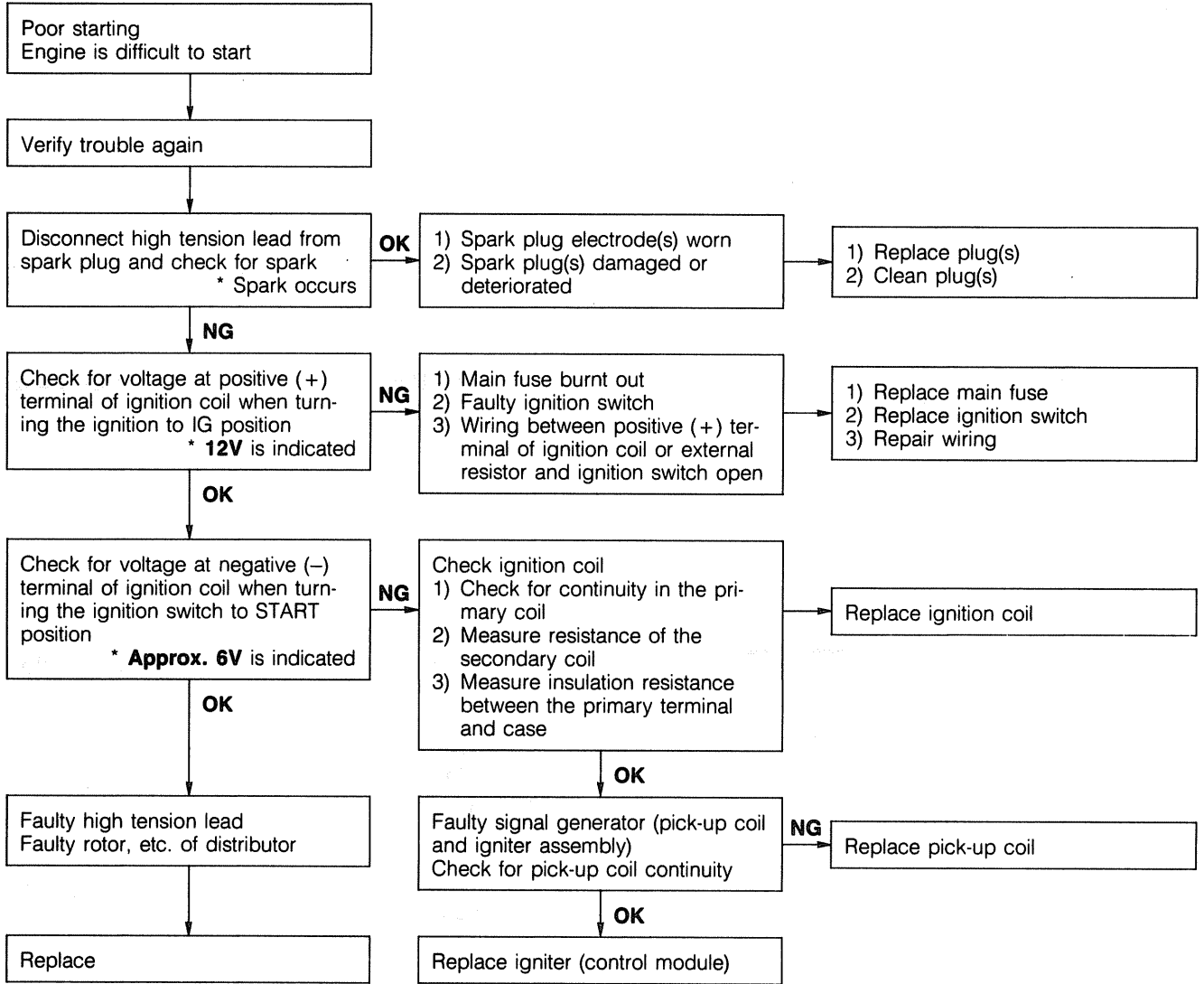
1. Apply engine oil to the O-ring and driven gear.
2. Install the distributor and connect the high-tension leads and distributor connector.
3. Tighten lock bolt to the specified torque.

**Torque specification:**

**19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)**



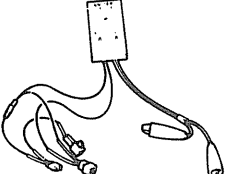
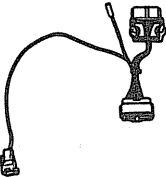
## H.E.I. TROUBLESHOOTING (Non-Turbo)



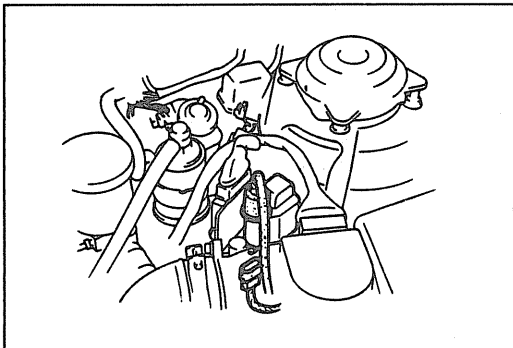
7BU05X-089

## IGNITER (TURBO)

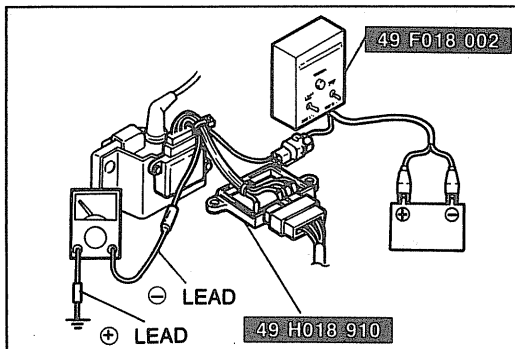
PREPARATION  
SST

<p>49 F018 002 Igniter checker</p> 	<p>For inspection of igniter</p>	<p>49 H018 910 Adapter harness</p> 	<p>For inspection of igniter</p>
--	----------------------------------	---	----------------------------------

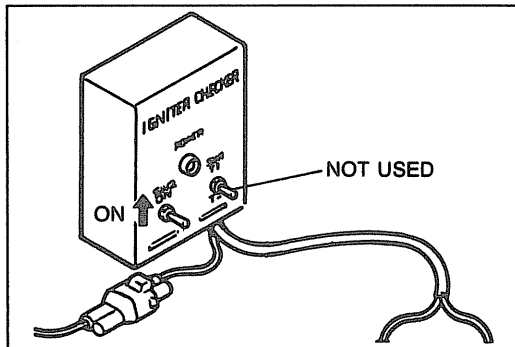
06U0GX-0023



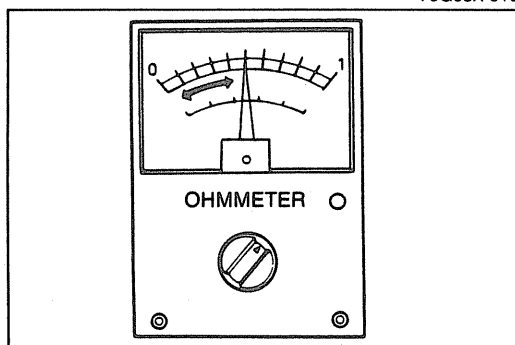
06U0GX-024



86U05X-066



79G05X-010



06U0GX-028

## INSPECTION

**Warning**

- While checking the igniter, disconnect the connector from the ignition coil.

1. Disconnect the igniter connector.
2. Connect the **SST** between the igniter and igniter connector.

**Caution**

- Do not misconnect the ohmmeter leads.

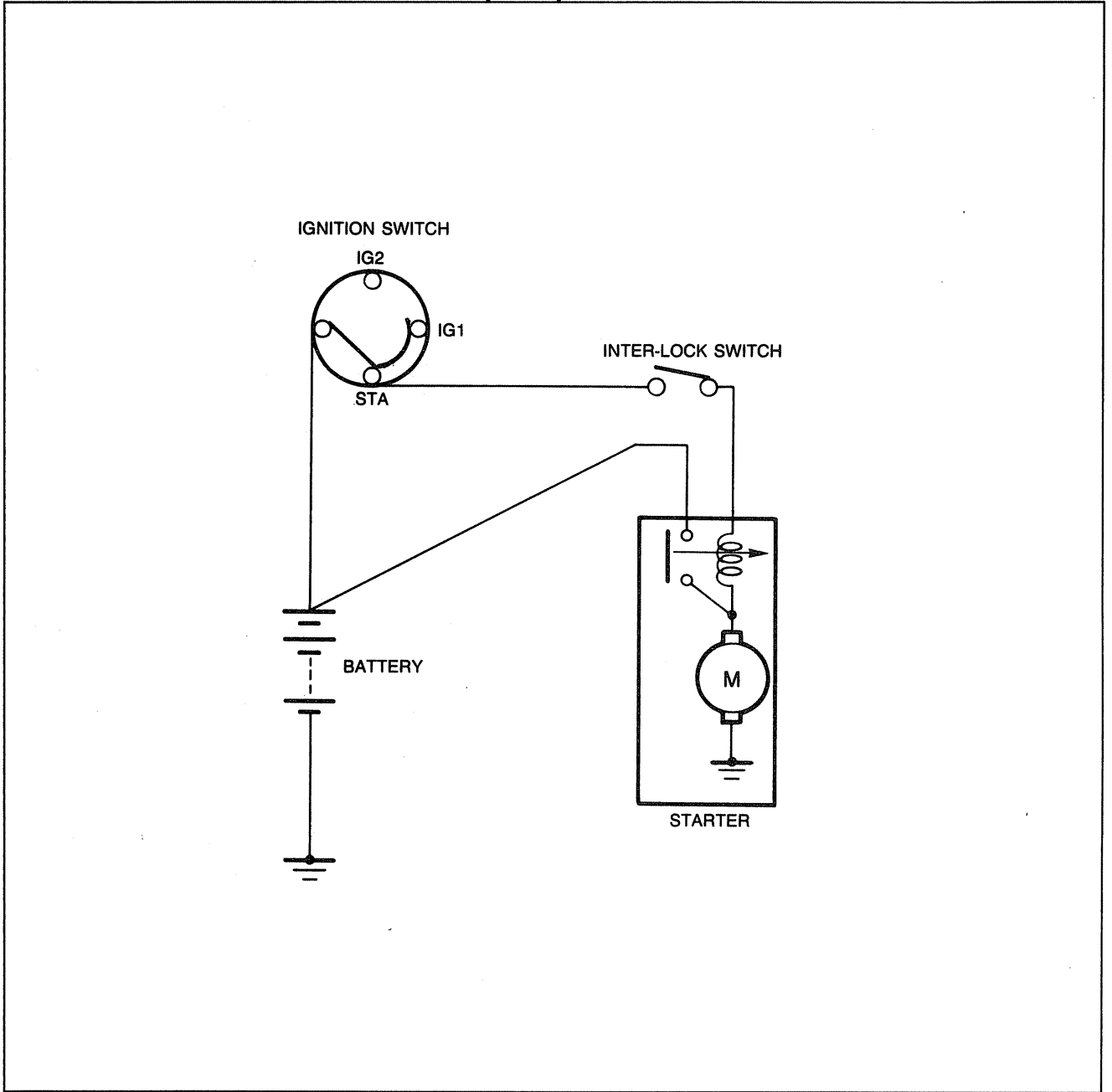
**Connect as follows:**

- + lead to ground
- lead to **SST**

3. Connect an ohmmeter between the **SST** and ground and set the scale change dial to X1.
4. Connect the **SST** to the battery.
5. Turn the ignition switch ON.
6. Push up the "SW2" switch on the **SST** while observing the ohmmeter.

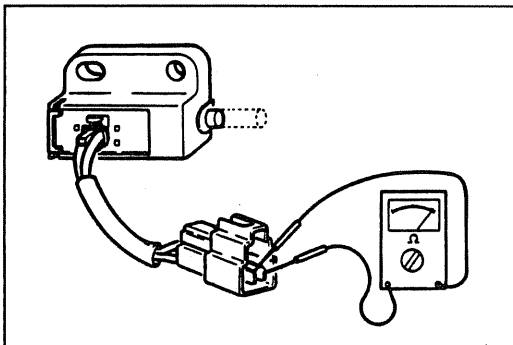
7. The pointer needle on the ohmmeter should jump up and then return.
8. Replace the igniter, if necessary.

STARTER INTERLOCK SYSTEM (MTX)



06U0GX-025

This system is similar to that of the inhibitor switch on an ATX vehicle. If the clutch pedal is not depressed during starting, battery power will not be supplied to the starter and it will not operate.



77U05X-016

**INTERLOCK SWITCH Inspection**

1. Disconnect the interlock switch connector.
2. Connect a circuit tester to the switch.
3. Check the continuity.

Pedal	Continuity
Depressed	Yes
Released	No

4. Replace the switch, if necessary.