SERVICE MANUAL

DATSUN 260Z
MODEL S30 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EE

ENGINE ELECTRICAL SYSTEM

EE

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BATTERY

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REMOVAL

1. Disconnect negative and positive terminals.
2. Remove nuts from battery clamps; take off clamps.
3. Remove battery.

CHECKING ELECTROLYTE LEVEL

Remove six vent plugs and check electrolyte level in each cell.

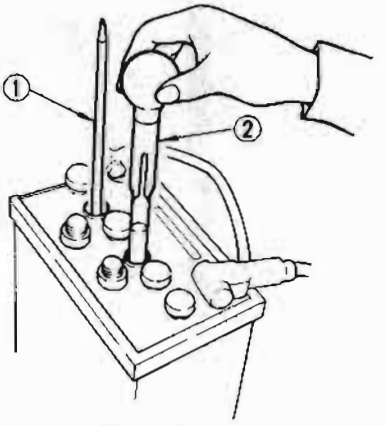
If necessary, add distilled water.

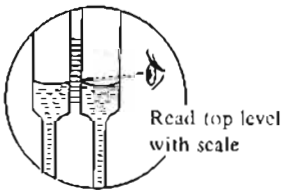
CHECKING SPECIFIC GRAVITY

Specific gravity of battery electrolyte is tested by a hydrometer. If the state of charge of battery is 60%, or specific-gravity reading is below 1.20 [as corrected at 20°C (68°F)], battery must be recharged or battery-electrolyte concentration adjusted.

Add or subtract gravity points according to whether the electrolyte temperature is above or below 20°C (68°F) standard.

The gravity of electrolyte changes 0.0007 for every 1°C (1.8°F) temperature. A correction can then be made by using the following formula:





1 Thermal gauge
2 Hydrometer

EE001

Fig. EE-1 Checking specific gravity

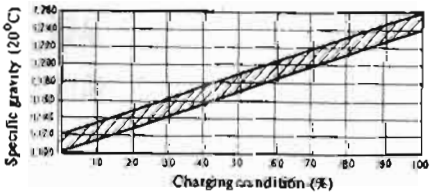
$$S20 = St + 0.0007 (t - 20)$$

Where

- St: Specific gravity of electrolyte at t°C
- S20: Specific gravity of electrolyte corrected at 20°C (68°F)
- t: Electrolyte temperature

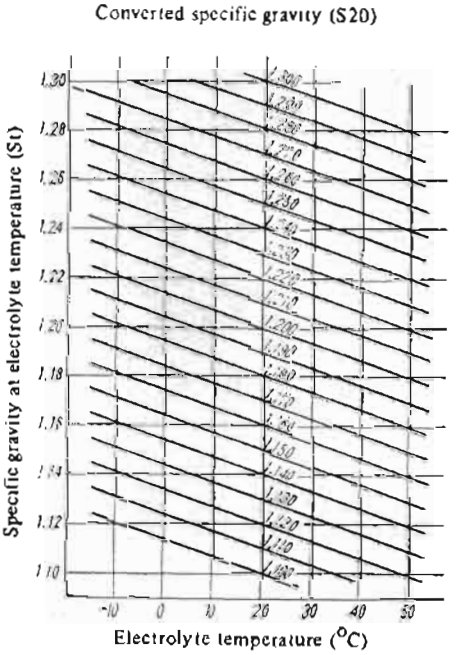
For example: A hydrometer reading of 1.260 at 30°C (86°F) would be 1.267 corrected to 20°C (68°F), indicating fully charged battery. On the other hand, a hydrometer reading of 1.220 at −10°C (14°F) would be 1.199 corrected to 20°C (68°F), indicating a partially charged battery.

The state of charge of battery can be determined by the following table if the specific gravity of electrolyte is known. Before checking, check to be sure that cells are filled to correct level.



EE002

Fig. EE-2 Charging condition



EE003

Fig. EE-3 Specific gravity at electrolyte temperature

Battery freezing

Temperature at which battery electrolyte freezes varies with acid concentration or its specific gravity. A battery with an insufficient charge will freeze at lower temperatures. If specific gravity of a battery falls below 1.1, this is an indication that battery is completely discharged and will freeze readily when temperatures fall below freezing.

Note: Use extreme caution to avoid freezing battery since freezing will generally ruin the battery.

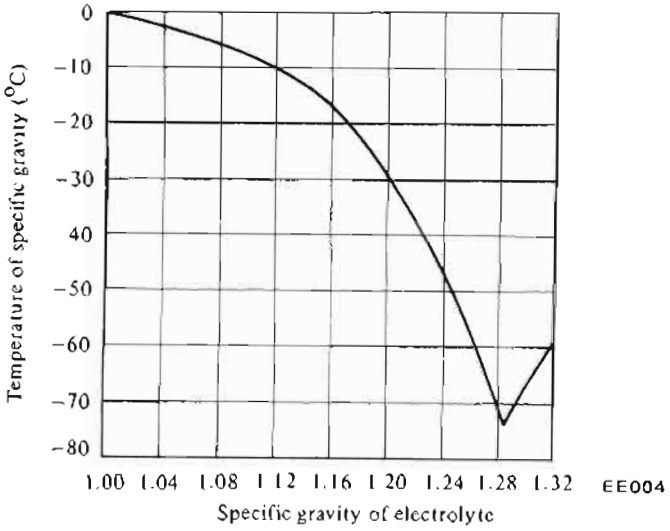


Fig. EE-4 Freezing point of electrolyte

CHARGING

If electrolyte level is satisfactory battery must be recharged when electrolyte-gravity reading falls below 1.20. If battery is quick-charged to bring it up to full charge, the operation should be carried out with negative terminal removed.

Prior to charging, corroded terminals should be cleaned with a brush and common baking-soda solution. In addition:

1. Be sure that electrolyte level is above top of each plate.
2. Keep removed plugs in a safe place.
3. Do not allow electrolyte temperature to go over 45°C (113°F).
4. After recharging, check to be certain that specific gravity does not exceed 1.260 [at 20°C (68°F)]. Correction can be made by adding distilled water into cells as necessary.
5. Keep battery away from open flame while it is being recharged.
6. After all vent plugs have been tightened, clean all sprayed electrolyte off upper face of battery.

INSTALLATION

1. Install and tighten clamps securely.
2. After clamps have been tightened, clean battery cable terminals and apply grease to retard formation of corrosion.

TROUBLE DIAGNOSES AND CORRECTIONS

Battery is not charged correctly.

1. Correctly adjust belt tension of alternator.
2. Complete connections in charging system.
3. Connect battery terminals securely.

Lighting load test

1. Make sure that electrolyte level is correct.
2. Crank engine for three seconds (with ignition system open).
3. Turn on headlight (low beam) for one minute, and then measure specific gravity of each cell of battery.

Specific gravity of each cell is less than 1.200.

1. When specific gravity can not be raised above 1.200 by charging, the battery is faulty.

Specific gravity of some cells is above 1.200 but the others show lower specific gravity.

Unbalance is within 0.05.

1. Discharged battery. Charge it and repeat lighting load test.

Unbalance is within 0.05.

1. Battery is satisfactory.

Unbalance of specific gravity between cells exceeds 0.05.

1. Battery is faulty.

Specific gravity of each cell is above 1.20.

Unbalance of specific gravity between cells exceeds 0.05.

1. Battery is faulty.

STARTING MOTOR

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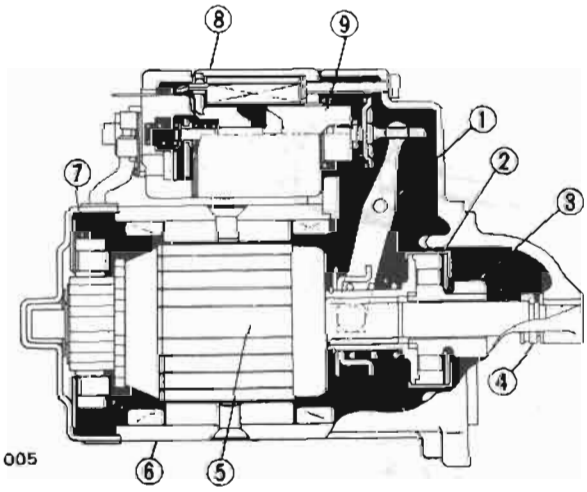
SERVICE DATA EE-11
TROUBLE DIAGNOSES AND CORRECTIONS EE-11

SPECIFICATIONS

Model		L26 engine	
Type		HITACHI S114-122N (For manual transmission)	HITACHI S114-182 (For automatic transmission)
Voltage		12 Volts	←
Output		1.0 KW	1.2 KW
Starting current (Voltage)		Less than 460 amps. (6 Volts)	Less than 500 amps. (5 Volts)
No load current (Voltage)		Less than 60 amps. (12 Volts)	←
No load starter revolution	rpm	More than 5,000	More than 6,000
Shift type of pinion gear		Magnetic shift	←
Number of teeth on pinion gear		9	←
Number of teeth on ring gear		120	←

DESCRIPTION

The function of the starting system, which consists of the battery, ignition switch, starting motor and solenoid, is to crank the engine. The electrical energy is supplied from the battery, the solenoid completes the circuit to operate the starting motor, and then the motor carries out the actual cranking of the engine.



1 Shift lever
2 Over-running clutch
3 Pinion
4 Pinion stopper
5 Armature
6 Yoke
7 Brush
8 Magnetic switch assembly
9 Plunger

Fig. EE-5 Sectional view of starting motor

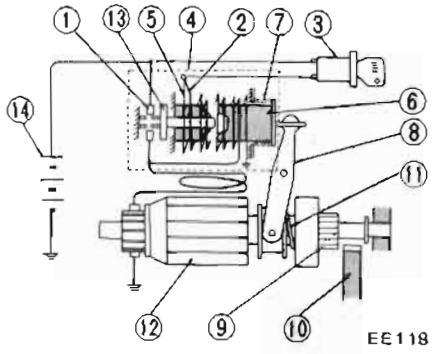
OPERATION

When the ignition switch is turned fully clockwise to the START position, battery current flows through "series" and "shunt" coils of the solenoid, magnetizing the solenoid The plunger is pulled into the solenoid so that it operates the shift lever to move the drive pinion into the flywheel ring gear. Then the solenoid switch contacts close after the drive pinion is partially engaged with the ring gear.

Closing of the solenoid switch contacts causes the motor to crank the engine and also cuts out the "series" coil of the solenoid, the magnetic pull of the "shunt" coil being sufficient to hold the pinion in mesh after the shifting has been performed.

After the engine starts running, the driver releases the ignition key and it automatically returns to the ON position.

This breaks the solenoid circuit so that reverse current flows through the series coil. As this happens, the resultant force of the magnetic fields in the shunt coil and the series coil becomes zero. The return spring then actuates the shift lever to pull the plunger, which allows the solenoid switch contacts to open. Consequently, the starting motor stops.

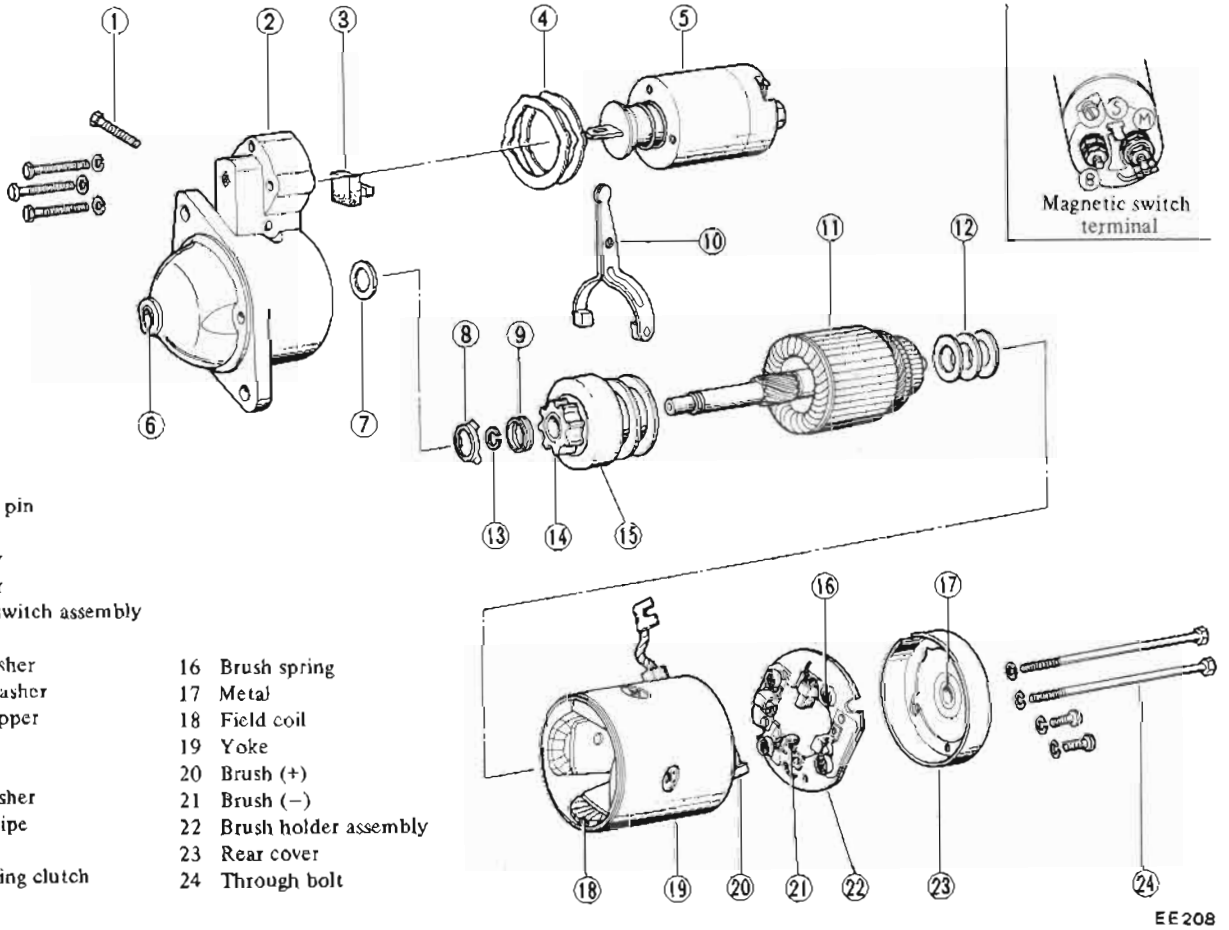


1 Stationary contact
2 Series coil
3 Ignition switch
4 Solenoid
5 Shunt coil
6 Plunger
7 Return spring
8 Shift lever
9 Drive pinion
10 Ring gear
11 Pinion sleeve spring
12 Armature
13 Movable contactor
14 Battery

Fig. EE-6 Starting motor circuit

More positive meshing and demeshing of the pinion and the ring gear teeth are secured by means of the over-running clutch. The over-running clutch employs a shift lever to slide the pinion along the armature shaft, into or out of mesh with the ring gear teeth. The over-running clutch is designed to transmit driving torque from the motor armature to the ring gear, but permits the pinion to over-run the armature after the engine has started.

CONSTRUCTION



1 Shift lever pin
2 Gear case
3 Dust cover
4 Dust cover
5 Magnetic switch assembly
6 Metal
7 Thrust washer
8 Stopper washer
9 Pinion stopper
10 Shift lever
11 Armature
12 Thrust washer
13 Stopper clipe
14 Pinion
15 Over running clutch
16 Brush spring
17 Metal
18 Field coil
19 Yoke
20 Brush (+)
21 Brush (−)
22 Brush holder assembly
23 Rear cover
24 Through bolt

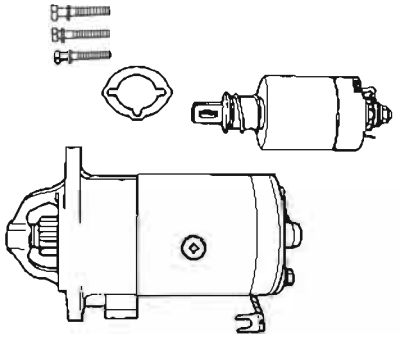
Fig. EE-7 Exploded view of starting motor

REMOVAL

1. Disconnect battery ground cable.
Disconnect black wire with yellow tracer from magnetic switch terminal, and black battery cable from battery terminal of magnetic switch.
2. Remove two bolts securing starting motor to transmission case. Pull starter assembly forward and remove starting motor.

DISASSEMBLY

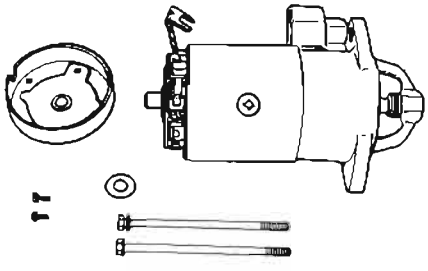
1. Loosen nut securing connecting plate to magnetic switch "M" terminal. Remove three screws securing magnetic switch and remove magnetic switch assembly.



EE008

Fig. EE-8 Removing magnetic switch assembly

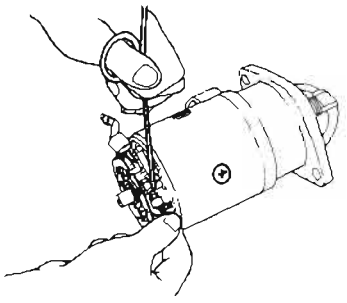
2. Remove two through bolts and brush cover assembly.



EE009

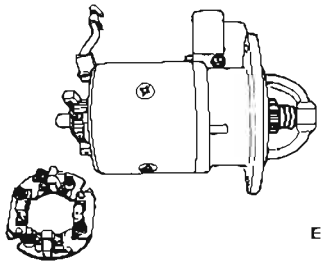
Fig. EE-9 Removing brush cover

3. Set brushes free from commutator by lifting up brush springs.



EE013

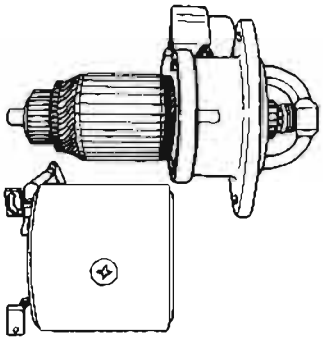
Fig. EE-10 Setting free brushes



EE014

Fig. EE-11 Removing brush holder

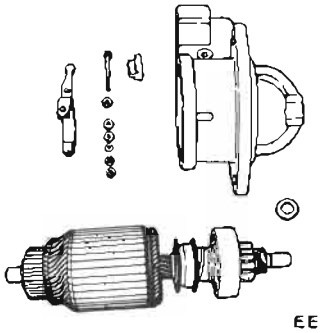
4. Remove yoke assembly by hitting lightly with a wooden hammer.



EE010

Fig. EE-12 Removing yoke assembly

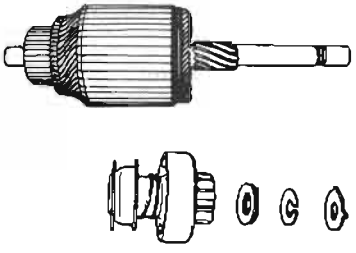
5. Withdraw armature assembly and shift lever.



EE011

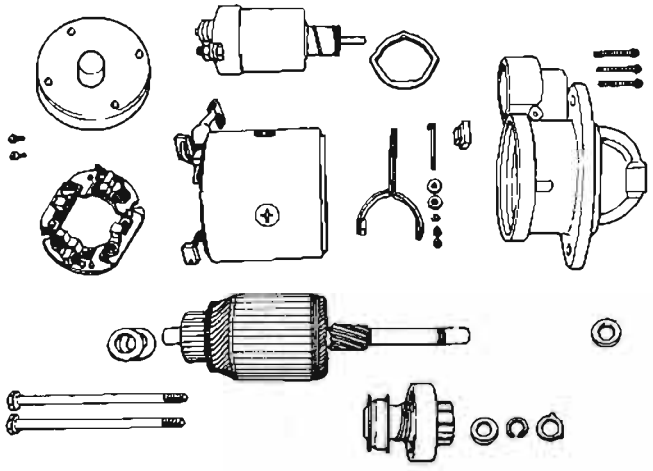
Fig. EE-13 Removing armature assembly and shift lever

6. Remove pinion stop ring located at the end of armature shaft. To remove stop ring, first push stop ring to clutch side and then, after removing snap ring, remove stop ring with over-running clutch. Withdraw over-running clutch assembly from armature shaft.



EE012

Fig. EE-14 Removing over-running clutch assembly



EE015

Fig. EE-15 Disassembly

CLEANING AND INSPECTION

Clean all disassembled parts, but do not use grease-dissolving solvents for cleaning over-running clutch, armature assembly, magnetic switch assembly and field coils since such a solvent would dissolve grease packed in clutch mechanism and would damage coils or other insulators.

Check them for excessive damage or wear, and replace if necessary.

Terminal

Check terminal for damage and wear, and replace if necessary.

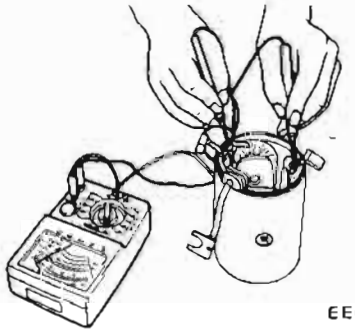
Field coil

Check field coil for insulation. If the insulation of coil is damaged or worn it should be replaced.

Testing field coil for continuity:

Connect the probe of a circuit tester or an ohmmeter to field coil positive terminal and positive brush holder.

If tester shows no conduction field, circuit or coil is open.



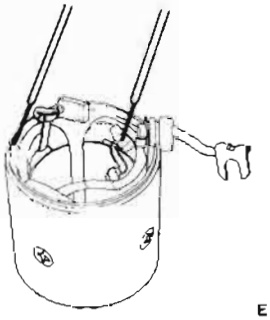
EE016

Fig. EE-16 Testing field coil for continuity

Testing field coil for ground:

Place one probe of circuit tester onto yoke and the other onto field coil lead (positive terminal).

If very little resistance is read, field coil is grounded.



EE017

Fig. EE-17 Testing field coil for ground

Field coil tester for short:

Unsolder the connected portion of each coil and proceed as described above.

If a faulty coil is found, it should be replaced.

Brushes and brush lead wire

Check the surface condition of brush contact and wear of brush. If a loose contact is found it should be replaced.

If brush is worn down to less than 12.5 mm (0.492 in), replace.

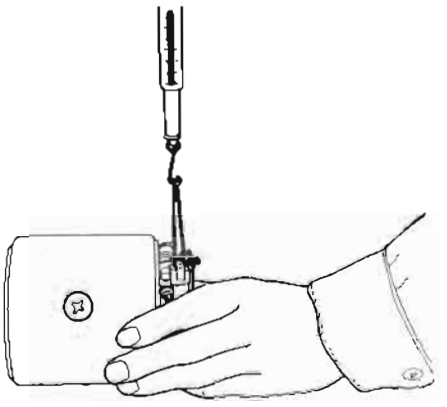
Check the connection of lead clip and lead wire.

Check brush holders and spring clip to ensure that they are not deformed or bent, and will properly hold brushes against the commutator.

If brushes or brush holders are dirty, they should be cleaned.

Brush spring tension

Check brush spring tension by a spring scale as shown in Figure EE-18. The reading should be 1.6 kg (3.53 lb). Replace spring if tension is lower than 1.4 kg (3.09 lb).



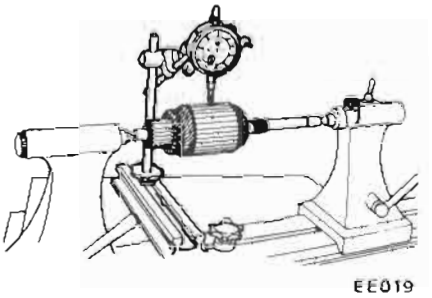
EE018

Fig. EE-18 Inspecting brush spring tension

Armature assembly

Check external appearance of armature and commutator.

1. Measure armature shaft for bend with a dial gauge. Replace armature shaft if the bend exceeds 0.08 mm (0.0031 in).



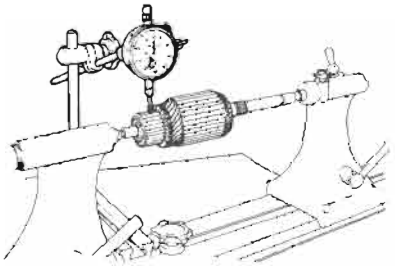
EE019

Fig. EE-19 Inspecting armature shaft for bend

2. Inspect commutator. If the surface of commutator is rough, it must be sanded lightly with a No. 500 emery cloth. Commutator must also be checked for out-of-round. If the out-of-round is more than 0.2 mm (0.0079 in), or the depth of insulating mica is less than 0.2 mm (0.0079 in) from commutator surface, commutator (armature) should be turned in a lathe, until the out-of-round is less than 0.05 mm (0.0020 in). Insulating mica should also be undercut so that the depth of it is 0.5 to 0.8 mm (0.020 to 0.031 in).

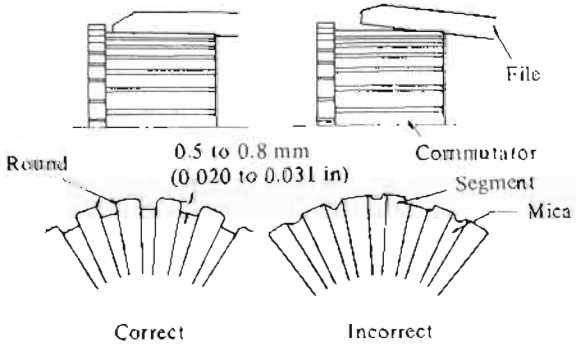
The wear limit of commutator diameter is 2 mm (0.079 in). If commutator is beyond repair, replace.

Note: If worn or damaged, it is recommended to replace commutator as an assembly.



EE020

Fig. EE-20 Inspecting commutator



EE021

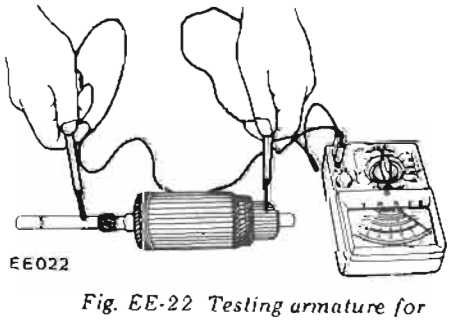
Fig. EE-21 Undercutting insulating mica

3. Inspect soldered connection of armature lead and commutator. If loose connection is found, solder it using rosin flux.

4. Armature test for ground

Using a circuit tester, place one test probe onto armature shaft and other onto each commutator bar.

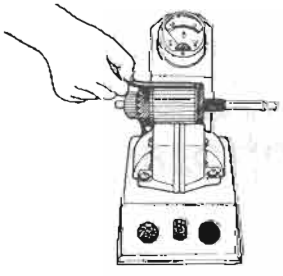
If tester shows conduction, armature is grounded and must be replaced.



EE022

Fig. EE-22 Testing armature for ground

5. Check armature for short by placing it on armature tester (growler) with a piece of iron over armature core, rotating armature. If the plate vibrates, armature is shorted.



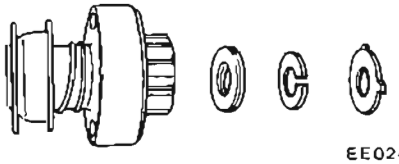
EE023

Fig. EE-23 Testing armature for short

6. Check armature for continuity by placing probes of tester on two segments side by side. If tester shows no conduction, the circuit is open.

Over-running clutch assembly

Inspect pinion assembly and screw sleeve. Screw sleeve must slide freely along armature shaft splines. If damage is found or resistance is felt when sliding, it must be repaired. Inspect pinion teeth. If excessive rubbing is found on teeth. Flywheel ring gear also must be inspected

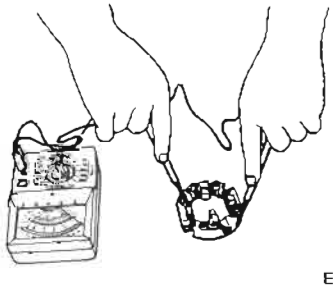


EE024

Fig. EE-24 Over-running clutch assembly

Brush holder test for ground

Using a circuit tester, place one test probe onto negative side of brush holder and another onto positive side. If tester shows conduction, brush holder is shorted to ground. Replace an insulator or brush holder.



EE025

Fig. EE-25 Testing brush for ground

Pinion case bearing metal

Inspect bearing metal for wear or side play. If clearance between bearing metal and armature shaft is more than 0.2 mm (0.0079 in), replace metal. Press in a new bearing and adjust clearance to 0.03 to 0.10 mm (0.0012 to 0.0039 in). Bearing metal should be pressed in so that end of bearing metal is flush with gear case.

Magnetic switch assembly

Inspect magnetic switch contacts. If a rough welding is found on the contact, it should be repaired.

ASSEMBLY

Reassemble starting motor in reverse sequence of disassembly.

When assembling, be sure to apply grease to gear case and rear cover bearing metal, and apply oil lightly to pinion.

TEST

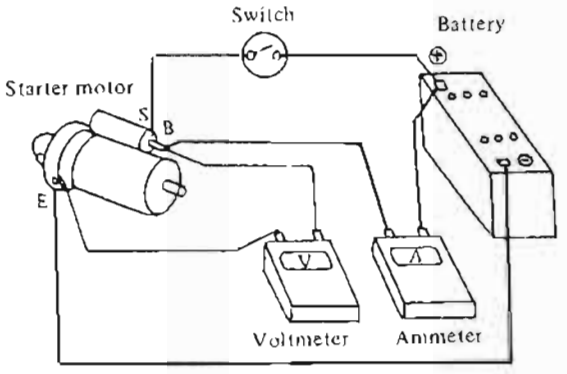
Performance test

Starter motor should be subjected to a "no-load" test whenever it has been overhauled to ensure that its performance will be satisfactory when installed in engine. Starter motor should also be subjected to the test when the cause of abnormal operation is to be determined. A brief outline of the test is given below.

No-load test

Connect starting motor in series with specified (12 volts) battery and an ammeter capable of indicating 1,000 amperes.

Specified current draw and revolution in these test are shown in "specification".



EE026

Fig. EE-26 No-load testing

Diagnosis of test

1. Low speed with no-load and high current draw may result from the following causes.

(1) Tight, dirty or worn bearings.

(2) Bent armature shaft or loosened field probe.

(3) Shorted armature;

Check armature further.

(4) A grounded armature or field;

a. Remove input terminal.

b. Raise two negative side brushes from commutator.

c. Using a circuit tester, place one probe onto input terminal and the other onto yoke.

d. If tester indicates conduction, raise the other two brushes and check field and armature separately to determine whether field or armature is grounded.

2. Failure to operate with high current draw may be caused by the following:

(1) A grounded or open field coil;

Inspect the connection and trace circuit by a circuit tester.

(2) Armature coil does not operate;

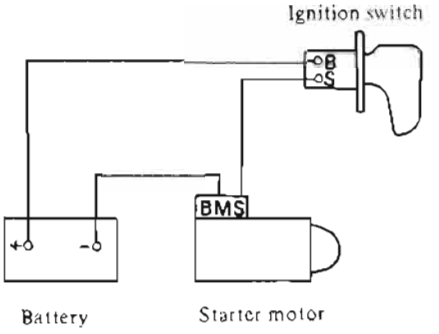
Inspect commutator for excessive burning. In this case, arc may occur on faulty commutator when motor is operated with no-load.

(3) Burned out commutator bar;

Weak brush spring tension, broken brush spring, rubber bush, thrust out of mica in commutator or a loose contact between brush and commutator would cause commutator bar to burn.

3. Low current draw and low no-load speed would cause high internal resistance due to loose connections, damaged leads, dirty commutator and causes listed on item 2-(3).

Magnetic switch assembly test

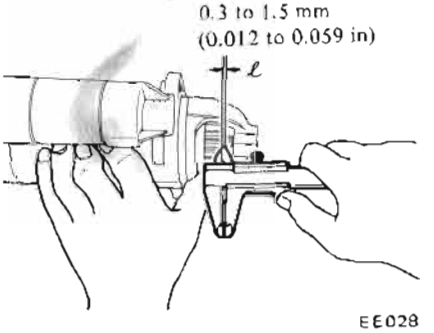


EE027

Fig. EE-27 Circuit of magnetic switch assembly test

If the starting motor check is "OK", check magnetic switch assembly. Connect cables between "negative" battery terminal and starting motor "M" terminal, "positive" battery terminal and starting motor "S" terminal connecting ignition switch in series as shown in Figure EE-27.

With ignition switch on, measure the gap "ℓ" between pinion front edge and pinion stopper.



EE028

Fig. EE-28 Measuring gap "ℓ"

SERVICE DATA

Item \ Model		S114-122N	S114-182
Armature shaft diameter (pinion side)	mm (in)	12.950 to 12.968 (0.5098 to 0.5106)	12.450 to 12.468 (0.4902 to 0.4909)
Armature shaft diameter (rear end)	mm (in)	11.450 to 11.468 (0.4508 to 0.4515)	12.450 to 12.468 (0.4902 to 0.4909)
Amendment limit of shaft diameter	mm (in)	0.10 (0.0039)	←
Amendment limit of shaft bent	mm (in)	0.08 (0.0031)	←
Clearance between shaft and bush	mm (in)	0.03 to 0.10 (0.0012 to 0.0039)	←
Amendment limit of dittoed clearance	mm (in)	0.20 (0.0079)	←
Outer diameter of commutator	mm (in)	35.0 (1.378)	40.0 (1.575)
Wear limit of commutator diameter	mm (in)	1.0 (0.039)	1.0 (0.039)
Brush length	mm (in)	18.5 (0.728)	16.0 (0.630)
Wear limit of dittoed length	mm (in)	6.0 (0.236)	4.0 (0.157)
(remaining brush should be more than)	mm (in)	12.5 (0.492)	12.0 (0.472)
Brush spring tension	kg (lb)	1.6 (35.3)	←
Front bracket metal inner diameter	mm (in)	13.000 to 13.018 (0.5118 to 0.5125)	12.500 to 12.527 (0.492 to 0.493)
Rear cover metal inner-diameter	mm (in)	11.500 to 11.521 (0.4528 to 0.4536)	12.500 to 12.521 (0.492 to 0.493)
Center bearing metal inner diameter	mm (in)	17.650 to 17.675 (0.6949 to 0.6959)	←

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Starting motor will not operate.	Discharged battery.	Charge or replace.
	Faulty solenoid switch.	Repair or replace.
	Loose connections of terminal.	Clean and tighten.
	Worn brushes.	Replace.
	Faulty starting motor.	Remove and test.

Condition	Probable cause	Corrective action
Noisy starting motor.	Loose securing bolt. Worn pinion gear. Poor lubrication. Worn commutator. Worn brushes.	Tighten. Replace. Add oil. Disassemble motor. Replace.
Starting motor cranks slowly.	Discharged battery. Loose connection of terminal. Worn brushes. Locked brushes.	Charge or replace. Clean and tighten. Replace. Inspect brush spring tension or repair brush holder.
Starting motor cranks slowly	Dirty or worn commutator. Armature rubs field coil. Faulty solenoid switch.	Clean and repair. Replace assembly. Repari or replace.
Starting motor operates but does not crank engine.	Worn pinion. Locked pinion guide. Worn ring gear.	Replace. Repair. Replace.
Starting motor will not disengage even if ignition switch is turned off.	Faulty solenoid switch Faulty gear teeth.	Repair or replace. Replace.

CHARGING CIRCUIT

The charging circuit consists of the battery, alternator, regulator and necessary wiring to connect these parts. The purpose of this system is to convert mechanical energy from the engine into electrical energy which is used to operate all electrically operated units and to keep the battery fully charged.

When the ignition switch is set to "ON", current flows from the battery to ground through the ignition switch, voltage regulator IG terminal, primary side contact point "P1", movable contact point "P2", voltage regulator "F" terminal, alternator "F" terminal, field coil and alternator "E" terminal, as shown in Figure EE-29 by full line arrow marks. Then the rotor in the alternator is excited. On the other hand, current flows from the battery to ground through the ignition switch, warning lamp, voltage regulator "L" terminal, lamp side contact point "P4", movable contact point "P5", and voltage regulator "E" terminal, as shown by dotted line arrow marks. Then, the warning lamp lights.

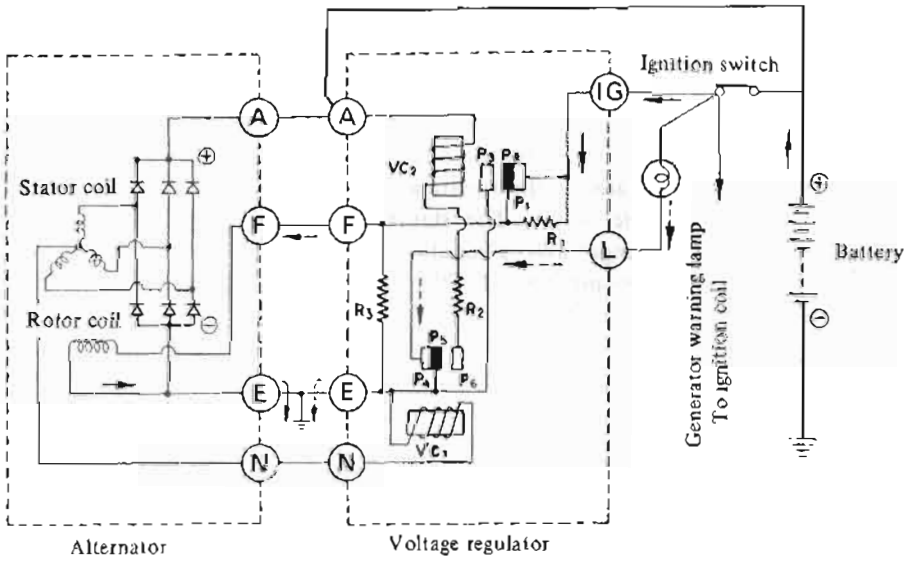
When the alternator begins to operate, three-phase alternating current is induced in the stator coil. This alternating current is rectified by the positive and negative silicon diodes. The rectified direct current output reaches the alternator "A" and "E" terminals.

On the other hand, the neutral point voltage reaches "N" and "E" terminals (nearly a half of the output voltage), and current flows from voltage regulator "N" terminal to "E" terminal or ground through the coil "VC1" as shown in Figure EE-30 by the dotted line arrow marks. Then, the coil "VC1" is excited, and the movable contact point "P5" is separated from the primary side contact P4. This action causes the warning lamp to turn off and complete the voltage winding circuit, as shown by the full line arrow marks.

When the alternator speed is increased or the voltage starts to rise excessively, current through the coil "VC1" further increases and contact point P5 comes into contact with contact point P6. Thus, current begins to flow through the coil "VC2" and contact point P2 is separated from P2 by the magnetic force of coil "VC2". Therefore, registor "R1" is applied into the rotor circuit and output voltage is decreased. As the output voltage is decreased, the movable contact point "P2" and primary side contact "P1" come into contact

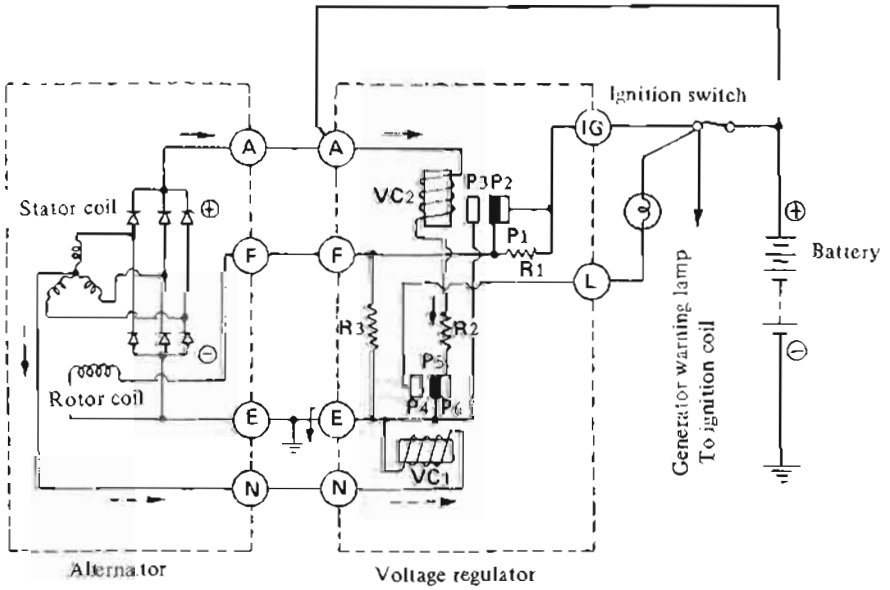
once again, and the alternator voltage increases. Thus, the rapid vibration of the movable contact point "P2" maintains an alternator output voltage constant.

When the alternator speed is further increased or the voltage starts to rise excessively, the movable contact point "P2" comes into contact with secondary side contact point "P3". Then, the rotor current is shut off and alternator output voltage is decreased immediately. This action causes movable contact "P2" to separate from secondary contact "P3". Thus, the rapid vibration of the movable contact point "P2", or breaking and completing the rotor circuit, maintains an alternator output voltage constant.



EE029

Fig. EE-29 Charging circuit (I)



EE030

Fig. EE-30 Charging circuit (II)

ALTERNATOR

CONTENTS

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DESCRIPTION

Alternator	Car
LT150-10	S30 model except for Canada
LT160-23	S30 model for Canada

In the alternator, a magnetic field is produced by the rotor which consists of alternator shaft, field coil, pole pieces, and slip rings. The slip rings pressed in the shaft conduct only a small field current. Output current is generated in the armature coils located in the stator. The stator has three windings and generates three-phase alternating current. Silicon diodes act like a one-way valve for electricity so that charging current passes easily but reverse current is shut out.

In model LT150-10, LT160-23 pack type silicon diodes are used.

Six diodes (three negatives and three positives), are installed in positive and negative plates as an assembly.

These diodes are direct-soldered at their tips, and constructed with positive and negative conjunction.

They are mounted on the two plates which combine the function of heat-dissipating plate and positive/negative terminals and are light in weight and easy to service.

Three diodes each (three negatives and three positives) are installed in positive and negative side rear cover.

LT160-23 is basically the same as LT150-10 but differs only in generated output. In this chapter, LT150-10 is described as the standard.

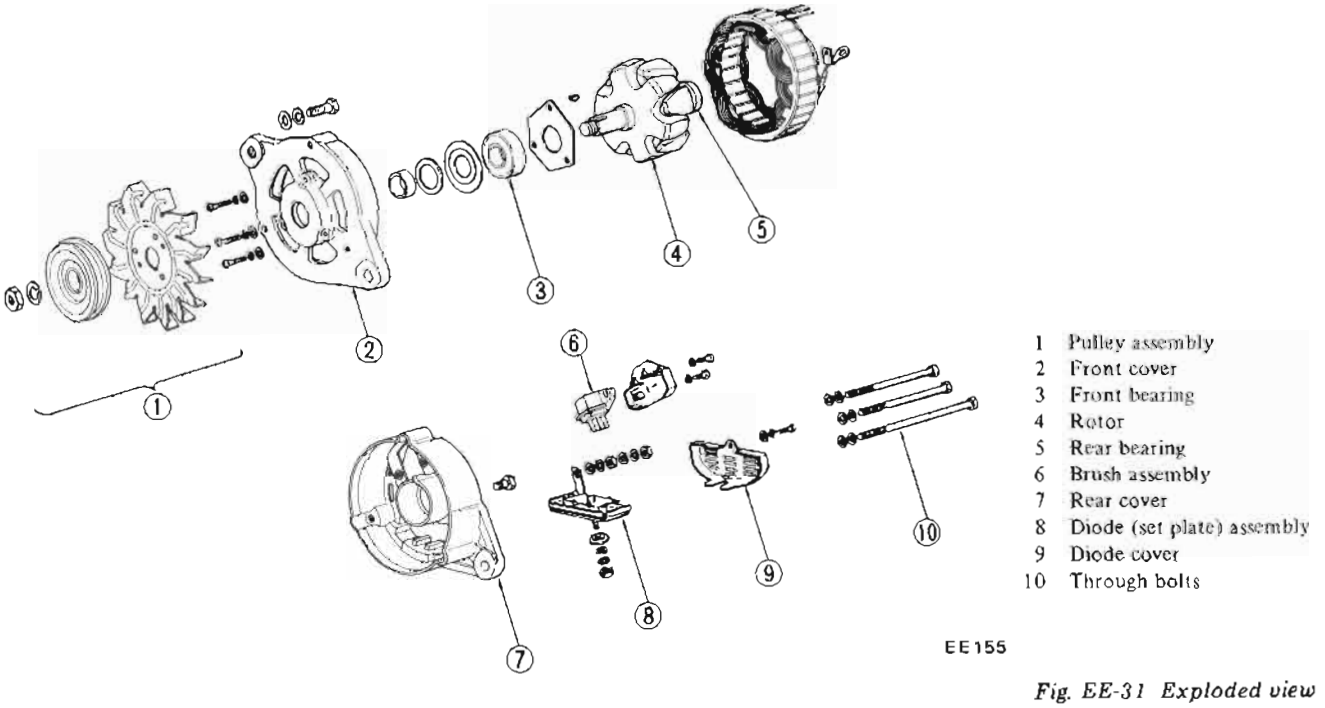
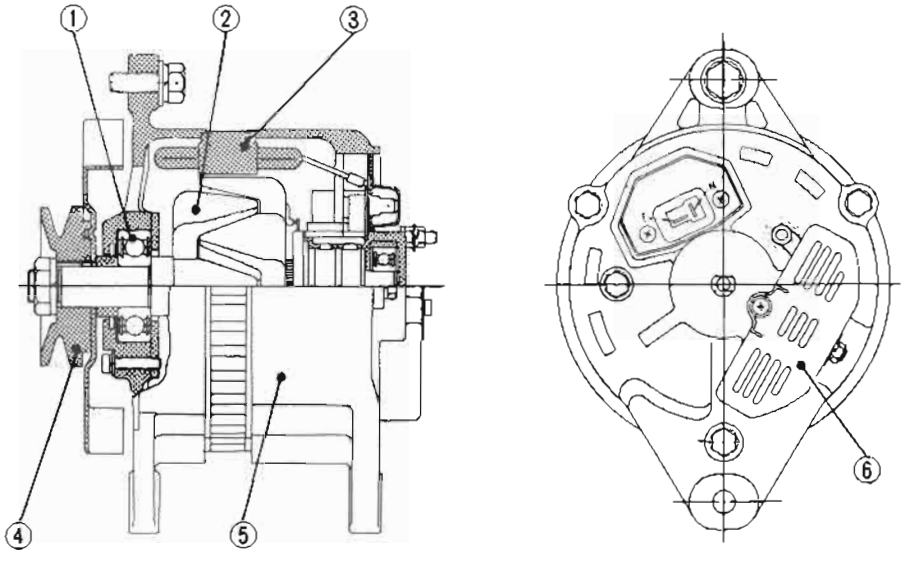


Fig. EE-31 Exploded view



1 Front bearing
2 Rotor
3 Stator
4 Pulley
5 Rear cover
6 Encased diode

Fig. EE-32 Sectional view

REMOVAL

1 Disconnect negative battery terminal.
2. Disconnect two lead wires and connector from alternator.
3. Loosen adjusting bolt.
4. Remove alternator drive belt.
5. Remove parts associated with alternator from engine.
6. Remove alternator from car.

DISASSEMBLY

1. Remove pulley nut, pulley rim, fan and spacer.

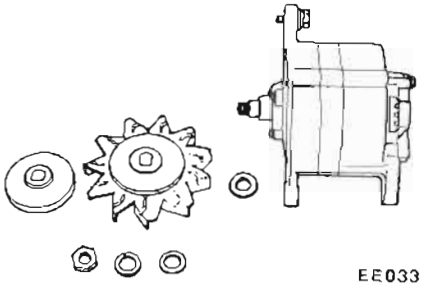
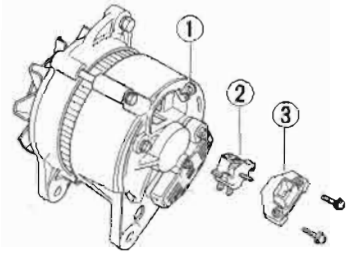


Fig. EE-33 Removing pulley and fan

2. Remove brush holder fixing screws, and remove brush holder cover. Pull brush holder forward, and remove brushes together with brush holder.

Note: Do not disconnect N terminal from stator coil lead wire.



1 "N" terminal
2 Brush holder
3 Brush holder cover

Fig. EE-34 Removing brush

3. Remove through bolts. Separate front cover with rotor from rear cover with stator by lightly tapping front bracket with a wooden mallet.

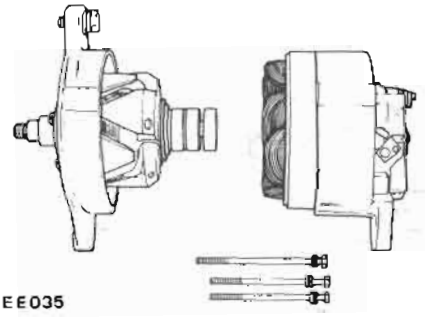

EE035

Fig. EE-35 Separating front cover with rotor from rear cover

4. Remove three set screws from bearing retainer, and separate rotor from front cover.

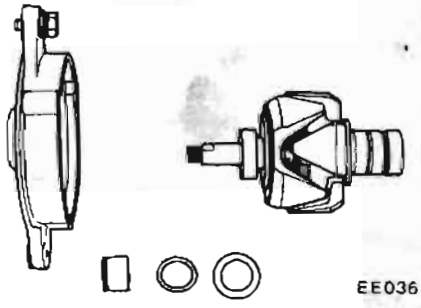

EE036

Fig. EE-36 Removing rotor

5. Pull rear bearing out from rotor assembly with a press or bearing puller.

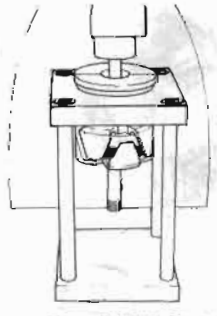

EE037

Fig. EE-37 Pulling out rear bearing (I)

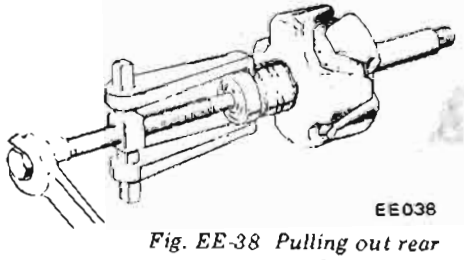
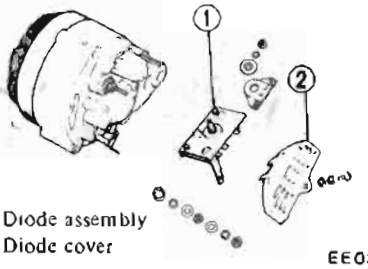

EE038

Fig. EE-38 Pulling out rear bearing (II)

6. Remove diode cover fixing screw, and remove diode cover. Disconnect three stator coil lead wires from diode terminal with a soldering iron.

7. Remove A terminal nut and diode installation nut, and remove diode assembly.



1 Diode assembly
2 Diode cover

EE039

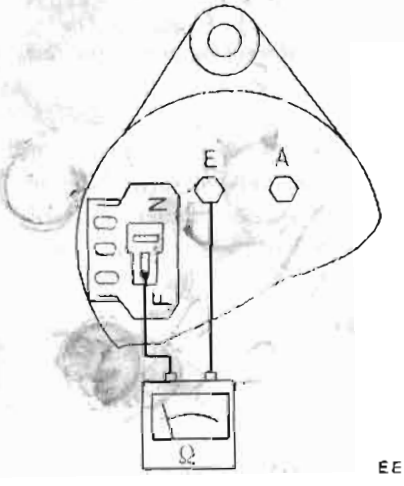
Fig. EE-39 Removing diode assembly

Note: Use care in handling diode assembly to prevent undue stress on it.

INSPECTION AND REPAIR

Remove alternator from vehicle and apply tester between lead wire F (white with black tracer) and lead wire E (black color).

When the resistance is approximately 5Ω, the condition of brush and field coil is satisfactory. When no conduction exists in brush or field coil, or when resistance differs significantly between those parts, disassemble and inspect.



EE040

Fig. EE-40 Inspecting alternator

Rotor inspection

1. Conduction test of rotor coil

Apply tester between slip rings of rotor as shown in Figure EE-41. If there is no conduction, discontinuity of field coil may exist. When resistance is approximately 4.4Ω at normal ambient temperature, condition is satisfactory.

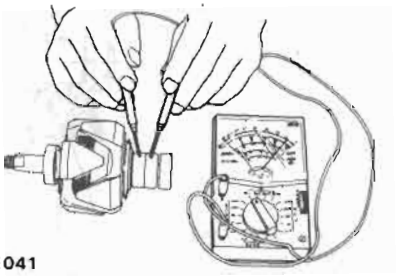

EE041

Fig. EE-41 Conduction test of rotor coil

2. Ground test of rotor coil

Check conduction between slip ring and rotor core. If conduction exists, replace rotor assembly, because field coil or slip ring may be grounded.

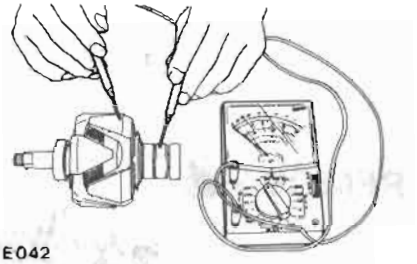

EE042

Fig. EE-42 Testing rotor coil for ground

Inspection of stator

1. Conduction test

Stator is normal when there is conduction between individual stator coil terminals. When there is no conduction between individual terminals, cable is broken.

Replace with stator assembly.

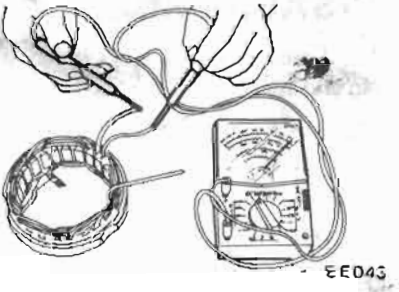

EE043

Fig. EE-43 Testing stator for conduction

2. Ground test

If each lead wire of armature coil (including neutral wire) is not conductive with stator core, condition is satisfactory. If there is conduction, stator coil is grounded.

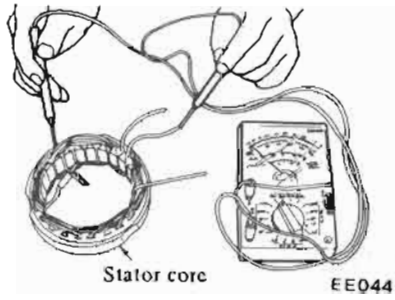


Fig. EE-44 Testing stator for ground

Diode installed on ⊕ plate is a positive diode which allows current flowing from terminal to ⊕ plate only. In other words, current does not flow from ⊕ plate to terminal.

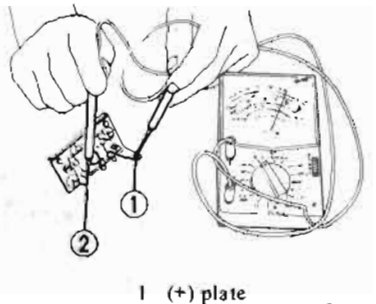


Fig. EE-46 Inspecting positive diode

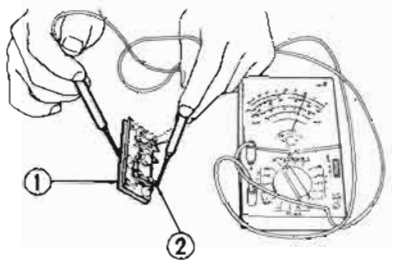


Fig. EE-47 Inspecting negative diode

Inspection of diode

Perform a conduction test on diodes in both directions, using an ohmmeter. A total of six diodes are used; three are mounted on the positive ⊕ plate, and other three are on the negative ⊖ plate. The conduction test should be performed on each diode, between the terminal and plate.

Diode installed on ⊖ plate is a negative diode which allows current flowing from ⊖ plate to terminal only. In other words, current does not flow from terminal to ⊖ plate.

If current flows in both positive and negative directions, diode is short-circuited. If current flows in one direction only, diode is in good condition. If there is a faulty diode, replace all diodes (six diodes) as an assembly. (See table below.) These diodes are unserviceable.

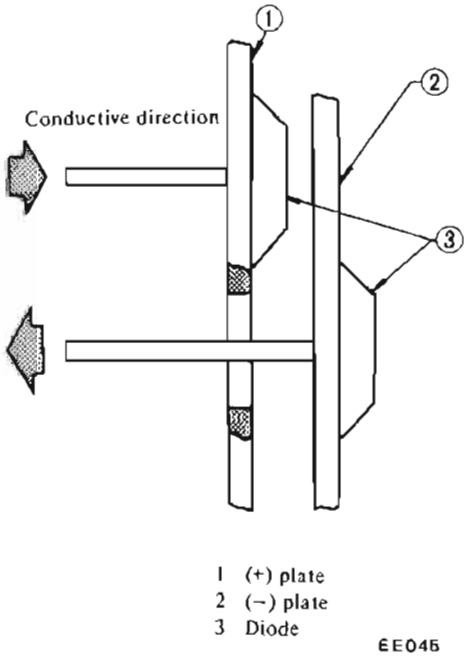


Fig. EE-45 Conductive direction of diode

Test probe of a circuit tester		Conduction
⊖	⊕	
terminal	⊕ plate	O
⊕ plate	terminal	–
terminal	⊖ plate	–
⊖ plate	terminal	O
⊖ plate	⊕ plate	O
⊕ plate	⊖ plate	–

Inspection of brush

Check movement of brush and if movement is notsmooth, check brush holder and clean if necessary.

Check brush for wear. If it is worn down to less than the specified limit, replace brush assembly.

Check brush pig tail and, if faulty, replace.

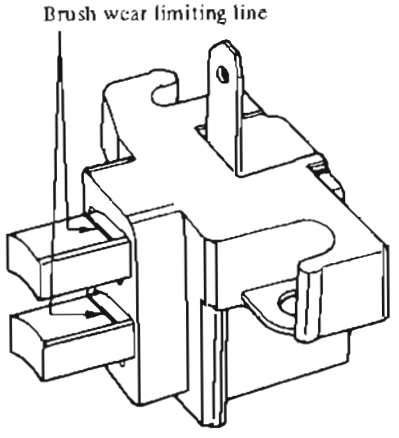


Fig. EE-48 Brush wear limit

Spring pressure test

With brush projected approximately 2 mm (0.079 in) from brush holder, measure brush spring pressure by the use of a spring balance. Normally, the rated pressure of a new brush spring is 255 to 345 g (9.0 to 12.2 oz).

Moreover, when brush is worn, pressure decreases approximately 20 g (0.7 oz) per 1 mm (0.039 in) wear.

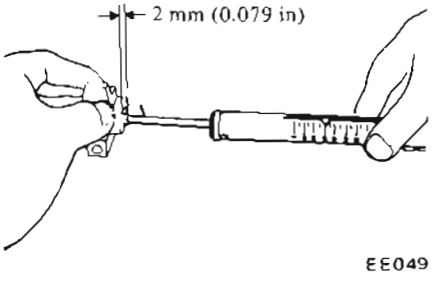
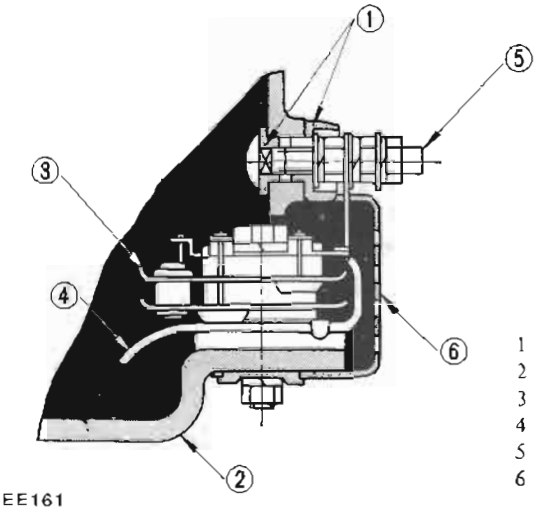


Fig. EE-49 Measuring spring pressure

REASSEMBLY

Reassemble alternator in the reverse sequence of disassembly noting the following:

1. When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.
2. When installing diode A terminal, install insulating bush and insulating tube correctly.



1 Insualting bush
2 Rear cover
3 Diode assembly
4 Stater coil lead wire
5 A terminal bolt
6 Diode cover

Fig. EE-50 Sectional view of diode and A terminal

3. Tighten pulley nut with tightening torque of 350 to 400 kg-cm (301 to 344 in-lb). When pulley is tightened, make sure that deflection of V-groove is less than 0.3 mm (0.0118 in).

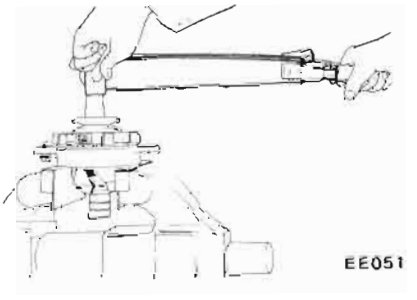


Fig. EE-51 Tightening pulley nut

ALTERNATOR TEST

Before conducting an alternator test, make sure that the battery is fully charged.

A 30-volt voltmeter and suitable test probes are necessary for the test. Set up a test circuit as shown in Figure EE-52 and test alternator in the manner indicated in the flow chart below:

1. Disconnect connectors at alternator.
2. Connect one test probe from voltmeter positive terminal to "N" terminal or "A" terminal. Connect the other test probe to ground. Make sure that voltmeter registers battery voltage.
3. Turn on headlights and switch to Main Beam.
4. Start engine.
5. Increase engine speed gradually until it is approx. 1,100 rpm., and take the voltmeter reading.

Measured value: Below 12.5 volts
Alternator is in trouble. remove and check it for condition.

Measured value: Over 12.5 volts
Alternator is in good condition.

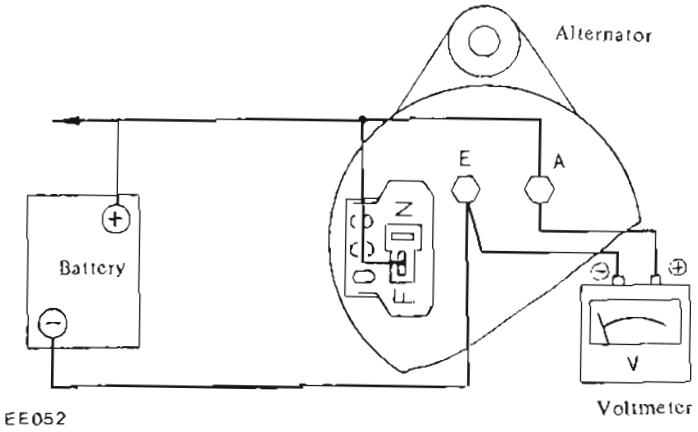


Fig. EE-52 Testing alternator

Notes:
a. Do not run engine at a speed of more than 1,100 rpm while test is being conducted on alternator.
b. Do not race engine.

SPECIFICATIONS AND SERVICE DATA

Specifications

Item \ Model	LT150-10	LT160-23
Applicable to	S30 model except for Canada	S30 model for Canada
Maker	HITACHI	←
Nominal rating	12V-50A	12V-60A
Ground polarity	Negative	←

Item		Model LT150-10	LT160-23
Revolution	rpm	1,000 to 13,500	1,050 to 13,500
Minimum revolution under no load	rpm	Less than 1,000	Less than 1,050
Output current	rpm	37.5A (14V, 2,500 rpm)	45A (14V, 2,500 rpm)
Pulley ratio		2.09	←

Service data

Item		Model LT150-10	LT160-23
Stator coil			
Resistance per a phase	Ω	0.17 [at 20°C (68°F)]	0.052 [at 20°C (68°F)]
Rotor coil			
Resistance	Ω	4.4 [at 20°C (68°F)]	3.97 [at 20°C (68°F)]
Brush			
Brush length	mm (in)	14.5 (0.571)	←
Wear limit	mm (in)	7 (0.276)	←
Spring pressure	kg (lb)	0.25 to 0.35 (0.55 to 0.77)	←
Slip ring			
Outer dia.	mm (in)	31 (1.220)	←
Reduction limit	mm (in)	1 (0.039)	←
Repair accuracy	mm (in)	0.05 (0.0197)	←

REGULATOR

CONTENTS

DESCRIPTION EE-21
MEASUREMENT OF REGULATOR VOLTAGE EE-22
ADJUSTMENT EE-24
Voltage regulator EE-24
Charging relay EE-24
SPECIFICATIONS AND SERVICE DATA EE-25
TROUBLE DIAGNOSES AND CORRECTIONS (Including alternator) EE-26

DESCRIPTION

The regulator consists basically of a voltage regulator and a charge relay. The voltage regulator has two sets of contact points, a lower set and upper set, to control alternator voltage. An armature plate placed between the two sets of contacts, moves upward or downward or vibrates. The lower contacts, when closed, complete the field circuit direct to ground; and the upper contacts, when closed, complete the field circuit to ground through a resistance (field coil), and produce alternator output.

The charge relay is similar in construction to the voltage regulator.

When the upper contacts are closed, ignition warning lamp goes on.

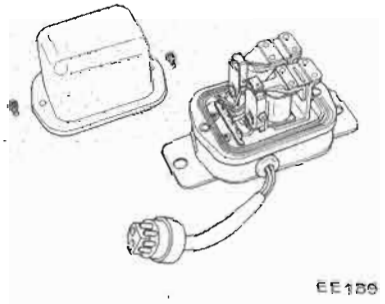
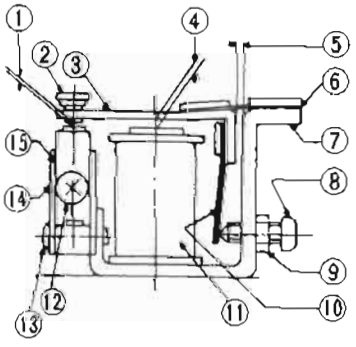


Fig. EE-53 View of removing cover

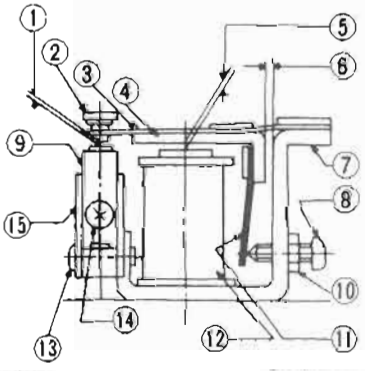
Regulator model	Car	Alternator
TLIZ-79	S30 model	LT150-10 or LT160-23

As regards construction, the voltage regulator is very similar to the charge relay as shown in Figure EE-54.



1 Point gap
2 Lower contact
3 Armature
4 Core gap
5 Yoke gap
6 Connecting spring
7 Yoke
8 Adjusting screw
9 Lock nut
10 Adjust spring
11 Coil
12 3 mm (0.118 in) dia. screw
13 4 mm (0.157 in) dia. screw
14 Contact set
15 Upper contact

(a) Construction of voltage regulator



1 Point gap
2 Charge relay contact
3 Connecting spring
4 Armature
5 Core gap
6 Yoke gap
7 Yoke
8 Adjusting screw
9 Voltage regulator contact
10 Lock nut
11 Adjust spring
12 Coil
13 3 mm (0.118 in) dia. screw
14 4 mm (0.157 in) dia. screw
15 Contact set

(b) Construction of charge relay

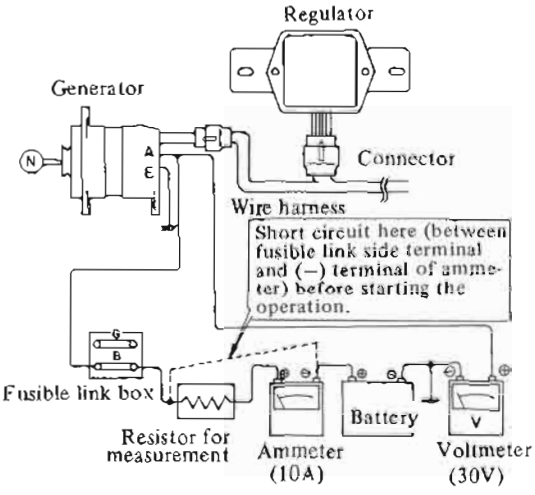
Fig. EE-54 Structural view

MEASUREMENT OF REGULATOR VOLTAGE

Regulator voltage is measured with regulator assembled with alternator. When measuring voltage with regulator mounted on vehicle, it is necessary to rotate engine at high speed.

Connect DC voltmeter (15-30V), DC ammeter (15-30A), battery and resistor (0.25 ohms) with cables as shown.

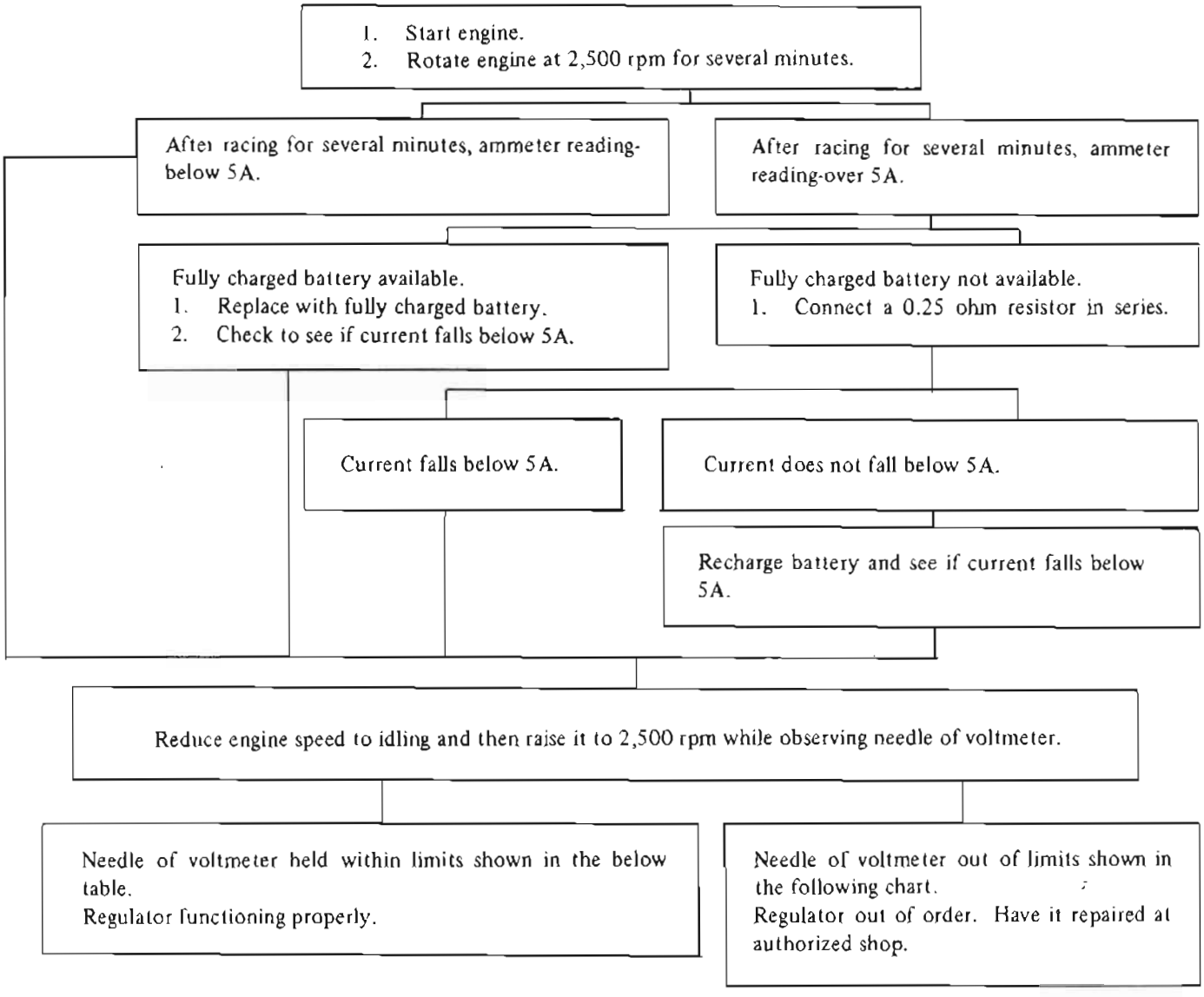
1. Check to be sure that all electrical loads such as lamps, air conditioner, radio etc. are disconnected.
2. Before starting engine, be sure to make short circuit with a cable between fusible link side terminal of resistor (0.25Ω) and negative side terminal of ammeter. Failure to follow this precaution will cause needle of ammeter to swing violently, resulting in a damaged ammeter.



EE055

Fig. EE-55 Measuring regulator voltage with regulator on car

3. Refer to the following chart to determine if regulator and relative parts are in good condition.



Regulator model TLIZ-79 (HITACHI)

Temperature °C (°F)	Voltage V
−10 (14)	14.75 to 15.25
0 (32)	14.60 to 15.10
10 (50)	14.45 to 14.95
20 (68)	14.30 to 14.80
30 (86)	14.15 to 14.65
40 (104)	14.00 to 14.50

Notes:

a. Do not measure voltage immediately after driving. Do this while regulator is cold.

b. To measure voltage, raise engine speed gradually from idling to rated speed.

c. Voltage may be approximately 0.3V higher than rated for two to three minutes after engine is started, or more specifically, when regulator becomes self-heated. Measurements should then be made within one minute after starting engine, or when regulator is cold.

d. The regulator is of a temperature-compensating type. Before measuring voltage, be sure to measure surrounding temperature and correct measurements according to the table at left.

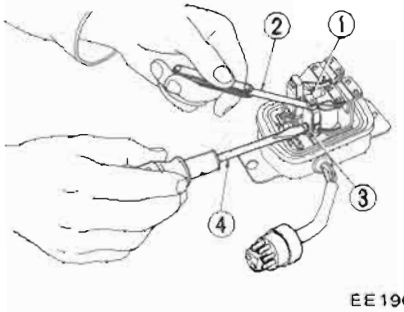
ADJUSTMENT

Voltage regulator

When regulating voltage, as measured above, deviates from rated value, adjust regulator in accordance with the following instructions.

1. Inspect contact surface, and if rough, lightly polish with fine emery paper (#500 or 600).
2. Measure each gap, and adjust if necessary. Adjust core gap and point gap in that order. No adjustment is required for yoke gap.
3. Adjusting core gap

Loosen screw [4 mm (0.157 in) diameter] which is used to secure contact set on yoke, and move contact upward or downward properly. (See Figure EE-56.)



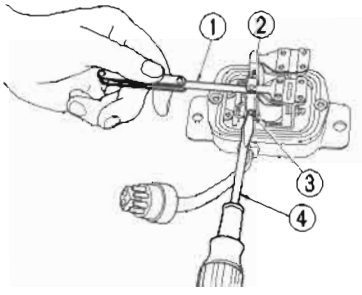
EE190

1 Contact set
2 Thickness gauge
3 4 mm (0.157 in) dia. screw
4 Crosshead screwdriver

Fig. EE-56 Adjusting core gap

4. Adjusting point gap

Loosen screw [3 mm (0.118 in) diameter] used to secure upper contact, and move upper contact upward or downward as necessary. (See Figure EE-57.)



EE191

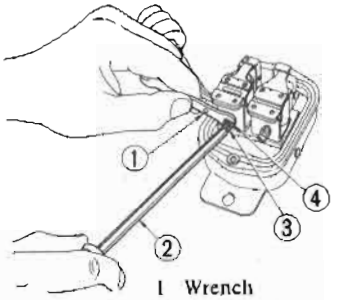
1 Thickness gauge
2 Upper contact
3 3 mm (0.118 in) dia. screw
4 Crosshead screwdriver

Fig. EE-57 Adjusting point gap

5. Adjusting voltage

Adjust regulating voltage as follows:

Loosen lock nut securing adjusting screw. Turn this screw clockwise to increase, or counterclockwise to decrease, regulating voltage. (See Figure EE-58.)



EE192

1 Wrench
2 Crosshead screwdriver
3 Adjusting screw
4 Lock nut

Fig. EE-58 Adjusting regulating voltage

Charging relay

Normal relay operating voltage is 8 to 10V as measured at alternator "A" terminal. Relay itself, however, operates at 4 to 5 V.

Use a DC voltmeter, and set up a circuit as shown in Figure EE-59.

1. Connect positive terminal of voltmeter to regulator lead connector "N" terminal with negative terminal grounded.
2. Start engine and keep it idle.
3. Take voltmeter reading.

0 Volt

1. Check for continuity between "N" terminals of regulator and alternator.
2. Alternator circuit faulty if continuity exists.

Below 5.2 Volts

(Pilot lamp remains lit)
1. Check fan belt tension.
2. If correct, remove regulator and adjust as necessary.

Over 5.2 Volts

(Pilot lamp remains lit)
Pilot lamp relay coil or contact points out of order.
Replace regulator.

Over 5.2 Volts

(Pilot lamp does not light)
Pilot lamp relay assembly is in good condition.

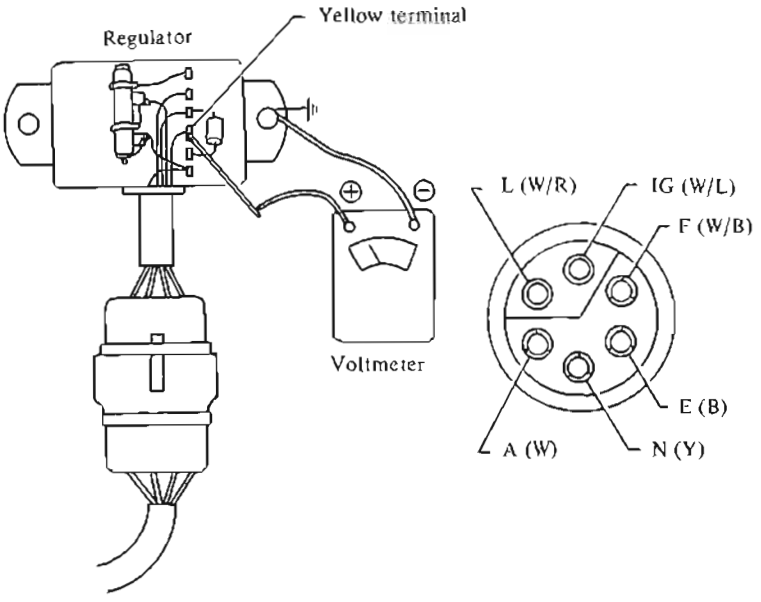


Fig. EE-59 Testing charging relay

SPECIFICATIONS AND SERVICE DATA

Voltage regulator		
Model		TLIZ-79
Regulating voltage (with fully charged battery)	V	*14.3 to 15.3 [at 20°C (68°F)]
Voltage coil resistance	Ω	10.5 [at 20°C (68°F)]
Rotor coil inserting resistance	Ω	10
Voltage coil series resistance	Ω	31
Smoothing resistance	Ω	40
Core gap	mm (in)	0.6 to 1.0 (0.024 to 0.039)
Point gap	mm (in)	0.3 to 0.4 (0.012 to 0.016)
Charge relay		
Release voltage	V	4.2 to 5.2 at "N" terminal
Voltage coil resistance	Ω	37.8 [at 20°C (68°F)]
Core gap	mm (in)	0.8 to 1.0 (0.031 to 0.039)
Point gap	mm (in)	0.4 to 0.6 (0.016 to 0.024)

*Standard temperature gradient: −0.015V/°C

TROUBLE DIAGNOSES AND CORRECTIONS (Including alternator)

Condition	Probable cause	Corrective action
No output	Sticking brushes.	Correct or replace brushes and brush springs.
	Dirty brushes and slip rings.	Clean.
	Loose connections or broken leads.	Retighten or solder connections. Replace leads if necessary.
	Open stator winding.	Repair or replace stator.
	Open rotor winding.	Replace rotor.
	Open diodes.	Replace.
	Shorted rotor.	Replace.
	Shorted stator.	Repair or replace.
	Grounded "A" terminal.	Replace insulator.
	Broken fan belt.	Replace.
Excessive output	Broken neutral wire (color of wire is white.)	Replace wire.
	Faulty voltage regulator.	Check regulator operation and repair or replace as required.
	Poor grounding of alternator and voltage regulator "E" terminal.	Retighten terminal connection.
	Broken ground wire (color of wire is black.).	Replace.
Low output	Loose or worn fan belt.	Retighten or replace.
	Sticking brushes.	Correct or replace brushes and springs if necessary.
	Low brush spring tension.	Replace brush springs.
	Faulty voltage regulator.	Check regulator operation and repair or replace as required.
	Dirty slip rings.	Clean.
	Partial short, ground, or open in stator winding.	Replace stator.
	Partially shorted or grounded rotor winding.	Replace rotor.
	Open or faulty diode.	Replace.
Noisy alternator	Loose mounting.	Retighten bolts.
	Loose drive pulley.	Retighten.
	Faulty ball bearing.	Replace.
	Improperly seated brushes.	Seat correctly.

IGNITION CIRCUIT

The ignition circuit consists of ignition switch, transistor ignition unit, distributor, wiring, spark plugs and battery. (on the models equipped with the automatic transmission, advanced control relay and temperature switch)

The distributor is of the no-contact type and is equipped with a pick up coil which electrically detects the ignition point signal in place of the circuit breaker of the present distributor. The transistor ignition unit is a new addition, which generates the signal required for the make and break of the primary electric current for the ignition coil. Although the former ignition coil through the primary resistor to battery. This makes battery voltage available at coil efficiently and keeps ignition voltage as high as possible.

The circuit is equipped with a resistor. During cranking, electrical current bypasses the secondary resistor, thereby connecting the ignition coil through the primary resistor. This makes battery voltage available at efficiently and keeps ignition voltage as high as possible.

The primary resistor serves to protect transistor ignition circuit.

The low voltage current is supplied by the battery or alternator and flows through the primary circuit.

It consists of the ignition switch, resistor, primary winding of the ignition coil, transistor ignition unit and all connecting low tension wiring.

The high voltage current is produced by the ignition coil and flows through the secondary circuit, resulting in high voltage spark between the electrodes of the spark plugs in engine cylinders.

This circuit contains the secondary winding of the ignition coil, distributor high tension cables to coil and spark plugs, distributor rotor and cap.

When the ignition switch is turned on and the distributor reluctor rotates, the primary current flows through the primary winding of the coil and through transistors ignition unit to ground. This flow produces a magnetic field around the coil winding, and then electrical energy in the coil.

When the primary circuit is opened by circuit of transistor ignition unit, the magnetic field built up in the primary winding of the coil moves through the secondary winding of the coil, inducing high voltage. This high voltage is produced every time the primary circuit opens.

The high voltage current flows through the high tension cable to the distributor cap, then the rotor distributes the current to one of the spark plug terminals in the distributor cap.

Then the spark occurs while the high voltage current jumps the gap between the insulated electrode and the ground side electrode of the spark plug. This process is repeated for each power stroke of the engine.

The spark plugs require periodic service. Spark plugs should be removed, inspected and maintained to obtain good firing.

The remainder of the ignition component parts should be inspected for only their operation, air gap of distributor, tightness of electrical terminals, and wiring condition.

Periodically inspection and apply grease (NLGI consistency No. 1 containing MoS_2 or equivalent) to distributor rotor shaft, if necessary.

On the automatic transmission equipped model, the advance control relay and temperature switch are provided. The temperature switch is a bimetal type. When the engine coolant is at low temperatures, the contact points are open and current will not flow through the relay, so that the transistor ignition unit transmits advanced ignition signals.

When the coolant reaches a fixed temperature and the bimetal temperature switch contacts are so closed as to let an electric current flow the relay, another voltage is applied to the ignition unit, which transmits retarded signals. In this way, advanced signal is changed over by the temperature of engine coolant.

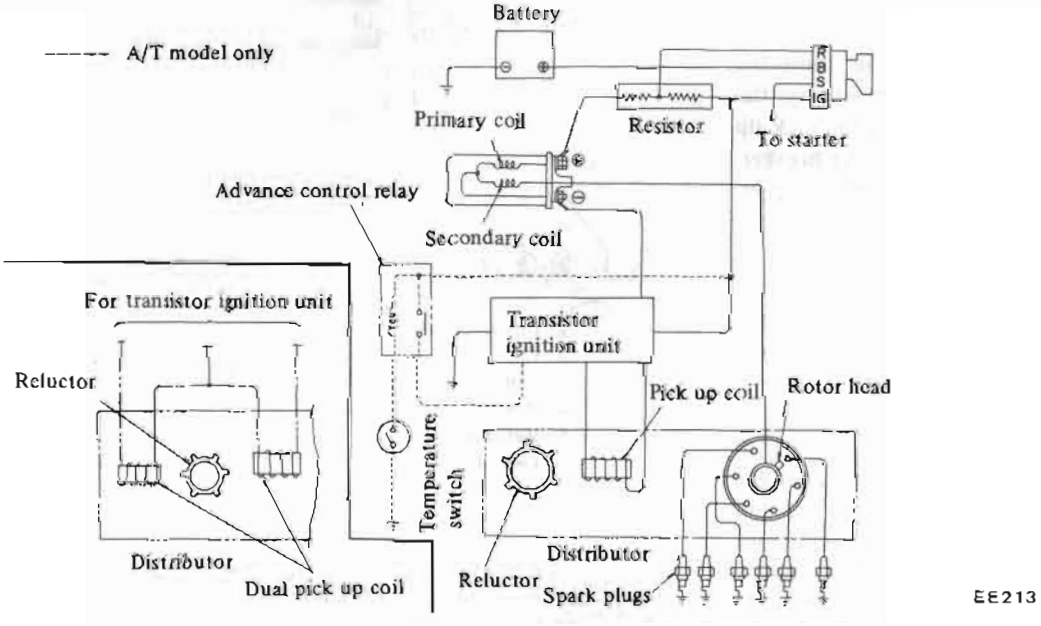


Fig. EE-60 Ignition system circuit diagram

DISTRIBUTOR

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Inspection and adjustment of phase difference ... EE-30
Advanced mechanism EE-30
DISASSEMBLY AND ASSEMBLY EE-31
Disassembly EE-31
Assembly EE-31
SPECIFICATIONS AND SERVICE DATA EE-33

CONSTRUCTION

Distributor	Applied model
D6F3-01	Manual transmission
D6F3-02	Automatic transmission

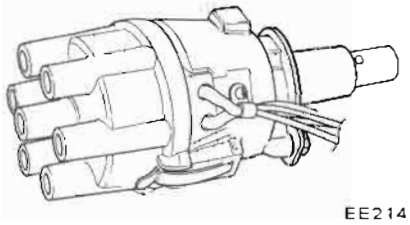


Fig EE-61 External view of distributor (D6F3-02)

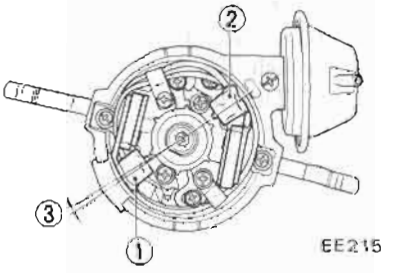
In the former distributor the ignition point is detected by the cam and breaker arm, while in this transistor ignition unit it is detected by the reluctor on the shaft and the pick up coil provided in place of the breaker. The pick up coil consists of a magnet, coil and etc. The amount of magnetic flux passing through the pole piece in the coil is changed at the moment the pole piece faces the protrusion of the reluctor, and then the electrical signal is generated in the pick up coil.

This electric signal is conducted into the transistor ignition unit, which in turn breaks the primary coil current running through the ignition coil and generates high voltage in the secondary winding. Also, this transistor ignition unit utilizes this electric signal to restore the primary coil to the original state after cutting off the primary current for a fixed time.

The D6F3-01 type has a single pick up coil. The D6F3-02 has dual pick up coil that always generates both advanced and retarded signals and sends to the control unit. The advance circuit of control is on, while the retard circuit is closed when the relay is off. Refer to Figure EE-60.

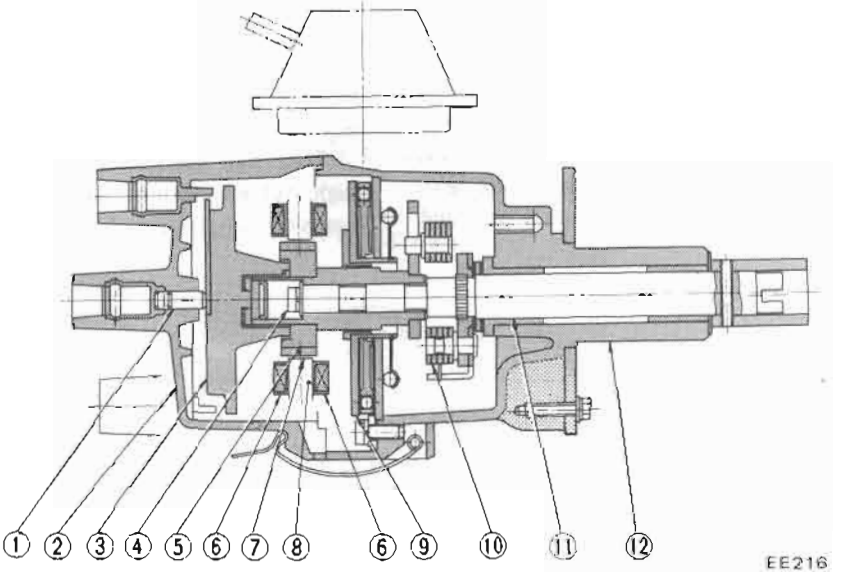
A phase difference of 7° crank angle is adopted. Two pick up coils, which consist of advanced and retarded coil, are placed in parallel with each other in the primary ignition circuit.

The difference in phase can be adjusted by turning the adjusting screw.



1 Advanced pick up coil
2 Retarded pick up coil
3 Phase difference

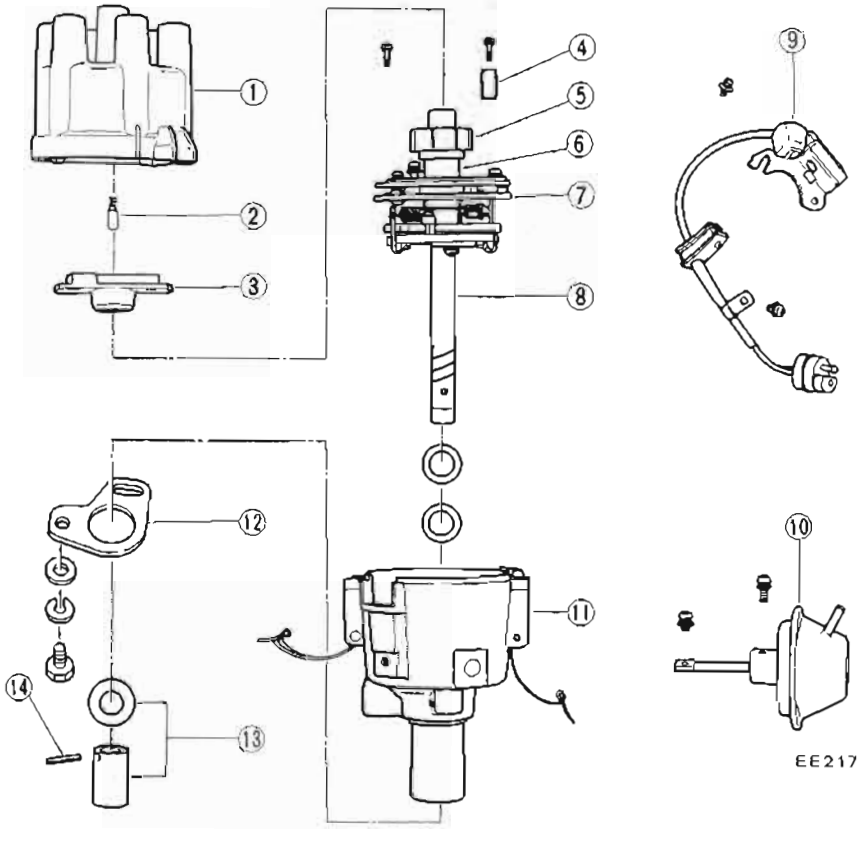
Fig. EE-62 External view of dual pick up coils



1 Center carbon
2 Cap
3 Rotor head
4 Rotor shaft setting screw
5 Reluctor
6 Pick up coil
7 Air gap
8 Pole piece
9 Breaker plate
10 Governor weight
11 Shaft
12 Housing

Fig. EE-63 Construction

The centrifugal and vacuum advance angle mechanisms employ the former mechanical type as it is. See Figure EE-63.



1 Distributor cap assembly
2 Center carbon
3 Rotor head assembly
4 Cap setter
5 Reluctor
6 Rotor shaft assembly
7 Breaker plate assembly
8 Shaft assembly
9 Pick up set
10 Vacuum control assembly
11 Housing
12 Fixing plate
13 Collar set
14 Roll pin

Fig EE-64 Components of distributor

CHECKING AND ADJUSTMENT

Cap and rotor head

Cap and rotor head must be inspected at regular intervals. In addition, remove cap and clean all dust and carbon deposits from cap and rotor from time to time. If cap is cracked or is leaking, replace with a new one.

Air gap

Standard air gap is 0.3 to 0.4 mm (0.0118 to 0.0157 in) (both single gap and dual gap distributors).

If the gap is off the standard, adjustment should be made by loosening pick up coil screws.

Gap gauge is required for adjustment. Air gaps must be checked from time to time.

Air gap: 0.3 to 0.4 mm (0.0118 to 0.0157 in)

At this time, remove rubber cap from tip end of rotor shaft.

Check grease and, if necessary, add.

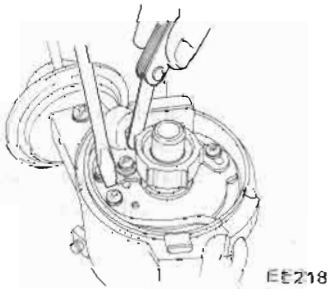
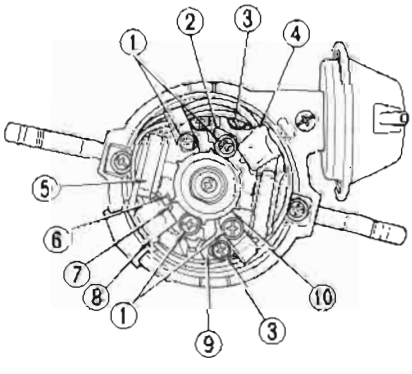
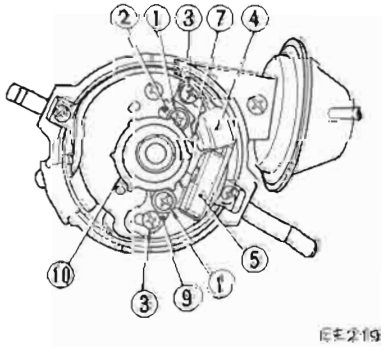


Fig. EE-65 Measuring air gap



1 Adjuster plate set screws (air gap)
2 Adjuster plate (air gap)
3 Adjuster plate set screws (phase difference)
4 Pick-up coil (retarded side)
5 Permanent magnet



6 Air gap
7 Pole piece
8 Pick-up coil (advanced side)
9 Adjuster plate (phase difference)
10 Reluctor

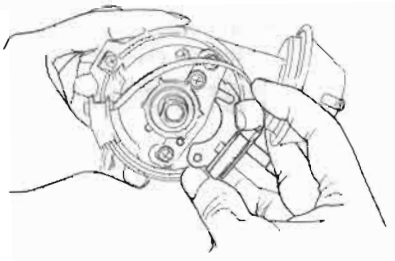
Fig. EE-66 Breaker

To replace, proceed as follows;

Reluctor cannot be removed.

To remove pick-up coil, remove two pick-up coil assembly securing screw and core screws clamping primary lead wire.

Install new pick up coil assembly in reverse sequence of removal.



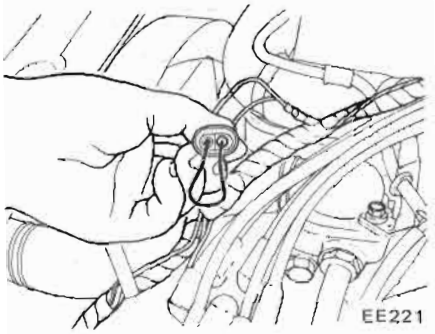
EE220

Fig. EE-67 Disassembling pick up coil

Inspection and adjustment of phase difference

To check phase difference, install distributor on engine and proceed as follows:

1. Disconnect the connector of engine harness from water temperature switch (advanced side).
2. With engine idling, adjust ignition timing by rotating distributor to specifications
3. Connect harness terminal for temperature switch circuit with a suitable lead wire (retarded side). See Figure EE-68.



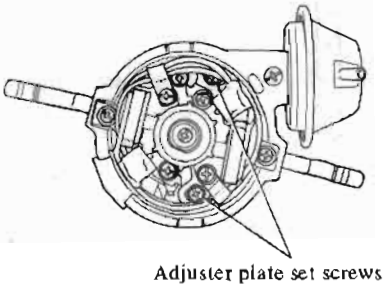
EE221

Fig. EE-68 Short-circuit of advance control relay

4. With engine still idling, check to determine that phase delay is 7 degrees in terms of crank shaft angular displacement.

To correct proceed as follows:

(1) Referring to figure EE-69, turn out adjuster plate screws ½ to 2 turns. The screws are located at pick up coil assembly on retarded side.



EE222

Fig. EE-69 Adjuster plate set screws

(2) Turn adjuster plate until correct phase difference is obtained.

Ignition timing is retarded when plate is turned counterclockwise.

Note:

Refer to graduations on breaker plate to make adjustment easier. One graduation corresponds to crankshaft angular displacement of 4 degrees.

Advance mechanisms

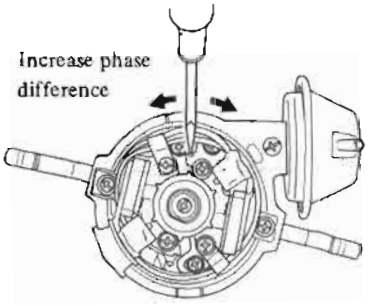
≪Specifications≫

	L26 engine	
Vacuum advance Distributor degrees/ Distributor vacuum mmHg (in Hg)	0°/300 (11.8)	6°/475 (18.7)
Centrifugal advance Distributor degrees/ Distributor revolution rpm	0°/500	13°/1,600

≪Vacuum advance mechanism mechanical parts≫

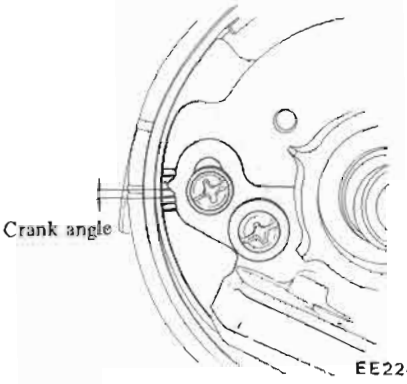
If vacuum advance mechanism falls to operate properly, check for the following items and correct the trouble as required.

1 Check vacuum inlet for signs of leakage at its connection. If necessary,



EE223

Fig. EE-70 Adjusting phase difference



EE224

Fig. EE-71 Phase difference adjusting scale

(3) Make sure that the ignition timing of advance side meets specifications.

(4) After adjustment, connect temperature switch harness.

Adjustment procedures described above apply to dual pick up coil for advance angle. To adjust single pick up coil advance angle, loosen two screws securing distributor to fixing plate, then adjust as necessary.

retighten or replace with a new one.
2. Check vacuum diaphragm for air leak.

If leak is found, replace vacuum controller assembly.

3. Inspect breaker plate for smooth moving.

If plate does not move smoothly, this condition could be due to sticky steel balls or pivot. Apply grease to steel balls or, if necessary, replace distributor assembly.

≪Centrifugal advance mechanical parts≫

When cause of engine malfunction is traced to centrifugal advance mechanical parts, use distributor tester to check its characteristics. See to the specifications above.

If nothing is wrong with its characteristics, conceivable causes are faulty or abnormal wear of driving part or others. So do not disassembly it.

In the event of improper characteristics, check closely rotor shaft assembly, governor weight and shaft.

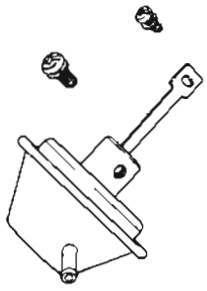
If any of above parts are malfunctioning, replace distributor assembly.

DISASSEMBLY AND ASSEMBLY

Disassembly

To disassemble, follow the below procedure.

1. Take off cap and disconnect rotor head.
2. Remove two screws shown in Figure EE-73, and detach vacuum controller.



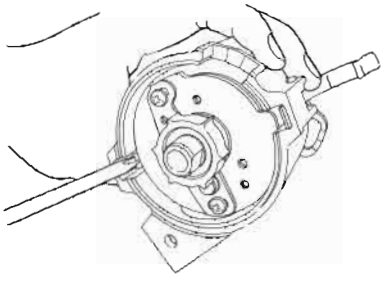
EE226

Fig. EE-73 Disassembly vacuum controller

3. Remove pick-up assembly.

Refer to Fig. EE-74, when contact set is removed.

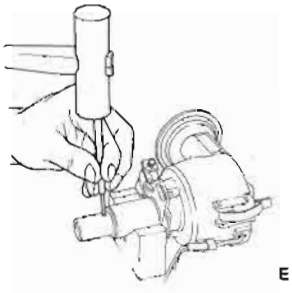
4. Remove breaker plate setting screws.



EE227

Fig. EE-74 Unscrewing breaker setting screws

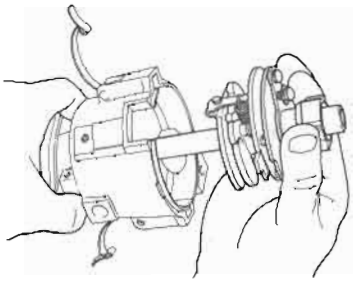
5. Pull knock pin out and disconnect collar to remove the all rotating parts.



EE228

Fig. EE-75 Removing knock pin

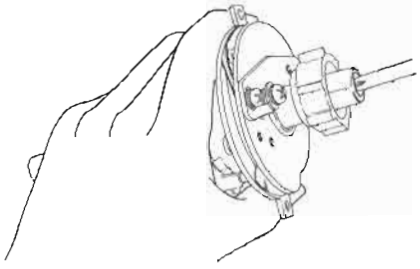
6. Remove shaft assembly along with breaker plate assembly from housing.



EE229

Fig. EE-76 Removing rotation parts

7. Remove rotor shaft setting screw.



EE230

Fig. EE-77 Removing rotor shaft assembly

8. Remove rotor shaft assembly along with breaker plate assembly from drive shaft.

9. When governor weight and spring are disconnected, be careful not to stretch or deform governor spring.

After disassembling, apply grease to governor weights.

Assembly

Assembly can be made in reverse sequence of disassembly. Refer to Figure EE-78 for replacement and reassembly of governor spring and rotor shaft.

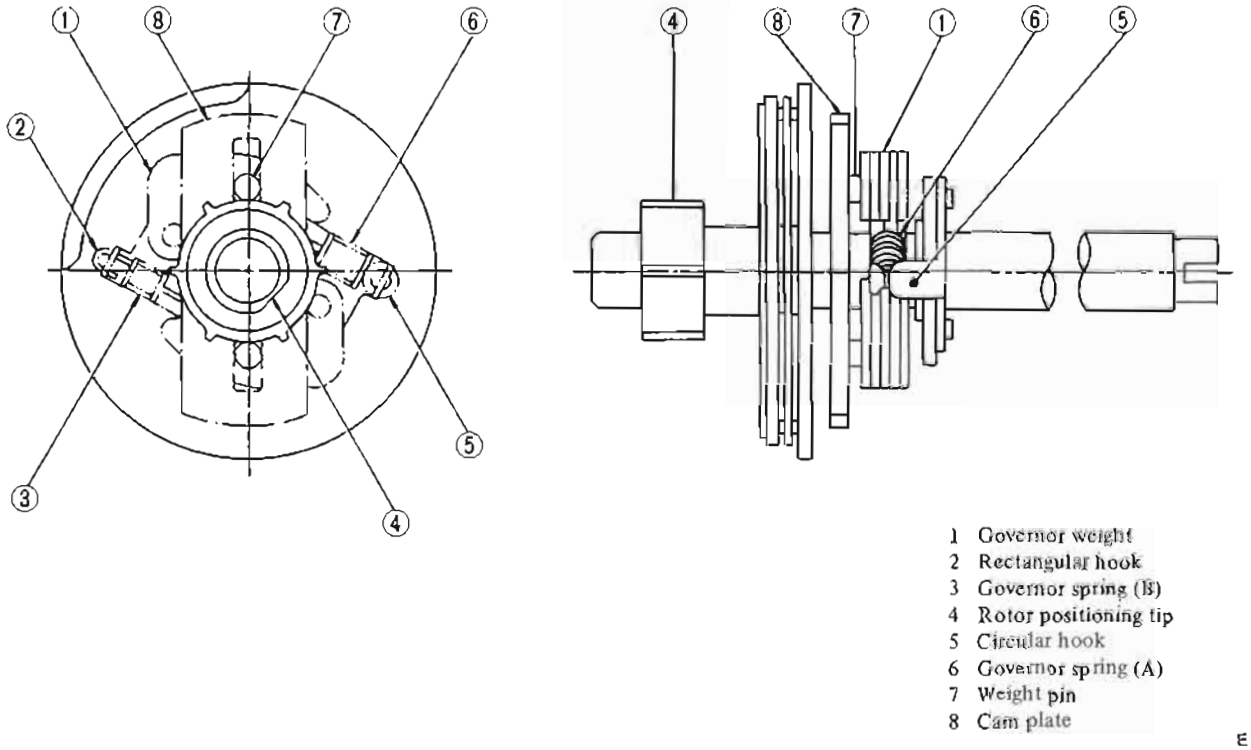


Fig. EE-78 Setting governor spring and cam

In assembling distributor, use caution so that rotor head positioning tip at rotor shaft is set on governor spring circular hook side.

The weight pin for governor spring A with circular hook goes in long rectangular hole.

Also check to be sure that weight pin on spring A is in slit in timing plate with a clearance between the two at beginning and end of governor operation.

Meanwhile, weight pin on opposite side goes in short rectangular hole.

It does not leave clearance either at the start of advancing.

With unit assembled, check to be sure that driven slit and rotor position tip (4) are set in the same direction. See Figure EE-78.

After assembly check operation of governor before installing it on engine.

Ignition timing should be tested with unit mounted on engine.

SPECIFICATIONS AND SERVICE DATA

Distributor type	D6F3-01	D6F3-02
Make	HITACHI	←
Applied engine (vehicle)	L26 with Manual Transmission	L26 with Automatic Transmission
Firing order	1-5-3-6-2-4	←
Rotating direction	Counterclockwise	←
Ignition timing (degree)	7° (B.T.D.C.)/750 rpm	8° (B.T.D.C.)/600 rpm (Retard) in "D" range 15° (B.T.D.C.)/600 rpm (Advance) in "D" range
Idling rpm	750 rpm	600 rpm
Phase difference (degree)	———	7° at crank angle

≪ All distributors ≫

Air gap	mm (in)	0.30 to 0.40 (0.0118 to 0.0157) (Advanced and Retarded side equally)
Shaft diameter (lower part)	mm (in)	12.430 to 12.440 (0.4894 to 0.4898)
Housing inner diameter	mm (in)	12.450 to 12.468 (0.4902 to 0.4909)
Clearance between shaft and housing	mm (in)	0.010 to 0.038 (0.0004 to 0.0015)
Repair limit of clearance	mm (in)	0.08 (0.0031)
Shaft diameter (upper part)	mm (in)	7.986 to 7.995 (0.3144 to 0.3148)
Rotor shaft inner diameter	mm (in)	8.000 to 8.015 (0.3150 to 0.3156)
Clearance between shaft and rotor shaft	mm (in)	0.005 to 0.029 (0.0002 to 0.0011)
Weight pivot diameter	mm (in)	4.972 to 4.990 (0.1959 to 0.1965)
Weight hole diameter	mm (in)	5.000 to 5.018 (0.1969 to 0.1976)
Clearance between pivot and hole	mm (in)	0.010 to 0.046 (0.0004 to 0.0018)

TRANSISTOR IGNITION UNIT

CONTENTS

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Continuity check of ignition coil primary windings EE-36
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Checking transistor ignition unit EE-36

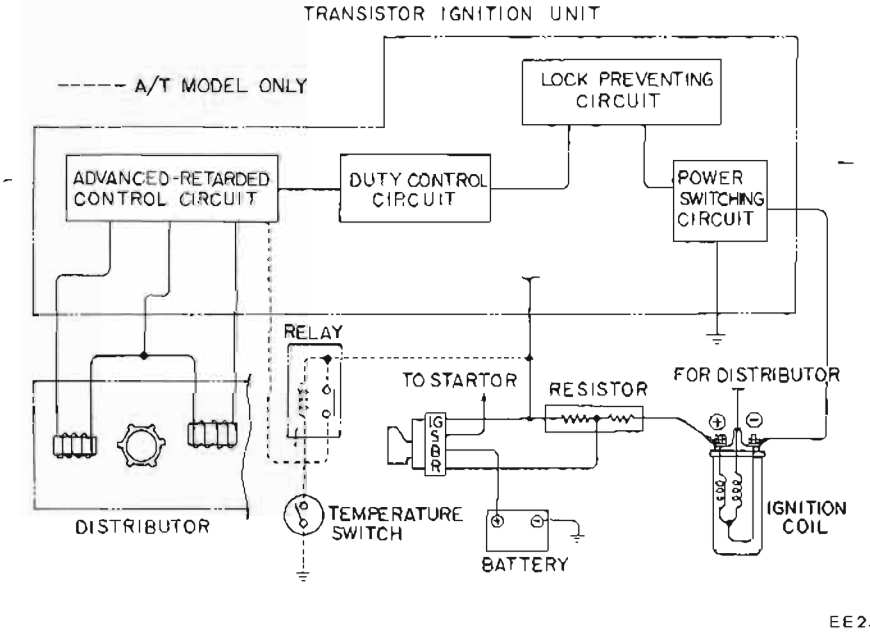


Fig. EE 79 Transistor ignition unit circuits diagram of full transistor ignitor

DESCRIPTION

Transistor ignition unit

The transistor ignition unit provides the following functions:

1. It makes and breaks the electric current in the primary circuit of the ignition coil.
2. The duty control circuit sets the rate of make and break within one cycle, i.e., this maintains good ignition characteristics of engine from low speed to high speed and is equal to the dwell angle in the conventional breaker type distributor.
3. A preventive circuit against locking is provided. This cuts off the primary electric current in the ignition coil after a fixed (within 10 seconds) even when the ignition switch is turned on with the engine not running.
4. On the models equipped with the automatic transmission, a dual pick up coil distributor is used. Two signals with phase difference are generated and transmitted to the transistor ignition unit from the distributor. The transistor ignition unit receives two signals, advanced or retarded, and has the circuit to select either of them with the advance control relay. The transistor ignition unit to be used together with the single pick up coil distributor is basically the same as the transistor ignition unit used with the dual pick up coil distributor, except the advance circuit.

Each component part of this unit is highly reliable, however, should any part be found faulty, the entire assembly must be replaced.

Advance control relay

When the engine coolant is at low temperatures, electric current does not flow in the advance control relay and its contacts are open.

Thus the advance circuit of the transistor ignition unit operates. When the engine coolant rises in temperature, current flows through the relay and its contact points close.

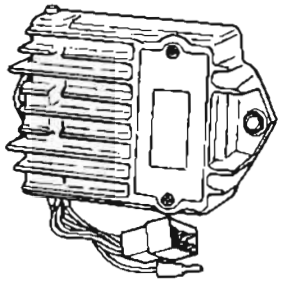
Thus the retarded circuit of the transistor ignition unit operates.

REMOVAL AND INSTALLATION

Transistor ignition unit is located on dashboard in car room.

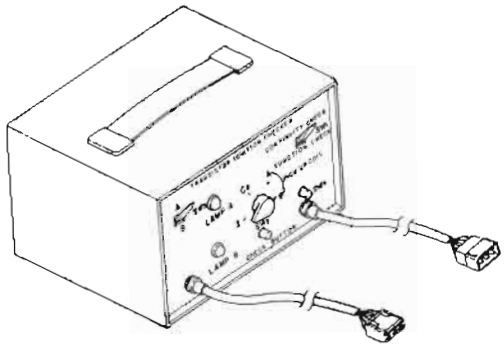
To remove it, detach two setting screws and disconnect connector.

To install, reverse the order of removal.



EE233

Fig. EE-80 External view of control unit



EE210

Fig. EE-81 Transistor ignition unit checker

INSPECTION

If the engine does not run due to faulty ignition system, check the ignition system as follows:

Check for a cracked distributor rotor or cap and corroded terminals. Visually inspect high tension cord for condition and, if necessary, use an ignition oscilloscope or ohmmeter to make performance checks. Check spark plugs and adjust gaps as necessary.

Replace a spark plug which is not suitable for further use. If the above checks cannot correct the problem, check the entire ignition system with the checker. This section describes the quick check of the transistor ignition system with the use of a transistor ignition unit checker.

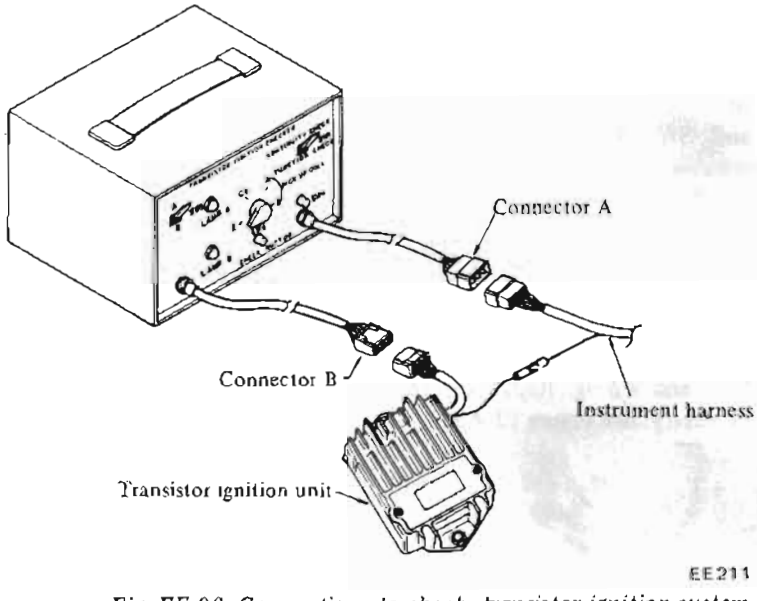
This checker provides full information regarding the condition of the transistor ignition system installed on a car. All functional tests are simply made with selector switches, a check button and indicator lamps. It is a compactly built portable checker and operates on the power from the battery mounted on a car.

Test procedures

Disconnect connector which connects transistor ignition unit to instrument harness. Then engage the checker's connector "A" with instrument harness, and the checker's connector "B" with transistor ignition unit. See Figure EE-82.

Set selector switches SW_1, SW_2 and SW_3 in the "Continuity check", "Z" and "A" positions. And then, turn ignition switch ON. Make sure that lamp "B" is off, if necessary, push SW_4 off.

Note: Do not run the engine while test is being performed.



EE211

Fig. EE-82 Connections to check transistor ignition system

Power supply voltage and power supply circuit continuity checks

1. The wiring in power supply circuit is in good order, if the lamp "A" is on. Failure of lamp "A" to light properly in the above test requires inspection of the battery and wiring in the power supply.

Locate the malfunction and correct. Although lamp "B" remains off throughout the above continuity checks, it is not an indication of any condition.

2. Next, press check button. If lamp "A" goes out, power supply voltage is normal. See Figure EE-84. If lamp "A" fails to go out, check battery.

Continuity check of ignition-coil primary windings

With ignition switch ON, SW_1 in the "Continuity check", SW_3 in "A" and SW_4 in "OFF" positions, move selector switch SW_2 to the "CO" position. The lamp "A" should remain lighted. Then press check button. If lamp "A" goes out, wiring in the ignition coil primary circuit is in good order. If it does not, inspect wiring in the above circuit, locate problem and correct. See Figure EE-85.

Continuity check of pick up coil "A" (retarded side)

With ignition switch ON, SW_1 in the "Continuity check", SW_3 in "A" and SW_4 in "OFF" positions, set selector switch SW_2 in the "Pick up coil A" position. The lamp "A" should stay on. Then depress check button. If lamp "A" goes out, pick up coil "A" and wiring in that circuit are normal. Failure of the lamp "A" to go out requires inspection of the pick up coil "A" and wiring. Repair or replace if necessary. See Figure EE-86.

Continuity check of pick up coil "B" (advanced side)

This inspection procedure is intended only for testing distributor on automatic transmission models.

With ignition switch ON, SW_1 in the "Continuity check", SW_3 in "A" and SW_4 in "OFF" positions, set selector switch SW_2 in the "Pick up coil B" position. The lamp "A" goes out when check button is depressed, the pick up coil "B" and wiring in its circuit are normal. But if it fails to go out, replace pick up coil on the advanced side or inspect related interconnecting wiring. Locate problem and correct. See Figure EE-87.

Checking transistor ignition unit

Manual transmission models

1. With ignition switch ON, selector switch SW_1 in "Continuity check", SW_2 in "Z" and SW_3 in "A" positions, push selector switch SW_4 on.

The lamp "B" should light. Then, turn selector switch SW_1 to "Function check" position. And then depress check button. If lamp "B" goes out, it indicates that switching circuit of ignition coil primary in transistor ignition unit is in good order. Failure of lamp "B" to go out shows that transistor ignition unit is in malfunction.

Replace transistor ignition unit. Although lamp "A" will go out when check button is depressed, it is not an indication of any condition. See Figure EE-88.

2. Depress SW_4 again. If lamp "B" lights up within 10 seconds after switch SW_4 has been depressed, lock protection circuit in transistor ignition unit is in good order.

Automatic transmission models

The transistor ignition unit, which is adopted on the automatic transmission model, contains both advancing and retarding circuits which should be checked for condition. This checker will not do for determining phase difference of transistor ignition unit on the automatic transmission model. As for information, see the section, "Inspection and Adjustment of Phase Differences" in "Distributor".

1. Retarded circuit check

With the ignition switch ON, set the selector switches, SW_1, SW_2 and SW_3 in the "Continuity check", "Z" and "A" positions, respectively.

Depress the switch SW_4, and lamp "B" will go on. Next, move the selector switch SW_1 to "Function check" position. And then depress the check button. If lamp "B" goes out, the switching circuit of the primary ignition windings in the transistor ignition unit is normal.

Failure of lamp "B" to go out requires replacement of the transistor ignition unit. Although lamp "A" goes out when check button is depressed, it is not an indication of any condition. See Figure EE-89.

Depress the switch SW_4 again. If lamp "B" lights up within 10 seconds after switch SW_4 has been depressed, the locking protection circuit in the transistor ignition unit is functioning properly.

2. Advanced circuit check

Disconnect water temperature switch connector at engine harness connector.

With the ignition switch ON, set the selector switches, SW_2, SW_3 and SW_1 in the "Z", "B" and "Continuity check" positions, respectively. Then push the switch SW_4, and lamp "B" will go on. Next, move switch SW_1 to "Function check" position. And then depress the check button.

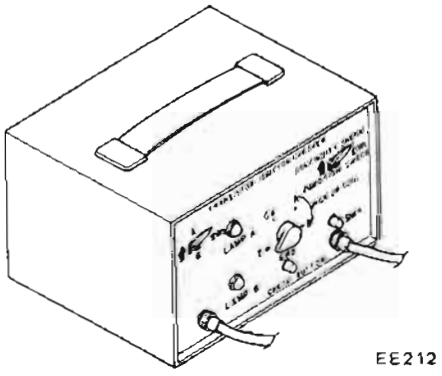
If lamp "B" goes out, the advanced circuit is normal. See Figure EE-90.

DIAGNOSES AND TESTING CHART

Test equipment required: Transistor Ignition Unit Checker.

Power supply wiring check

Ignition switch	ON (with engine not running)
SW_1	Continuity check side
SW_2	"Z" position
SW_3	"A" position
SW_4	OFF (Lamp B is off.)



EE212

Fig. EE-83 Checking wiring in power supply

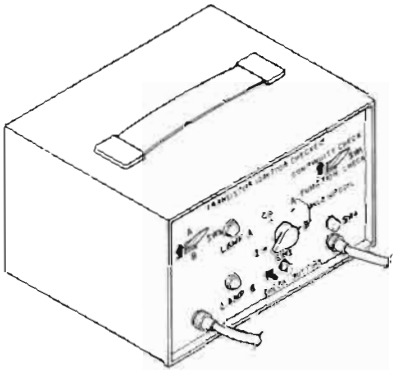
Lamp A	ON	OK
	OFF	Check battery, ignition switch and power line harness. If necessary, recharge battery, replace ignition switch, repair or replace harness.

Battery check

Ignition switch	ON
SW_1	Continuity check side
SW_2	"Z" position
SW_3	"A" position
SW_4	OFF (Lamp B is off.)
Check button	ON (PUSH)

Lamp A	OFF	OK
	ON	Check battery. Recharge or replace

Note: Lamp A is off while check button is pushed and is on when released, if battery is good.

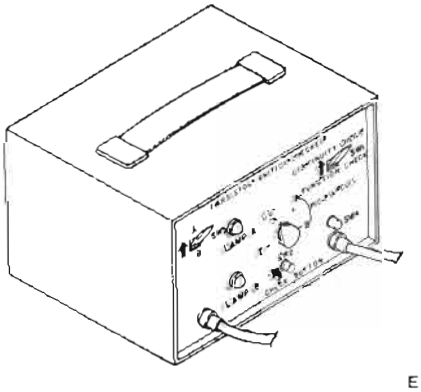


EE225

Fig. EE-84 Battery checking

Continuity check of ignition coil primary windings

Ignition switch	ON
SW_1	Continuity check side
SW_2	"Co" position
SW_3	"A" position
SW_4	OFF (Lamp B is off.)
Check button	ON (PUSH)



EE236

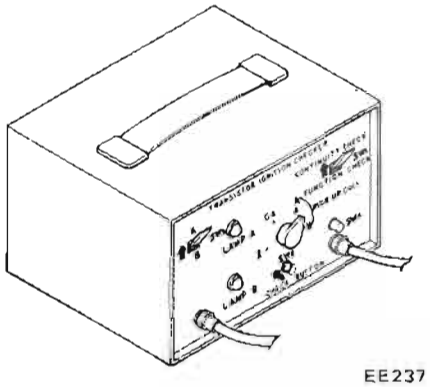
Fig. EE-85 Checking wiring in ignition coil primary circuit

Lamp A	OFF	OK
	ON	Make a continuity check in resistor and ignition coil primary windings. If necessary, replace. Check harness and terminals. Retighten terminal screws or replace as required.

Note: Lamp A is off while check button is pushed and is on when released, if ignition coil primary winding is good.

Pick up coil "A" continuity check (Retarded side)

Ignition switch	ON
SW_1	Continuity check side
SW_2	Pick up coil "A" position
SW_3	"A" position
SW_4	OFF (Lamp B is off.)
Check button	ON (PUSH)



EE237

Fig. EE-86 Pick up coil "A" continuity check

Lamp A	OFF	OK
	ON	Make a continuity check at connector of pick up coil A. If necessary, correct. Replace open pick up coil.

Note: Lamp A is off while check button is pushed and is on when released, if pick up coil "A" is good

Pick up coil "B" continuity check (Advanced side)
(Automatic transmission model only)

Ignition switch	ON	
SW_1	Continuity check side	
SW_2	Pick up coil "B" position	
SW_3	"A" position	
SW_4	OFF (Lamp B is off.)	
Check button	ON (PUSH)	
Lamp A	OFF	OK
	ON	Make a continuity check in connector of pick up coil B. Replace open pick up coil.

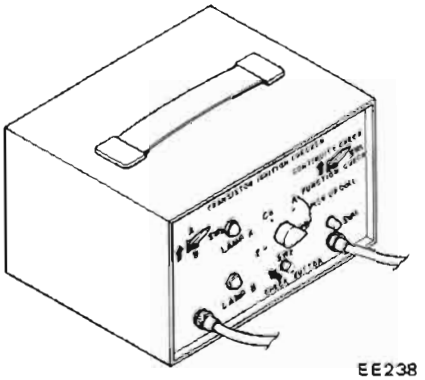


Fig. EE-87 Pick up coil "B" continuity check

Note: Lamp A is off while check button is pushed and is on when released, if pick up coil "B" is good.

Transistor ignition unit check
(Manual transmission model only)

Ignition switch	ON
SW_1	Continuity check side
SW_2	"Z" position
SW_3	"A" position
SW_4	ON (PUSH)
Lamp B	ON
SW_1	Function check side
Check button	ON (PUSH)

Lamp B	OFF	OK
	ON	Replace transistor ignition unit.

Spark from center cord

Strong spark	Weak or no spark

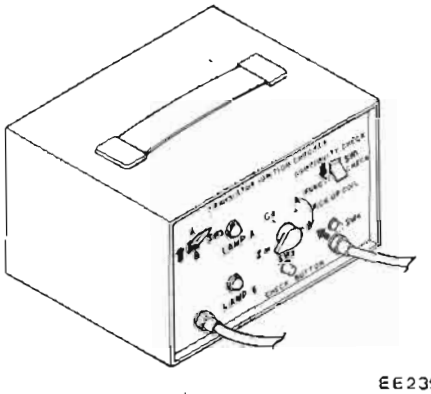
OK

Check high tension cord continuity.

If necessary, replace ignition coil and high tension cord.

SW_4	OFF (PUSH)

Lamp B	OFF and ON within 10 seconds	OK
	ON continuously	Replace



EE239

Fig. EE-88 Transistor ignition unit check (manual transmission model)

Transistor ignition unit check
(Automatic transmission model only)

Ignition switch	ON

SW_1	Continuity check side

SW_2	"Z" position

SW_3	"A" position

SW_4	ON (PUSH)

Lamp B	ON

SW_1	Function check side

Check button	ON (PUSH)

Lamp B	OFF	OK
	ON	Replace transistor ignition unit.

Spark from center cord

Strong spark	Weak or no spark

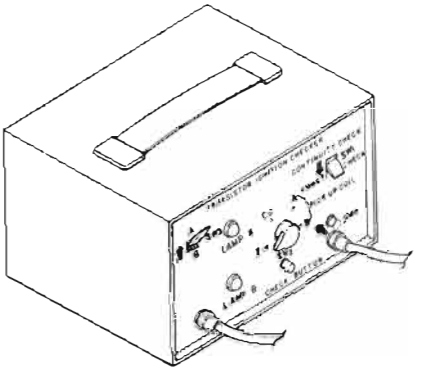
OK	Check high tension cord continuity

If necessary, replace ignition coil and high tension cord.

SW_4	OFF (PUSH)

Lamp B	OFF and ON within 10 seconds	OK
	Stays ON	Replace

SW_3	"B" position



EE239

Fig. EE-89 Transistor ignition unit check (automatic transmission model, retarded side)

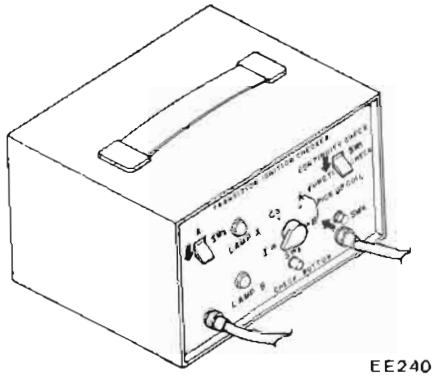


Fig. EE-90 Transistor ignition unit check (automatic transmission model, advanced side)

When checking items in the Flow Chart in succession with the checker, perform only the operations described in ▭ to ensure that lamps ("A" and "B") goes on and out as instructed.

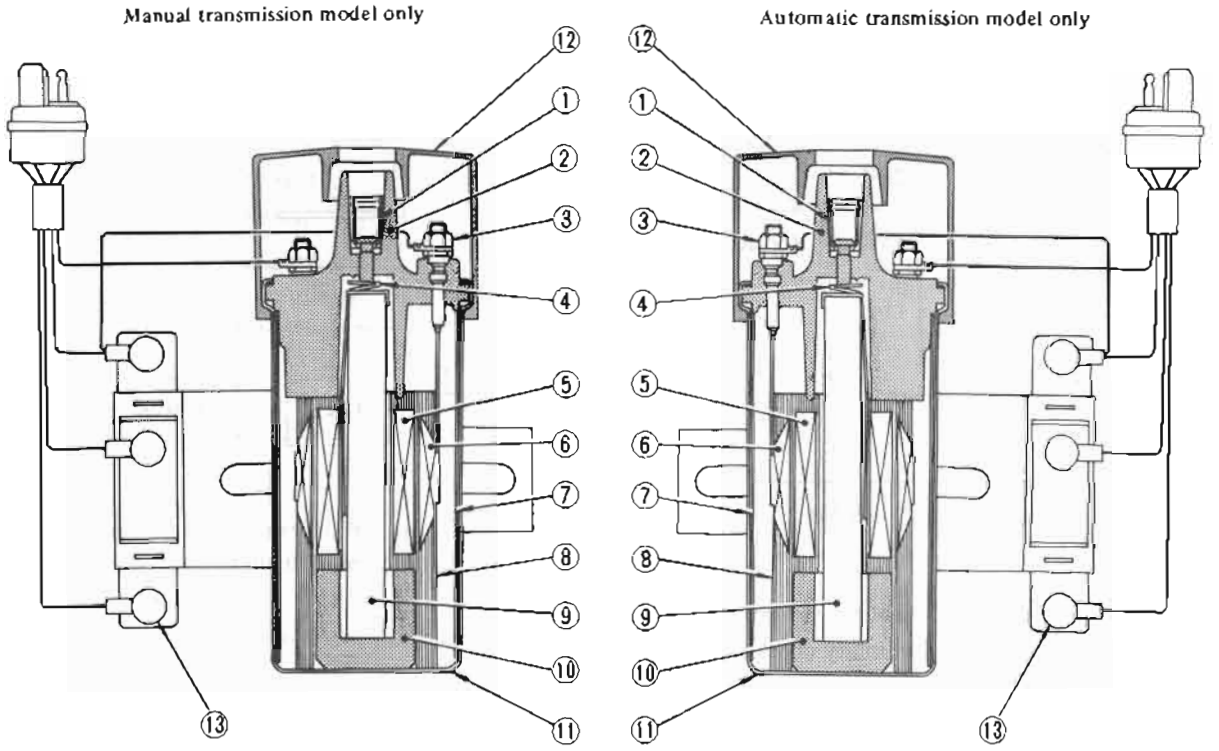
IGNITION COIL

The ignition coil is an oil-filled type. The ignition coil case is filled with oil, which has good insulating and heat-radiating characteristics.

The ignition coil has a greater ratio between the primary and secondary windings so as to step the battery voltage up to higher voltage, thus causes stronger sparks to jump the spark plug gap.

The cap is made of alkyd resin, which offers high resistance to electric arc and increased insulation.

The ignition coil and resistor should be handled as a matched set.



1 Secondary terminal
2 Cap
3 Primary terminal
4 Spring
5 Secondary coil
6 Primary coil
7 Side core
8 Insulator oil
9 Center core
10 Segment
11 Case
12 Rubber cap for ignition coil
13 Rubber cap for terminal

Fig. EE-91 Construction

SPECIFICATIONS

Make and type		HITACHI C.I.T.-12 and C.I.T.-13
Primary voltage	V	12
Spark	mm (in)	More than 7 (0.2756)
Primary resistance at 20°C (68°F)	Ω	0.45 to 0.55
Secondary resistance at 20°C (68°F)	Ω	8.5 to 12.7
External resistor at 20°C (68°F)	Ω	1.2 to 1.4

SPARK PLUG

CONTENTS

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INSPECTION EE-45
CLEANING AND REGAP EE-45
SPECIFICATIONS AND SERVICE DATA EE-46
TROUBLE DIAGNOSES AND CORRECTIONS EE-46

DESCRIPTION

The spark plugs are of the resistor type, having 14 mm (0.55 in) threads and a gap of 0.8 to 0.9 mm (0.031 to 0.035 in). The inspection and cleaning should be made every suitable maintenance period. If necessary, replace.

Note: All spark plugs installed on an engine must be of the same brand and the same number of heat range.

INSPECTION

1. Remove spark plug wire by pulling on boot, not on wire itself.
2. Remove spark plugs.
3. Check electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion. Refer to Figure EE-92.

Normal: Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.

Carbon fouled: Dry fluffy carbon deposits on the insulator and electrode are usually caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.

Oil fouled: Wet black deposits indicate excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after rapair, use a hotter plug.

Overheating: White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, low fuel pump pressure, wrong selection of fuel, a hotter plug, etc.
It is advisable to replace with plugs having colder heat range.

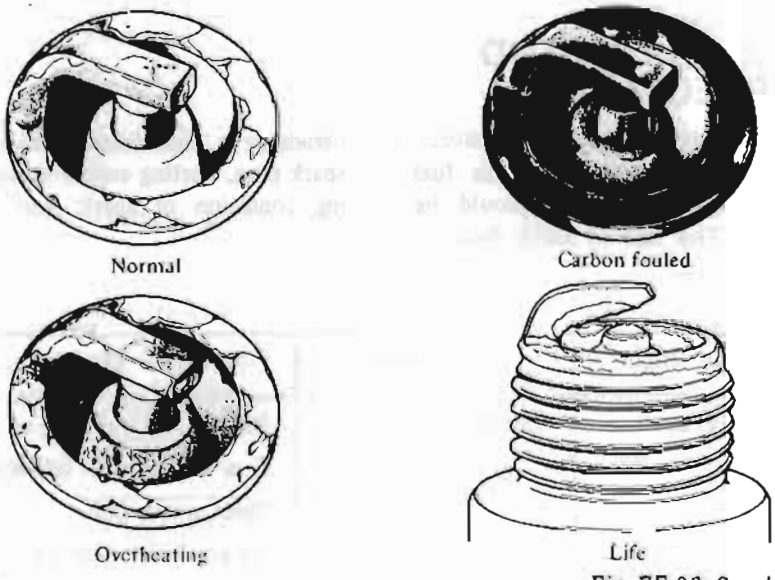


Fig. EE-92 Spark plug

4. After cleaning, dress electrodes with a small fine file to flatten the surfaces of both center and side electrodes in parallel. Set spark plug gap to specification.
5. Install spark plugs and torque each plug to 1.5 to 2.0 kg-m (11 to 15 ft-lb).
6. Connect spark plug wires.

CLEANING AND REGAP

Clean spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain. If deposits are too stubborn, discard plugs.

After cleaning spark plugs, renew firing surface of electrodes with file mentioned above. Then gap spark plugs to 0.8 to 0.9 mm (0.031 to 0.035 in) using a round wire feeler gauge. All spark plugs new or used should have the gap checked and reset by bending ground electrode.

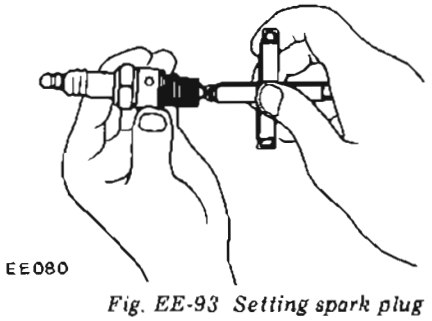


Fig. EE-93 Setting spark plug gap

SERVICE DATA AND SPECIFICATIONS

Item / Make	NGK
Item / Model	BP-6ES
Applied engine	L26
Size (screw dia. x reach) mm (in)	14 x 19 (0.55 x 0.75)
Plug gap mm (in)	0.8 to 0.9 (0.031 to 0.035)
Tightening torque kg-m (ft-lb)	1.5 to 2.0 (11 to 14)

TROUBLE DIAGNOSES AND CORRECTIONS

1. When engine does not start

If there is no problem in fuel system, ignition system should be checked. This can be easily done by detaching a high tension cable from spark plug, starting engine and observing condition of spark that occurs between high tension cable and spark plug terminal. After checking this, repair as necessary.

Spark length	Location	Probable cause	Corrective action
No sparks at all	Distributor	Breakage of lead-wire on low tension side.	Repair.
		Poor insulation of cap and rotor head.	Replace.
		Open pickup coil.	Replace.
		Air gap wider than specification.	Adjust
	Ignition coil	Wire breakage or short circuit of coil.	Replace with new one.
	High tension cable	Wire coming off.	Repair.
		Faulty insulation.	Replace.
	Transistor ignition unit	Faulty transistor ignition unit.	Replace.
Less than 6 mm (0.236 in)	Spark plugs	Electrode gap too wide.	Correct or replace.
		Too much carbon.	Clean or replace.
		Broken neck of insulator.	Replace.
		Expration of plug life.	Replace.
	Distributor	Air gap too wide.	Correct.
	Transistor ignition unit	Faulty transistor ignition unit.	Replace.

2. Engine rotates but does not run smoothly.

This may be caused by the ignition system or other engine conditions not related to ignition. Therefore, first a complete inspection of ignition system should be carried out.

Condition	Location	Probable cause	Corrective action
Engine misses	Distributor	Foreign matter on pick up coil.	Clean.
		Improper air gap.	Correct.
		Leak of electricity at cap and rotor head.	Repair or replace.
		Breakage of pick up coil lead wire.	Replace.
		Worn or shaky breaker plate.	Replace assembly.
		Worn or shaky distributor driving shaft.	Replace assembly.
	Ignition coil	Layer short circuit or inferior quality coil.	Replace with good one.
	High tension code	Deterioration of insulation with consequent leak of electricity.	Replace.
	Spark plugs	Dirty.	Clean.
		Leak of electricity at upper porcelain insulator.	Repair or replace.
	Transistor ignition unit	Faulty transistor ignition unit.	Replace.
Engine causes knocking very often	Distributor	Improper ignition timing. (too retarded)	Correct the fitting.
		Coming off or breakage of governor spring.	Correct or replace.
		Worn pin or hole of governor.	Replace.
	Spark plugs	Burnt too much.	Replace.
Engine does not deliver enough power	Distributor	Improper ignition timing. (too retarded)	Correct the fitting.
		Improper functioning governor.	Replace assembly.
		Foreign particles stuck in air gap.	Clean.
	Spark plugs	Dirty.	Clean.