

ENGINE ELECTRICAL SYSTEM

Return To Main Table of Contents

GENERAL	2
CHARGING SYSTEM.....	4
STARTING SYSTEM.....	23
IGNITION SYSTEM.....	32
AUTOMATIC SPEED CONTROL (CRUISE) SYSTEM ...	43

GENERAL

SPECIFICATIONS

Distributor

Type		Contact pointless type
Ignition interval	No.1 cylinder	0°
	No.2 cylinder	60° ± 0.5°
	No.3 cylinder	120° ± 0.5°
	No.4 cylinder	180° ± 0.5°
	No.5 cylinder	240° ± 0.5°
	No.6 cylinder	360° ± 0.5°
Ignition order		1 - 2 - 3 4 - 5 - 6
Advance mechanism		Controlled by electronic control unit

Ignition Coil

Type	Molded coil
Primary coil resistance	0.8 Ω ± 0.08 Ω
Secondary coil resistance	12.1 KΩ ± 1.8 Ω

Spark Plug

Type	
NGK	PGR5A 11
NO	P16PR11
Plug gap	10-1.1 mm (0.039-0.043 in.)

Starter Motor

Type	Reduction drive (with planetary gear)
Voltage	12 V
output	1.2 KW
Free running characteristics	
Terminal voltage	11 V
Current	Max. 90 A
Speed	Min. 3000 rpm
Number of pinion teeth	8
Pinion gap	0.5-2.0 mm (0.0197-0.079 in.)

GENERAL

Alternator

Type	Battery voltage sensing
Rated output	12 V / 90 A
Rotor speed	1,000 - 18,000 rpm
Voltage regulator setting	14.4 ± 0.3 V
Temperature compensated	-10 ± 3 mV/°C
Voltage regulator type	Electronic built-in type

Battery

Type	MF68 AH
Cold cranking [at -17.8°C (0°F)]	540A
Reverse capacity	122 min.
Specific gravity [at 25°C (77°F)]	1,280 ± 0.01
Ampere hours (5HR)	55 AH
(20HR)	68 AH

NOTE

1. **COLD CRANK AMPERAGE** is the amperage a battery can deliver for 30 seconds and maintain a terminal voltage of 7.2 or greater at a specified temperature.
2. **REVERSE CAPACITY RATING** is the amount of time a battery can deliver 25A and maintain a minimum terminal voltage of 10.5 at 26.7°C (80°F).

TIGHTENING TORQUE

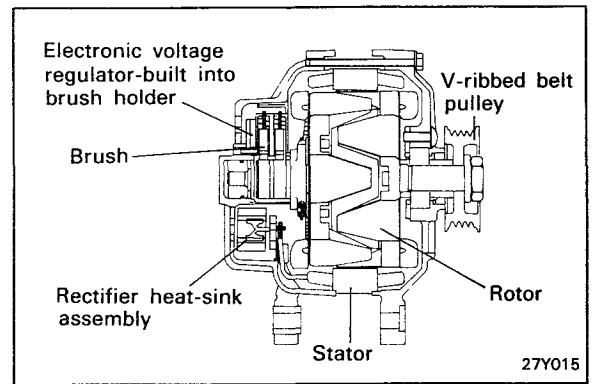
Items	Nm	kg.cm	lb.ft
Alternator terminal (B+)	4 - 6	40 - 60	2.9 - 4.3
Starter motor terminal (B+)	10 - 16	100 - 160	7.3 - 11.8
Battery terminal	4 - 6	40 - 60	2.9 - 4.3
Spark plug	20 - 30	200 - 300	15 - 22

CHARGING SYSTEM

GENERAL INFORMATION

The charging system includes a battery, an alternator with a built-in regulator, and the charging indicator light and wires. The alternator has six built-in diodes (three positive and three negative), each rectifying AC current to DC current. Therefore, DC current appears at alternator "B" terminal.

In addition, the charging voltage of this alternator is regulated by the battery voltage detection system. The main components of the alternator are the rotor, stator, rectifier, capacitor, brushes, bearings and V-ribbed belt pulley. The brush holder contains a built-in electronic voltage regulator.



TROUBLESHOOTING

Symptom	Probable cause	Remedy
Charging warning indicator does not light with ignition switch "ON" and engine off.	Fuse blown.	Check fuses.
	Lamp burned out.	Replace lamp.
	Wiring connection loose.	Tighten loose connections.
	Electronic voltage regulator faulty.	Replace voltage regulator.
Charging warning indicator does not go out with engine running. (Battery requires frequent recharging).	Drive belt loose or worn.	Adjust tension or replace drive belt.
	Battery cables loose, corroded or worn.	Repair or replace cables.
	Fuse blown.	Check fuses.
	Fusible link blown.	Replace fusible link.
	Electronic voltage regulator or alternator faulty.	Test alternator.
	Wiring faulty.	Repair wiring
Discharge battery.	Drive belt loose or worn.	Adjust tension or replace drive belt.
	Wiring connection loose or open circuit.	Tighten loose connection or repair wiring.
	Fusible link blown.	Replace fusible link.
	Poor grounding.	Repair.
	Electronic voltage regulator or alternator faulty.	Test alternator.
	Battery life.	Replace battery.
Overcharge	Electronic voltage regulator faulty.	Replace voltage regulator.
	Voltage sensing wire faulty.	Repair wire

CHARGING SYSTEM

SERVICE ADJUSTMENT PROCEDURES

VOLTAGE DROP TEST OF ALTERNATOR OUTPUT WIRE

This test determines whether or not the wiring between the alternator B terminal and the battery (+) terminal (including fusible link) is within specifications.

Preparation

1. Turn the ignition switch to "OFF".
2. Disconnect the battery GND cable.
3. Disconnect the alternator output lead from the alternator "B" terminal.
4. Connect a DC ammeter (0 to 100A) in series to the "B" terminal and the disconnected output lead. Connect the (+) lead of the ammeter to the "B" terminal and the (-) lead to the disconnected output wire.

NOTE:

Use of an inductive type ammeter that measures current without disconnecting the harness is preferred. The reason is that, while checking a vehicle that has low output current due to a poor connection of the alternator "B" terminal, when the terminal is loosened and a test ammeter is connected, the poor connection will be corrected. As a result, the cause may *not* be determined.

5. Connect a voltmeter between the alternator "B" terminal and battery (+) terminal. Connect the (+) lead wire of the voltmeter to the "B" terminal and the (+) lead wire to the battery (+) terminal.
6. Connect the battery ground cable.

Test

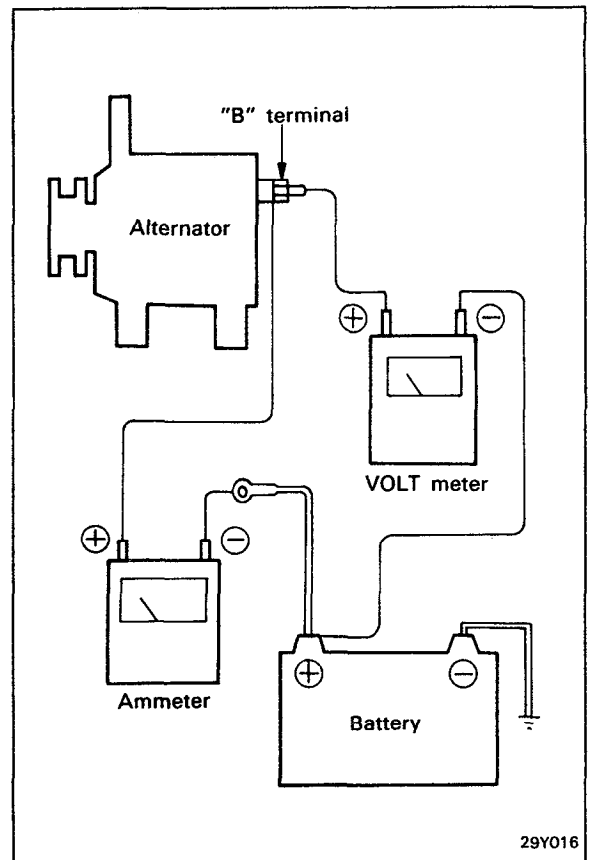
1. Start the engine.
2. Turn the headlamps ON and OFF. Adjust the engine speed so that the ammeter reads 20A and note the reading of the voltmeter

Result

1. The reading should be less than the standard value.

Standard value : 0.2V max.

2. If the voltmeter indicates a value larger than the standard value, poor wiring can be suspected.
The wiring from the alternator "B" terminal to the fusible link and battery (+) terminal. Check for corroded or loose connections.



CHARGING SYSTEM

3. Upon completion of the test, let the engine idle. Turn off the lights and ignition switch.
4. Disconnect the battery ground cable.
5. Disconnect the ammeter and voltmeter that were connected for test purposes.
6. Connect the alternator output wire to the alternator "B" terminal.
7. Connect the battery ground cable.

OUTPUT CURRENT TEST

The test determines if the alternator output is within normal specifications.

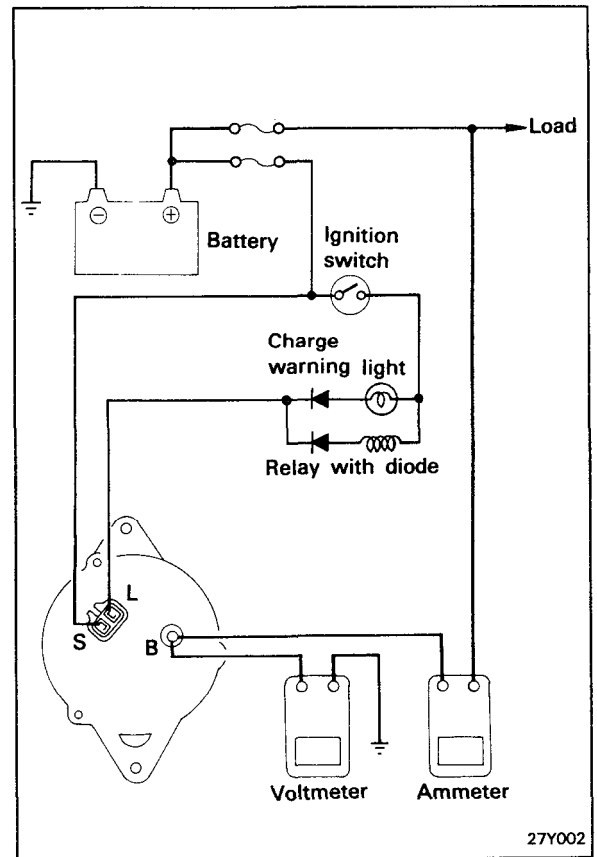
Preparation

1. Prior to the test, check the following items and correct as necessary.
 - 1) Check the battery installed in the vehicle to ensure that it is in good condition. The test method is described in the "BATTERY" section.
 - 2) Check the tension of the alternator drive belt.
2. Turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Disconnect the alternator output wire from the alternator "B" terminal.
5. Connect a DC ammeter (0 to 100A) in series between the "B" terminal and the disconnected output wire. Connect the (+) lead wire of the ammeter to the alternator "B" terminal and the (-) lead wire to the disconnected output wire.

NOTE:

Tighten each connection securely because of heavy current flow. Do not rely on clips.

6. Connect a voltmeter (0 to 20V) between the "B" terminal and ground. Connect the (+) lead wire of the voltmeter to the alternator "B" terminal and (-) lead wire to ground.
7. Connect a tachometer and re-connect the battery ground cable.
8. Leave the engine hood open.



CHARGING SYSTEM

Test

1. Check to see that the voltmeter reads the same value as the battery voltage.
If the voltmeter reads 0V, an open circuit in the wire between the alternator "B" terminal and battery (+) terminal, a blown fusible link or poor grounding can be suspected.
2. Turn on the headlamp switch and start the engine.
3. Set the headlamp on high beam and the heater blower switch on HIGH. Quickly increase the engine speed to 2,500 rpm and read the maximum output current value indicated by the ammeter.

NOTE:

After the engine start up, the charging current quickly drops. Therefore, the above operation must be done quickly to read maximum current value correctly.

Result

1. The ammeter reading must be higher than the standard value. If it is lower but the alternator output wire is normal, remove the alternator from the vehicle and check it.

Standard value: 53A min.

NOTE:

- 1) The nominal output current value is shown on the nameplate affixed to the alternator body.
- 2) The output current value changes with the electrical load and the temperature of the alternator itself. Therefore, the output current may not be obtained if the vehicle electrical load at the time of the test is low. In such a case, keep the headlamps on to discharge the battery or use the lamps of another vehicle to increase the electrical load.

The nominal output current may not be obtained if the temperature of the alternator itself or ambient temperature is too high.

In such a case, reduce the temperature before testing again.

2. Upon completion of the output current test, lower the engine speed to idle and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the test ammeter, voltmeter and the engine tachometer.
5. Connect the alternator output wire to the alternator "B" terminal.
6. Connect the battery ground cable.

REGULATED VOLTAGE TEST

The purpose of this test is to check that the electronic voltage regulator controls the voltage correctly.

Preparation

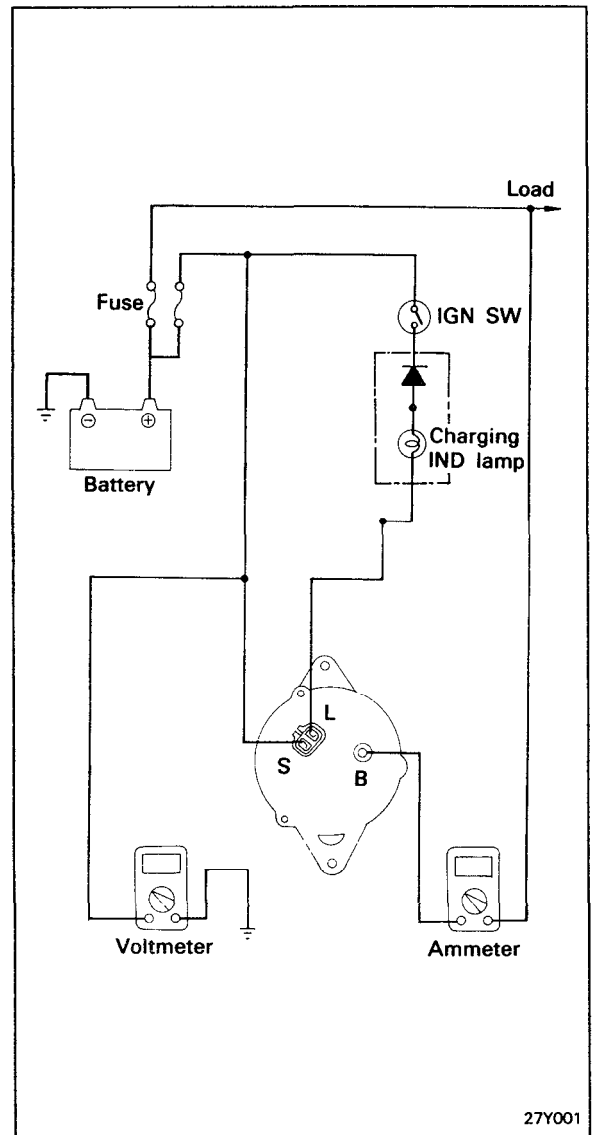
1. Prior to the test, check the following items and correct if necessary.
 - 1) Check the battery installed on the vehicle to see that it is fully charged. For- battery checking method, see the "BATTERY" section.
 - 2) Check the alternator drive belt tension.
2. Turn the ignition switch to "OFF".
3. Disconnect the battery ground cable.
4. Connect a digital voltmeter between the "S" terminal of the alternator and ground. Connect the (+) lead of the voltmeter to the "S" terminal of the alternator, inserting from the wire side of the 2-way connector and connect the (-) lead to ground or the battery (-) terminal.
5. Disconnect the alternator output wire from the alternator "B" terminal.
6. Connect a DC ammeter (0 to 100A) in series between the "B" terminal and the disconnected output wire. Connect the (+) lead wire of the ammeter to the alternator "B" terminal and. the (-) lead wire to the disconnected output wire.
7. Connect an engine tachometer and reconnect the battery ground cable.

Test

1. Turn on the ignition switch and check that the voltmeter indicates battery voltage.
If it reads 0V, there is an open circuit in the wire between the alternator "S" terminal and the battery (+), or the fusible link is blown.
2. Start the engine. Keep all lamps and accessories off.
3. Run the engine at a speed of about 2,500 rpm and read the voltmeter when the alternator output current drops to 10A or less.

Result

1. If the voltmeter reading agrees with the value listed in the following table, the voltage regulator is functioning correctly. If the reading is other than the standard value, the voltage regulator or the alternator is faulty.



CHARGING SYSTEM

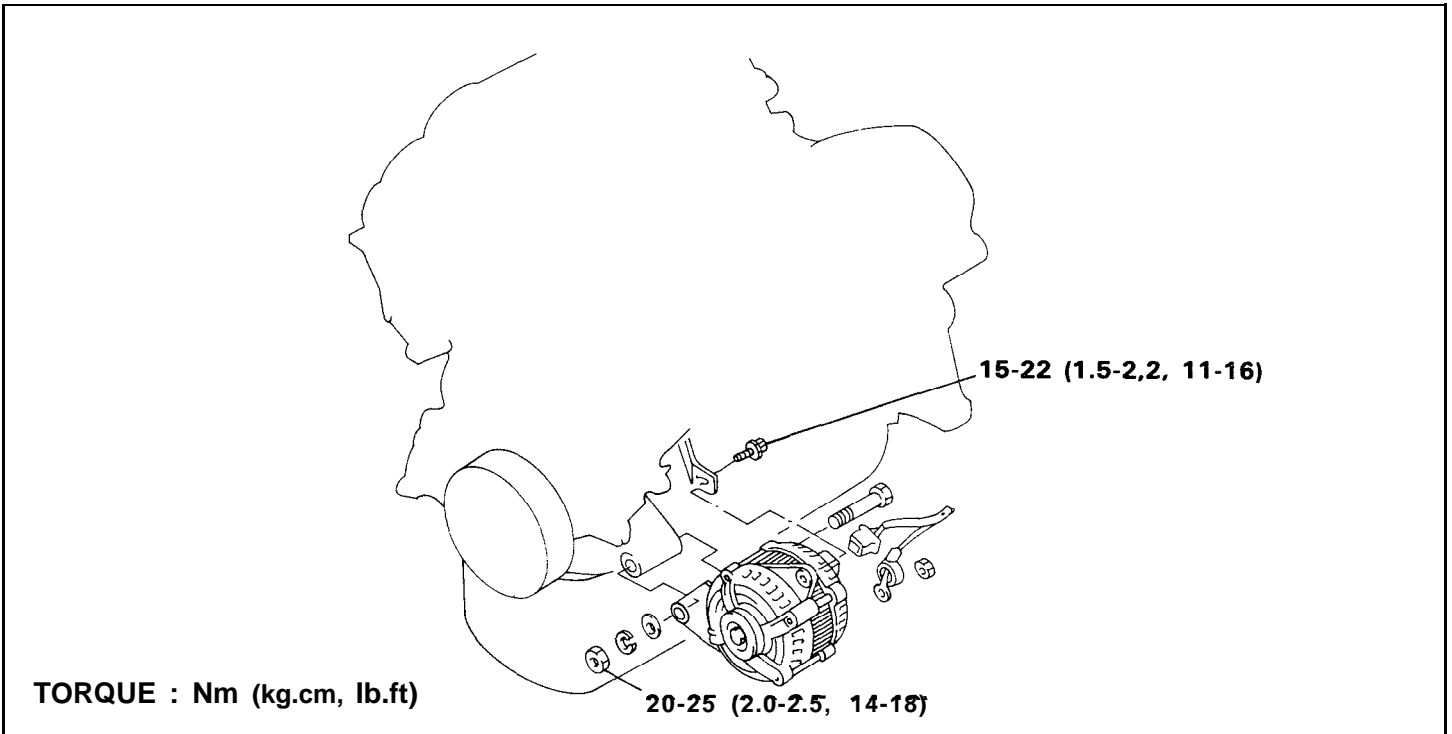
Regulating Voltage Table

Voltage regulator ambient temperature °C (°F)	Regulated voltage [Standard value]
-20 (-4)	14.2 - 15.4
20 (68)	13.9 - 14.9
60 (140)	13.4 - 14.6
80 (176)	13.1 - 14.5

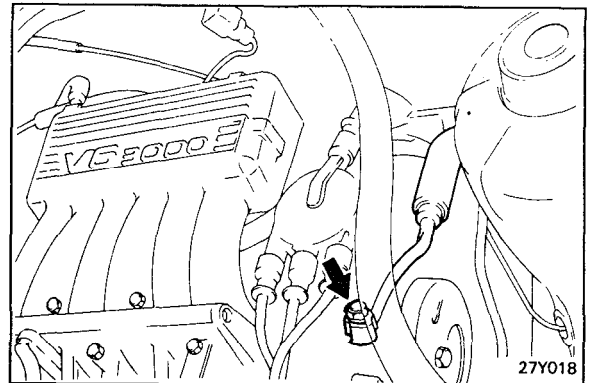
2. After the test, lower the engine speed to idle and turn the ignition switch to "OFF".
3. Disconnect the battery ground cable.
4. Remove the test voltmeter, ammeter and engine tachometer.
5. Connect the alternator output lead to the alternator "B" terminal.
6. Connect the battery ground cable.

CHARGING SYSTEM

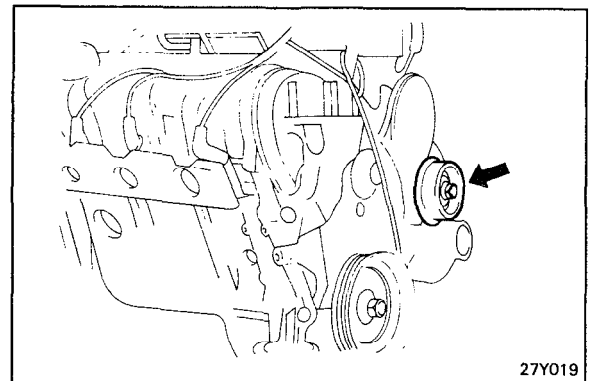
ALTERNATOR REMOVAL AND INSTALLATION



1. Remove the distributor cap.
2. Remove the power steering pressure hose nut.

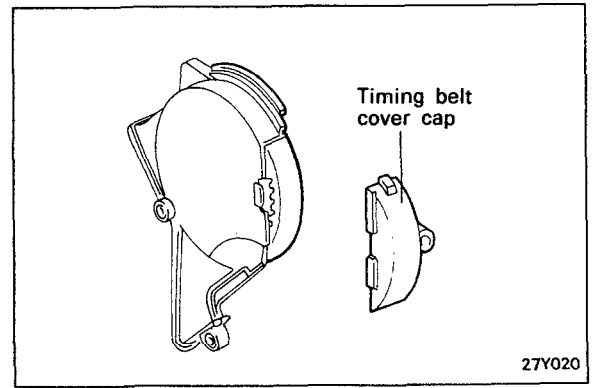


3. Loosen the tensioner and then remove the V-belt.

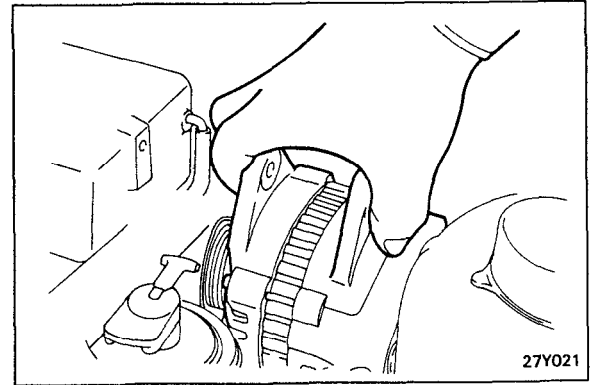


CHARGING SYSTEM

4. Remove the timing belt cover cap and the timing belt upper cover (A).

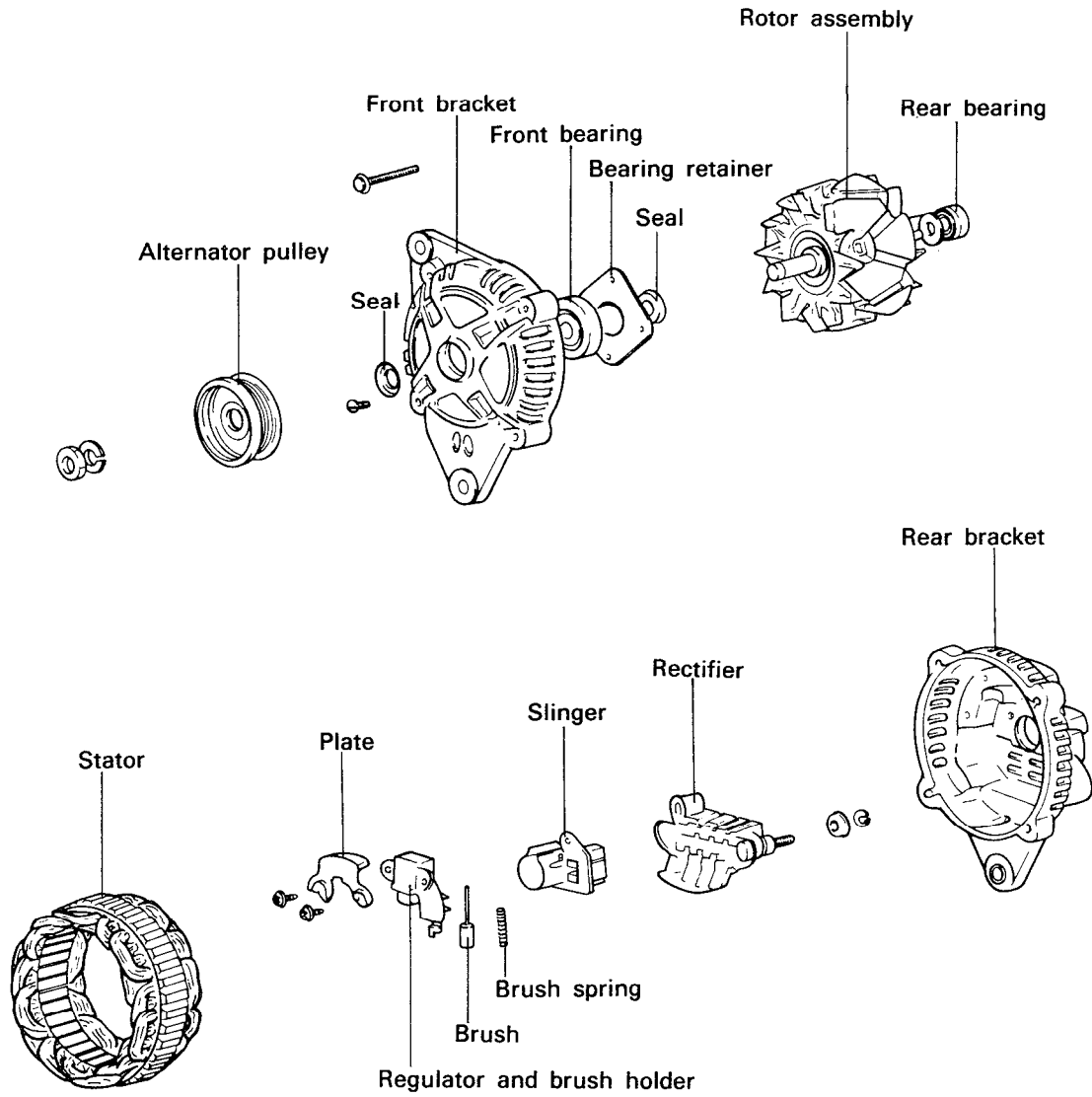


5. Remove the alternator from the engine compartment.
6. Installation is the reverse order of removal.
7. Be sure to check for power steering.



CHARGING SYSTEM

COMPONENTS



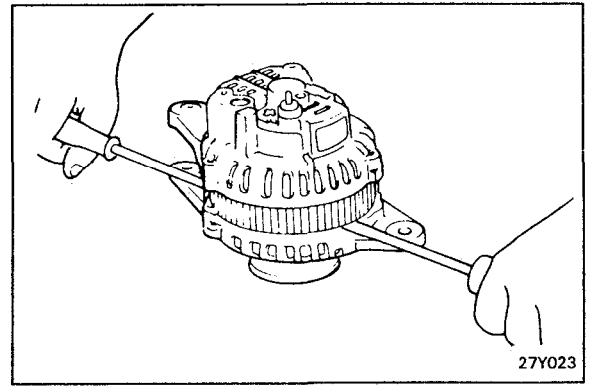
CHARGING SYSTEM

DISASSEMBLY

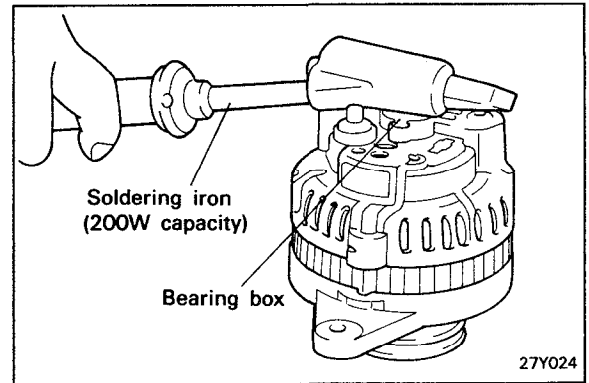
1. Remove the four through bolts.
2. Insert a flat tip screwdriver between the front bracket and stator core and pry downward.

CAUTION

- 1) Do not insert the screwdriver too deep, as this may cause damage to the stator coil.



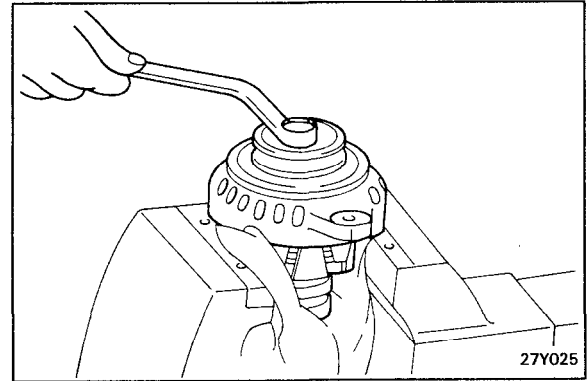
- 2) The rear cover may be hard to remove because a ring is used to lock the outer race of the rear bearing. To facilitate removal of the rear cover, heat the bearing section with a 200-watt soldering iron. Do not use a heat gun, as it may damage the diode assembly.



3. Secure the rotor in a vise with the pulley side up.

CAUTION

Be careful that the vise jaws do not damage the rotor.



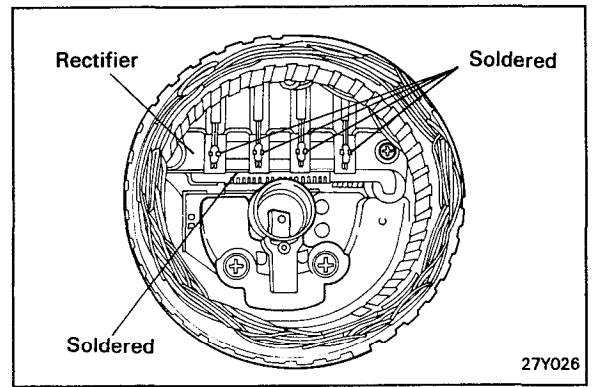
4. Remove the pulley nut, spring washer and the pulley.
5. Remove the front bracket and the two seals.
6. Remove the rotor from the vise.
7. Remove the brush holder screws, the rectifier screws, and the nut from the B terminal.
8. Remove the stator assembly from the rear bracket.
9. Detach the slinger from the brush holder.

CHARGING SYSTEM

10. When the stator is to be removed, unsolder the four stator leads to the main diodes on the rectifier.

CAUTION

- 1) When soldering or unsoldering, make sure any the heat of the soldering iron is not transmitted to the diode for a long period of time.
 - 2) Use care that undue force is not exerted on the diode leads.
11. When separating the rectifier from the brush holder, unsolder the plate soldered to the rectifier.

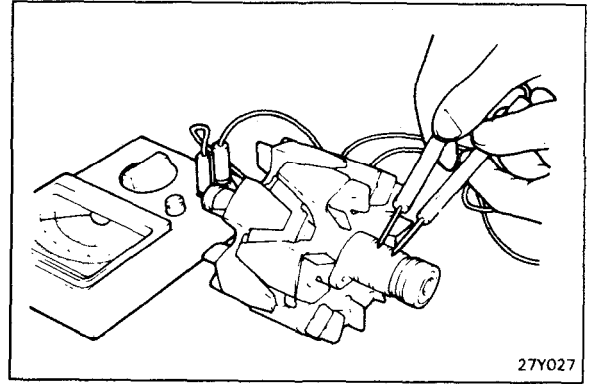


INSPECTION

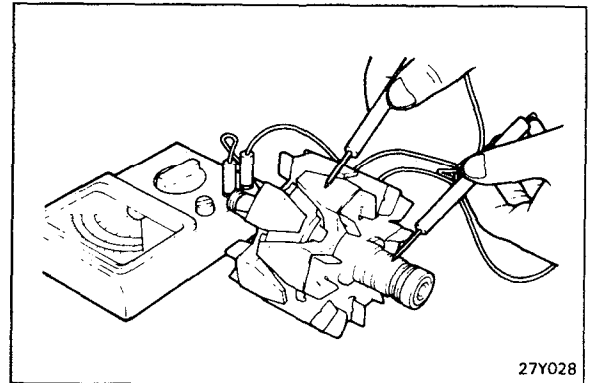
ROTOR

1. Check the rotor coil for continuity. Check that there is continuity between the slip rings.
If the resistance is extremely low, it means there is a short.
If there is no continuity or a short circuit, replace the rotor assembly.

Resistance value : 3.0Ω

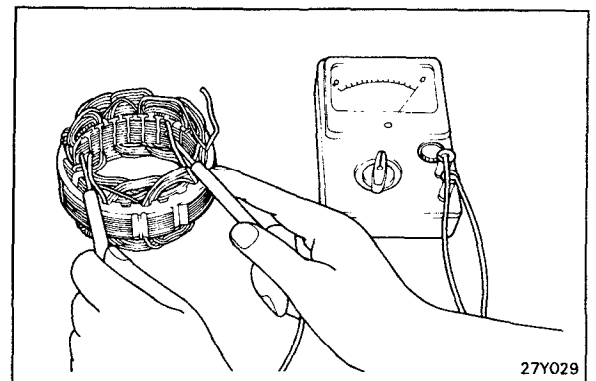


2. Check the rotor coil for ground. Check that there is no continuity between the slip ring and core.
If there is continuity, replace the rotor assembly.

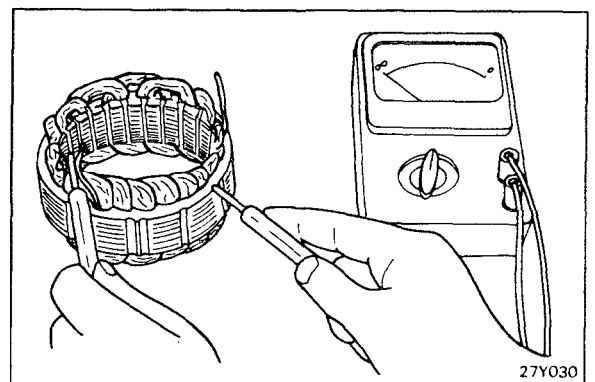


STATOR

7. Make a continuity check on the stator coil. Check that there is continuity between the coil leads.
If there is no continuity, replace the stator assembly.



2. Check the coil for grounding. Check that there is no continuity between the coil and the core.
If there is continuity, replace the stator assembly.

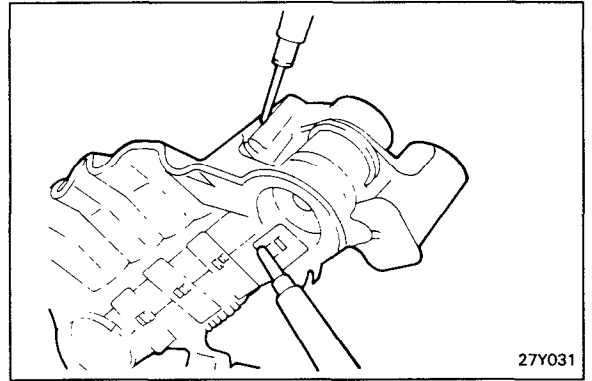


RECTIFIERS

Positive rectifier test

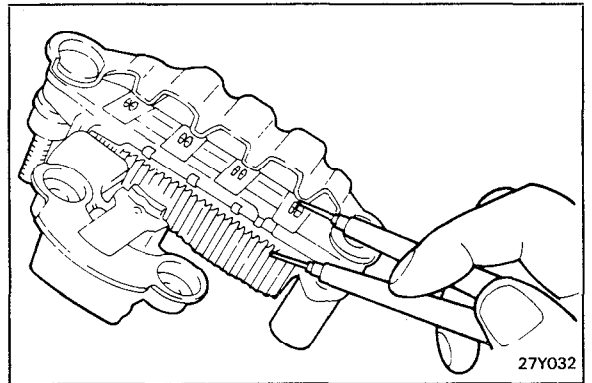
Check for continuity between the positive rectifier and the stator coil lead connection with an ohmmeter. The ohmmeter should read continuity in only one direction. If there is continuity in both directions, the diode is shorted.

Replace the rectifier assembly.



Negative rectifier test

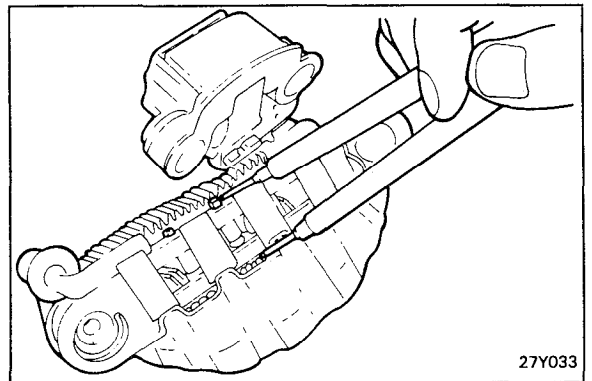
Check for continuity between the negative rectifier and the stator coil lead connection. The ohmmeter should read continuity in only one direction. If there is continuity in both directions, the diode is shorted, and the rectifier assembly must be replaced.



DIODE TRIO TEST

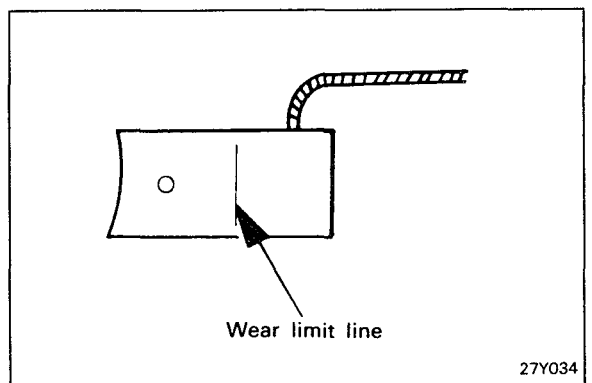
Check the three diodes for continuity by connecting an ohmmeter to both ends of each diode. Each diode should have continuity in only one direction.

If there is continuity in both directions, the diode is defective and the assembly must be replaced.



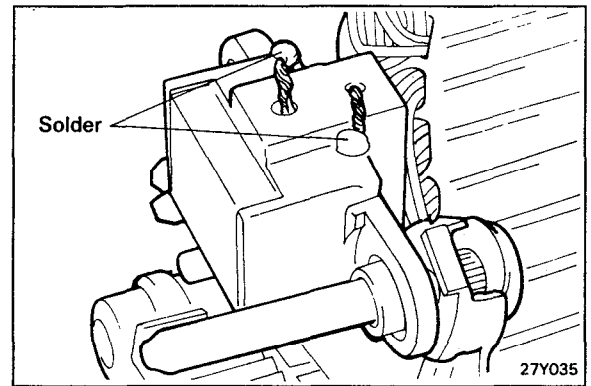
BRUSH REPLACEMENT

1. Replace the brush by the following procedures if it is worn to the limit line.

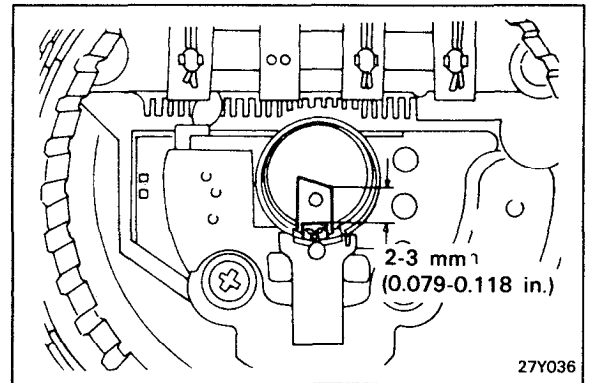


CHARGING SYSTEM

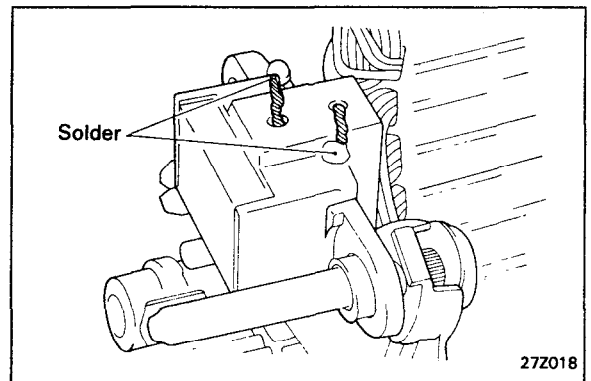
2. Unsolder the pigtail and remove the old brush and spring.



3. Install the brush spring and a new brush in the brush holder.
4. Push the brush into the brush holder end frame until a pin can be installed to retain the brush in the retracted position.



5. Solder pigtail to brush holder as shown in the illustration.

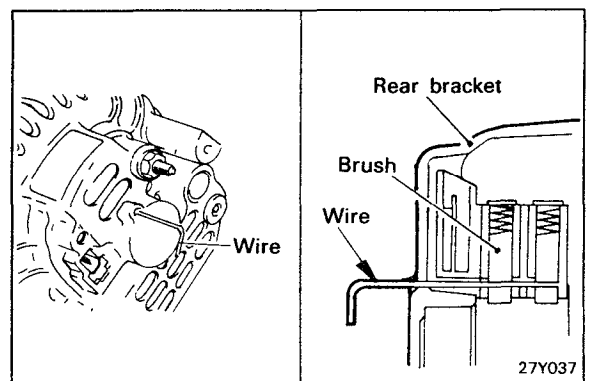


REASSEMBLY

Perform the assembly in reverse procedure, paying attention to the followings.

Before rotor is attached to rear bracket, insert wire through small hole made in rear bracket to lift brush.

After the rotor has been installed, remove the wire holding the brush in place.



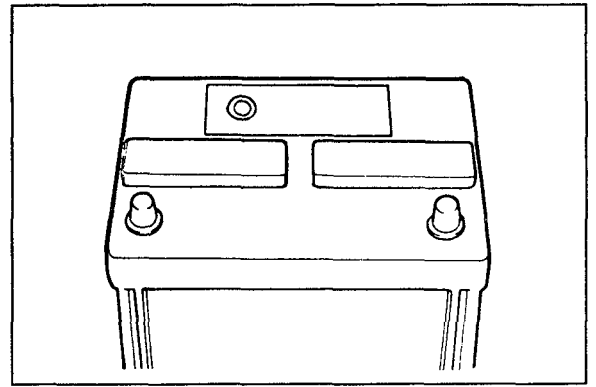
CHARGING SYSTEM

BATTERY

BATTERY-MAINTENANCE FREE TYPE

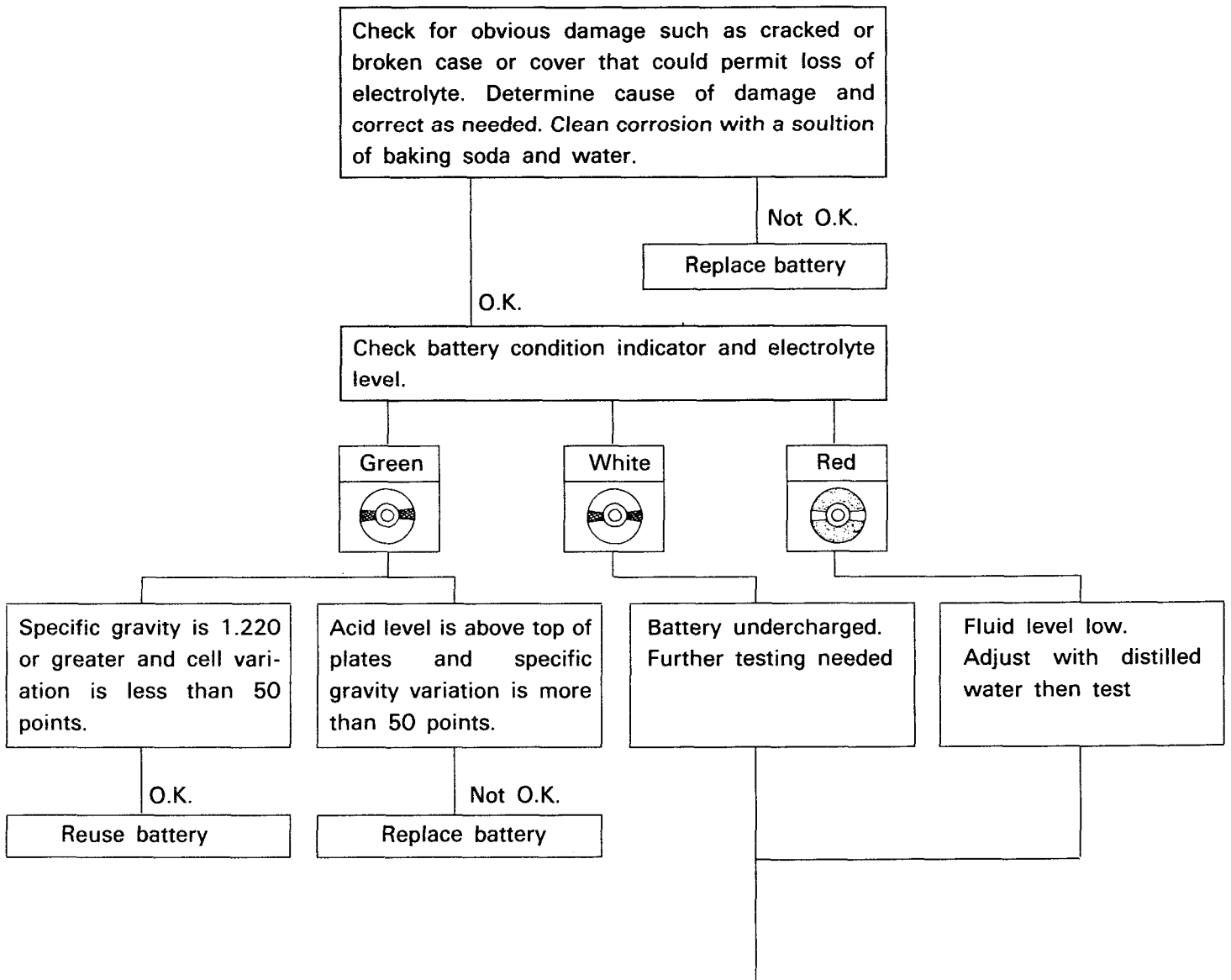
General Information

1. The maintenance-free battery is, as the name implies, totally maintenance free.
2. Water never needs to be added to the maintenance-free battery.
3. The battery is completely sealed, except for small vent holes in the cover.
4. The battery contains a visual test indicator,

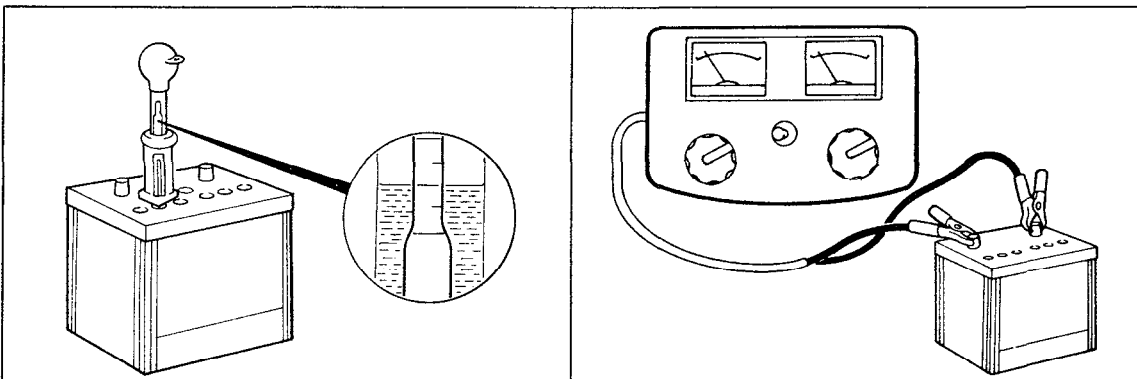
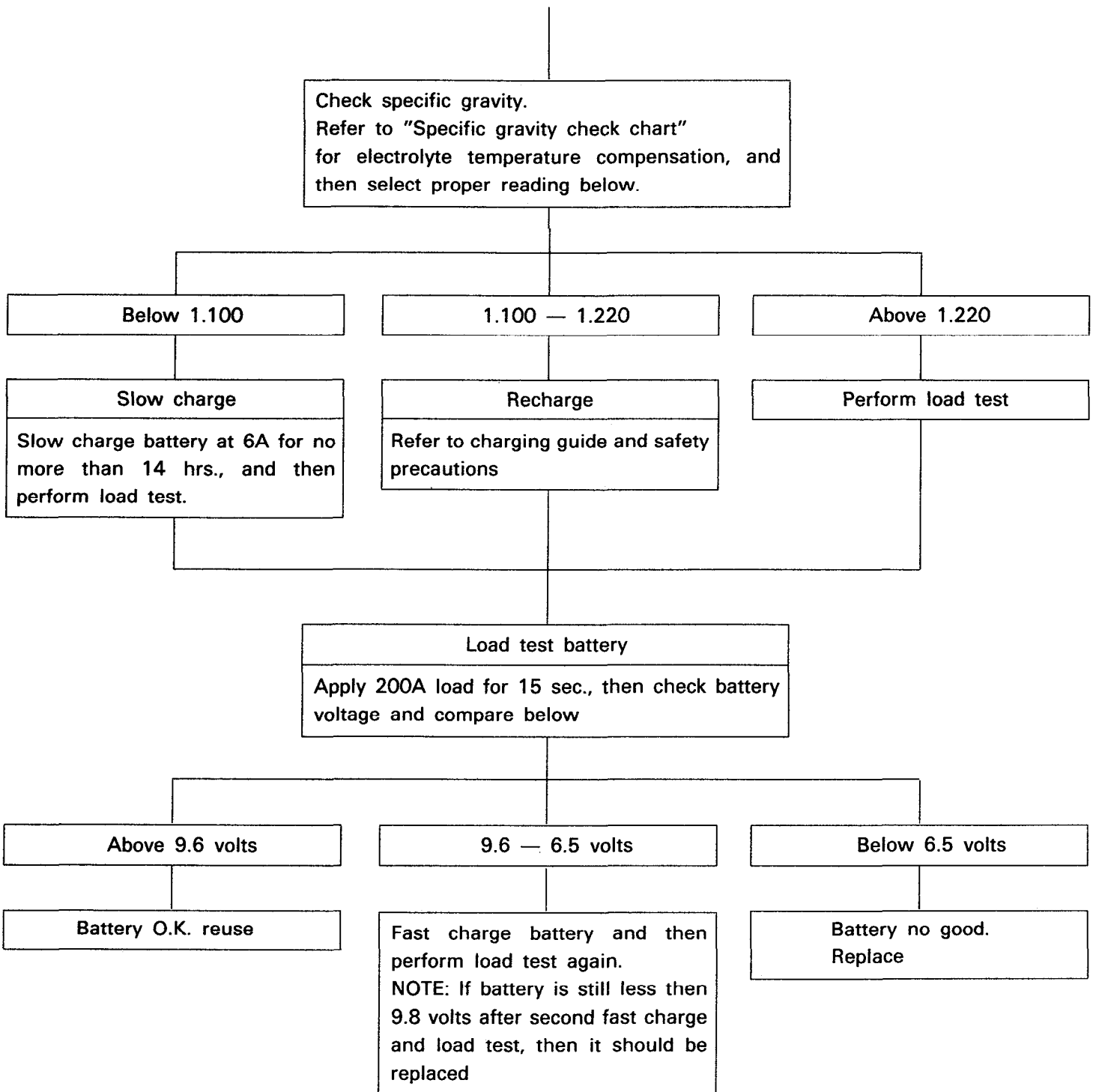


TROUBLESHOOTING

Battery Visual Inspection (1)



CHARGING SYSTEM



SPECIFIC GRAVITY CHECK CHART

The specific gravity of battery electrolyte changes with temperature. Heat thins the solution and lowers the specific gravity. Cold thickens the solution and raises the specific gravity.

A fully charged battery should have a specific gravity between 1.260 and 1.280, with the electrolyte temperature at 80°F. If the electrolyte temperature is above or below 80°F, the specific gravity reading must be corrected by adding 4 points (.004) for each 10° above 80°F or subtracting 4 points for every 10° below 80°F.

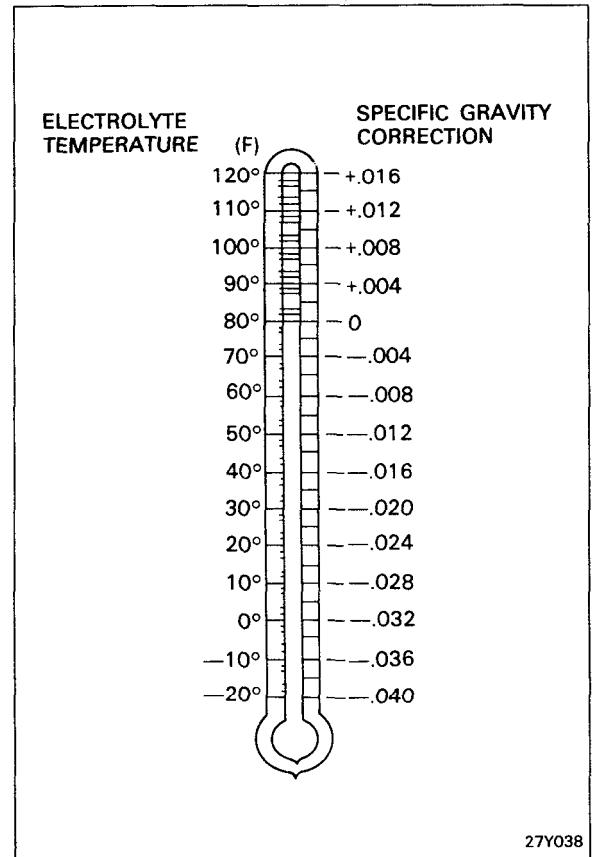
Example: The hydrometer reading is 1.280, and the electrolyte temperature reading is 10°F. By using the chart, the specific gravity must be lowered by .028 points. The true corrected reading is 1.252.

$$1.280 - .028 = 1.252$$

You should never take a hydrometer reading immediately after water has been added. The water and electrolyte must be mixed by either charging for a few minutes at a low rate or allowing the battery to sit for an hour.

CAUTION

A difference of 50 points (0.050) or more between one or more cells indicates a defective battery. It should be replaced.



27Y038

CHARGING SYSTEM

BATTERY CHARGE RATE

Charge method Battery type Specific gravity Current	Fast charge	Slow charge
	MF68AH	MF68AH
	25A	6A
Below 1.100	4 hours	14 hours
1.100 - 1.130	3 hours	12 hours
1.130 - 1.160	2.5 hours	10 hours
1.160 - 1.190	2.0 hours	8 hours
1.190 - 1.220	1.5 hours	6 hours
Above 1.220	1 hours	4 hours

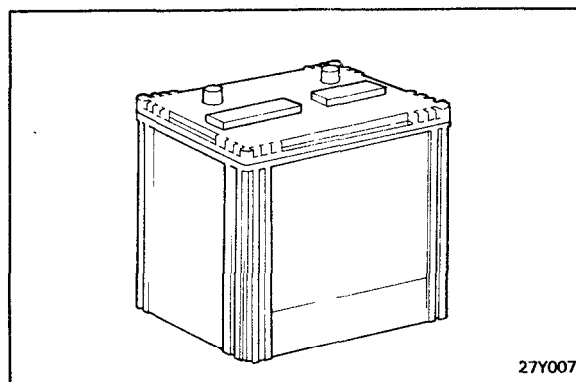
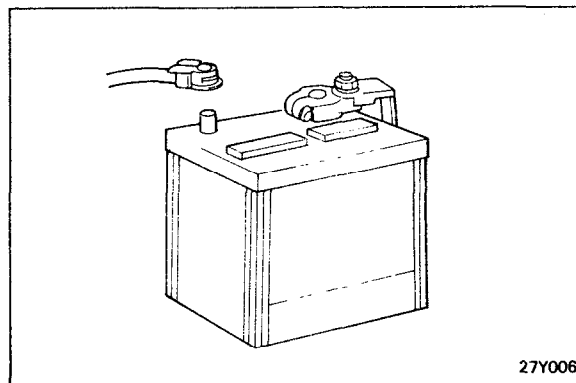
Battery Visual Inspection (2)

1. Make sure the ignition switch is in the Off position and all accessories are Off.
2. Disconnect the battery cables (negative first).
3. Remove the battery from the vehicle.

CAUTION

Care should be taken in the event the battery case is cracked or leaking to protect your skin from the electrolyte. A suitable pair of rubber gloves (not the house hold type) should be worn when removing the battery.

4. Inspect the battery carrier for damage caused by the loss of acid from the battery. If acid damage is present, it will be necessary to clean the area with a solution of clean warm water and baking soda. Scrub the area with a stiff bristle brush and wipe with a cloth moistened or baking soda and water.
5. Clean the top of the battery with the same solution as described in Step (4).
6. Inspect the battery case and cover for cracks. If cracks are present, the battery must be replaced.
7. Clean the battery post with a suitable battery post cleaner.
8. Clean the inside surface of the terminal clamps with a suitable battery terminal cleaning tool. Replace damaged or frayed cables and broken terminal clamps.



CHARGING SYSTEM

9. Install the battery in the vehicle.
10. Connect the cable terminals to the battery post, making sure the top of the terminals are flush with the top of the post.
11. Tighten the terminal nut securely.
12. Coat all connections with light mineral grease after tightening.

CAUTION

When batteries are being charged, an explosive gas forms beneath the cover of each cell. Do not smoke near batteries being charged or which have recently been charged. Do not disconnect live circuits at the terminals of the batteries being charged. A spark will occur where the circuit is broken.

Keep all open flames away from the battery.

STARTING SYSTEM

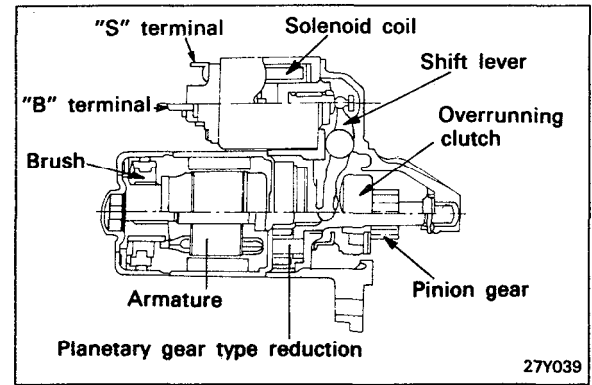
STARTING SYSTEM

GENERAL INFORMATION

The starting system includes the battery, starter motor, solenoid switch, ignition switch, inhibitor switch, connection wire and battery cables.

When the ignition key is turned to the start position, current flows and energizes the coil of the starter motor's solenoid. When this happens, the solenoid plunger and clutch shift lever are activated, and the clutch pinion engages the ring gear. The contacts close and the starter motor cranks.

In order to prevent damage caused by excessive rotation of the starter armature when the engine is started an overrunning clutch is used on the pinion gear.



TROUBLESHOOTING

Symptom	Probable cause	Remedy
Engine will not crank.	Battery charge low	Charge or replace battery.
	Battery cables loose, corroded or worn	Repair or replace cables. _
	Inhibitor switch faulty	Adjust or replace switch.
	Fusible link blown	Replace fusible link.
	Starter motor faulty	Repair starter motor.
	Ignition switch faulty	Replace ignition switch.
Engine cranks slowly.	Battery charge low	Charge or replace battery.
	Battery cables loose, corroded or worn	Repair or replace cables.
	Starter motor faulty	Repair starter motor.
Starter keeps running.	Starter motor faulty	Repair starter motor.
	Ignition switch faulty	Replace ignition switch.
Starter spins but engine will not crank.	Short in wiring	Repair wiring.
	Pinion gear teeth broken or starter motor faulty	Repair starter motor.
	Ring gear teeth broken	Replace flywheel ring gear or torque converter.

STARTING SYSTEM

SERVICE ADJUSTMENT

PINION GAP ADJUSTMENT

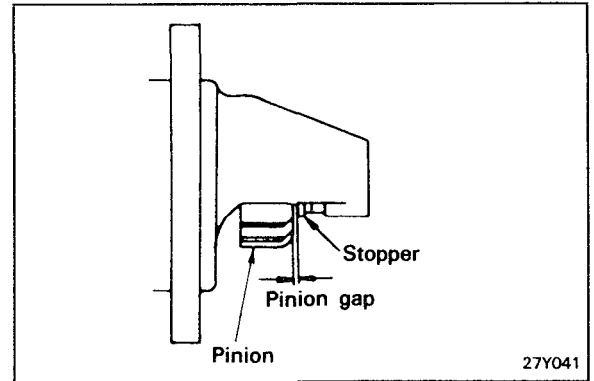
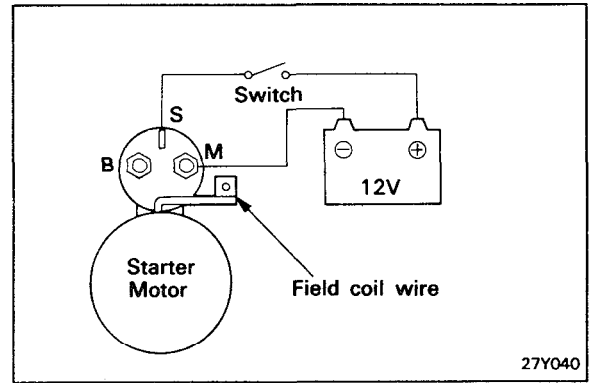
1. Disconnect the field coil wire from the M-terminal of the solenoid.
2. Connect a 12V battery between the S-terminal and the M-terminal.
3. The pinion will move out.

CAUTION

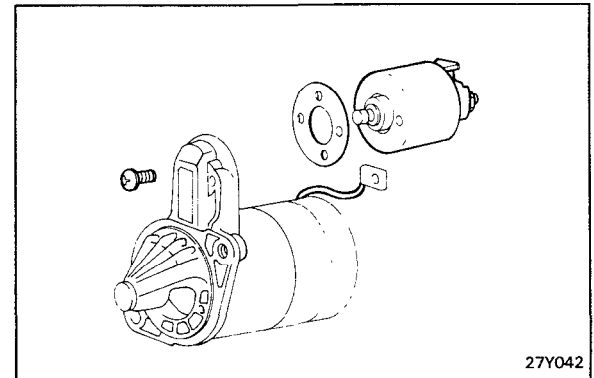
This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

4. Check the pinion to stopper clearance (pinion gap) with a feeler gauge.

Pinion gap : 0.5-2.0 mm (0.02-0.079 in.)



5. If the pinion gap is out of specification, adjust by adding or removing gaskets between the solenoid and the front bracket.



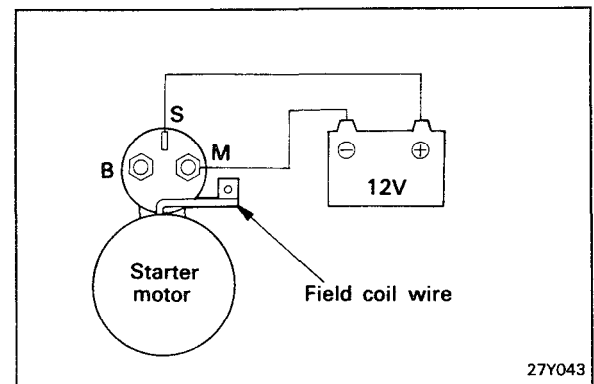
MAGNETIC SWITCH PULL-IN

1. Disconnect the field coil wire from the M-terminal of the magnetic switch.
2. Connect a 12V battery between the S-terminal and the M-terminal.

CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

3. If the pinion moves out, then the pull-in coil is good. If it doesn't, replace the magnetic switch.



STARTING SYSTEM

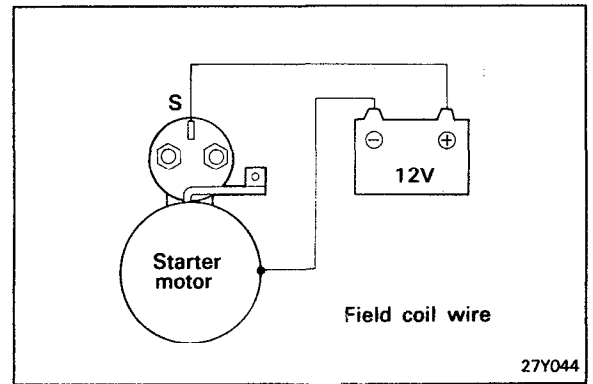
MAGNETIC SWITCH HOLD-IN TEST

1. Disconnect the field coil wire from the M-terminal of the magnetic switch.
2. Connect a 12V battery between the S-terminal and the body.

CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

3. If the pinion remains out, everything is in order. If the pinion moves, the hold-in circuit is open. Replace the magnetic switch.

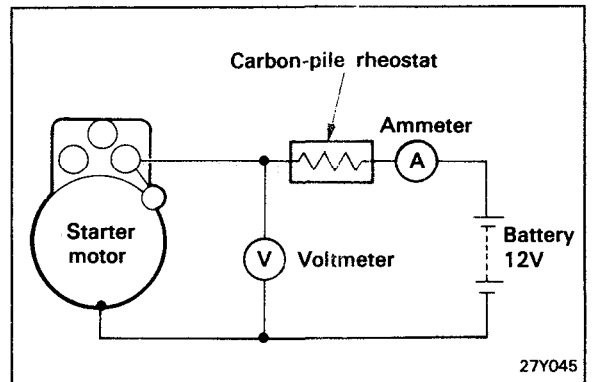


FREE RUNNING TEST

1. Place the starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to the starter motor as follows.
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostat as shown in the figure.
3. Connect a voltmeter (15-volt scale) across the starter motor.
4. Rotate the carbon pile to the off position.
5. Connect a battery cable from the battery negative post to the starter motor body.
6. Adjust the rheostat until the battery voltage shown on the voltmeter reads 11 volts.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

Current: Max. 90 Amps (reduction drive type)

Speed: Min. 3,000 rpm



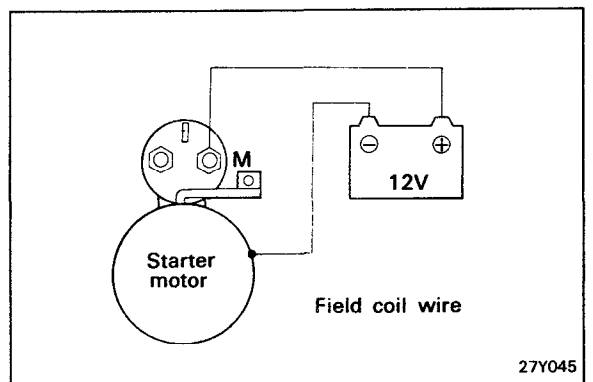
MAGNETIC SWITCH RETURN TEST

1. Disconnect the field coil wire from the M-terminal of the magnetic switch.
2. Connect a 12V battery between the M-terminal and the body.

CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

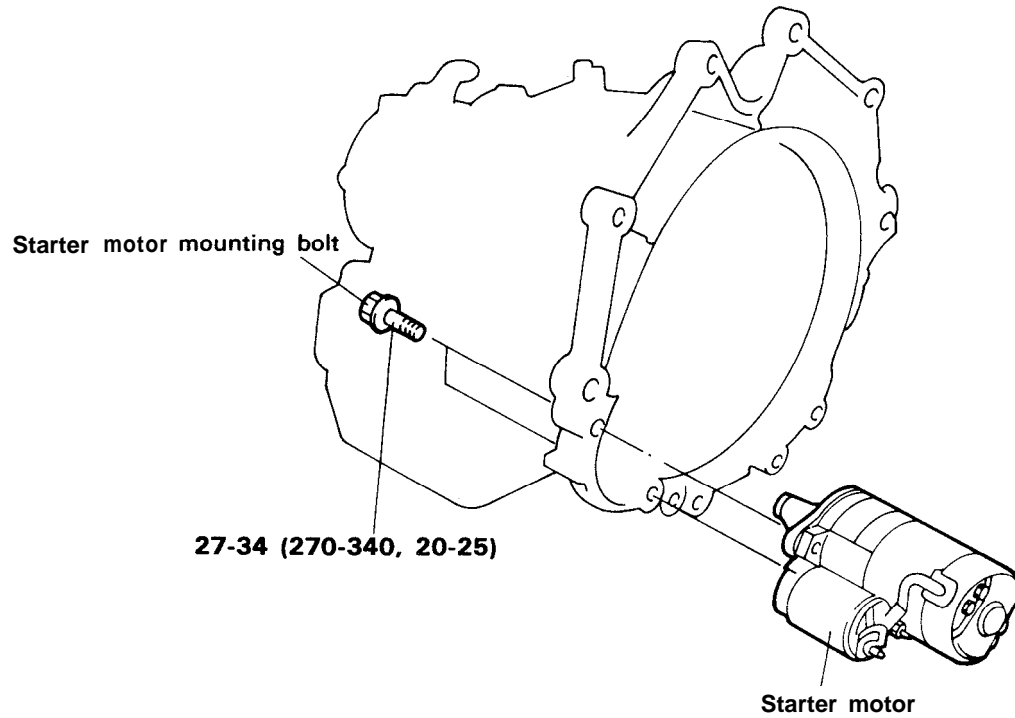
3. Pull the pinion out and release. If the pinion returns quickly to its original position, everything is in order. If it doesn't, replace the magnetic switch.



STARTING SYSTEM

STARTER MOTOR

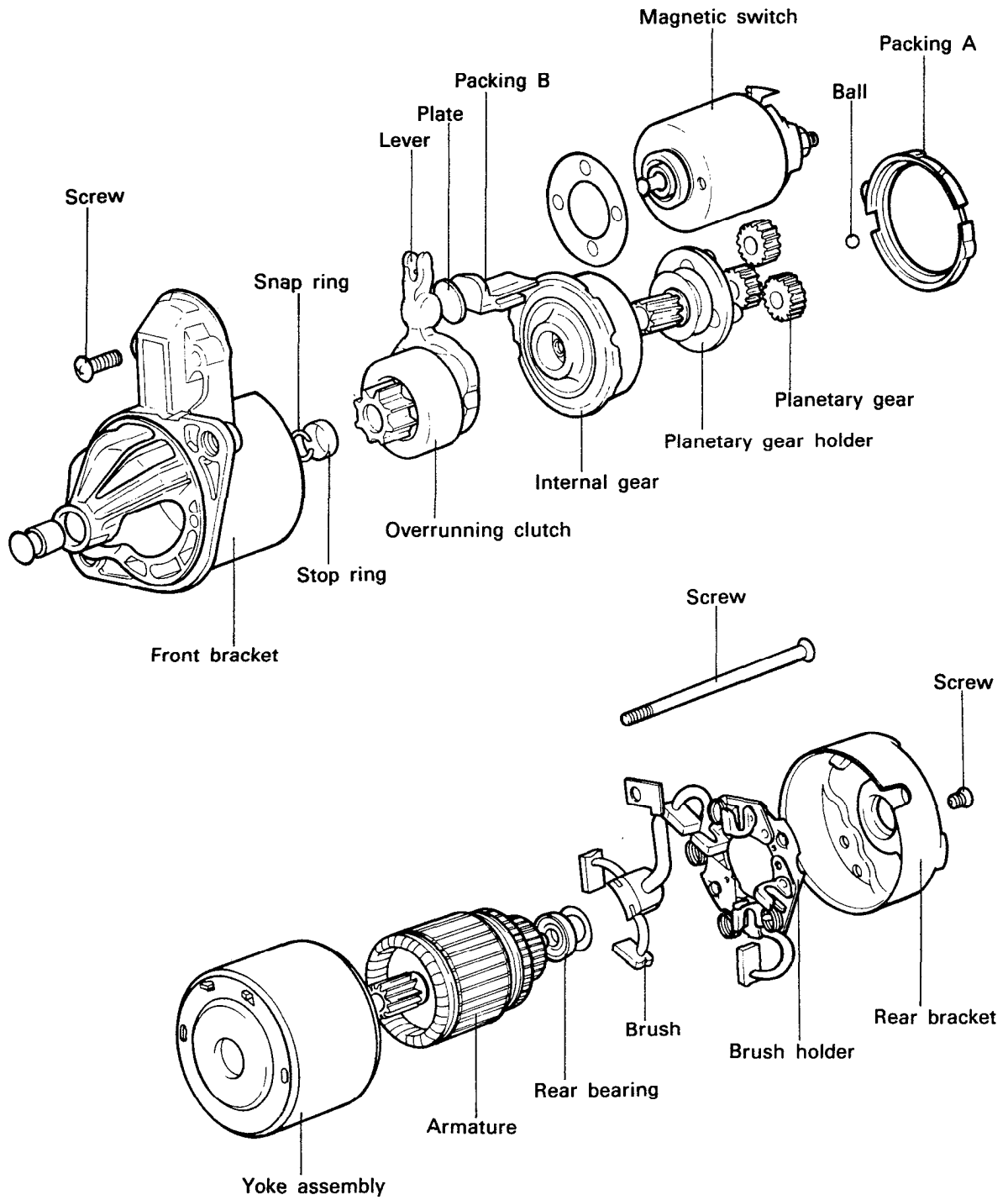
REMOVAL AND INSTALLATION



TORQUE : Nm (kg.cm, lb.ft)

STARTING SYSTEM

COMPONENTS (REDUCTION DRIVE TYPE)

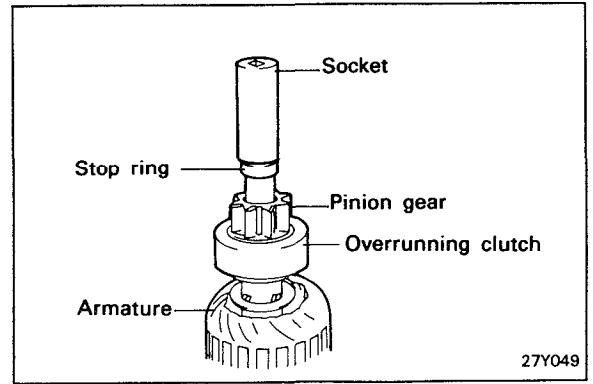


STARTING SYSTEM

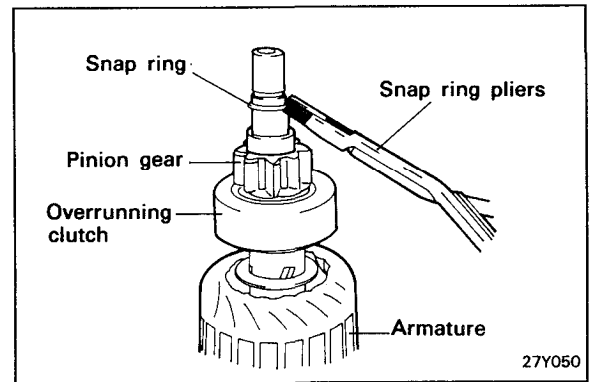
DISASSEMBLY

REMOVAL OF THE SNAP RING AND STOP RING

1. Press against the stop ring, using an appropriate socket wrench, on the snap ring side.



2. After removing the snap ring (using snap-ring pliers), remove the stop ring and the overrunning clutch.



CLEANING STARTER MOTOR PARTS

1. Do not immerse the parts in cleaning solvent. Immersing the yoke and field coil assembly and/or armature will damage the insulation. Wipe these parts with a cloth only.
2. Do not immerse the drive unit in cleaning solvent. The Overrunning clutch is pre-lubricated at the factory and solvent will remove lubrication from the clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.

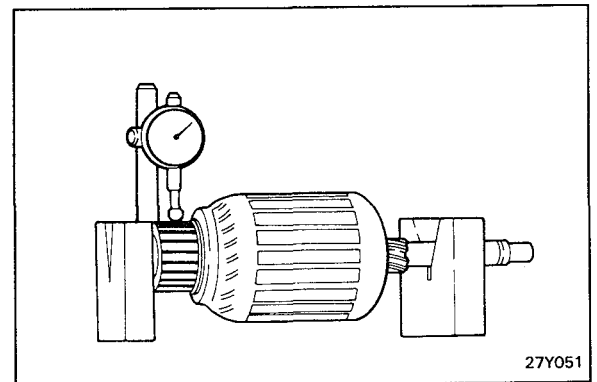
INSPECTION

CHECKING THE COMMUTATOR

1. Place the armature on a pair of V-blocks, and check the runout using a dial indicator.

Standard value: 0.05 mm (0.002 in.)

Limit: 0.1 mm (0.0039 in.)

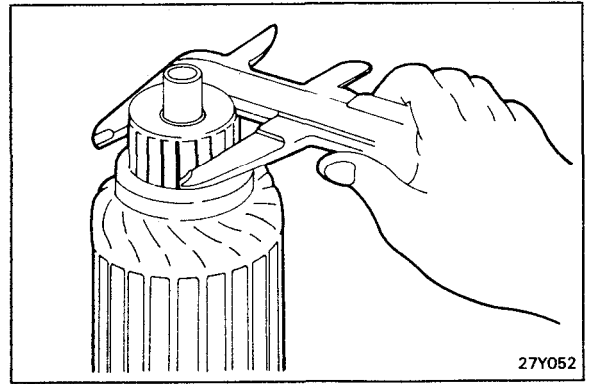


STARTING SYSTEM

2. Check the outer diameter of the commutator.

Standard value: 29.4 mm (1.157 in.)

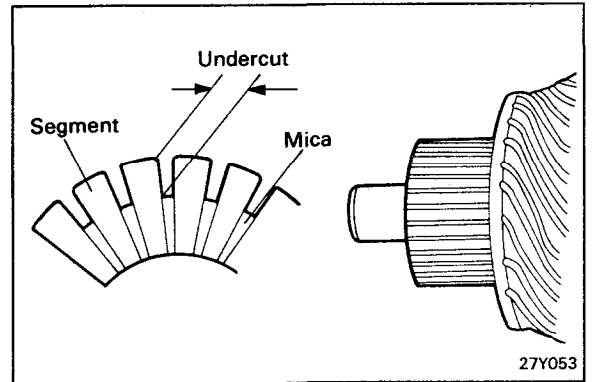
Limit: 28.4 mm (1.118 in.)



3. Check the depth of the undercut between the commutator segments.

Standard value: 0.5 mm (0.020 in.)

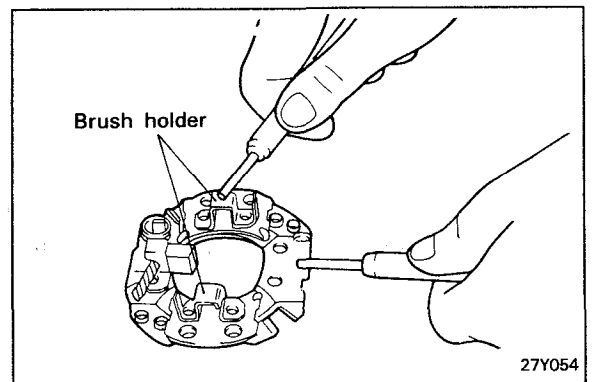
Limit: 0.2 mm (0.0079 in.)



BRUSH HOLDER

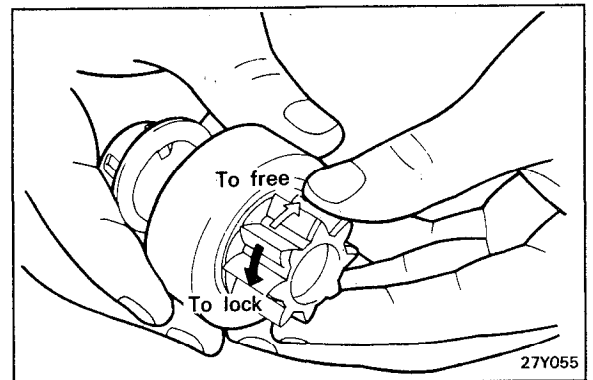
Check for continuity between the brush holder plate and the brush holder.

The normal condition is no continuity.



OVERRUNNING CLUTCH

1. While holding the clutch housing, rotate the pinion. The drive pinion should rotate smoothly in one direction, but should not rotate in the opposite direction. If the clutch does not function properly, replace the overrunning clutch assembly.
2. Inspect the pinion for wear or burrs. If the pinion is worn or damaged, replace the overrunning clutch assembly. If the pinion is damaged, inspect the ring gear for wear or burrs.

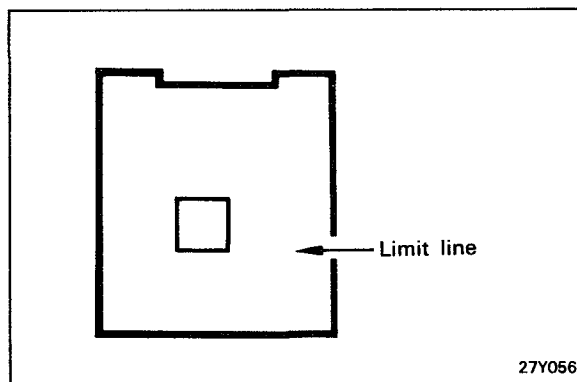


FRONT AND REAR BRACKET BUSHING

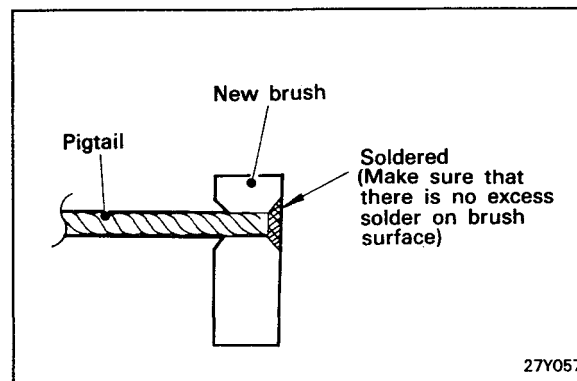
Inspect the bushing for wear or burrs. If the bushing is worn or damaged, replace the front or rear bracket assembly.

REPLACEMENT OF BRUSHES AND SPRINGS

1. Brushes that are worn beyond the wear limit line, or oil-soaked, should be replaced.
2. When replacing the field coil brushes, remove the pigtail by crushing the worn brush with pliers, taking care not to damage the pigtail.



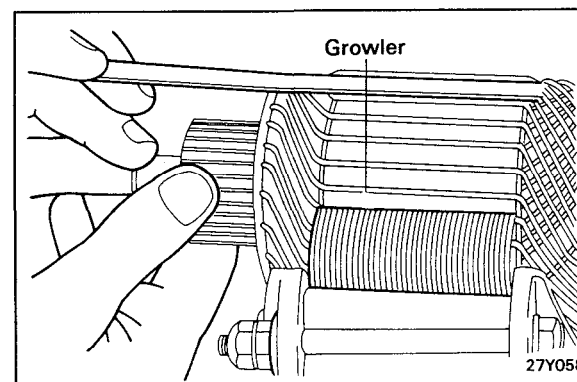
3. Sand the pigtail end with sandpaper to ensure a good solder joint.
4. Insert the pigtail into the hole provided in the new brush and solder it. Make sure that pigtail and excess solder are not on the brush surface.
5. When replacing the ground brush, slide the brush from the brush holder by prying the retaining spring back.



TESTING THE ARMATURE

TESTING THE ARMATURE FOR SHORT-CIRCUITS

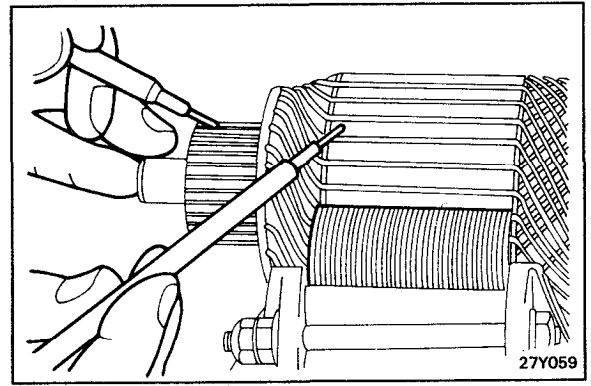
1. Place the armature in an armature tester.
2. Hold a thin steel blade parallel and just above the armature while rotating it slowly in growler. A shorted armature will cause the blade to vibrate and be attracted to the core. Replace a shorted armature.



STARTING SYSTEM

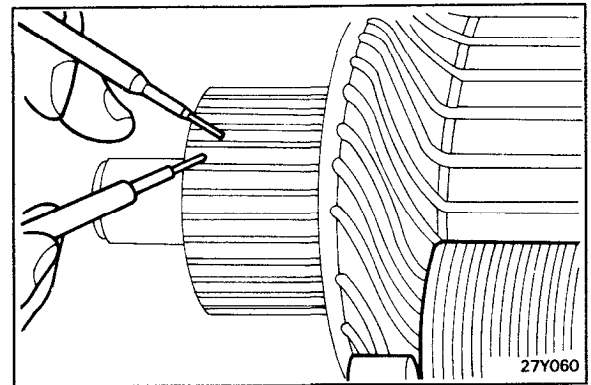
TESTING THE ARMATURE FOR GROUNDS

Check the insulation between the armature coil cores and the commutator segments. They are normal if there is no continuity.



CHECKING FOR ARMATURE COIL WIRING DAMAGE/DISCONNECTION

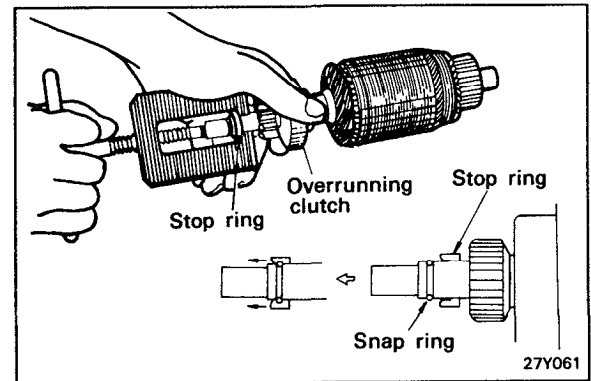
Check for continuity between the segments. They are normal if there is continuity.



SERVICE POINTS OF ASSEMBLY

INSTALLATION OF THE STOP RING AND SNAP RING

Using a suitable pulling tool, pull the overrunning clutch stop ring over the snap ring.

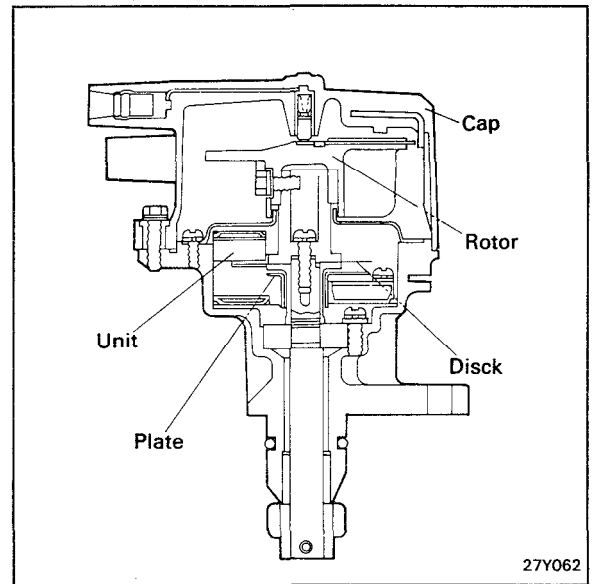


IGNITION SYSTEM

GENERAL INFORMATION

Ignition timing is controlled by the electronic ignition system. The standard reference ignition timing data for engine operating conditions are programmed into the memory of the electronic control unit (ECU).

The engine conditions (rpm, load, warm-up condition, etc.) are detected by the various sensors. Based on these sensor signals and the ignition timing data, signals to interrupt the primary current are sent to the power transistor. The ignition coil is activated, and timing is controlled in this way.

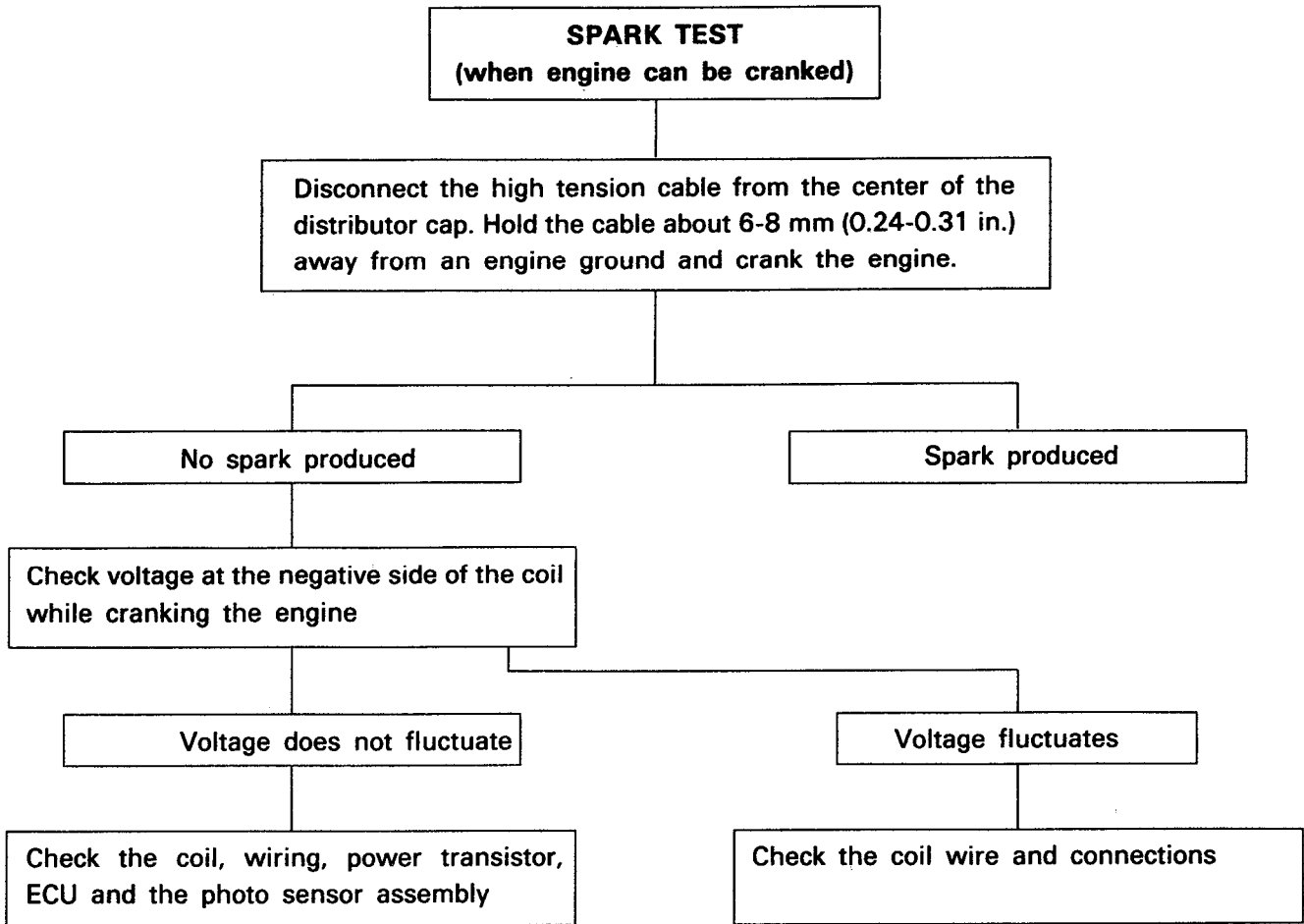


TROUBLESHOOTING

Symptom	Probable cause	Remedy
Engine will not start or hard to start. (Crank OK)	Incorrect ignition timing	Adjust ignition timing
	Ignition coil faulty	Inspect ignition coil
	Power transistor faulty	Inspect power transistor
	Distributor faulty	Inspect distributor
	High tension cord faulty	Inspect high tension cord
	Spark plugs faulty	Replace spark plugs
	Ignition wiring disconnected or broken	Inspect wiring
Rough idle or stalls	Spark plugs faulty	Replace spark plugs
	Ignition wiring faulty	inspect wiring
	Incorrect ignition timing	Adjust ignition timing
	Ignition coil faulty	Inspect ignition coil
	Power transistor faulty	Inspect power transistor
	High tension cord faulty	Inspect high tension cord
Engine hesitates/poor acceleration	Spark plugs faulty	Replace spark plugs
	Ignition wiring faulty	Inspect wiring
	Incorrect ignition timing	Adjust ignition timing
Poor gasoline mileage	Spark plugs faulty	Replace spark plugs
	Incorrect ignition timing	Adjust ignition timing
Engine overheats	Incorrect ignition timing	Adjust ignition timing

SERVICE ADJUSTMENT PROCEDURES

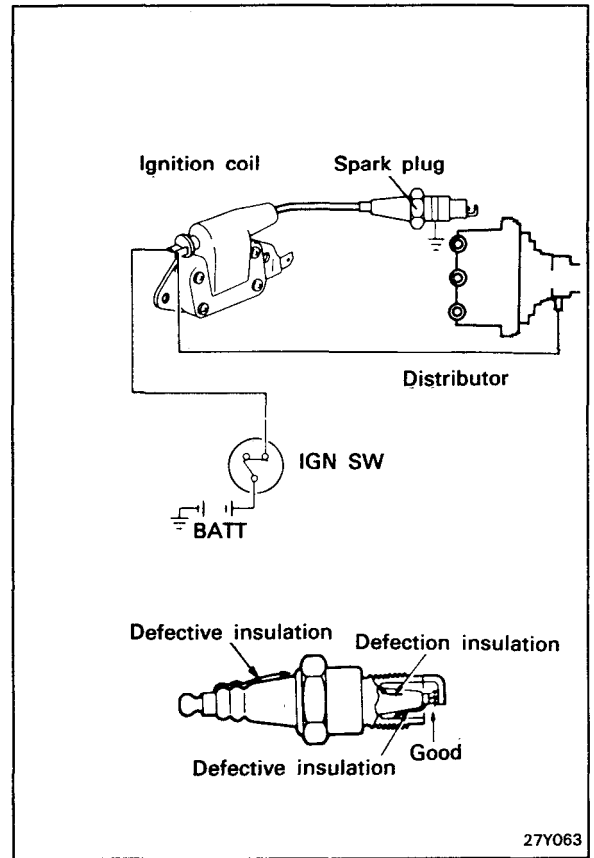
SPARK TEST



IGNITION SYSTEM

SPARK PLUG TEST (WHEN ENGINE CAN BE CRANKED)

Connect a spark plug to the high tension cable, ground the outer electrode (main body), and crank the engine. If the spark plug is good, however, sparks will be produced in the gap. In a defective spark plug, no sparks will occur.

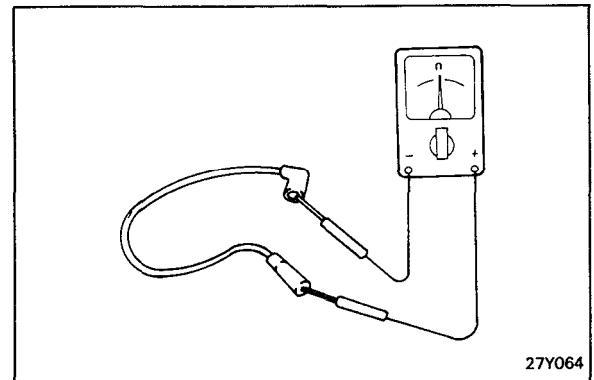


CHECKING SPARK PLUG CABLES

1. Check the cap and outer shell for cracks.
2. Measure the resistance.

Unit: kΩ

High tension cable	Spark plug cable					
	No.1	No.2	No.3	No.4	No.5	No.6
5.8	7.4	5.4	9.1	6.9	10.2	8.0



CHECKING SPARK PLUGS

INSPECTION AND CLEANING OF SPARK PLUGS

1. Disconnect the spark plug cable from the spark plug.

NOTE

When the spark plug cable is pulled off, be sure to remove by pulling on the spark plug boot. If the spark plug cable is removed by pulling on the cable, it may be damaged.

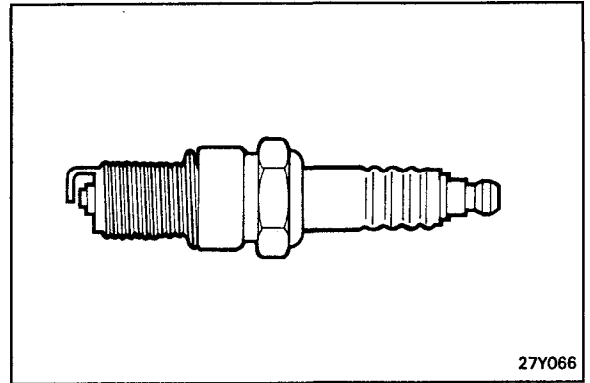
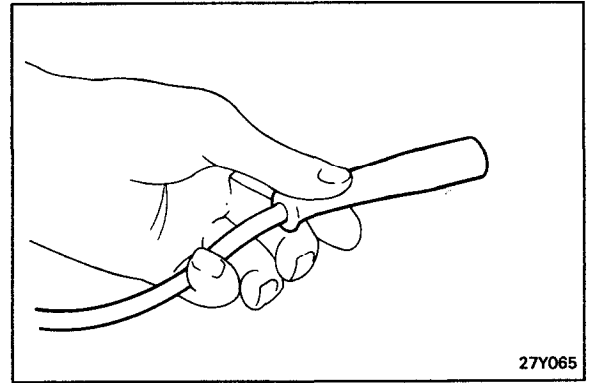
2. Using a plug wrench, remove all the spark plugs from the cylinder head.

CAUTION

Use care not to allow foreign matter to enter through the spark plug holes.

3. Check the spark plugs for the following:

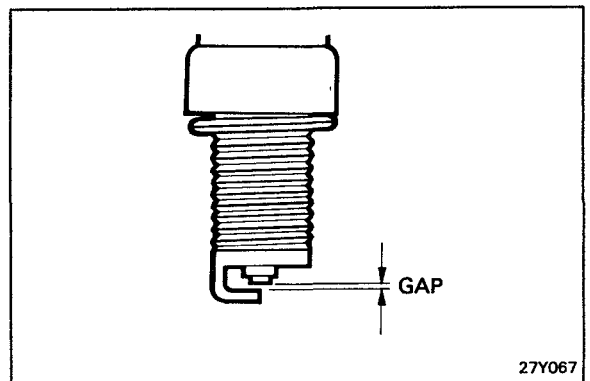
- 1) Broken insulator
- 2) Worn electrode
- 3) Carbon deposits
- 4) Damaged or broken gasket.
- 5) Burnt condition of the porcelain insulator at the spark gap.



Condition	Dark deposite	White deposite
Description	<ul style="list-style-type: none"> o Too rich a fuel mixture o Low air intake 	<ul style="list-style-type: none"> o Too lean a fuel mixture o Advanced ignition timing o Insufficient plug tightening

4. Check the spark plug gap using a wire gap gauge and adjust if necessary.

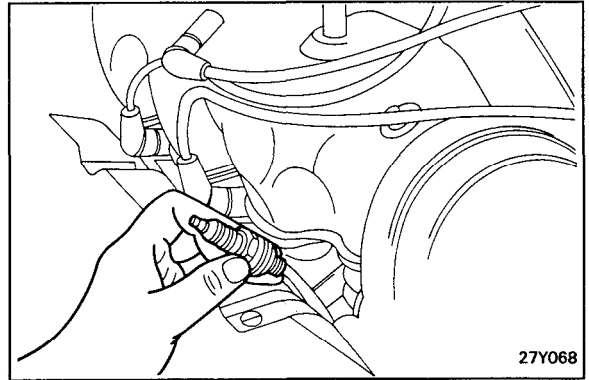
Standard value: 1.0-1.1 mm (0.039-0.043 in.)



IGNITION SYSTEM

5. Tighten the spark plugs to the specified torque.
If it is overtorqued, damage to the threaded portion of the cylinder head may occur.

Spark plug: 20-30 Nm (204-306 kg.cm. 15-22 lb.ft)



IGNITION TIMING

IGNITION TIMING ADJUSTMENT

Adjustment conditions:

Coolant temperature: 85-95°C (185-203°F)

All accessories: Off

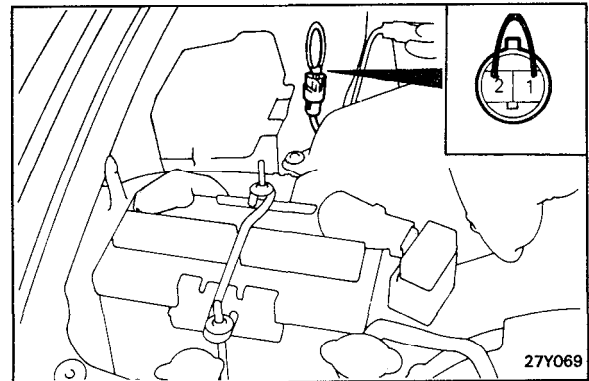
Transmission: N (Neutral)

Parking Brake ON

1. Connect a timing light and tachometer.
2. Start the engine and check the curb idle speed.

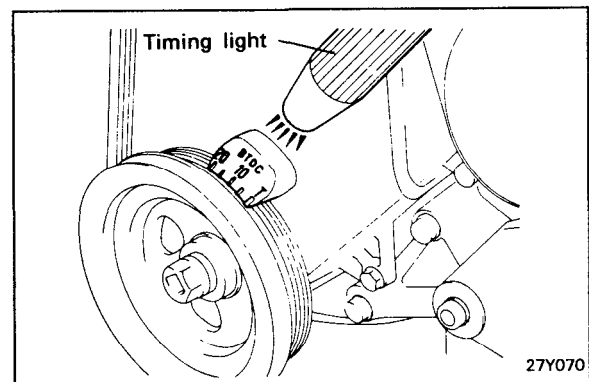
Curb idle speed: 700 ± 100 rpm

3. With the engine stopped, connect a wire to the ignition-timing adjustment terminal (located in the engine compartment), and ground it.



4. Start and run the engine at idle speed.
5. Check the basic ignition timing and adjust if necessary.

Basic ignition timing: 5° ± 2° BTDC



IGNITION SYSTEM

7. If the timing is incorrect, loosen the distributor's holding nut, and then turn the distributor until the timing is correct.

NOTE

The ignition timing will be advanced if the distributor is turned to the right and retarded if it is turned to the left.

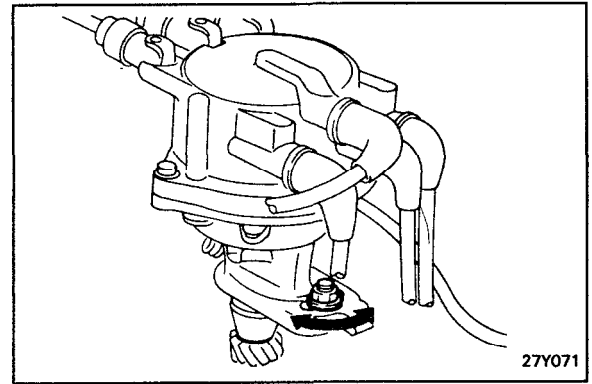
8. After adjustment, tighten the mounting nut.

CAUTION

Be careful, when tightening the nut, that the distributor does not move.

9. Stop the engine.
10. Disconnect the lead wire connected at step 3.
11. Start and run the engine at idle speed.
12. Check that the ignition timing at idle is correct.

Ignition timing at idle: 15°BTDC



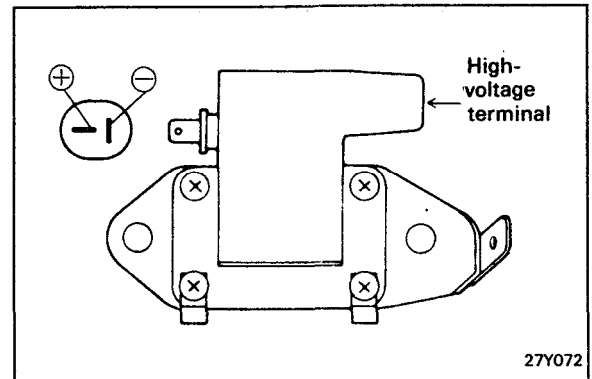
CHECKING THE IGNITION COIL

1. Measurement of the primary coil resistance.
Measure the resistance between the positive (+) terminal and the negative (-) terminal of the ignition coil.

Standard value: $0.8 \pm 0.08\Omega$

2. Measurement of the secondary coil resistance.
Measure the resistance between the ignition coil's positive (+) terminal and the high-voltage terminal.

Standard value: $12.1 \pm 1.8\text{ k}\Omega$

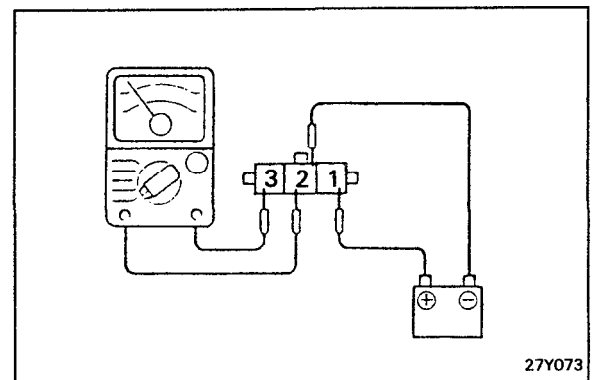


POWER TRANSISTOR

1. Connect the negative (-) terminal of a 3V power supply to terminal 2 of the power transistor; then check whether there is continuity between terminal 3 and terminal 2 when terminal 1 and the positive (+) terminal are connected and disconnected.

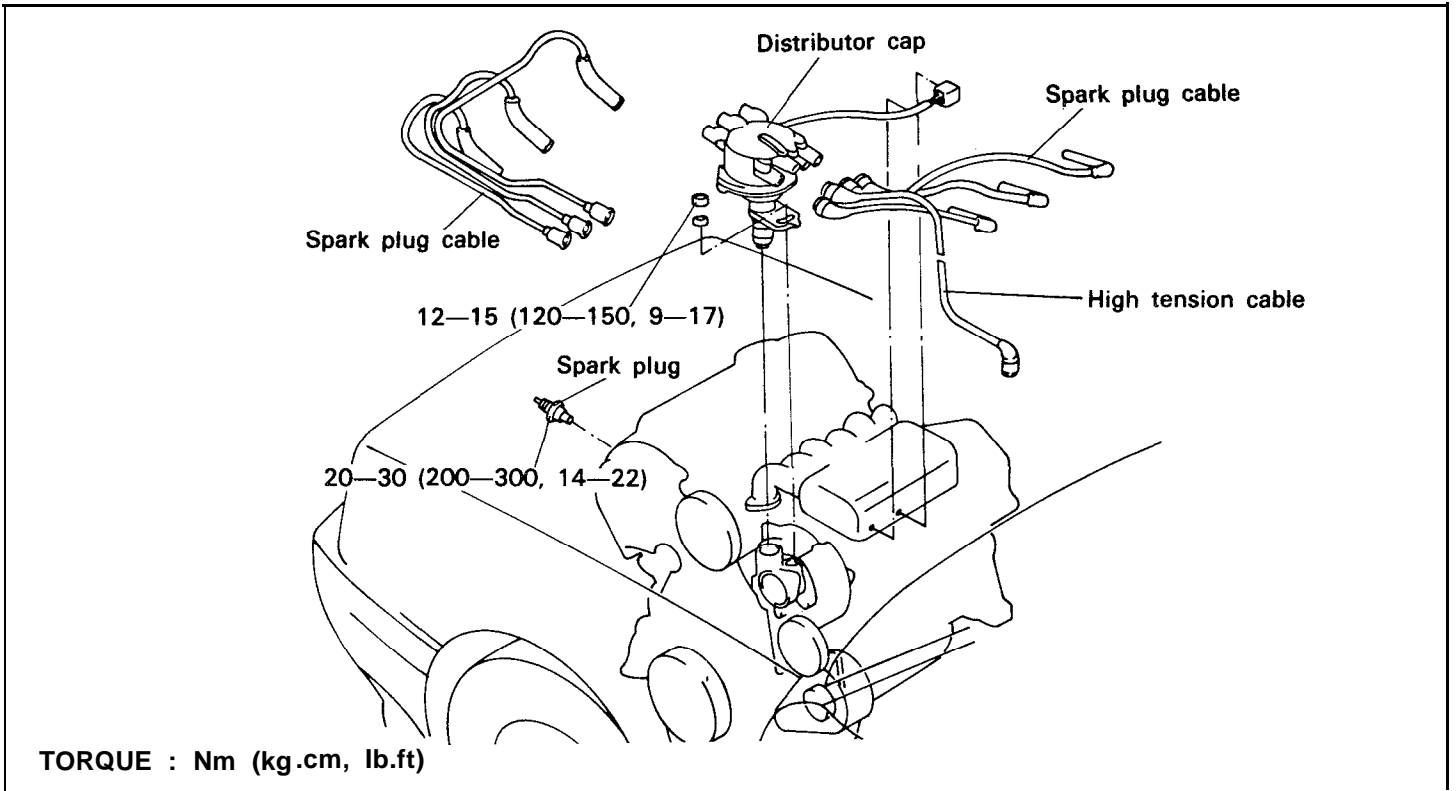
Terminal 1 and (+) terminal	Terminal 3 and terminal 2
Connected	Continuity
Unconnected	No continuity

2. Replace the power transistor if there is a malfunction.



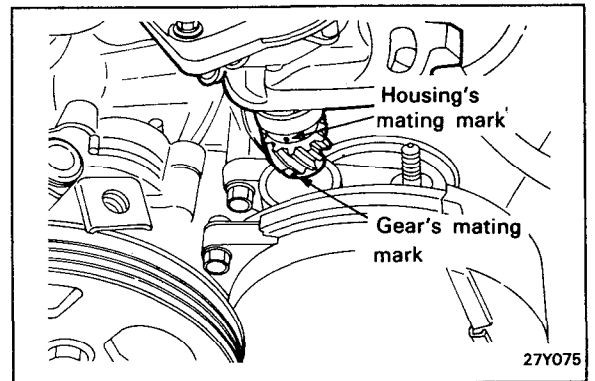
IGNITION SYSTEM

REMOVAL AND INSTALLATION

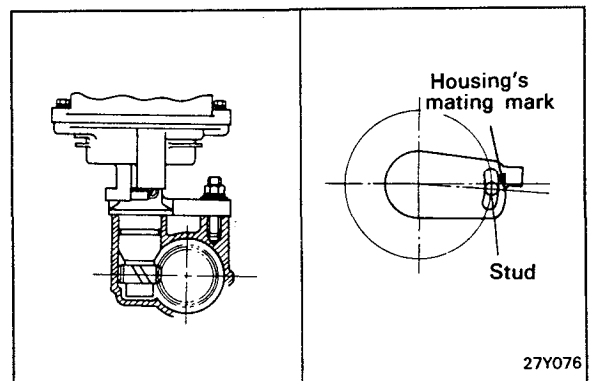


INSTALLATION OF DISTRIBUTOR

1. Turn the crankshaft so that the No.1 cylinder is at top dead center.
2. Align the distributor housing and gear mating marks.

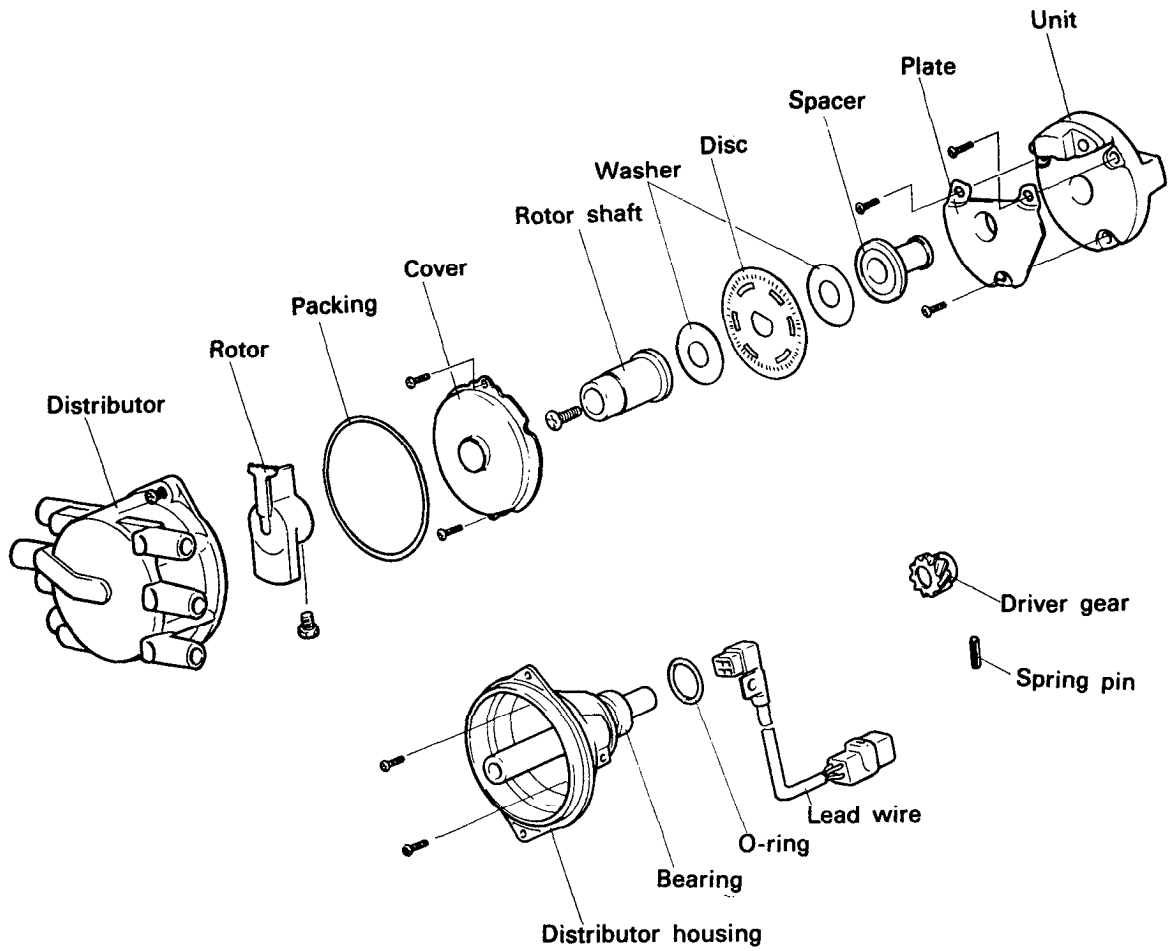


3. Install the distributor in the engine while aligning the groove of the distributor's installation flange with the center of the distributor installation stud.



DISTRIBUTOR

COMPONENTS

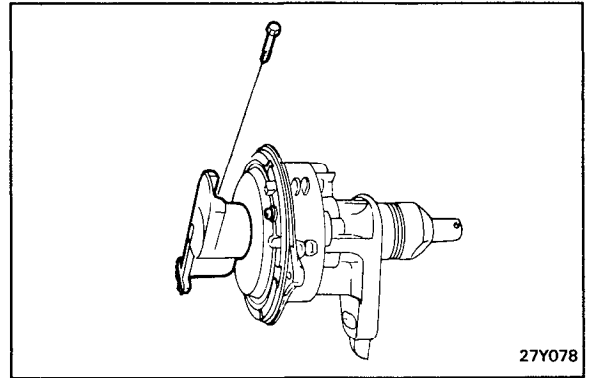


REMOVAL

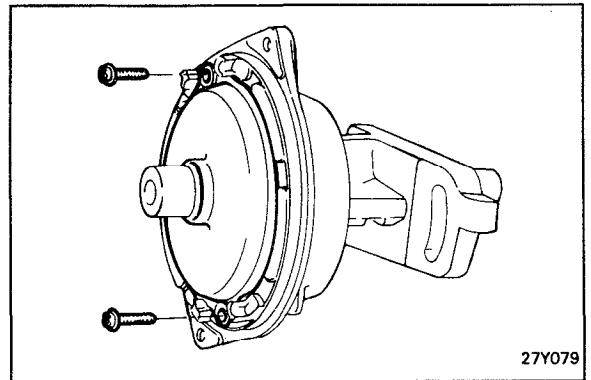
1. Disconnect the battery ground cable.
2. Remove the two distributor cap retaining bolts and move the cap to one side.
3. Disconnect the lead wire connector.
4. Remove the distributor mounting nut and remove the distributor assembly.

DISASSEMBLY

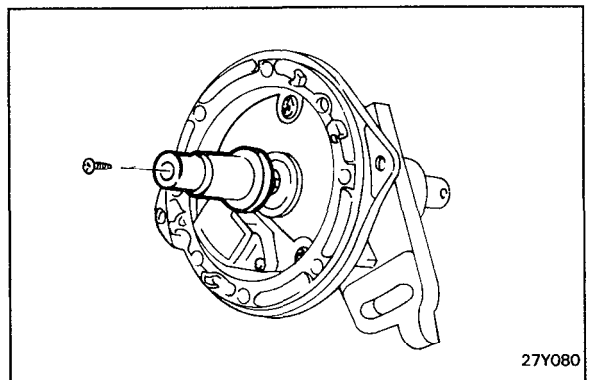
1. Lightly clamp the distributor in a vise equipped with soft jaws.
2. Remove the rotor installation screw and pull off the rotor from the rotor shaft.



3. Remove the packing.
4. Remove the two cover mounting screws and cover.



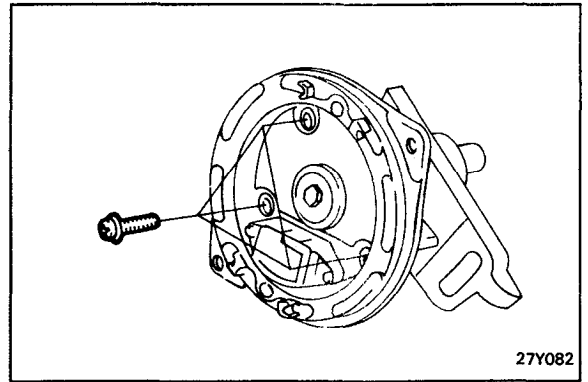
5. Remove the rotor shaft mounting screw.



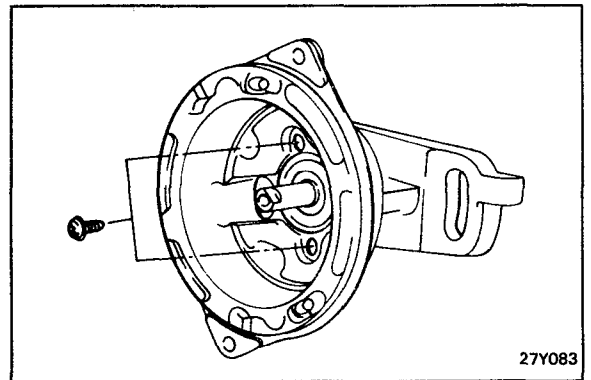
IGNITION SYSTEM

6. Remove the disc assembly and spacer.
7. Disconnect the lead wire connector.

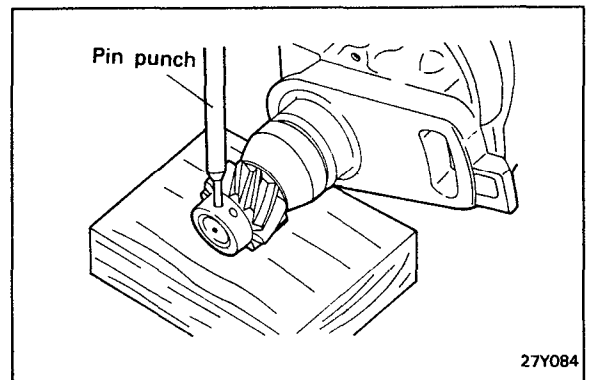
8. Lift off the plate and unit by removing the three mounting screws.



9. Remove the shaft bearing tightening screws.



10. Place the drive gear on a soft base (wooden block) so that the spring pin can be removed.
11. Remove the spring pin using removed punch.



REASSEMBLY

DISTRIBUTOR SHAFT

After coating the shaft with a small amount of engine oil, insert it into the housing.

CAUTION

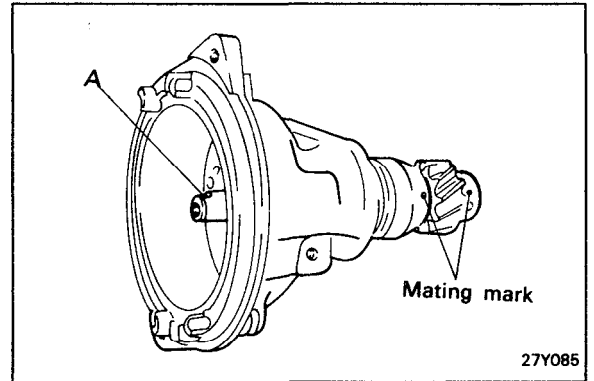
Do not use solvent or similar products.

DRIVE GEAR

1. Mount the gear on the shaft, aligning it with the mating mark.
2. When aligning the mark on the gear and the housing, line up the pin holes with notch "A" on the end of the shaft as shown in the figure, then drive in a new pin.

CAUTION

Drive in the pin so that the slit is at a right angle with the shaft.

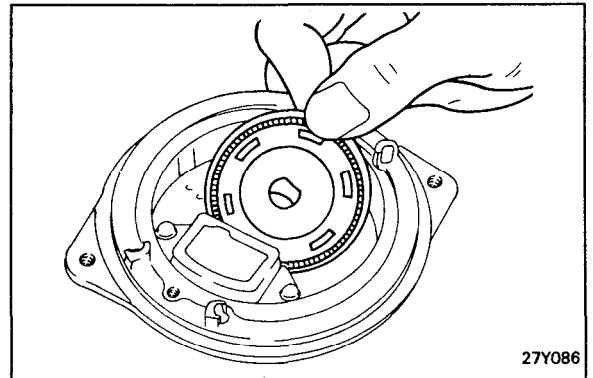


DISC

Insert the disc into the unit's sensor, matching it with the spacer.

CAUTION

The disc's slits must not be obstructed.

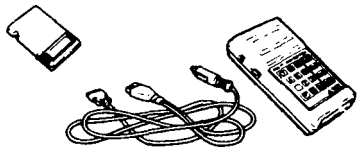


AUTOMATIC SPEED CONTROL (CRUISE)

SPECIFICATIONS

Items	Specifications
Speed control unit Operating voltage range Operating temperature Voltage drop between unit and actuator Operating speed range	DC 10 - 16 V -30 ~ +75°C (-22 ~ +167°F) 0.4 V Low speed limit : 40 ± 3 km/h (25 ± 2 mph) High speed limit : 145 ± 5 km/h (90 ± 3 mph)
Actuator Rated voltage Operating temperature Operating consumption Insulating resistance	DC 12 V -30 ~ +90°C (122 ~ +194°F) 3A or less (at 12V 20°C) 1MΩ or less (at 500V megger)
Cruise main switch Rated voltage Operating force Voltage drop	DC 12V 0.3 ~ 1.0 kg 0.15 V or less
Stop lamp switch Rated voltage Rated load Stop lamp Cruise control Insulating resistance	DC 12V 27 x 5 W (lamp load) 0.1 - 0.5 A (relay load) Min 3 MR (by 500 V megger)

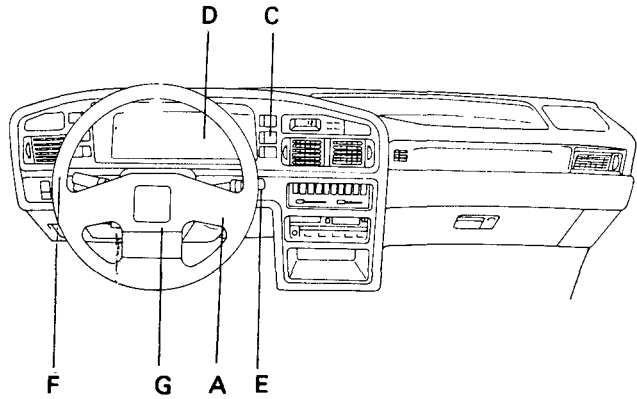
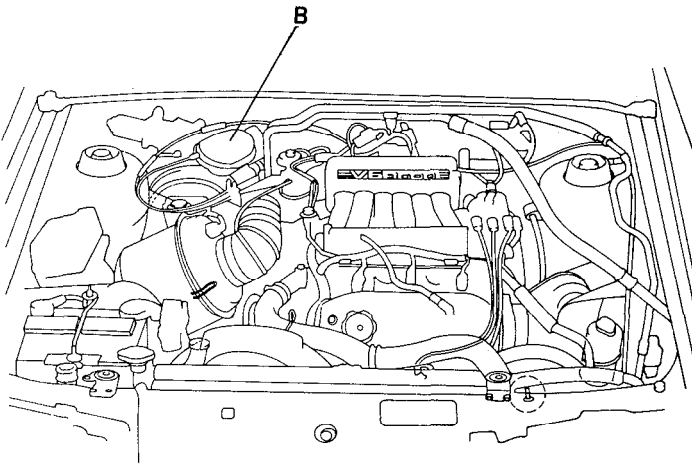
SPECIAL SERVICE TOOL

Tool (Number and name)	Illustration	Use
09391-33000 Multi-use tester		Reading diagnosis code

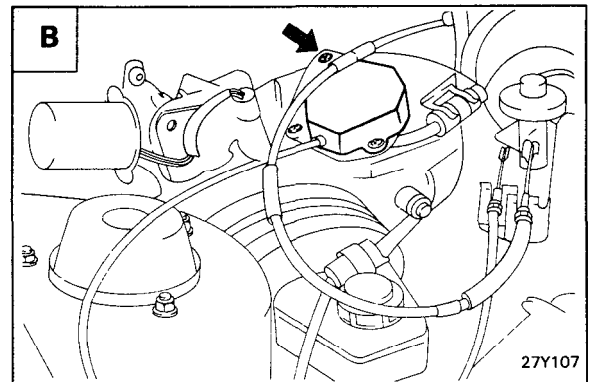
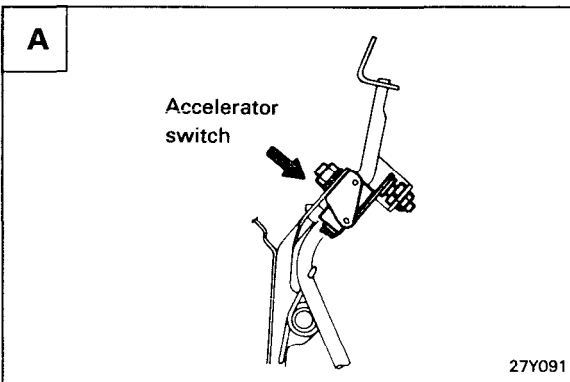
AUTOMATIC SPEED CONTROL (CRUISE)

Engine compartment

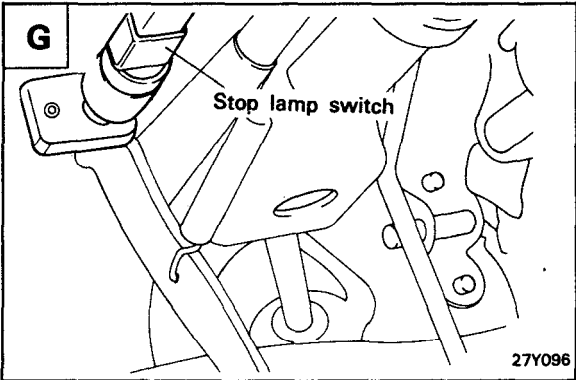
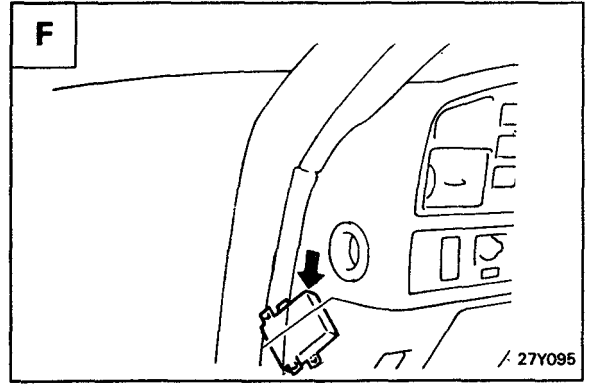
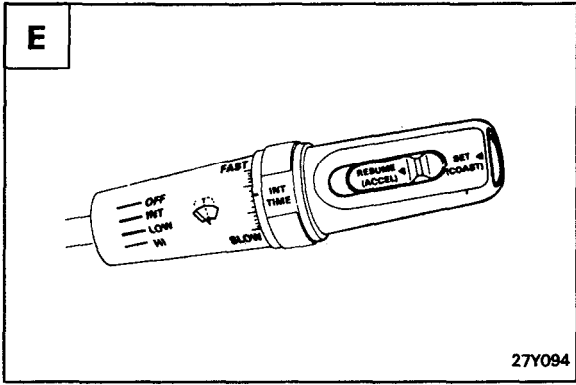
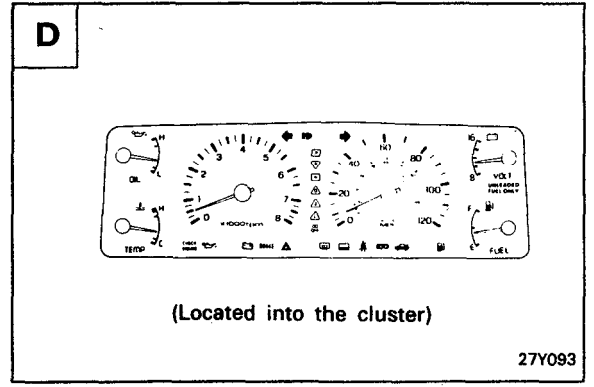
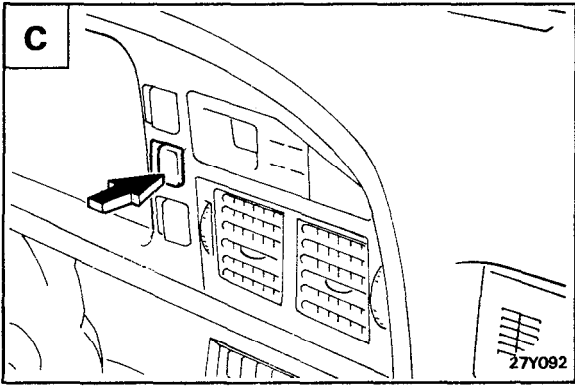
Interior



Name	Symbol	Name	Symbol
Accelerator switch	A	Speed-control switch	E
Actuator	B	Speed-control unit (cruise control unit)	F
Cruise main switch	C	Stop lamp switch	G
Reed switch (Vehicle speed sensor)	D		

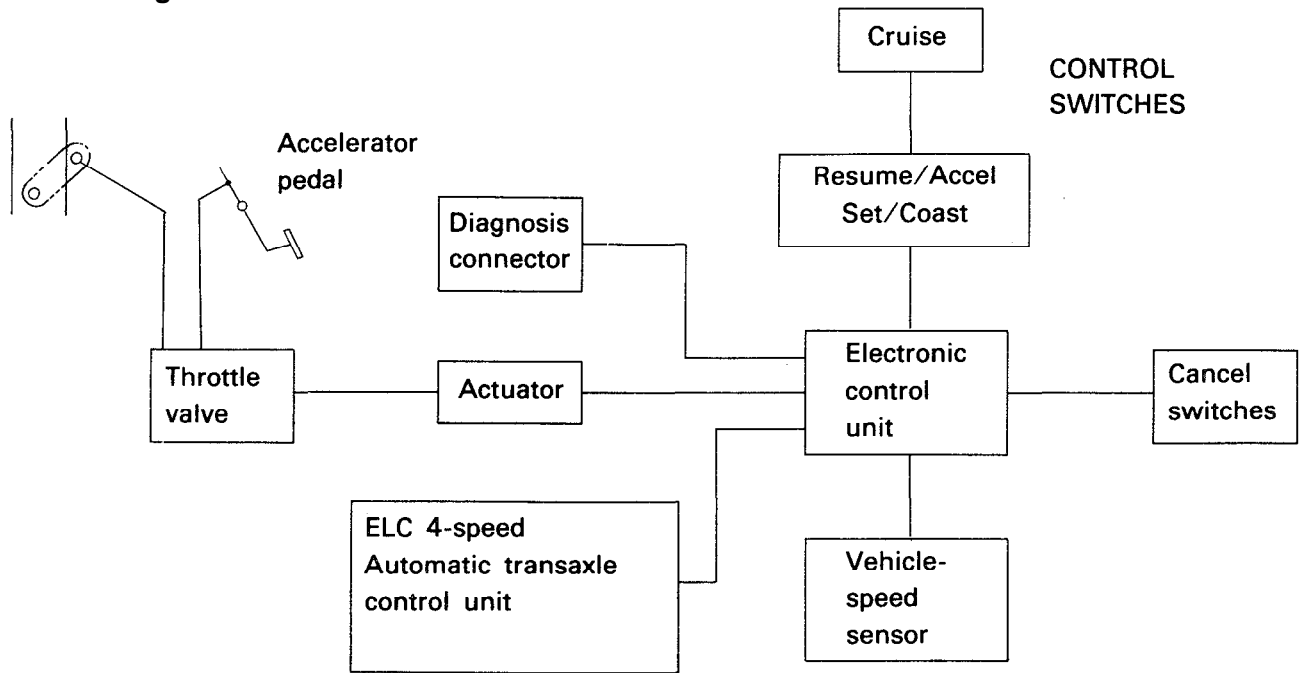


AUTOMATIC SPEED CONTROL (CRUISE)



AUTOMATIC SPEED CONTROL (CRUISE)

System Block Diagram



Component parts and function outline

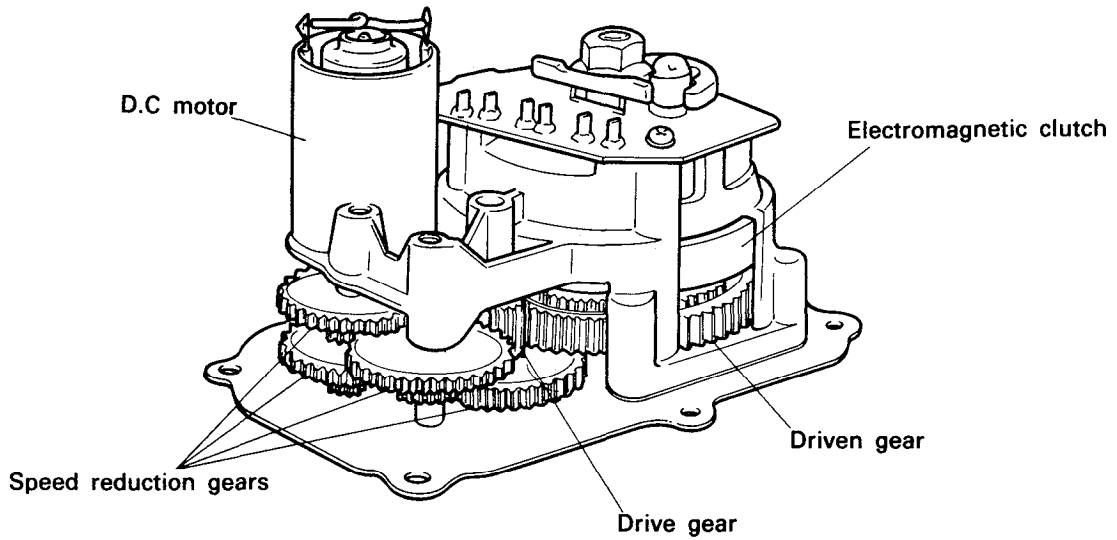
COMPONENT PART		FUNCTION
Vehicle-speed sensor		Converts vehicle speed to pulse.
Electronic control unit (ECU)		Receives signals from sensor and control switches; ECU controls all automatic speed control functions.
Actuator		Regulates the throttle valve to the set opening by signals from the ECU.
Control switch	CRUISE main switch	Switch for automatic speed control power supply.
	SET switch RESUME switch	Controls automatic speed control functions by SET (COAST) and RESUME (ACCEL).
	CRUISE main switch indicator	Illuminates when CRUISE main switch is ON (Built into CRUISE switch).
Piezo alarm		When the SET or RESUME switch is switched ON, the alarm sounds to notify the driver that the control unit has received the ON signal.

AUTOMATIC SPEED CONTROL (CRUISE)

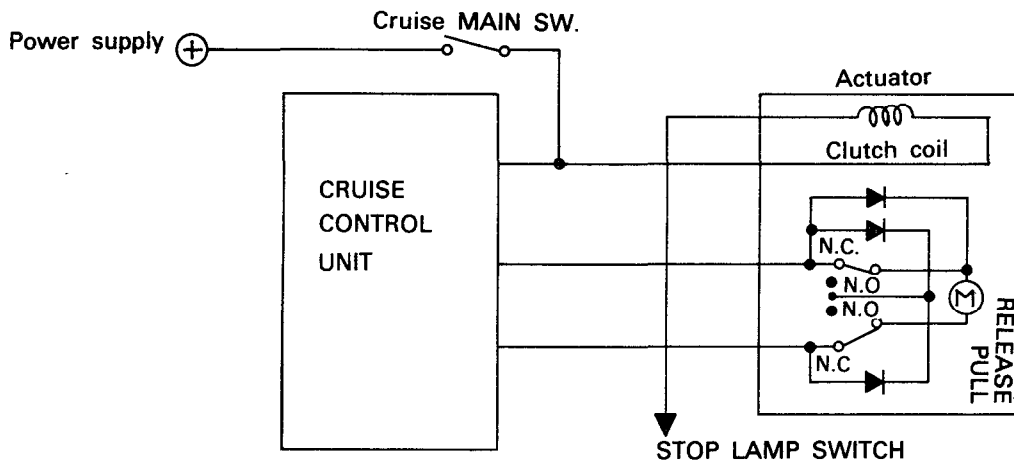
COMPONENT PART		FUNCTION
Cancel switch	Stop lamp switch/ Brake switch	Sends cancel signals to the ECU.
	Inhibitor switch	
ELC 4-speed automatic transaxle control unit		Controls the overdrive ON and OFF, based on signals from the ECU for the ASC.
Diagnostic connector		By connecting the voltmeter or multi-use tester, control unit diagnostic codes can be read.

AUTOMATIC SPEED CONTROL (CRUISE)

CONSTRUCTION OF ACTUATOR INTERNAL CONSTRUCTION

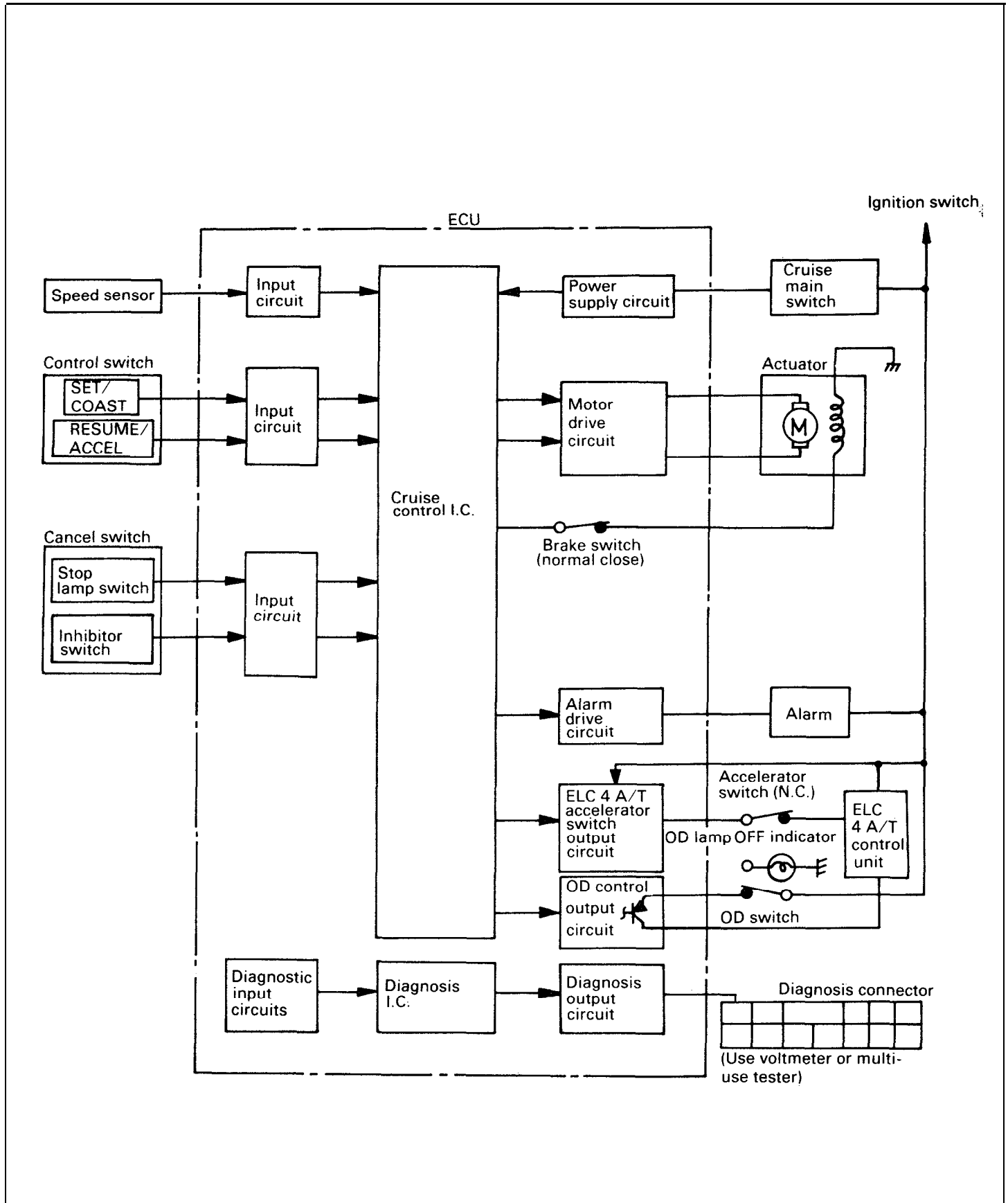


CIRCUIT DIAGRAM



AUTOMATIC SPEED CONTROL (CRUISE)

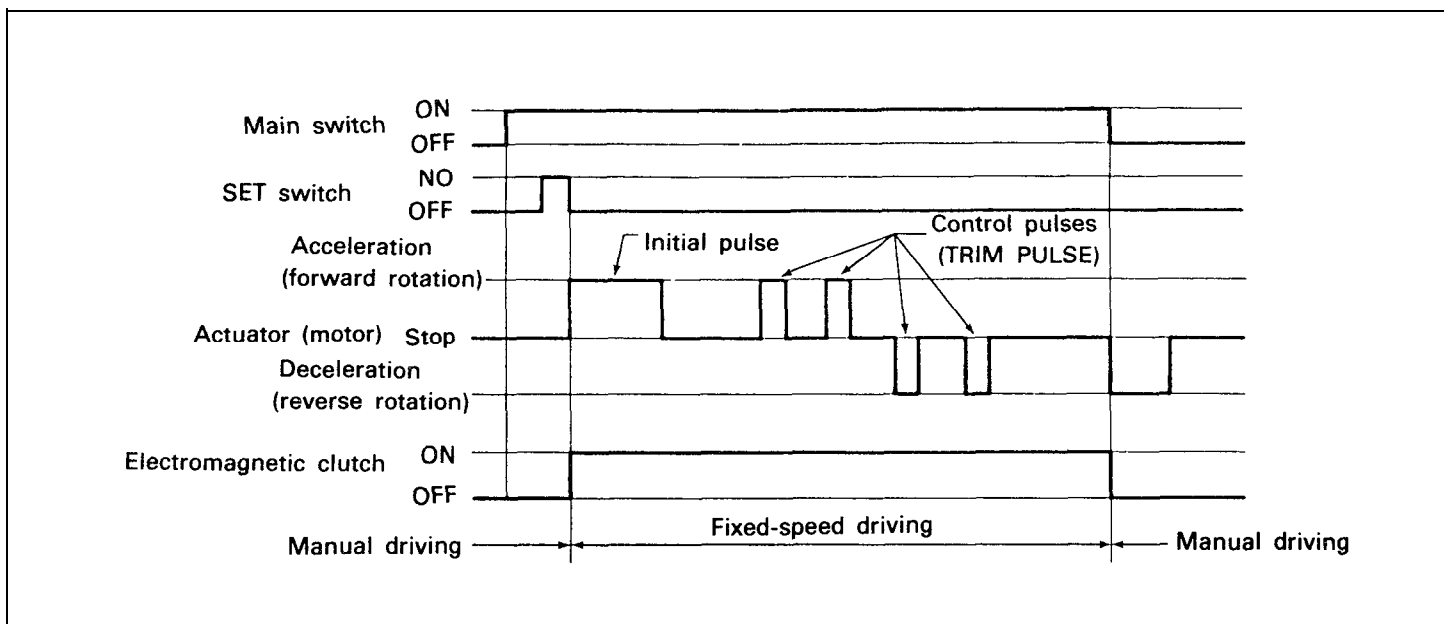
CONTROL LOGIC BLOCK DIAGRAM



CONTROL UNIT FUNCTIONS

1. SET (Fixed-speed control)

With the MAIN switch turned ON, the SET switch is switched from ON to OFF while the vehicle is being driven within the speed range in which speed settings are possible (approximately 40-145 km/h (25-90 mph)), the vehicle speed at the moment the SET switch was switched from ON to OFF is memorized as the “set vehicle speed”, and there after the actuator is controlled so that fixed-speed driving at that speed is possible. The following figure below shows the timing charts.



1) INITIAL PULSE

The initial pulse opens the throttle valve to a degree of opening which approximately corresponds to the vehicle speed. This pulse is output when the ASC system is set.

2) TRIM PULSE

The trim pulse is a control pulse for correcting the vehicle speed which is output response to detected speed errors.

The output pulse width is determined based on the amount of deviation between the current vehicle speed and the set vehicle speed, and on throttle position.

2. COAST

During fixed-speed driving, while the COAST switch is ON, the actuator's D.C. motor is caused to rotate to the REL (release) side. The vehicle speed when the switch is OFF as deceleration continues is entered in the memory, and is thereafter controlled as the fixed speed.

3. RESUME SPEED

When (after the ASC system is canceled by the cancel conditions) the RESUME switch is switched from OFF to ON, while driving at a vehicle speed which is the low-speed limit (approximately 40 km/h (25 mph)) or higher, the vehicle-speed memorized before cancelation of the ASC system will be controlled as the fixed speed.

4. ACCELERATION

During fixed-speed driving or above the low-speed limit, while the ACCELERATION switch is ON, the actuator's D.C. motor is caused to rotate to the PULL side. The vehicle speed when the switch is OFF as acceleration continues is entered in the memory, and is thereafter controlled as the fixed speed.

AUTOMATIC SPEED CONTROL (CRUISE)

5. CANCELLATION

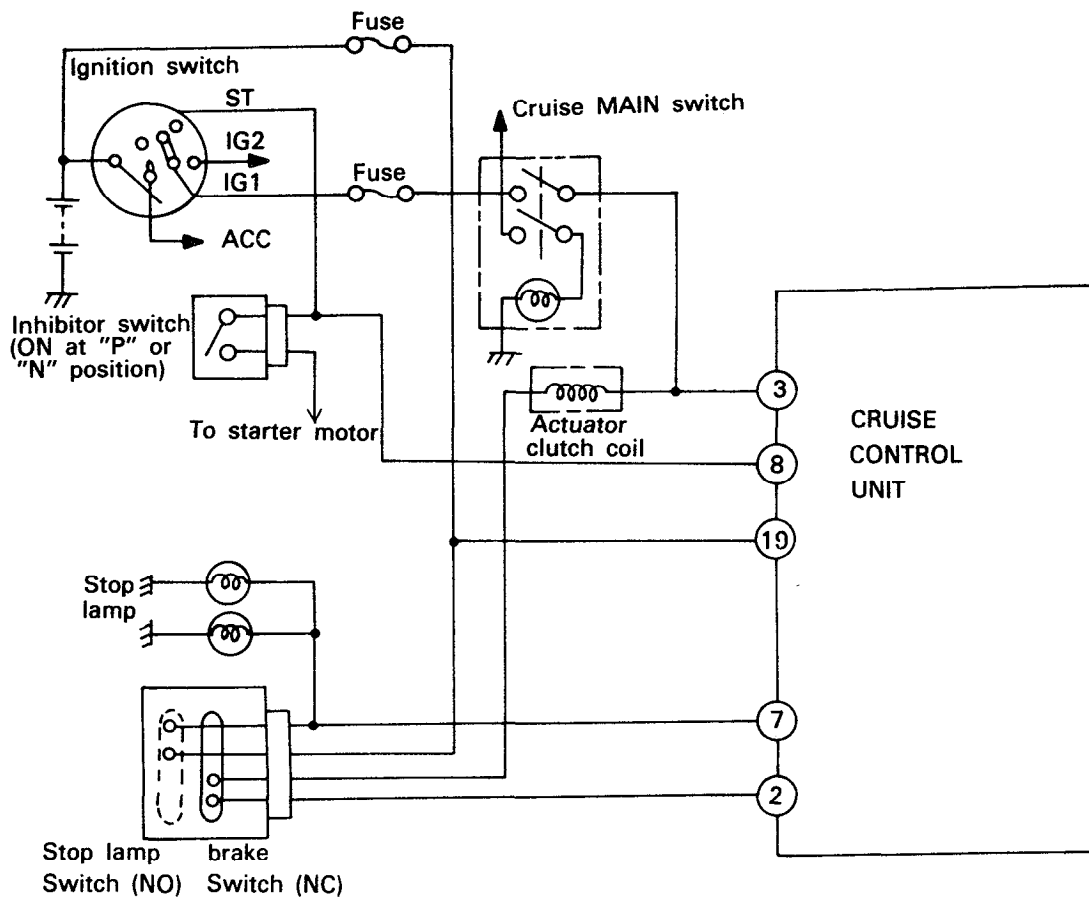
When the signals below are input (during fixed-speed driving), conductivity to the electromagnetic clutch is interrupted, thus canceling the ASC system.

- 1) Stop lamp switch ON (brake pedal depressed)
- 2) Inhibitor switch ON (selector lever at "P" or "N" position)

NOTE

When the brake pedal is depressed and the stop lamp switch is switched ON, the ASC system will be canceled even if there is wiring damage or disconnection at the fuse for the stop lamp.

CANCEL SWITCH CIRCUIT DIAGRAM



NO : Normal open
NC : Normal close

6. LOW-SPEED LIMIT

There is automatic cancellation at or below the low-speed limit (approximately 40 km/h (25 mph)).

AUTOMATIC SPEED CONTROL (CRUISE)

7. HIGH-SPEED LIMIT

The vehicle cannot be driven at a fixed speed which is at or higher than the high-speed limit (approximately 145 km/h (90 mph)).

Note that the vehicle speed memorized when the SET switch is pressed while the vehicle is traveling at the high-speed limit or higher will be the high-speed limit vehicle speed.

8. AUTOMATIC CANCELLATION

When, during fixed-speed driving, the signals described below are input, conductivity to the electromagnetic clutch is interrupted, thus canceling the ASC system.

- 1) If the vehicle speed decreases to a speed which is approximately 20 km/h (12 mph) or more below the memorized vehicle speed.
- 2) If there is no input of the vehicle speed signal for more than 0.5 second.
- 3) If there is damaged or disconnected wiring of the input line (stop lamp switch load side) of the stop lamp switch.
- 4) If the cancel switches (stop lamp switch, inhibitor switch) and command switches (SET switch or RESUME switch) are switched on at the same time.

NOTE

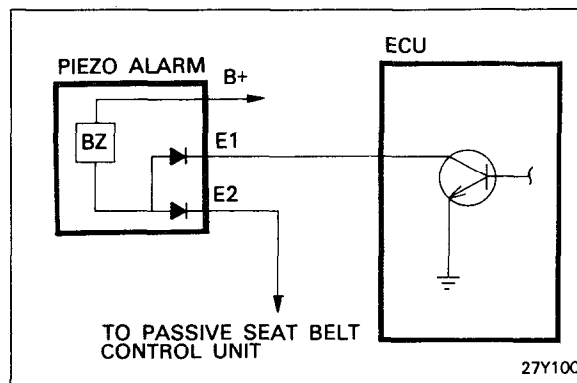
If the SET and RESUME switches are ON at the same time, the cruise control will operate in the COAST mode and the speed will decrease.

9. PIEZO ALARM

When the CRUISE switch is ON, SET switch or RESUME switch ON signals are received, the alarm is activated for approximately 0.2 second.

NOTE

- 1) Power is supplied from the fuse No.8 (10A) to the alarm.
- 2) This alarm is also used as the alarm for the passive seat belt system.

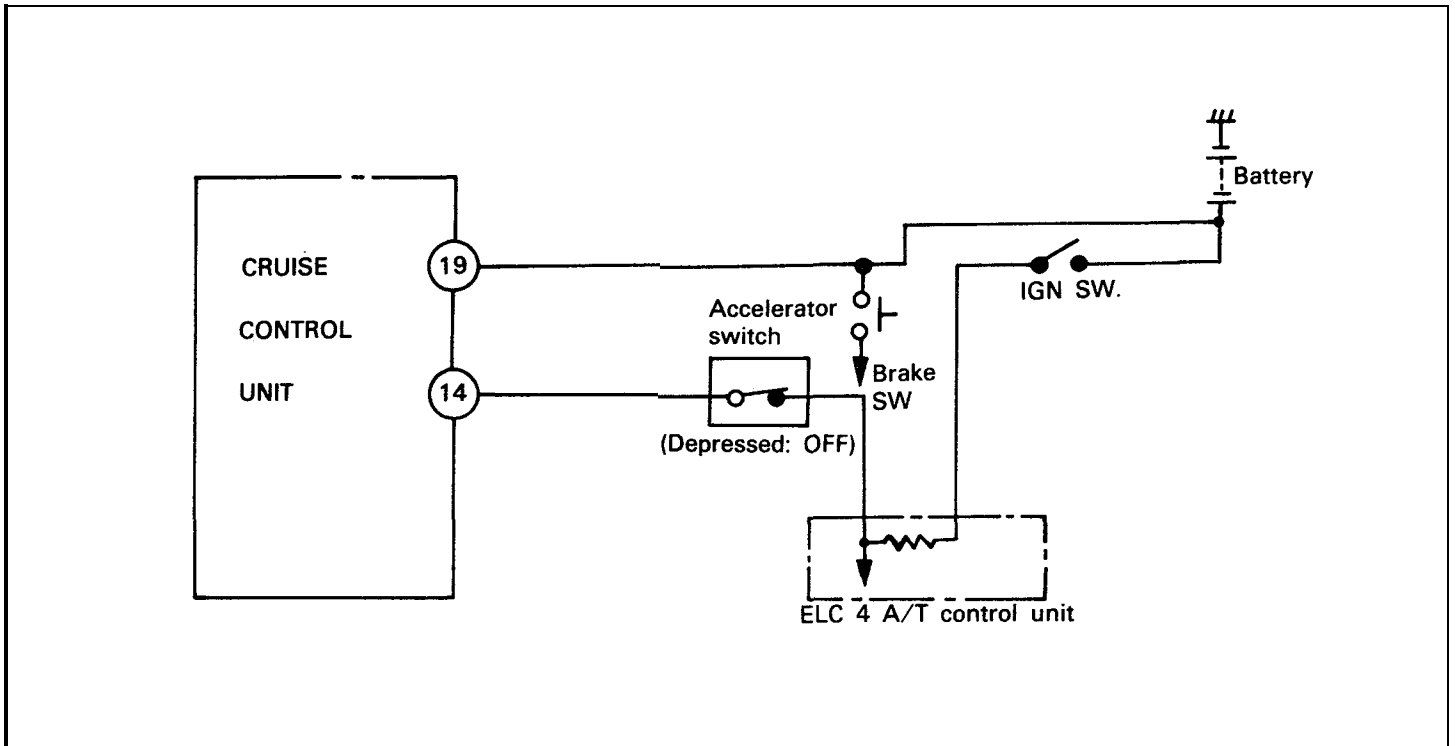


10. ACCELERATOR SWITCH

The accelerator switch is a switch that functions to detect the condition of the accelerator pedal, and is one of the ELC 4 A/T sensors.

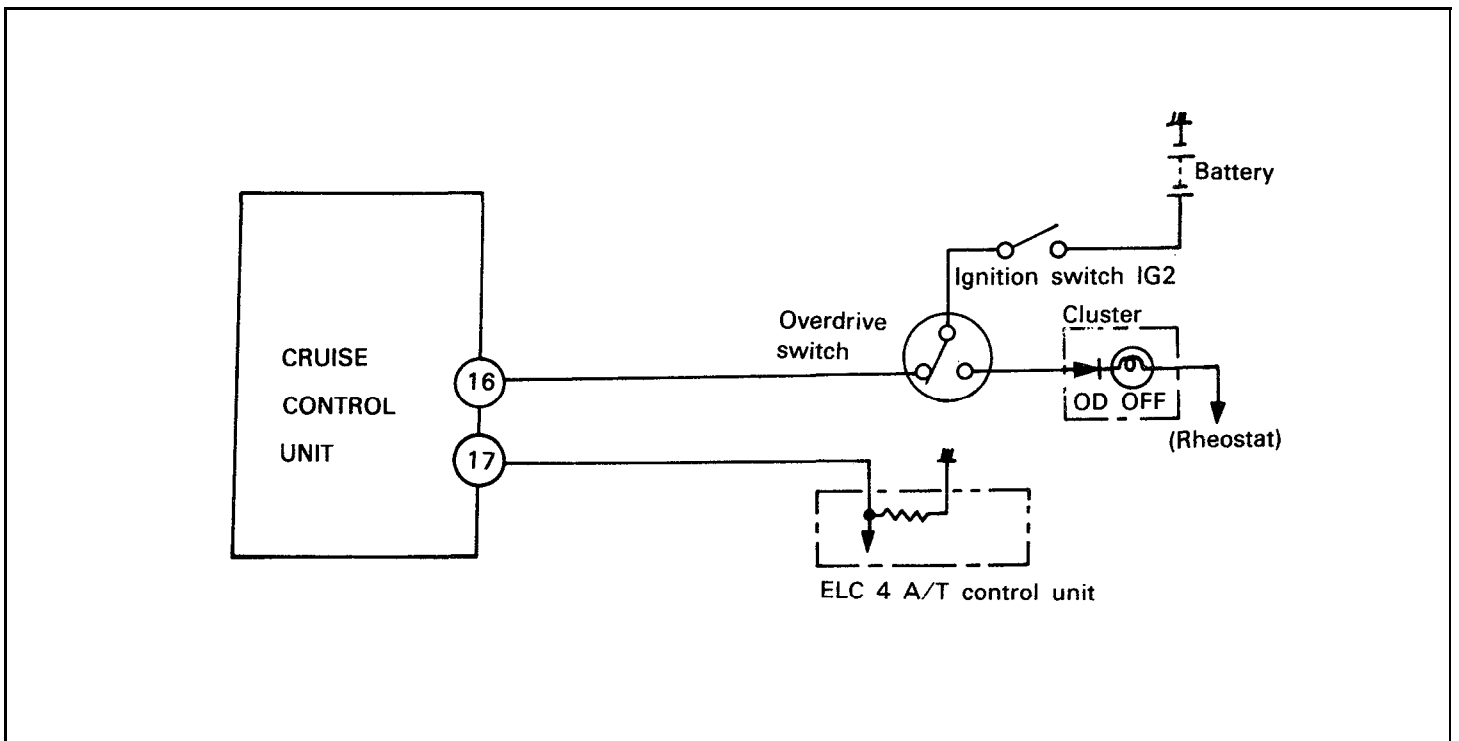
Because the accelerator pedal is not used during fixed-speed driving, the accelerator switch is OFF during this time only, so as not to adversely affect the function of the ELC 4 A/T.

AUTOMATIC SPEED CONTROL (CRUISE)



11. OVERDRIVE-CANCEL FUNCTION

When, during fixed-speed driving, the actual vehicle speed decreases to (or below) a speed which is below the memorized vehicle speed, and the actual vehicle speed continues at that reduced speed, or during the resume operation described in item 3 or the acceleration operation described in item 4, etc., it becomes necessary to return to the vehicle speed for a short time and to accelerate, the overdrive function of ELC 4 A/T-equipped models is canceled for a certain time.



AUTOMATIC SPEED CONTROL (CRUISE)

12. SELF-DIAGNOSIS FUNCTION

The cruise control system can display trouble codes from the cruise control unit through the diagnostic connector. The codes can be read by using a voltmeter or the multi-use tester. Be sure to turn the main switch "ON" before trying to read the codes.

NOTE

The display of the trouble codes starts if the vehicle speed decreases to less than approximately 20 km/h (12 mph) after the cancelation of the ASC system function, and stops if the vehicle speed increases to approximately 20 km/h (12 mph) or higher.

Self-diagnosis Descriptions and Displays

CODE NO.	DIAGNOSIS ITEM	DISPLAY PATTERNS	SELF-DIAGNOSIS DESCRIPTION
11	Clutch coil		<ol style="list-style-type: none"> 1. Open transistor 2. Open brake circuit, blown fuse 3. Stop lamp switch closed. 4. Stop lamp circuit open.
12	Speed sensor		No vehicle speed signal input for more than 1 seconds
13	Low speed limit		Vehicle speed less than 40 km/h.
14	Redundant brake		Vehicle speed less than memory speed by 20 km/h.
15	Control switch		SET and RESUME switches on simultaneously.
16	Cancel signal		<ol style="list-style-type: none"> 1. Open fuse or circuit in stop lamp switch. 2. Auto transaxle inhibit switch ON (closed). 3. Open circuit in stop lamp circuit. 4. Stop lamp switch ON.

AUTOMATIC SPEED CONTROL (CRUISE)

13. INPUT SWITCH CHECK

This unit has a check function for the input signal switch.

The display starts when the main switch is turned "ON" while the set and resume switches are turned "ON".

- 1) Trouble codes are stored in memory and displayed in sequential order of priority.
- 2) Smaller code number shall be placed higher in priority.
- 3) Even when an input of higher priority is detected among check function items, an item currently stored in memory shall be shown on display for one cycle. (One cycle shall be an interval during which all check functions stored in memory are shown on display.)
- 4) Code No.24 and 25 should be checked while a vehicle is running.

Input check table

CODE NO.	DIAGNOSIS ITEM	DISPLAY PATTERNS	SELF-DIAGNOSIS DESCRIPTION
21	Set switch ON		SET switch circuit normal
2 2	Resume switch ON		RESUME switch circuit normal
23	Cancel switch ON		Each CANCEL circuit normal
24	40 km/h over		When both No.24 and No.25 can be confirmed, vehicle-speed sensor circuit normal
25	40 km/h lower		

TROUBLE SHOOTING

BEFORE TROUBLESHOOTING

The ASC (Automatic speed-control) system performs control functions for the setting or cancellation of the fixed-speed driving speed based upon the data provided by input signals. As a result, when the ASC system is canceled, the cause of the cancellation is memorized in a separate circuit by the ECU, regardless of whether or not the ASC system condition is normal or abnormal, thus providing the ECU with the self-diagnosis function by certain fixed patterns, as well as the function of being able to check whether or not the ECU's input switches or sensor are normal. Thus, by effectively using these function, the time required checking and repair can be shortened.

NOTE

When the computer (ECU) power supply (ignition switch and main switch) is switched OFF, the memorized trouble codes are erased, and so for this reason the power supply must be left ON until the checking is completed.

SELF-DIAGNOSIS CHECKING

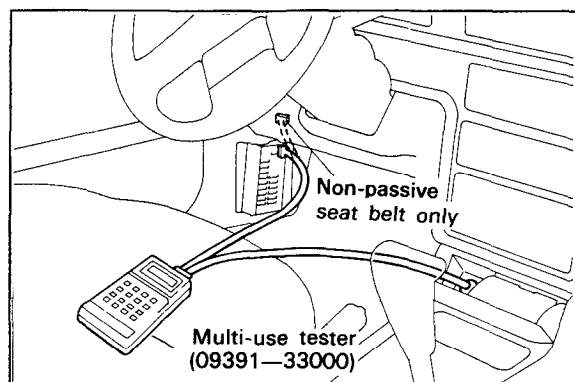
Self-diagnosis checking is performed when there has been an automatic cancellation, without cancel switch operation.

1. The following two methods can be used for checking the diagnosis. Note that the diagnosis check connector is located in the fuse box.

1) If a multi-use tester is used

Connect the multi-use tester's socket and connector to the cigarette lighter socket and the self-diagnosis check connector, and set the tester.

Use the tester according to its operation instructions; display the diagnosis code number and then check.



AUTOMATIC SPEED CONTROL (CRUISE)

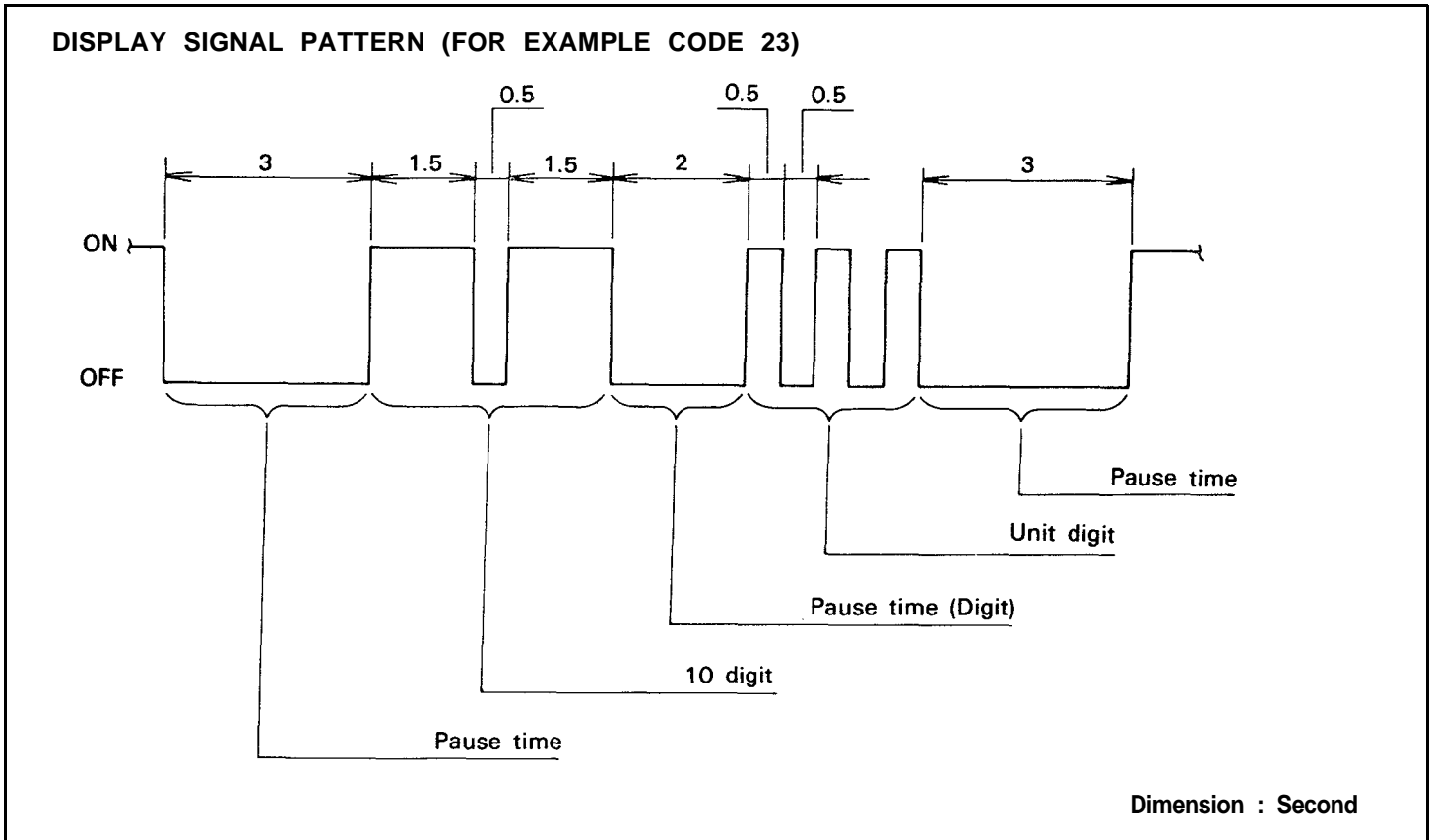
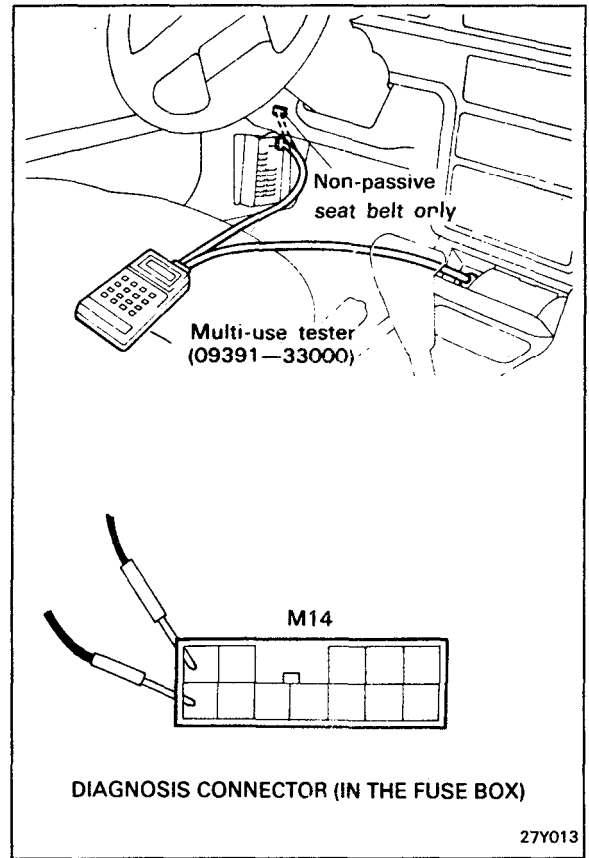
2) If a voltmeter is used

Connect a voltmeter between the ground terminal and the terminal for ASC of the diagnosis check connector. It is possible to discover which circuit is the cause of the cancellation by verifying the indication shown by the voltmeter with the display patterns shown on the next page.

2. When trouble codes No. 11, 12, 15 or 16 are displayed, check the troubleshooting symptom applicable to that number.

NOTE

Code No. 16 is entered in the memory as cancel switch ON signal input if the system is canceled by depressing the brake pedal, and code No. 13 or No. 14 is entered when there is an automatic cancellation because the vehicle speed drops when the vehicle is driven up a steep slope with the preset speed setting left set, etc., when however, there is a cancellation not intentionally made by the driver, the cause might be damaged or disconnected stop lamp switch input wiring, a malfunction of the stop lamp switch ON, etc., even though the same code No.16 is displayed.



TROUBLESHOOTING PROCEDURES

First, select the applicable malfunction symptom from the Trouble Symptom Charts.

Conduct the self-diagnostic test following the directions on the charts.

Determine the condition of all function circuits.

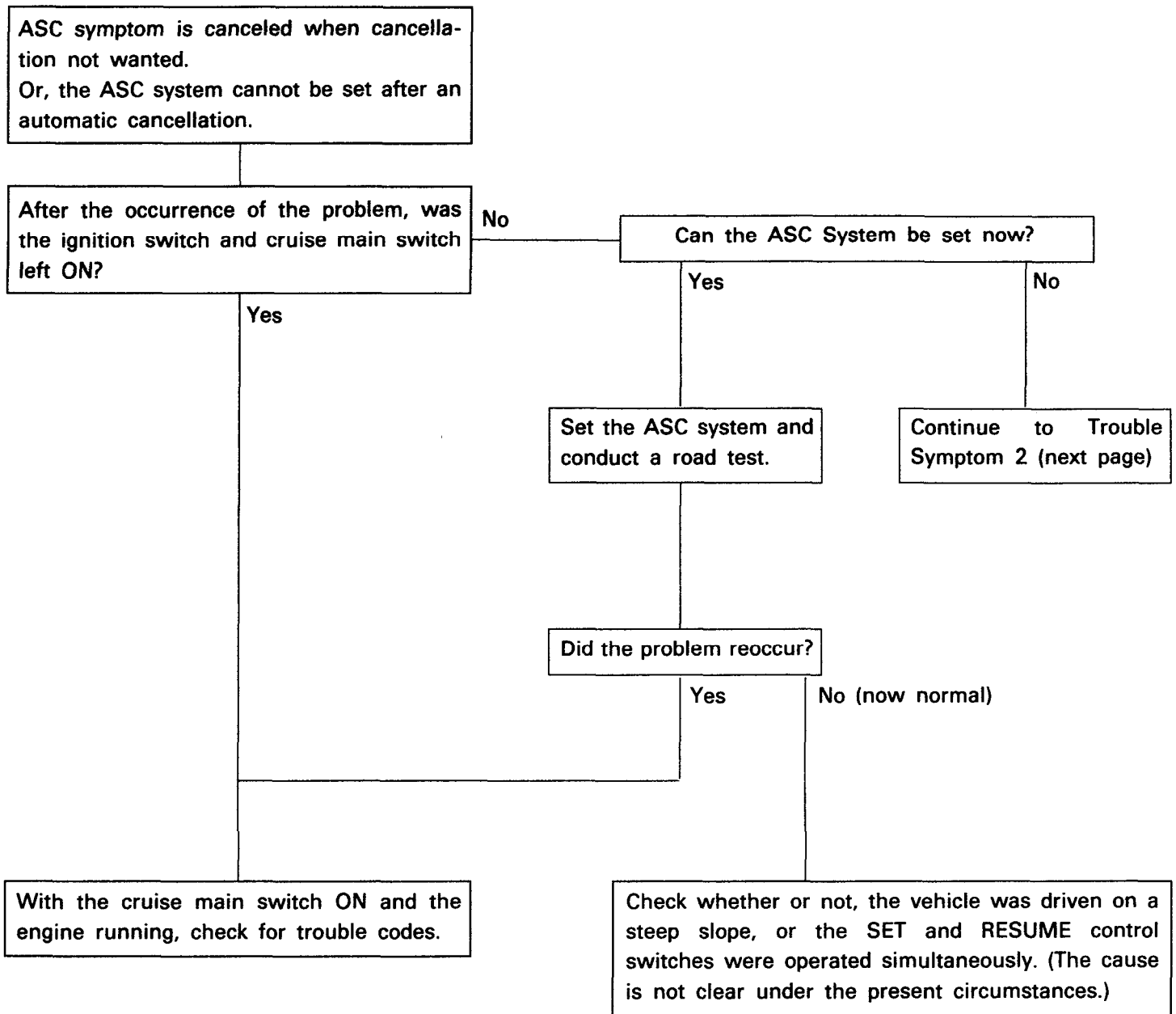
CAUTION

Because the computer (self-diagnosis) memory data will be erased, when the system is unintentionally canceled during fixed-speed driving, the ignition switch and/or the cruise main switch of the ASC system should not be switched OFF, and the battery should not be disconnected.

1. Make the following preliminary inspections.
 - 1) Check that the installation of the actuator, accelerator cables are correct, and that the cables and links are securely connected.
 - 2) Check that the accelerator pedal moves smoothly.
 - 3) Adjust the cable so there is no excessive tension or excessive play on the accelerator cable.
 - 4) Check that the ECU, actuator, cruise main and control switch and the connector of each cancel switch are connected securely.
2. Check in the sequence indicated in the Trouble Symptom Chart.
3. If these checks indicate a normal condition, replace the cruise control unit.

TROUBLE SYMPTOM CHARTS

Trouble Symptom 1



AUTOMATIC SPEED CONTROL (CRUISE)

Trouble Symptom 2

ASC system cannot be set

NOTE

If, after the occurrence of the problem, the ignition switch and the cruise main switch have not been switched OFF, it is possible to determine (by checking the diagnosis output code) which circuit canceled the system's operation.

This chart is to be used, for troubleshooting if it is not possible to use the self-diagnosis for checking.

Check the ECU power supply circuit and SET or RESUME switch. Are they normal ?

No

- o Damaged or disconnected wiring of the ECU power-supply circuit
- o Damaged or disconnected wiring of the SET or RESUME switch

Yes

Check the input check items

Input check items

Check results	Probable cause	Remedy
Code 21 remains even though SET switch is set to OFF.	SET switch ON malfunction	Replace the control switch
	SET switch input line short-circuit	Repair the harness.
Code 22 remains even though RESUME switch is set to OFF.	RESUME switch ON malfunction	Replace the control switch.
	RESUME switch input line short-circuit	Repair the harness.
Code 23 remains even though CANCEL switch is set to OFF.	Malfunction of the CANCEL circuit (ON malfunction)	Check or repair each CANCEL circuit.
Code 25 does not disappear, and code 24 does not appear, even though vehicle speed reaches approximately 40 km/h (25 mph) or higher.	Malfunction to the vehicle-speed sensor circuit (damaged or disconnected wiring, or short-circuit)	Check or repair the vehicle speed sensor circuit.

Normal

Check the actuator circuit

NOTE

If the check results of the actuator circuit of the actuator itself reveal a normal condition, replace the electronic control unit (ECU)

AUTOMATIC SPEED CONTROL (CRUISE)

Trouble Symptom 3

Trouble symptom	Probable cause	Remedy
<ul style="list-style-type: none"> o The set vehicle speed varies greatly upward or downward o “Surging” (repeated alternating acceleration and deceleration) occurs after setting 	Malfunction of the vehicle speed sensor circuit	Repair the vehicle speed sensor system, or replace the part
	Malfunction of the speedometer cable or speedometer drive gear	
	Actuator circuit poor contact	Repair the actuator system, or replace the part
	Malfunction of the actuator	
	Malfunction of the ECU	Replace the ECU

Trouble Symptom 4

Trouble symptom	Probable cause	Remedy
The ASC system is not canceled when the brake pedal is depressed	Damaged or disconnected wiring of the stop lamp switch	Repair the harness or replace the stop lamp switch
	Actuator drive circuit short	Repair the harness or replace the actuator
	Malfunction of the ECU	Replace the ECU

Trouble Symptom 5

Trouble symptom	Probable cause	Remedy
The ASC system is not canceled when the shift lever is moved to the “N” position (It is canceled, however, when the brake pedal is depressed)	Damaged or disconnected wiring of inhibitor switch input circuit	Repair the harness or repair or replace the inhibitor switch
	Improper adjustment of inhibitor switch	
	Malfunction of the ECU	Replace the ECU

AUTOMATIC SPEED CONTROL (CRUISE)

Trouble Symptom 6

Trouble symptom	Probable cause	Remedy
Cannot decelerate (coast) by using the SET switch'	Temporary damaged or disconnected wiring of SET switch input circuit	Repair the harness or replace the SET switch
	Actuator circuit poor contact	Repair the harness or replace the actuator
	Malfunction of the actuator	
	Malfunction of the ECU	Replace the ECU

Trouble Symptom 7

Trouble symptom	Probable cause	Remedy
Cannot accelerate or resume speed by using the RESUME switch	Damaged or disconnected wiring, or short circuit, or RESUME switch input circuit	Repair the harness or replace the RESUME switch
	Actuator circuit poor contact	Repair the harness or replace the actuator
	Malfunction of the actuator	
	Malfunction of the ECU	Replace the ECU

Trouble Symptom 8

Trouble symptom	Probable cause	Remedy
ASC system can be set while driving at a vehicle speed of less than 40 km/h (25 mph), or there is no automatic cancellation at that speed	Malfunction of the vehicle-speed sensor circuit	Repair the vehicle speed sensor system, or replace the part
	Malfunction of the speedometer cable or the speedometer drive gear	
	Malfunction of the ECU	Replace the ECU.

Trouble Symptom 9

Trouble symptom	Probable cause	Remedy
The cruise main switch indicator lamp does not illuminate (But ASC system is normal.)	Damaged or disconnected bulb of cruise main switch indicator lamp	Repair the harness or replace the part.
	Harness damaged or disconnected	

AUTOMATIC SPEED CONTROL (CRUISE)

Trouble Symptom 10

Trouble symptom	Probable cause	Remedy
No alarm sound when SET switch or RESUME switch is used. (But ASC system is normal.)	Malfunction of the alarm circuit	Repair the harness or replace the part
	Malfunction of the ECU	

Trouble Symptom 11

Trouble symptom	Probable cause	Remedy
Malfunction of control function by ON/OFF switching of ELC 4 A/T accelerator switch	Malfunction of circuit related to accelerator switch OFF function	Repair the harness or replace the part
	Malfunction of the ECU	

Trouble Symptom 12

Trouble symptom	Probable cause	Remedy
Overdrive is not canceled during fixed speed driving.	Malfunction of circuit related to overdrive cancelation, or malfunction of ECU	Repair the harness or replace the part
No shift to overdrive during manual driving.		

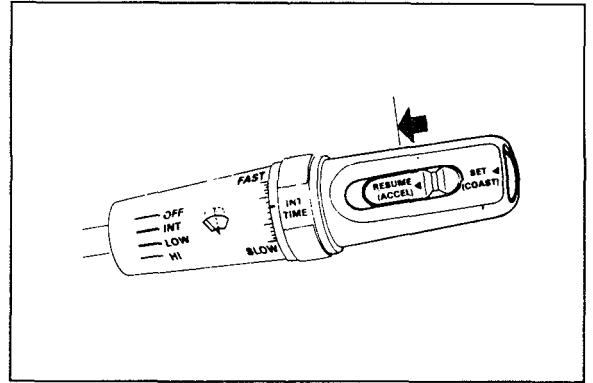
CHECKING AUTOMATIC SPEED CONTROL SETTING

CHECKING AUTOMATIC SPEED CONTROL MAIN SWITCH

1. Switch ON the MAIN switch.
2. Drive at the desired speed within the range of approximately 40-145 km/h (25-90 mph).
3. Press the SET button (of the control switch).
4. Check that the alarm sounds when the switch is pressed, and that when it is released the speed is the desired speed.

NOTE

If the vehicle speed decreases to approximately 20 km/h (12 mph) below the set speed, because of climbing a hill for example, the automatic speed control will be cancelled.

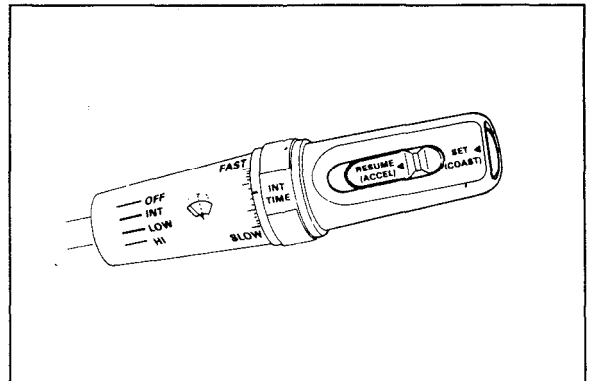


CHECKING SPEED INCREASE SETTING

1. Set to the desired speed.
2. Press the RESUME button (of the control switch).
3. Check that the alarm sounds when the switch is pressed, that acceleration continues while the switch is pressed, and that the speed at the time that the switch is released, becomes the driving speed.

NOTE

Even if, during acceleration, the vehicle speed reaches or exceeds the high speed limit [approximately 145 km/h] acceleration will continue and when the button is released, the speed at that time ("memorized speed") will become the high limit of the vehicle speed.



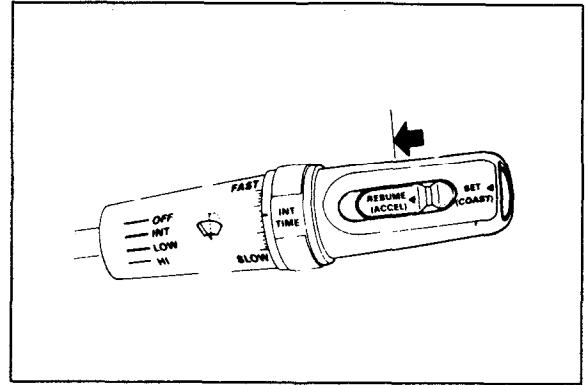
AUTOMATIC SPEED CONTROL (CRUISE)

CHECKING SPEED REDUCTION SETTING

1. Set to the desired speed.
2. Press the COAST button (of the control switch).
3. Check that the alarm sounds when the switch is pressed, that deceleration continues while the switch is pressed, and that the speed at the time that the switch is released becomes the driving speed.

NOTE

When the vehicle speed reaches the low limit [approximately 40 km/h (25 mph)] during deceleration, the automatic speed control will be cancelled.

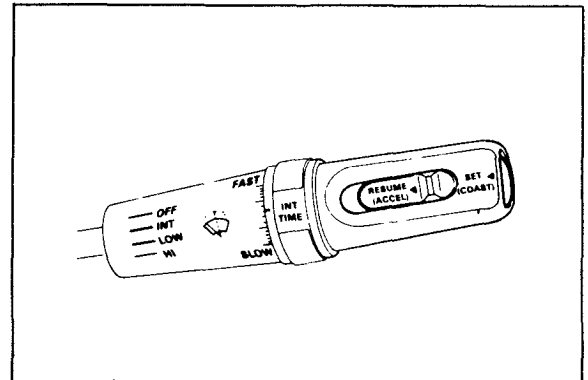


CHECKING AUTOMATIC SPEED CONTROL CANCELLATION

1. Set the automatic speed control.
2. Check that the ASC is cancelled when either of the operations below is performed.
 - 1) The brake pedal is depressed.
 - 2) The shift lever is moved to the "N" range.
 - 3) The automatic speed control MAIN switch is switched OFF.

CHECKING RETURN TO THE SET SPEED BEFORE CANCELLATION

1. Set the automatic speed control.
2. Check that the automatic speed control is cancelled when either of the operations below is performed.
 - 1) The brake pedal is depressed.
 - 2) The shift lever is moved to the "N" range.
3. Press the RESUME button (of the control switch) while driving at a vehicle speed of approximately 40 km/h (25 mph) or higher.
4. The alarm will sound when the switch is pressed. The ASC will return to the previously set speed before the automatic speed control was cancelled.



AUTOMATIC SPEED CONTROL (CRUISE)

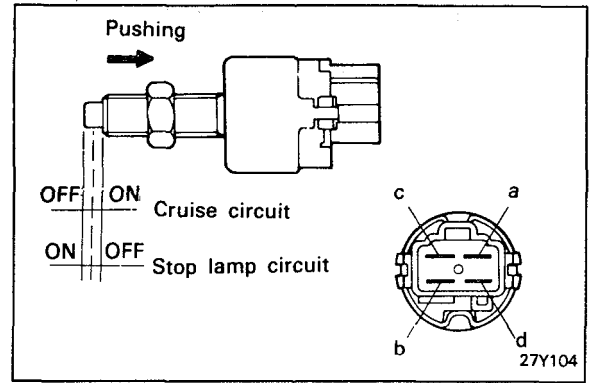
INDIVIDUAL PARTS INSPECTION

STOP LAMP SWITCH

INSPECTION

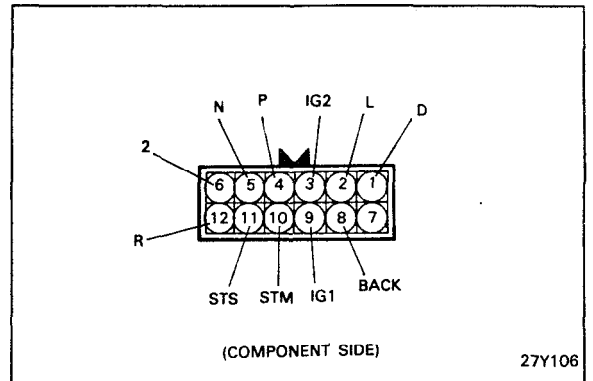
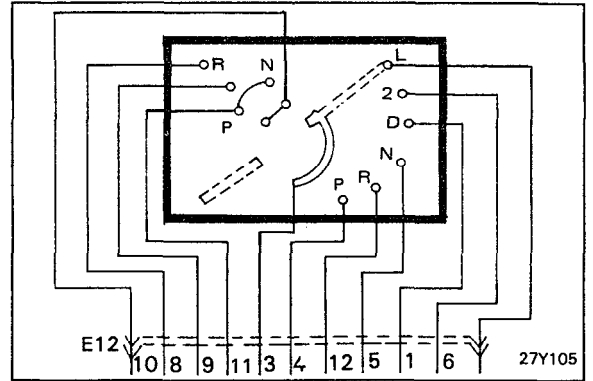
After operating the stop lamp switch, check for continuity between the terminals.

Position	Terminal	a	b	c	d
Pushing				○ ——— ○	
Not pushing		○ ——— ○			



CHECKING INHIBITOR SWITCH ('N' AND 'P' POSITIONS)

1. Disconnect the connector.
2. Check that there is continuity between connector (E12) terminals 3 and 5, 3 and 4 when the shift lever is moved to the "N" range and the "P" range.



CHECKING ACTUATOR

1. Disconnect the connector.
2. Measure the resistance value of the clutch coil.

Resistance of clutch coil between connector terminals (3) and (4)

Standard value : Approx. 550

