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who, well, didn't do much this time, since Paul Lee provided the thing already scanned and compiled into a PDF! (Thanks!). Go visit his website: <http://www.iluvmyrx7.com/index.htm> Lots of RX-7 goodness there.

There are several ways to get around in the document. I have provided Bookmarks to all the sections, and thumbnails are also provided in the Thumbnails side bar.

I have also included a label for the spine of a binder, for those who wish to print out all the pages and keep a dead-tree edition handy.☺

The original document is © 1979 Toyo Kogyo Co., Ltd., and remains so. This version is provided as a service for owners of first generation Mazda RX-7s who are having a devil of a time locating the factory service manual for a reasonable price.

If you really want to send me money, email me and I'll tell you where to send it, but it's not necessary. Consider this payback for all the good advice and information gleaned from the various RX-7 email lists!

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09/16/03

ELECTRICAL SYSTEM (ENGINE)

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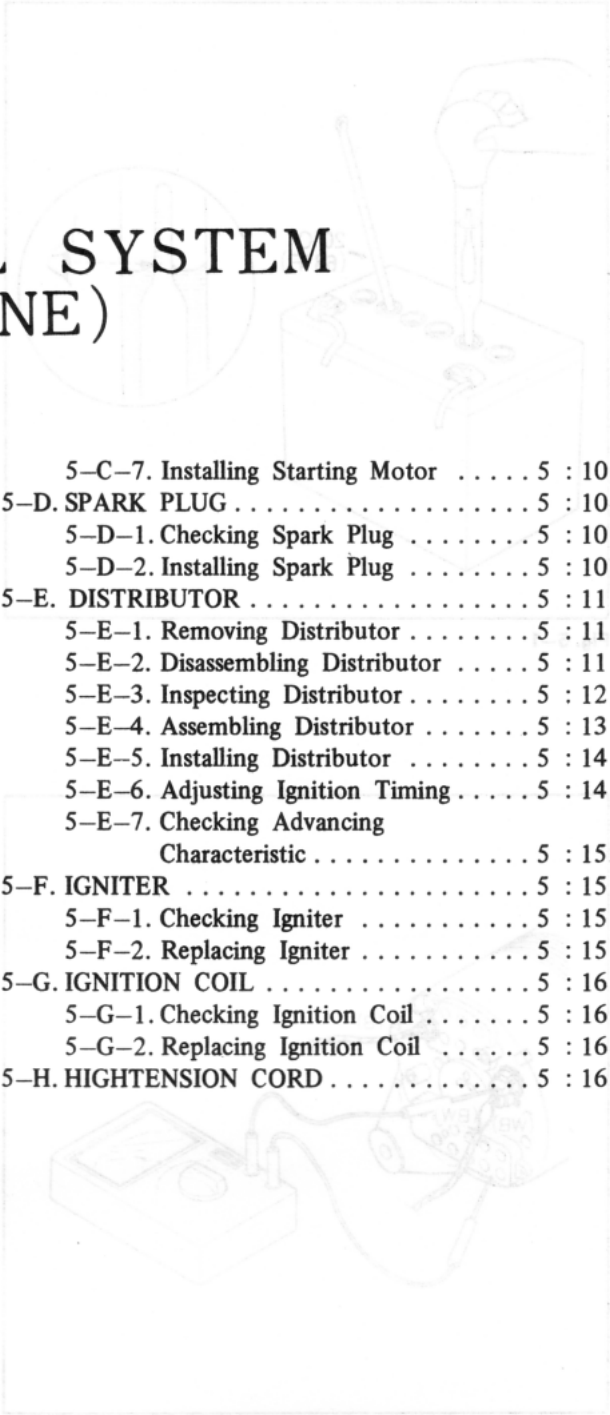


Fig. 2-3

5-A BATTERY
 5-A-1 Checking Battery
 1. Check the electrolyte level in each cell of the battery
 and add distilled water to the upper level the marks
 on the battery. Do not overfill.
 2. Check the specific gravity of the electrolyte with
 a hydrometer. The reading should be 1.265 to 1.285.
 Note:
 (a) Always disconnect the battery cables when charging
 the battery.
 (b) Keep all fire away from the top of open battery
 cells.
 5-B ALTERNATOR
 5-B-1 Precautions on Service
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 (No-load)
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 5-C-6 Assembling Starting Motor
 Note:
 The ignition switch should be switched off during
 above measurements.
 2. Switch on the ignition switch and check the "R"
 terminal (WR) voltage. The voltage is about 12
 volts.
 If the voltage is zero, both the alternator and the
 IC regulator are defective.

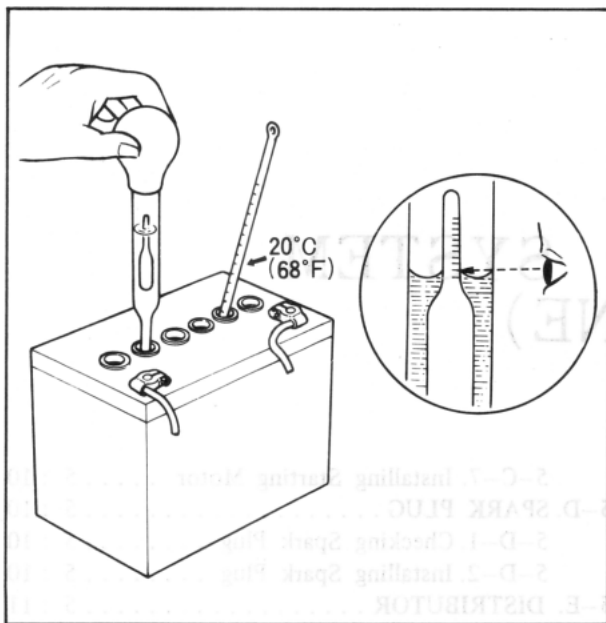


Fig. 5-1

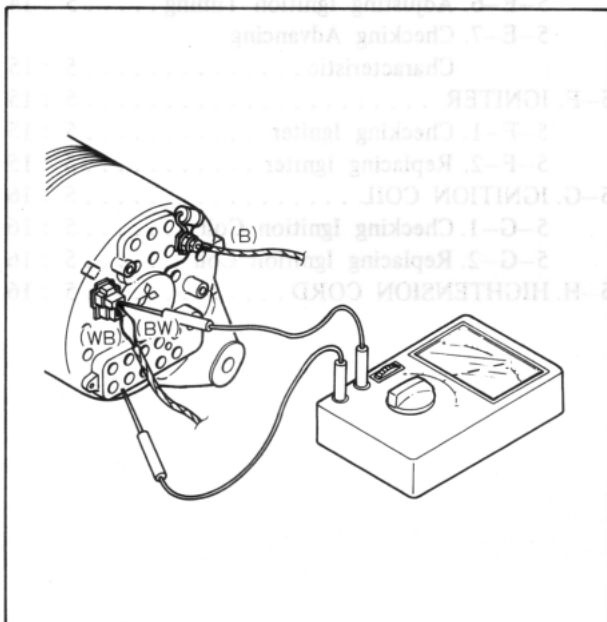


Fig. 5-2

5-A. BATTERY

5-A-1. Checking Battery

1. Check the electrolyte level in each cell of the battery, and add distilled water to the **upper level line** marked on the battery. **Do not** overfill.
2. Check the specific gravity of the electrolyte with a hydrometer. If the reading is below the specification, the battery requires recharging.

Note:

- a) **Always disconnect the battery cable when charging the battery.**
 - b) **Keep all fire away from the top of open battery cells when charging the battery.**
 - c) **Avoid contact sulphuric acid with skin, eyes, clothing or car.**
3. Check the tightness of the terminals to ensure good electrical connections. Clean the terminals and coat the terminals with grease.
 4. Inspect for corroded or frayed battery cables.
 5. Check the rubber protector on the positive terminal for proper coverage.

5-B. ALTERNATOR

5-B-1. Precautions on Service

When servicing the charging system, observe the following precautions.

1. **Do not** short across or ground any of the terminals on the alternator.
2. **Never** reverse battery cables, even for an instant, as the reverse polarity current flow will damage the diodes in the alternator.
3. Check the drive belt tension and adjust it to specification if necessary.

5-B-2. Checking Charging System on Car

If the charging system is not charging properly, it is advisable to determine whether the trouble is in the alternator or regulator.

1. Check the voltage of the "B" terminal on the alternator and compare it with the battery voltage. Make sure that no difference exists between both voltages.
2. Check the "R" terminal (BW) voltage and "L" terminal (WB) voltage. If either of the aforementioned voltage readings is not zero, the alternator is defective.

Note:

The ignition switch should be switched off during above measurements.

3. Switch on the ignition switch and check the "L" terminal (WB) voltage. The voltage is about 0.5 volt. If the voltage is zero, both the alternator and the IC regulator are defective.



Fig. 5-3

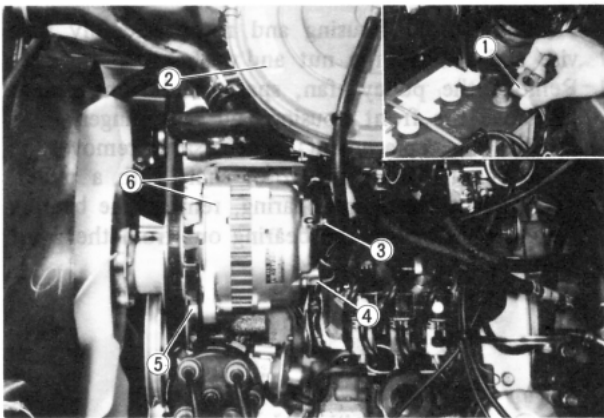


Fig. 5-4

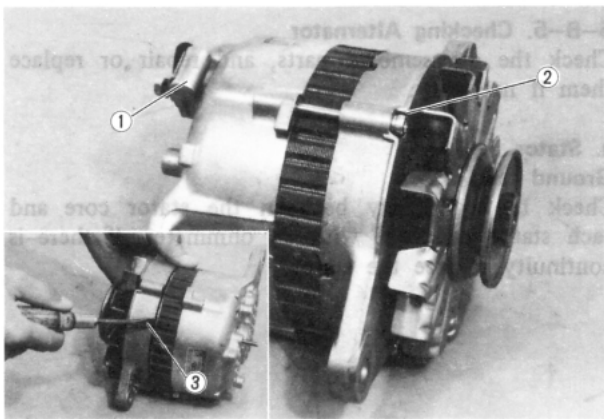


Fig. 5-5

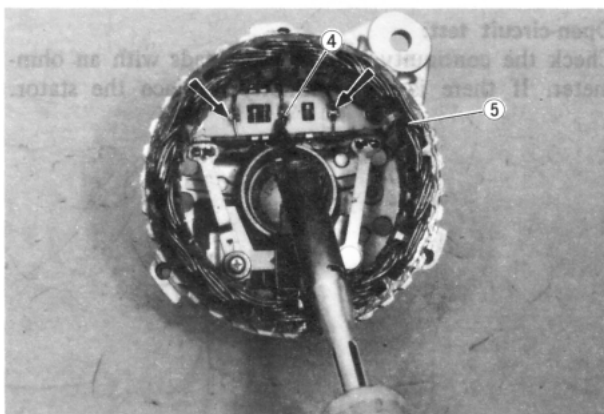


Fig. 5-6

4. If the aforementioned voltage (step 3) is close to the battery voltage, short-circuit the "F" terminal and the rear bracket of the alternator, and then read the "L" terminal (WB) voltage.

If the voltage is lower than that of the battery, the IC regulator is defective.

If the voltage is the similar to battery voltage, the alternator is defective.

Note:

The "F" terminal is located at a depth of 20 mm (0.79 in) in a hole which is near the "B" terminal.

5-B-3. Removing Alternator

1. Disconnect the battery negative cable.
2. Remove the air cleaner.
3. Disconnect a wire at the alternator "B" terminal.
4. Pull the multiple connector out from the alternator.
5. Remove the alternator strap bolt and disengage the drive belt.
6. Remove the alternator mounting bolt and remove the alternator.

5-B-4. Disassembling Alternator

1. Remove the radio noise suppression condenser and insulator from the "B" terminal.
2. Remove the through bolts.
3. Separate the front housing assembly by prying apart with a screwdriver at the slots of the front housing.

4. Unsolder the stator leads from the rectifier.

Note:

The unsoldering of the stator leads should be performed in less than twenty seconds as the excessive heat may damage the rectifier.

5. Remove the stator from the rear housing.

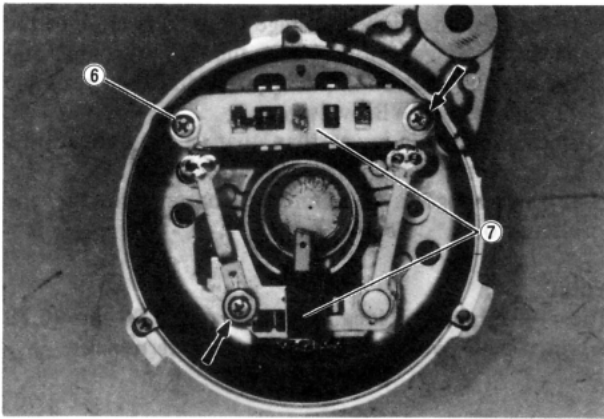


Fig. 5-7

6. Remove the screws attaching the rectifier and brush holder to the rear housing.
7. Carefully remove the rectifier and brush holder assembly from the rear housing.

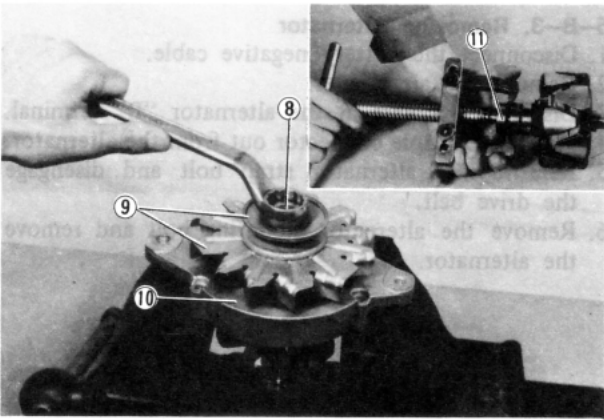


Fig. 5-8

8. Place the front housing and rotor assembly in a vise and remove the nut and washer.
9. Remove the pulley, fan, spacer and front slinger.
10. Remove the front housing and rear slinger.
11. If bearing replacement is necessary, remove the rear bearing from the rotor shaft with a puller. To replace the front bearing, remove the bearing retainer and press the bearing out from the front housing.

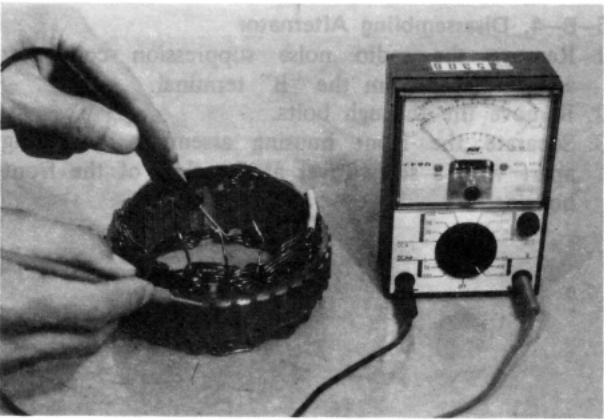


Fig. 5-9

5-B-5. Checking Alternator

Check the disassembled parts, and repair or replace them if necessary.

a. Stator

Ground test:

Check the continuity between the stator core and each stator coil lead with an ohmmeter. If there is continuity, replace the stator.

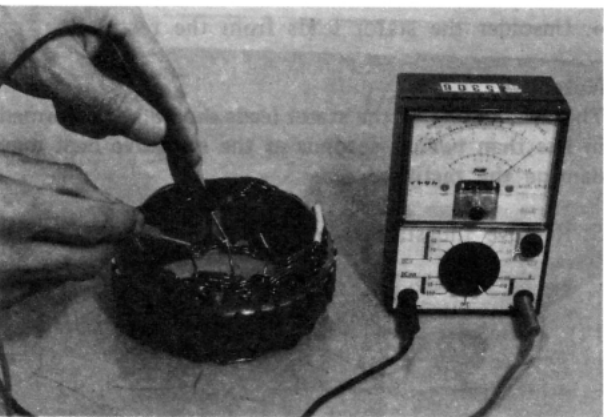


Fig. 5-10

Open-circuit test:

Check the continuity between the leads with an ohmmeter. If there is no continuity, replace the stator.

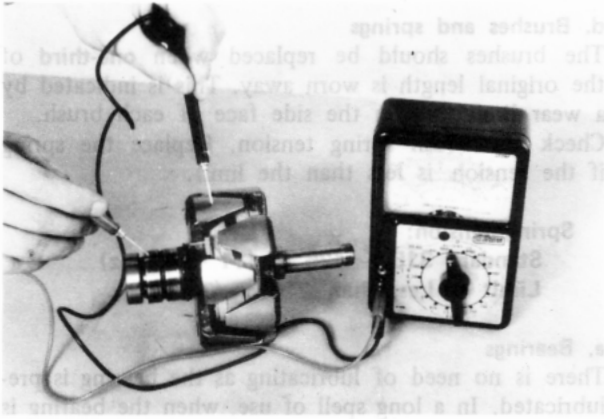


Fig. 5-11

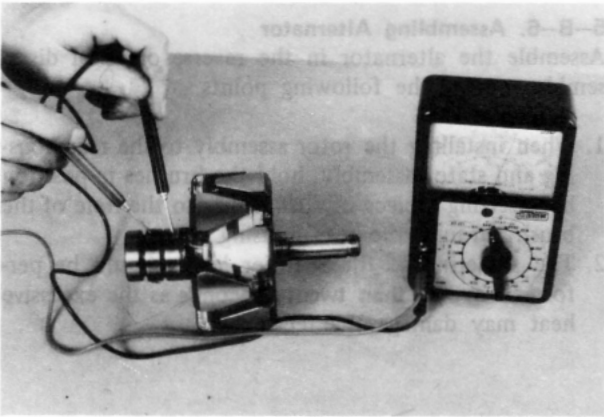


Fig. 5-12

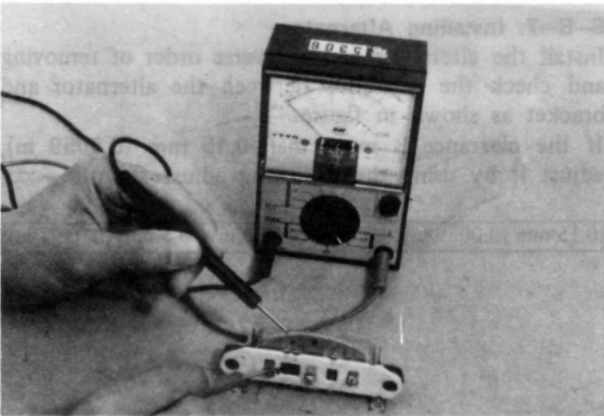


Fig. 5-13

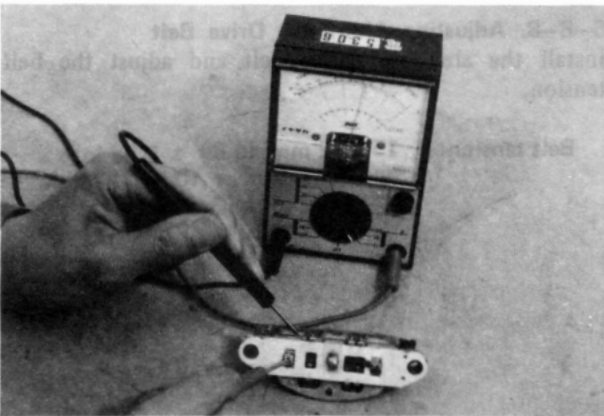


Fig. 5-14

b. Rotor

Ground test:

Check the continuity between the rotor and each slip ring with an ohmmeter. If there is continuity, replace the rotor.

Open-circuit test:

Check the continuity between the slip rings with an ohmmeter. If the reading is 5 ~ 6 ohms, there is no trouble in the rotor.

c. Rectifier assembly

Positive side:

1. Connect an ohmmeter (+) lead to the rectifier holder, and the (-) lead to the each rectifier terminal. If there is no continuity, replace the rectifier assembly.
2. Reverse polarity of an ohmmeter leads and check again. If there is continuity, replace the rectifier assembly.

Negative side:

1. Connect an ohmmeter (+) lead to the each rectifier terminal, and (-) lead to the rectifier holder. If there is no continuity, replace the rectifier assembly.
2. Reverse polarity of an ohmmeter leads and check again. If there is continuity, replace the rectifier assembly.

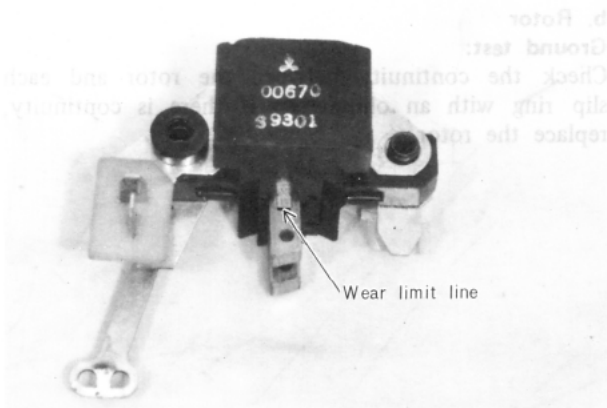


Fig. 5-15

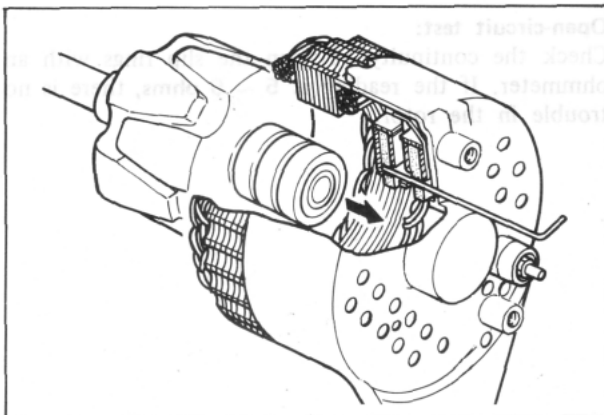


Fig. 5-16



Fig. 5-17

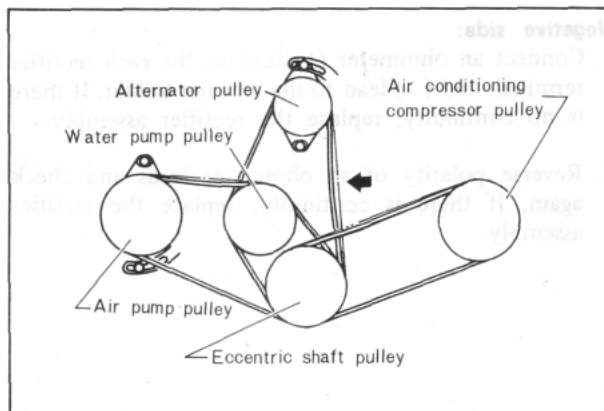


Fig. 5-18

d. Brushes and springs

The brushes should be replaced when **one-third** of the original length is worn away. This is indicated by a wear limit line on the side face of each brush. Check the brush spring tension. Replace the spring if the tension is less than the limit.

Spring tension:

Standard 315 ~ 426 gr (11 ~ 15 oz)
Limit Less than 210 gr (7 oz)

e. Bearings

There is no need of lubricating as the bearing is pre-lubricated. In a long spell of use, when the bearing is worn or damaged, replace it with a new one.

5-B-6. Assembling Alternator

Assemble the alternator in the reverse order of disassembly, **noting** the following points.

1. When installing the rotor assembly to the rear housing and stator assembly, hold the brushes in position by inserting a piece of stiff wire into the hole of the brush through the rear housing.
2. The soldering of the rectifier leads should be performed in **less than twenty seconds** as the excessive heat may damage the rectifier.

5-B-7. Installing Alternator

Install the alternator in the reverse order of removing and check the clearance between the alternator and bracket as shown in figure.

If the clearance is **more than 0.15 mm (0.0059 in)**, adjust it by using the following adjust shims.

0.15 mm (0.0059 in)	0.3 mm (0.0118 in)	0.5 mm (0.0197 in)
---------------------	--------------------	--------------------

5-B-8. Adjusting Alternator Drive Belt

Install the alternator drive belt and adjust the belt tension.

Belt tension: 15 ± 2 mm (0.59 ± 0.08 in)
When pressed at 10 kg (22 lb)

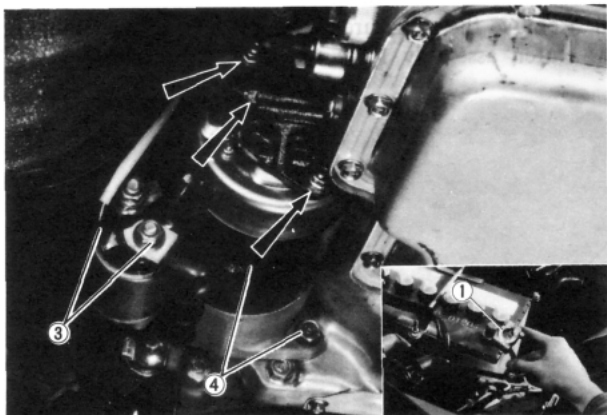


Fig. 5-19

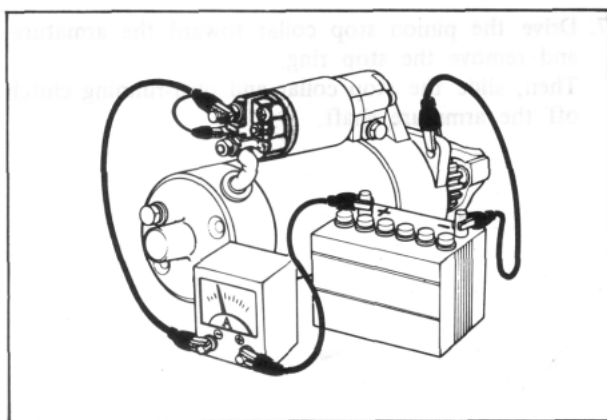


Fig. 5-20

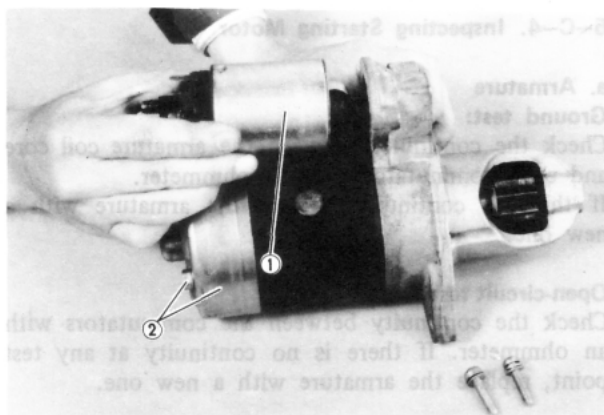


Fig. 5-21

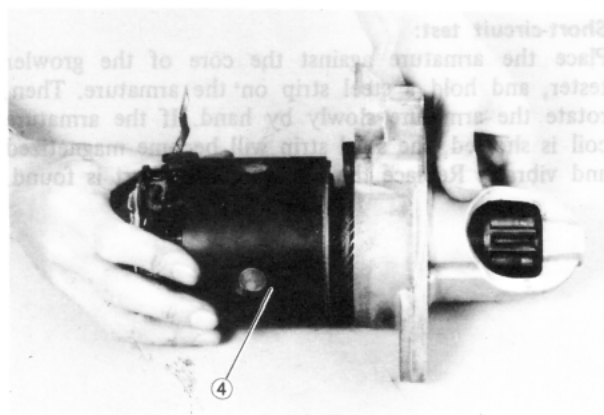


Fig. 5-22

5-C. STARTING MOTOR

5-C-1. Removing Starting Motor

1. Disconnect the battery negative cable.
2. Raise the vehicle and support it with stands.
3. Disconnect the battery cable from the magnetic switch "B" terminal, and ignition switch wire from the magnetic switch "S" terminal.
4. Remove the starting motor attaching bolts and remove the starting motor.

On the vehicle equipped with automatic transmission, remove the starting motor bracket, then remove the starting motor attaching bolts and remove the starting motor.

5-C-2. Testing Starting Motor (No-load)

1. Connect an ammeter as shown in figure.
2. Apply the battery voltage **adjusted to 11.5 volts** to the starting motor.
3. Operate the starting motor and take a reading.

Specified current:

Manual transmission	Less than 50 amp.
Automatic transmission	Less than 100 amp.

5-C-3. Disassembling Starting Motor

1. Disconnect the field strap and remove the magnetic switch, spring, plunger and washer.
2. Remove the through bolts and brush holder attaching screws, and then remove the rear cover.

3. Remove the insulator and washers from the rear end of the armature shaft.
4. Separate the yoke and brush holder assembly from the driving housing.

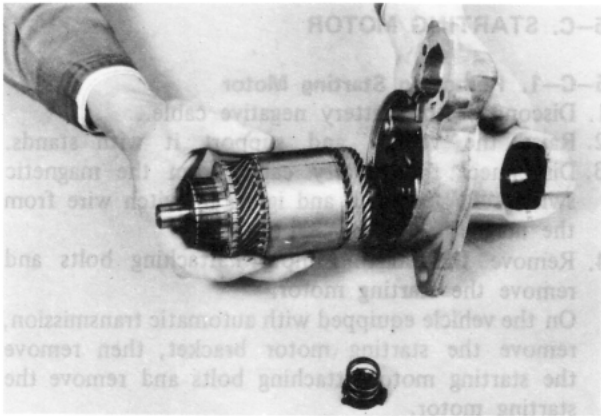


Fig. 5-23

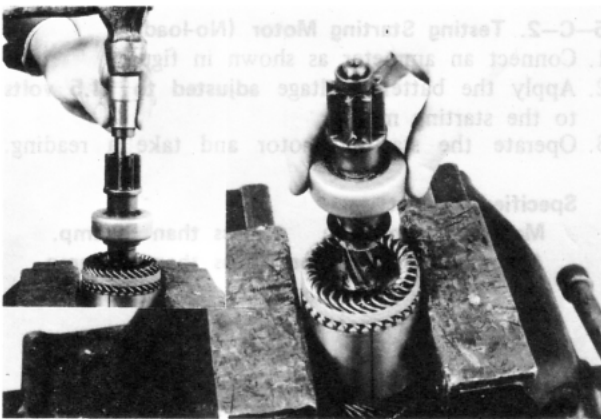


Fig. 5-24

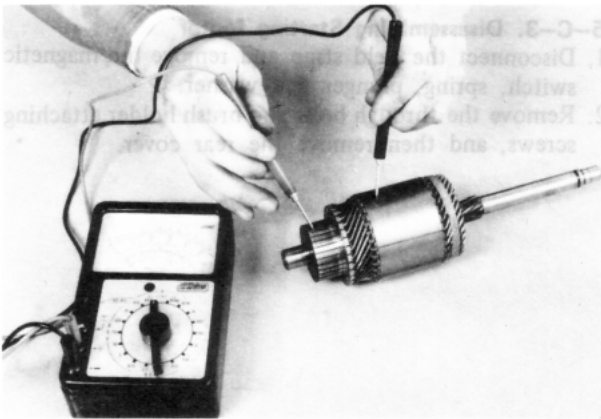


Fig. 5-25

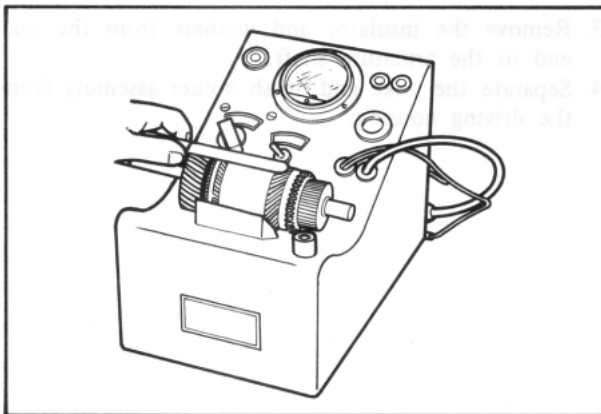


Fig. 5-26

6. Remove the armature, driving lever and over running clutch assembly from the driving housing.



7. Drive the pinion stop collar toward the armature, and remove the stop ring. Then, slide the stop collar and over-running clutch off the armature shaft.



5-C-4. Inspecting Starting Motor

a. Armature

Ground test:

Check the continuity between the armature coil core and each commutator with an ohmmeter. If there is continuity, replace the armature with a new one.

Open-circuit test:

Check the continuity between the commutators with an ohmmeter. If there is no continuity at any test point, replace the armature with a new one.

Short-circuit test:

Place the armature against the core of the growler tester, and hold a steel strip on the armature. Then, rotate the armature slowly by hand. If the armature coil is shorted, the steel strip will become magnetized and vibrate. Replace the armature if a short is found.

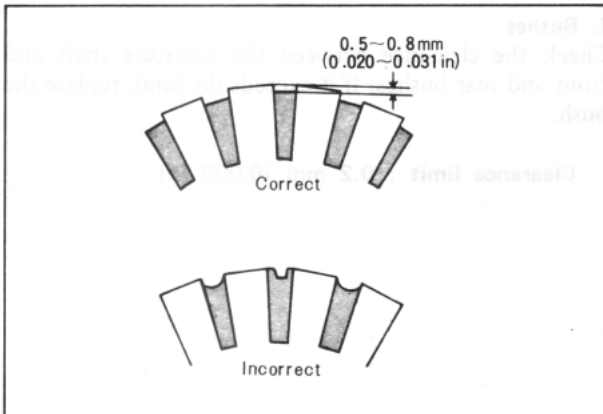


Fig. 5-27



Fig. 5-28

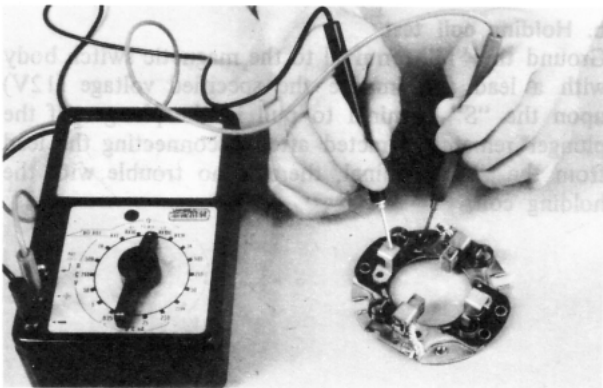


Fig. 5-29

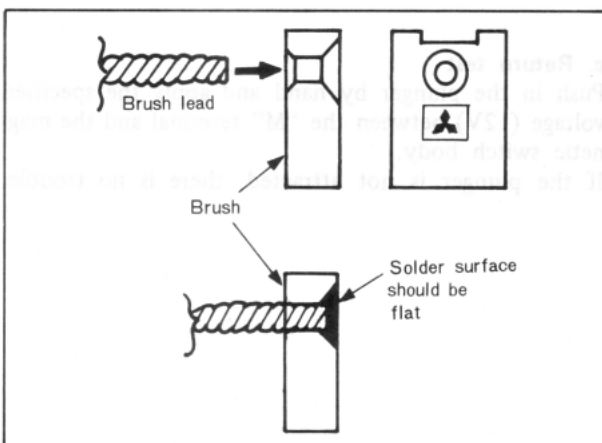


Fig. 5-30

b. Commutator

If the commutator is dirty, discolored or worn, clean it with emery paper. After cleaning, undercut the mica between the commutators to the depth of **0.5 ~ 0.8 mm (0.020 ~ 0.031 in)** as shown in figure.

c. Field coil

Ground test:

Check the continuity between the field terminal and yoke with an ohmmeter.

If there is continuity, replace the field coil and yoke assembly with new one.

Open-circuit test:

Check the continuity between the field terminal and each field coil brush with an ohmmeter. If there is no continuity, replace the field coil and yoke assembly with new one.

d. Brush holder

Check the continuity between the each brush holder and brush holder frame with an ohmmeter. If there is continuity, replace the brush holder assembly with new one.

e. Brushes and brush springs

Check the brushes and replace if they are worn down more than **one third** of their original length.

Check the spring tension, replace the spring if the tension is too low.

Standard spring tension :

1.4 ~ 1.8 kg (49 ~ 63 oz)

To replace the brush, proceed as follows:

1. Remove the brush from the holder.
2. Smash the old brush by tapping it with small hammer or pinching with pliers.
3. Clean the brush lead and insert the lead to small chamfer side of new brush.
4. Solder the lead and brush together, using rosin core solder. Use a 200-watt iron.

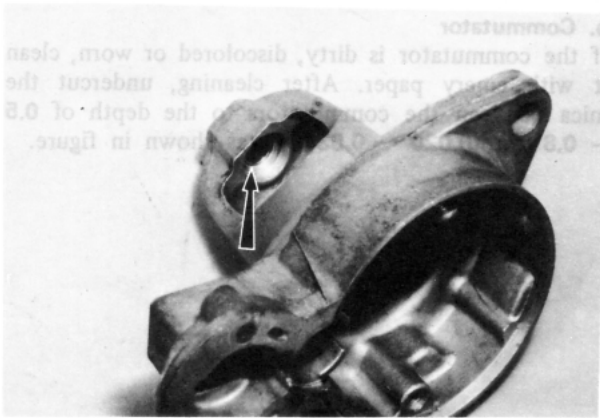


Fig. 5-31

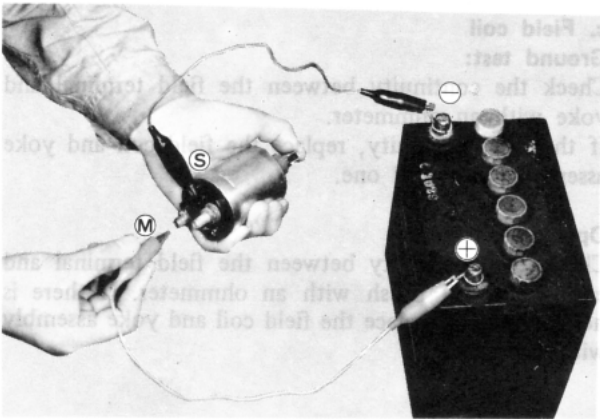


Fig. 5-32

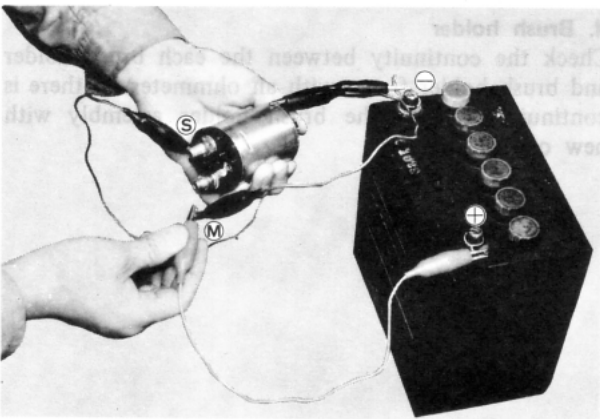


Fig. 5-33

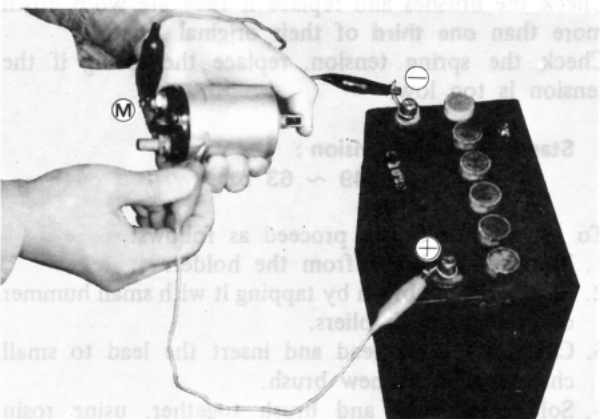


Fig. 5-34

f. Bushes

Check the clearance between the armature shaft and front and rear bushes. If it exceeds the limit, replace the bush.

Clearance limit : 0.2 mm (0.008 in)

5-C-5. Testing Magnetic Switch

a. Pull-in coil test

Apply the specified voltage (12V) between the "S" terminal and "M" terminal. If the magnetic switch is forcefully attracted, the pull-in coil is in good condition.

b. Holding coil test

Ground the "M" terminal to the magnetic switch body with a lead and impose the specified voltage (12V) upon the "S" terminal to pull in the plunger. If the plunger remains attracted after disconnecting the lead from the "M" terminal, there is no trouble with the holding coil.

c. Return test

Push in the plunger by hand and apply the specified voltage (12V) between the "M" terminal and the magnetic switch body. If the plunger is not attracted, there is no trouble.

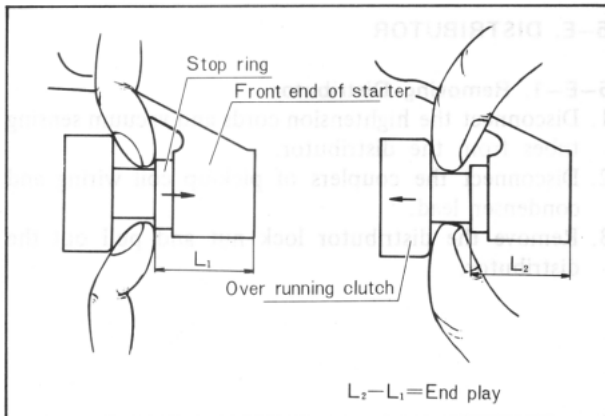


Fig. 5-35

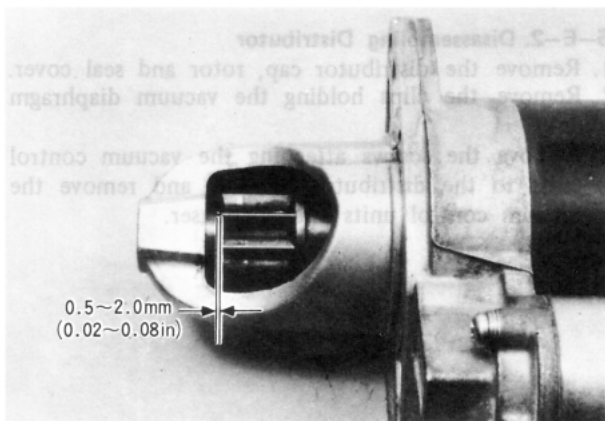


Fig. 5-36

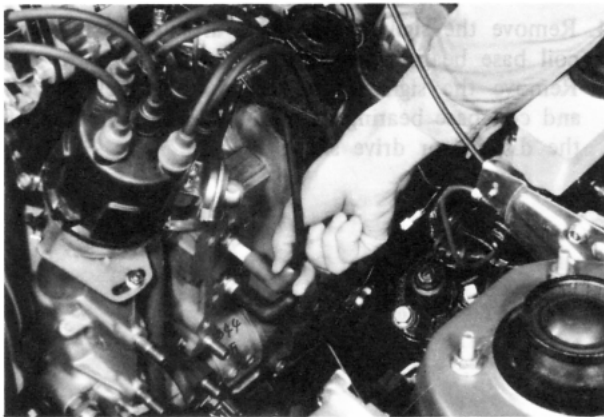


Fig. 5-37

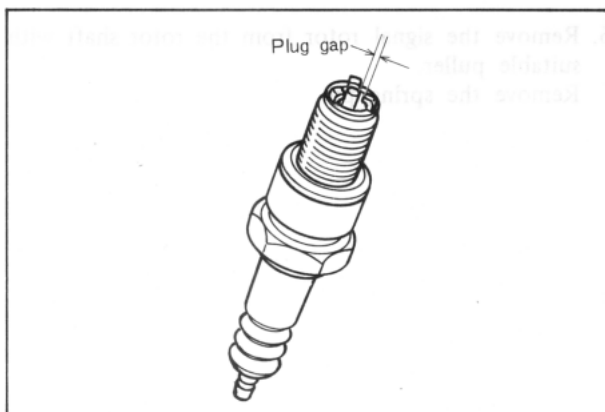


Fig. 5-38

5-C-6. Assembling Starting Motor

Assemble the starting motor in the reverse order of disassembly, **noting** the following points.

1. Adjust the armature shaft end play to **0.1 ~ 0.4 mm (0.004 ~ 0.016 in)** with a thrust washer on the rear end of the shaft.

2. When the magnetic switch is engaged, the clearance between the pinion and stop collar should be **0.5 ~ 2.0 mm (0.02 ~ 0.08 in)**.

This clearance can be adjusted by inserting the adjusting washer between the magnetic switch body and the driving housing.

5-C-7. Installing Starting Motor

Install the starting motor in the reverse order of removing.

5-D. SPARK PLUG

5-D-1. Checking Spark Plug

1. Disconnect the hightension cord and remove the spark plug.
Do not pull on the cords because the wire connection inside the cap may become separated.
2. Check the spark plugs for burned and eroded electrode, black deposits, fouling, and cracked porcelain.
3. Clean the spark plugs with a spark plug cleaner or a wire brush if they are fouled.
Replace the badly burned or eroded spark plugs.

4. Measure the electrode gap of each spark plug with a wire gauge. If it is improper, replace the spark plug.

Standard spark plug gap (initial):

1.05 ± 0.05 mm (0.041 ± 0.002 in)

5-D-2. Installing Spark Plug

Install the spark plug, **noting** following points.

1. Apply moly paste (0259 77 767A or 0259 77 768A) to the threads of spark plugs.
2. Torque each spark plug to **1.3 ~ 1.8 m·kg (9 ~ 13 ft·lb)**.

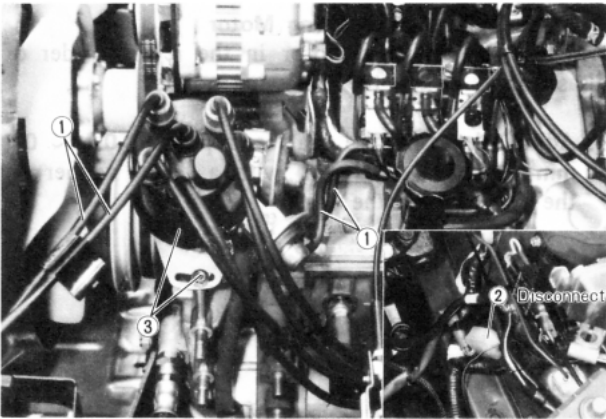


Fig. 5-39

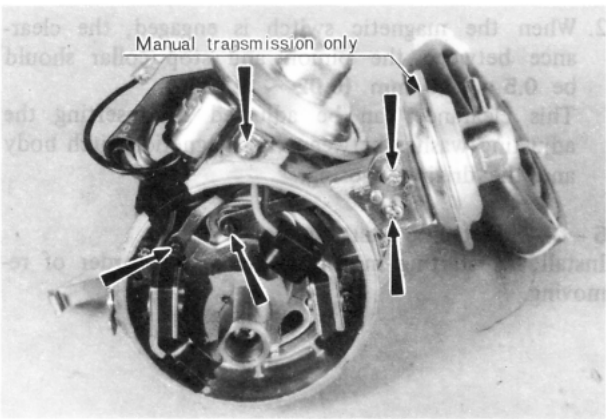


Fig. 5-40

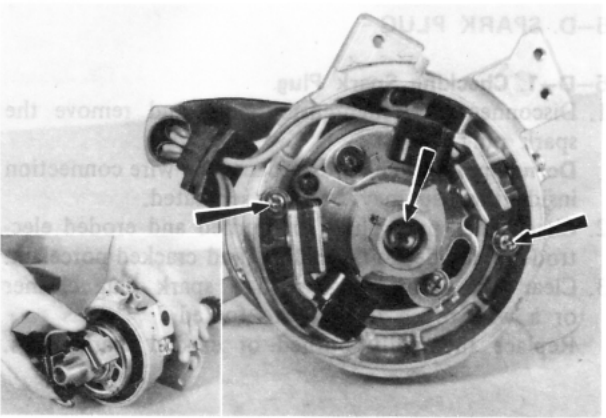


Fig. 5-41

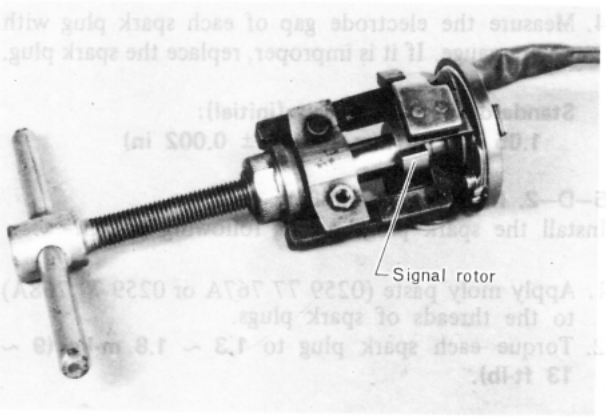


Fig. 5-42

5-E. DISTRIBUTOR

5-E-1. Removing Distributor

1. Disconnect the high-tension cords and vacuum sensing tubes from the distributor.
2. Disconnect the couplers of pick-up coil wiring and condenser lead.
3. Remove the distributor lock nut and pull out the distributor.

5-E-2. Disassembling Distributor

1. Remove the distributor cap, rotor and seal cover.
2. Remove the clips holding the vacuum diaphragm links.
3. Remove the screws attaching the vacuum control units to the distributor housing, and remove the vacuum control units and condenser.
4. Remove the signal rotor shaft attaching screw and coil base bearing attaching screws.
5. Remove the signal rotor, rotor shaft, pick-up coil and coil base bearing assembly through the top of the distributor drive shaft.

6. Remove the signal rotor from the rotor shaft with suitable puller. Remove the spring pin.



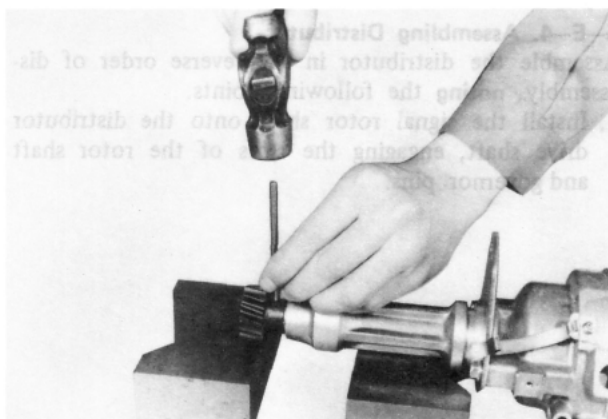


Fig. 5-43



Fig. 5-44

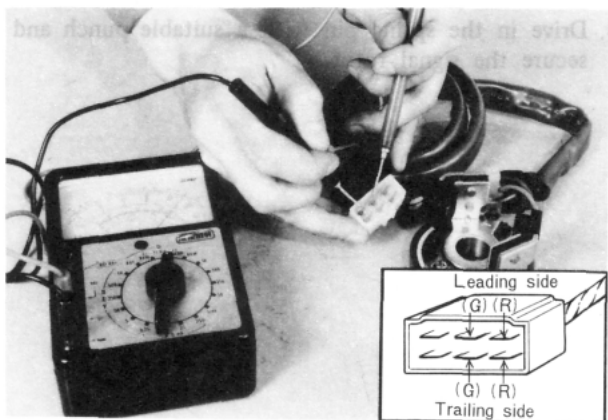


Fig. 5-45

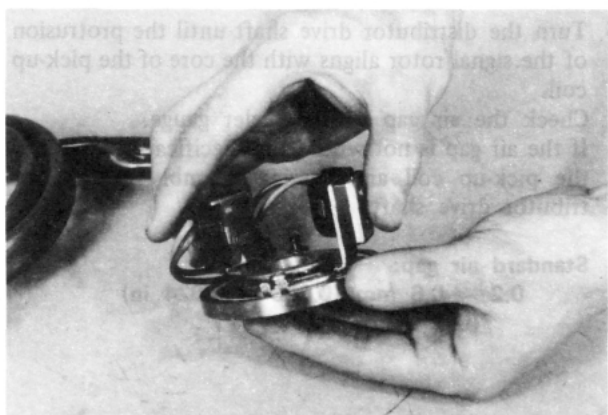


Fig. 5-46

7. Remove the governors by removing the springs.
8. Drive the lock pin out of the driven gear with a small drift and remove the gear and washers.
9. Remove the shaft through the top of the distributor housing.

5-E-3. Inspecting Distributor

Inspect the following parts and replace if necessary.

a. Distributor cap

Inspect the distributor cap for cracks, carbon tracks, burnt and corroded terminals. Check center contact for wear.

b. Rotor

Inspect the rotor for cracks and evidence of excessive burning at the end of the metal strip.

c. Pick-up coils

1. Connect an ohmmeter to terminals in the coupler and check the resistance of the pick-up coil. The standard resistances are $650 \pm 50 \Omega$ at 20°C (68°F) on both trailing and leading coils.
2. Connect an ammeter (maximum graduation is DC 1 mA.) to terminals in the coupler and place a screwdriver on the magnet core of the pick-up coil. Make sure that the indicator of the meter moves when the screwdriver is quickly separated from the core. The above test should be done on each trailing and leading coils.

d. Bearing

Inspect the bearing for roughness by slowly turning the outer race with hand.

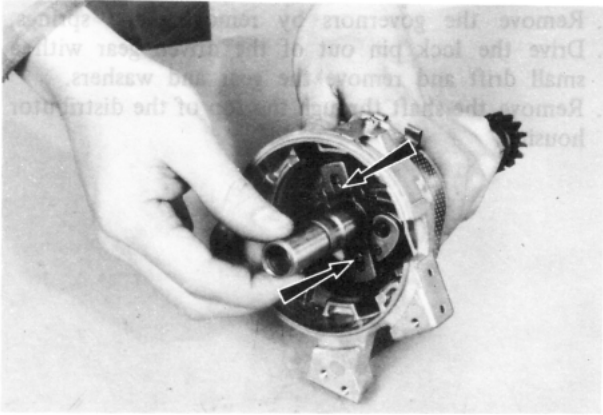


Fig. 5-47

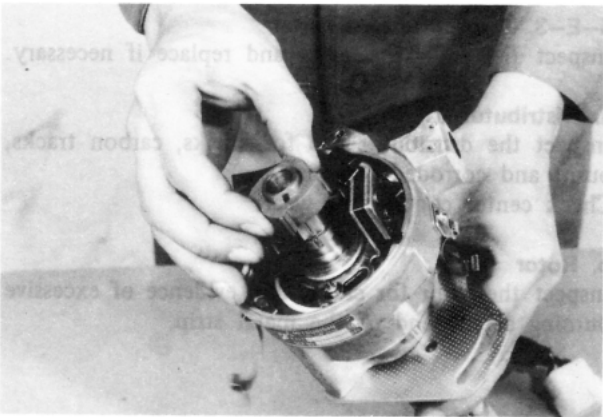


Fig. 5-48



Fig. 5-49

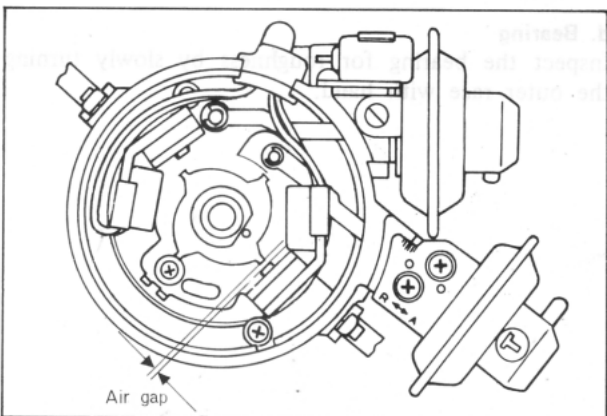


Fig. 5-50

5-E-4. Assembling Distributor

Assemble the distributor in the reverse order of disassembly, **noting** the following points.

1. Install the signal rotor shaft onto the distributor drive shaft, engaging the slots of the rotor shaft and governor pins.

2. Install the pick-up coil and coil base bearing assembly, and tighten the attaching screws.
3. Install the signal rotor onto the rotor shaft.

4. Drive in the spring pin with a suitable punch and secure the signal rotor.

5. Turn the distributor drive shaft until the protrusion of the signal rotor aligns with the core of the pick-up coil.

Check the air gap with a feeler gauge.

If the air gap is not within the specifications, replace the pick-up coil and bearing assembly or the distributor drive shaft.

Standard air gap:

0.2 ~ 0.6 mm (0.008 ~ 0.024 in)

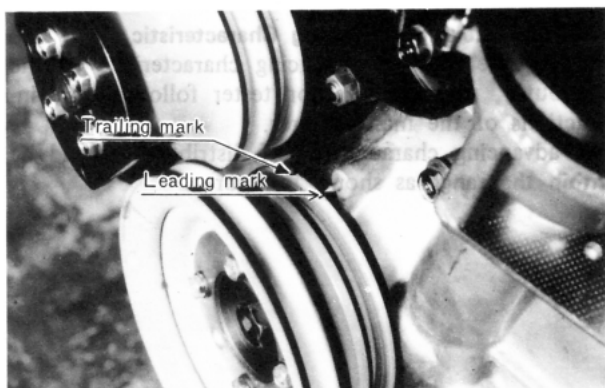


Fig. 5-51

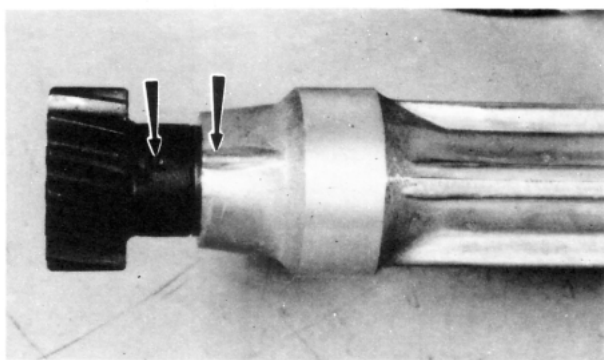


Fig. 5-52

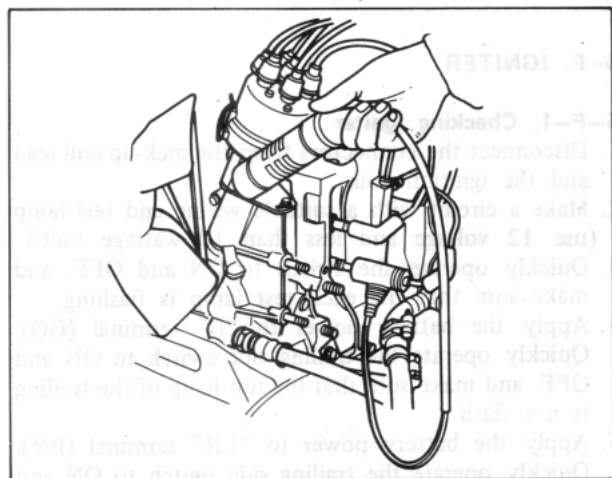


Fig. 5-53

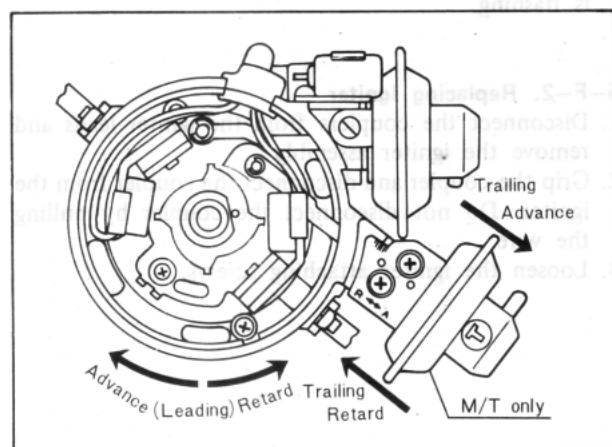


Fig. 5-54

5-E-5. Installing Distributor

1. Align the leading timing mark (yellow painted) on the eccentric shaft pulley with the indicator pin on the front cover.
2. Align the tally marks on the distributor housing and driven gear.
3. Install the distributor and lock nut.
4. Turn the distributor housing until the protrusion of the signal rotor aligns with the core of the pick-up coil.
Tighten the lock nut.
5. Connect the hightension cords, pick-up coil wiring coupler and condenser lead.
6. Connect the vacuum sensing tubes.
7. Adjust the ignition timing as described in Par. 5-E-6.

5-E-6. Adjusting Ignition Timing

1. Warm up the engine to the normal operating temperature.
2. Connect a tachometer to the engine.
3. Connect a timing light to hightension cord of the leading spark plug on the front.
4. Start the engine and run it at specified idle speed.
5. Aim the timing light at the timing indicator pin on the front cover.
6. If the leading timing is not correct, loosen the distributor lock nut and rotate the distributor housing until the correct leading timing is obtained.
7. Tighten the distributor lock nut, and recheck the leading timing.
8. Connect a timing light to hightension cord of the trailing spark plug on the front.
9. Check the trailing timing.
10. If the trailing timing is not correct, loosen the vacuum unit attaching screws of trailing and move the vacuum unit until the correct trailing timing is obtained.
11. Tighten the vacuum unit attaching screws and recheck the trailing timing.

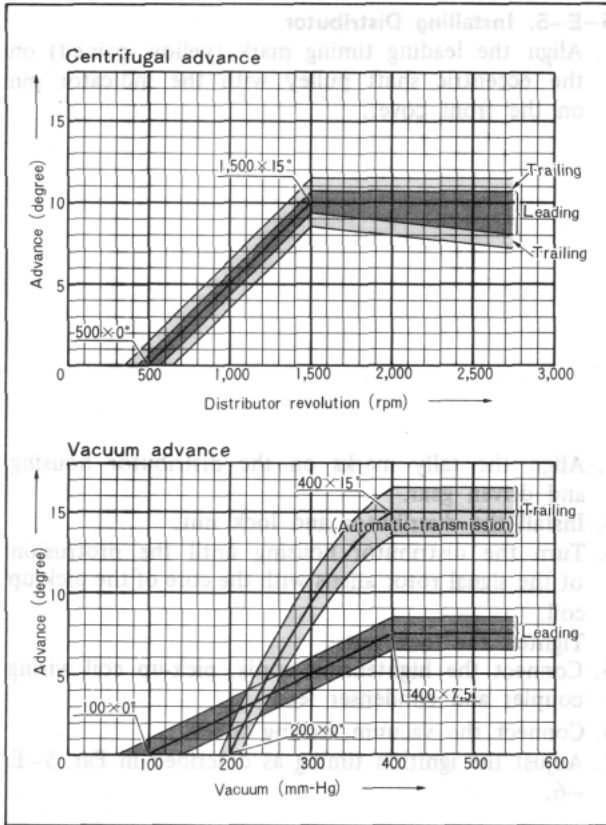


Fig. 5-55

5-E-7. Checking Advancing Characteristic

To test the ignition advancing characteristic of the distributor, use a distributor tester following the instructions of the manufacturer.

The advancing characteristic of distributor should be within the range as shown in figure.

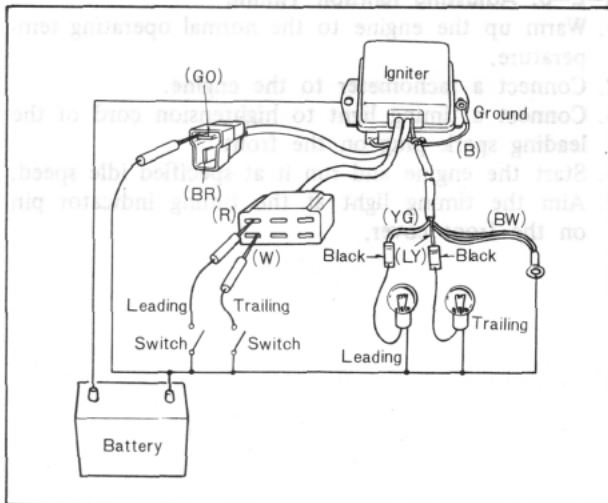


Fig. 5-56

5-F. IGNITER

5-F-1. Checking Igniter

1. Disconnect the connectors from the pick-up coil lead and the ignition coils.
2. Make a circuit with a suitable wiring and test lamp (use 12 voltage and less than 10 wattage bulb).
3. Quickly operate the switch to ON and OFF, and make sure that the each test lamp is flashing.
4. Apply the battery power to "L" terminal (GO). Quickly operate the trailing side switch to ON and OFF, and make sure that the test lamp of the trailing is not flash.
5. Apply the battery power to "LR" terminal (BR). Quickly operate the trailing side switch to ON and OFF, and make sure that the test lamp of the leading is flashing.

5-F-2. Replacing Igniter

1. Disconnect the couplers from the igniter leads and remove the igniter assembly.
2. Grip the coupler and disconnect the coupler from the igniter. Do not disconnect the coupler by pulling the wire.
3. Loosen the igniter attaching screws.

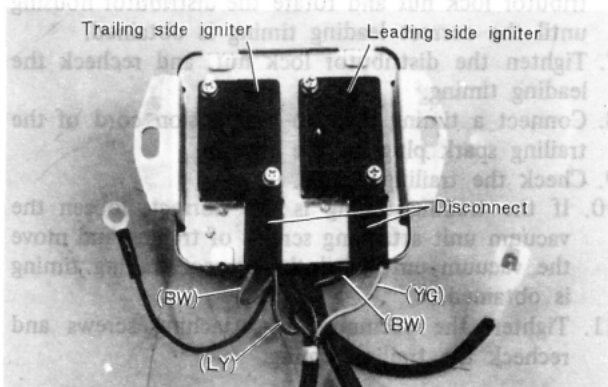


Fig. 5-57

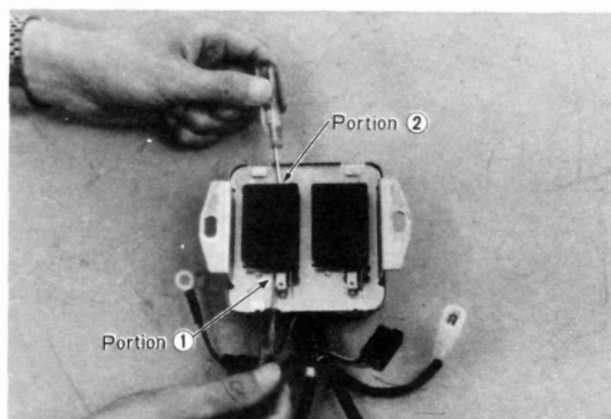


Fig. 5-58

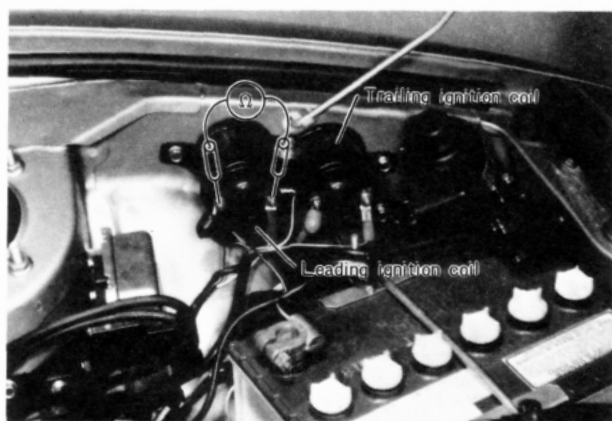


Fig. 5-59

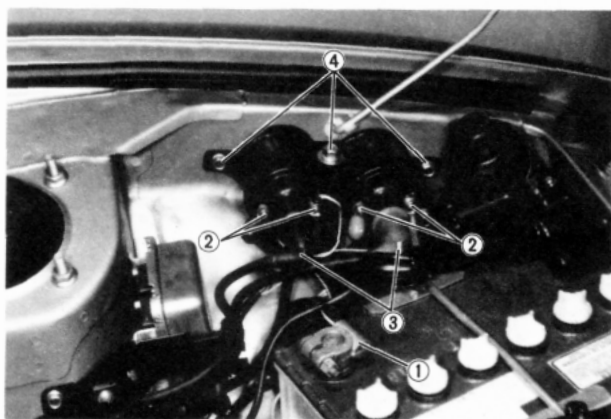


Fig. 5-60

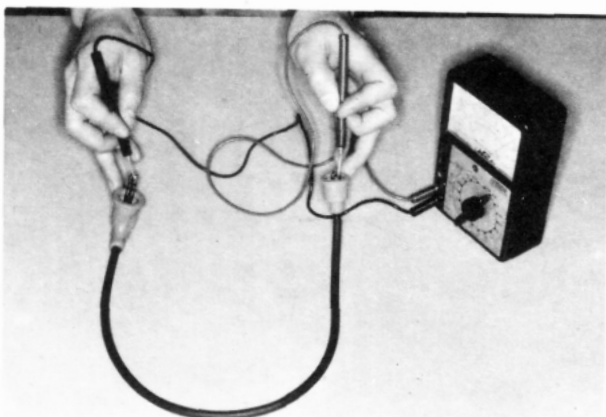


Fig. 5-61

4. Insert a screwdriver between the igniter and aluminum plate (portion ①), and slightly pry up the igniter.

Next, insert a screwdriver to portion ② and pry up the igniter.

The igniter should be pryed up with a screwdriver alternatively little by little until it can be removed.

5. Clean the mounting faces of igniter and aluminum plate and install the igniter in position.

Tighten the igniter attaching screws to 12 ~ 20 cm-kg (10 ~ 17 in-lb).

6. Install the igniter assembly and connect the couplers of the igniter leads.

5-G. IGNITION COIL

5-G-1. Checking Ignition Coil

Before testing the coil, always heat the coil to normal operating temperature.

Check the primary resistance with an ohmmeter.

It should be $1.35 \pm 10\%$ ohms on both the leading and trailing ignition coils.

5-G-2. Replacing Ignition Coil

1. Disconnect the negative cable from the battery.
2. Disconnect the couplers from the negative terminals of the ignition coils. Loosen the nuts from the positive terminals and remove the wire terminals.
3. Remove the high-tension cords from the leading and trailing ignition coils.
4. Remove the bracket attaching bolt and remove the coils.
5. Install the coils by following the removal procedures in the reverse order.

5-H. HIGHTENSION CORD

Check the resistance of each high-tension cord. The resistance should not exceed $16,000$ ohms $\pm 40\%$ per 1 m (39.37 in).

Note:

- a) When checking the resistance of the cords or setting ignition timing, do not puncture the cords with a probe.
- b) When removing the cords from the spark plugs, grasp and twist the moulded cap, then pull the cap off the spark plug. Do not pull on the cord because the wire connection inside the cap may become separated or the insulator may be damaged.