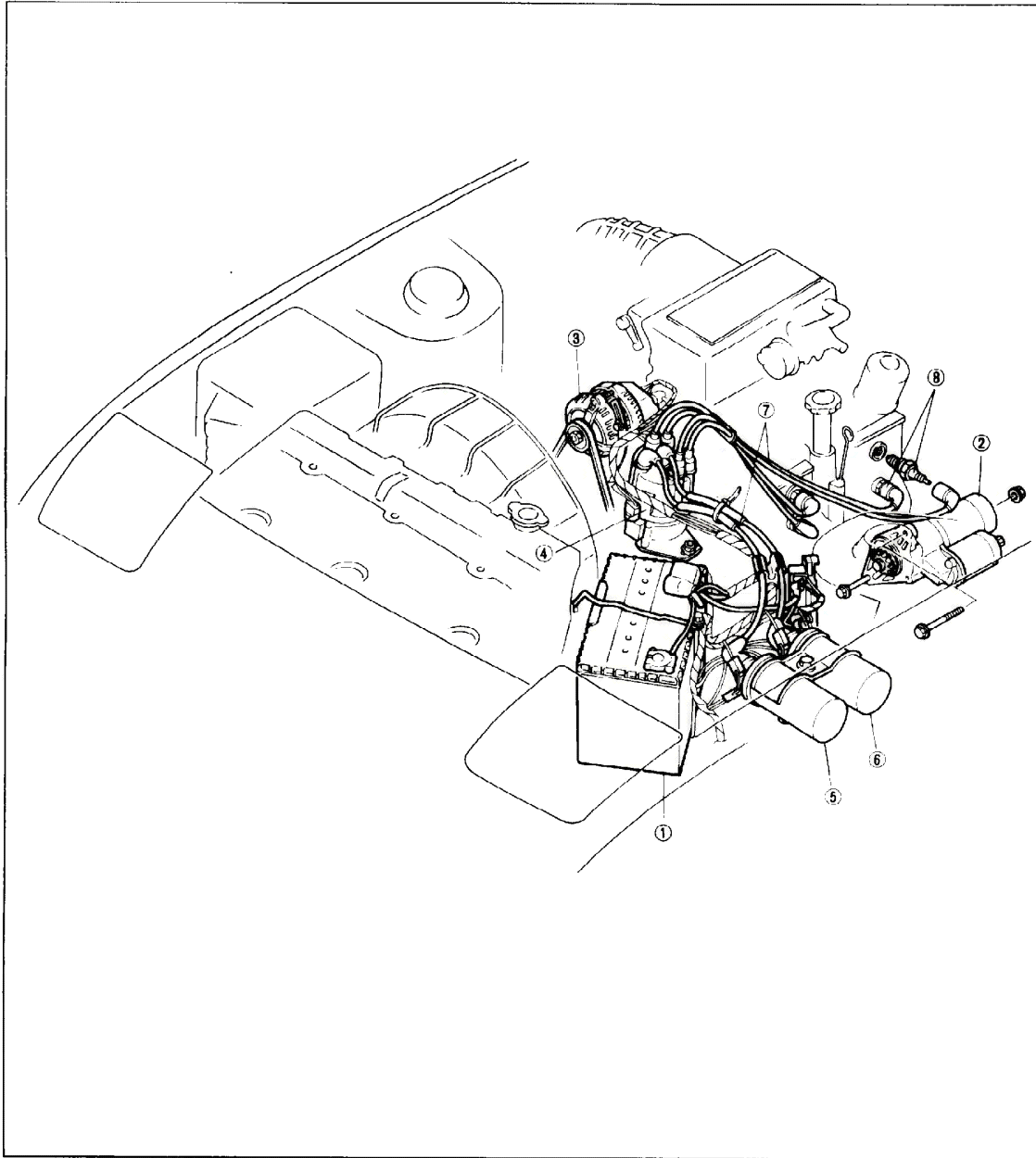


ENGINE ELECTRICAL SYSTEM

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OUTLINE

STRUCTURAL VIEW



1 Battery

2 Starter motor

3 Alternator

4 Distributor

5 Ignition coil (T)

6 Ignition coil (L)

7 Spark plug cables

8 Spark plugs

SPECIFICATIONS

			12A Engine	13B Engine
Voltage			12V Negative ground	
Ignition device	Spark timing		T: 20° ATDC L: 0° TDC	T: 20° ATDC L: 5° ATDC
	Breaker type		Contactless (igniter)	
	Spark-advance control	Centrifugal spark-advance	T&L: 0°/500 rpm 12.5°/2,063 rpm	T&L: 0°/500 rpm 4.5°/750 rpm 13.75°/2,000 rpm
		Vacuum spark-advance	rpm: distributor revolution	rpm: distributor revolution
	Spark plugs	Type	BR7EQ14, BR8EQ14, BR9EQ14 ... NGK W22EDR14, W25EDR14, W27EDR14 ... NIPPON DENSO	
Gap		1.4 ± 0.05 mm (0.055 ± 0.002 in)		
Battery	Type and capacity		50D20L : 50A 65D23L : 55A (20 hour rate)	
Alternator	Type		Λ5T30574	A5T40374
	Voltage—Capacity V—A		12V—55A	12V—60A
	Output test (at hot)	Voltage	13.5V	←
		Current	more than 51A	more than 53A
		Speed	2,500 rpm	2,500 rpm
	Type of regulator		IC regulator	←
	Regulated voltage		14.2 ~ 15.2	←
	Brush length	Standard	16.5 mm (0.65 in)	←
Wear limit		8 mm (0.31 in)	←	

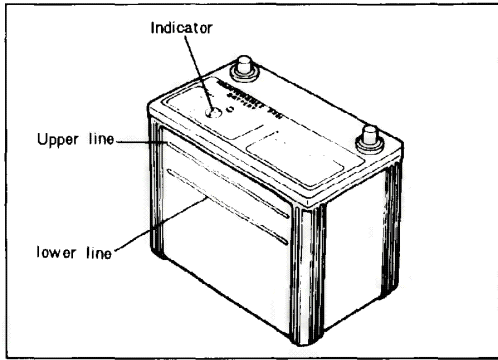
	Output (kW)	1.2 kW	2.0 kW
	Applicable		with M/T vehicle
Free running test	Voltage	11.5 V	←
	Current	Less than 60A	Less than 100A
	Speed	6,500 rpm	3,500 rpm
Brush length	Standard	17 mm (0.67 in)	←
	Wear limit	11.5 mm (0.45 in)	←
Depth of commutator		0.5 ~ 0.8 mm (0.02 ~ 0.03 in)	←
Pinion gap		0.5 ~ 2.0 mm (0.02 ~ 0.08 in)	←

5 TROUBLESHOOTING GUIDE

TROUBLESHOOTING GUIDE

47U05X-001

Problem	Probable Cause	Remedy	Page	
Starter motor does not turn at all, or its turning speed is too slow to start the engine.	Battery and related parts Poor contact of battery terminals Poor grounding of negative cable Voltage drop caused by discharged battery Insufficient voltage caused by battery malfunction	Clean and tighten Clean and repair Recharge Replace	5-5	
	Ignition switch and related parts Poor contact of ignition switch Loose ignition switch wiring or connector Broken wire between ignition switch and magnetic switch	Replace Repair Repair or replace	Section 15	
	Magnetic switch and related parts Loose wiring and/or connectors Burnt magnetic switch contact plate or contact Broken wire in magnetic switch pull-in coil Broken wire in magnetic switch holding coil	Repair Replace Replace	5-29	
	Starting motor and related parts Poor contact of brushes Fatigued brush spring Poor grounding of field coil Poor soldering of field coil Commutator malfunction Grounded amature Worn parts	Adjust contact or replace Replace Replace Repair Repair Replace Replace	5-25 5-27	
	Starting problem	insufficient battery capacity	Recharge	5-5
		Malfunction of spark plug(s)	Clean, adjust or replace	5-32
		Loose primary wiring	Tighten	
		Damaged distributor cap or rotor	Replace	5-33
		Ignition coil malfunction	Replace	5-37
	Starter motor turns but pinion gear does not mesh with ring gear	Igniter malfunction	Replace	5-37
Tip of overrunning clutch pinion is worn		Replace	5-28	
Fatigued overrunning clutch drive spring		Replace		
Overrunning clutch races		Replace		
Improper sliding of spline		Adjust contact and repair		
Worn bushing	Replace			
Starter motor turns continuously (does not stop)	Worn ring gear	Replace		
	Sticking contact plate of magnetic switch Layer shorting of coil of magnetic switch Ignition switch does not return	Replace Replace Replace	5-29 Section 15	
Misfiring of motor	Dirty or damaged spark plugs	Clean or replace	5-32	
	Malfunction of wiring, or poor wiring contact	Replace		
	Damaged distributor cap	Replace	5-33	
Discharging of battery	Loose V-belt	Adjust	5-11	
	Grounded or broken stator coil	Replace	5-15	
	Broken rotor coil	Replace		
	Poor contact of brush and slip ring	Clean or replace		
	Malfunction of rectifier	Replace		
	Malfunction of IC regulator	Replace	5-17	
	Insufficient or unsuitable battery electrolyte	Adjust	5-5	
	Malfunction of battery electrode (internal short circuit)	Replace		
	Poor contact of battery terminals	Clean and tighten		
	Excessive electric load	Check power consumption		
Overcharging of battery	IC regulator malfunction	Replace	5-13	
	Operating in extremely high temperature	Replace		



47U05X-002

BATTERY

INSPECTION

Checking the Battery

1. Check the indicator sign on the top of the battery. If the indicator sign is blue, the battery is normal.
2. If the blue indicator sign is not visible, then the electrolyte level of the battery is low and/or the capacity is insufficient.
3. Check whether or not the electrolyte level lies between the upper and lower lines. If low, add distilled water. Do not overfill. If the electrolyte level is acceptable and yet the blue indicator sign is not visible, the battery must be recharged.
4. Check the tightness of the terminals to ensure good electrical connections. Clean the terminals and coat the terminals with grease.
5. Inspect for corroded or frayed battery cables.
6. Check the rubber protector on the positive terminal for proper coverage.

RECHARGING

Charging Battery

Quick charging

Remove the battery from the vehicle and remove all the vent caps to perform a quick charge (6A or above, but max. 20A).

Slow charging

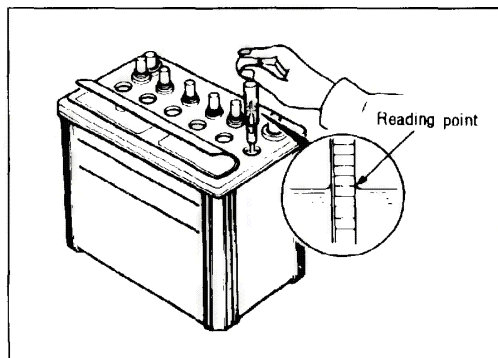
It is not necessary to remove the vent caps to perform a slow charge (under 5A).

Warnings

- a) Before performing maintenance or recharging of battery, turn off all accessories and stop the engine.
- b) The negative cable should be removed first and installed last.

Specific gravity of electrolyte at 20°C (68°F)		Charged rate (%)
50D20L	65D23L	—
1.280	1.280	100
1.220	1.230	75

47U05X-003



47U05X-004

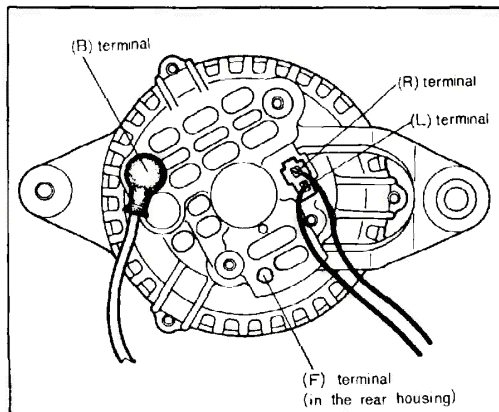
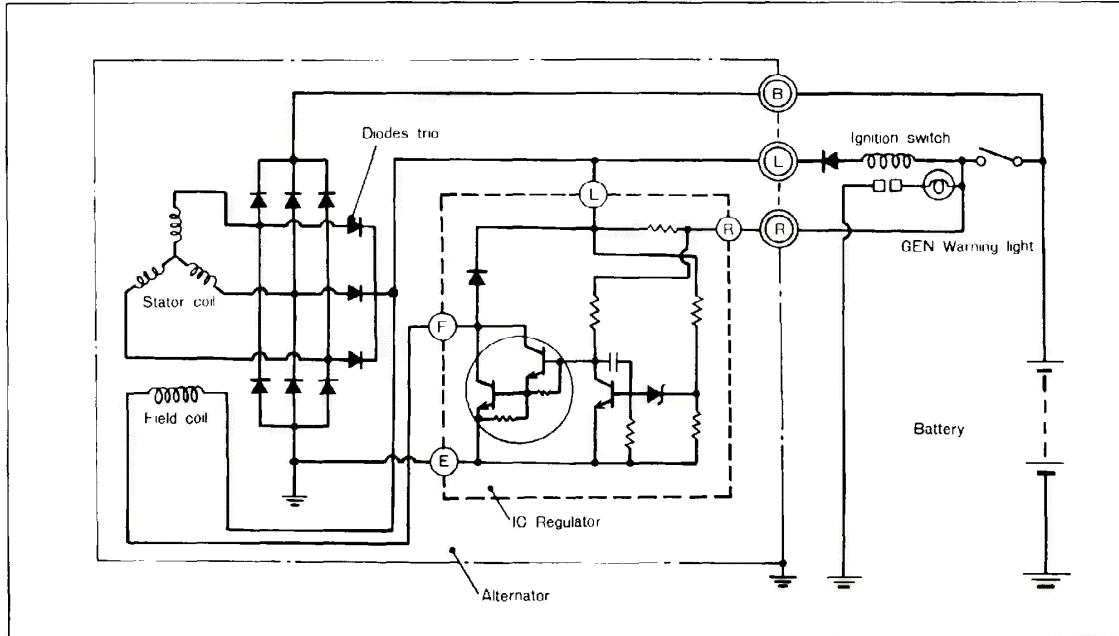
Checking specific gravity

1. If the indicator sign does not turn blue even when charged then measure the specific gravity with a hydrometer. When the specific gravity is under 1.220, charge once more.
2. If the indicator sign does not turn blue when the specific gravity is normal, the indicator could be defective.

5 ALTERNATOR

ALTERNATOR

CHARGING CIRCUIT



39G05X-003

CHARGING SYSTEM CAUTIONS

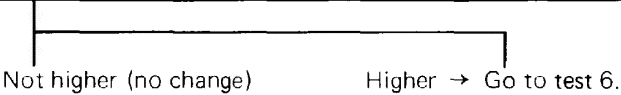
- Be sure battery connections are not reversed, because this will damage the rectifier.
- Do not use high-voltage testers, such as a megger, because they will damage the rectifier.
- Remember that battery voltage is always applied to the alternator's (B) terminal.
- Do not ground the (L) terminal while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

ON-VEHICLE INSPECTION

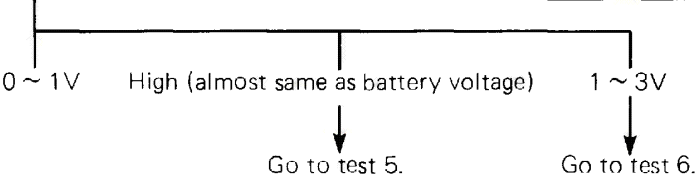
A. BATTERY OVERDISCHARGED

Note Rotation speed is engine rpm.

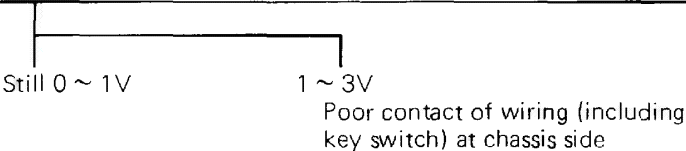
Test 1: With the engine idling, measure the voltage of the alternator's B terminal. Then measure B terminal voltage at about 2,000 rpm, and compare with voltage measured at idle speed. Is voltage at 2,000 rpm higher?



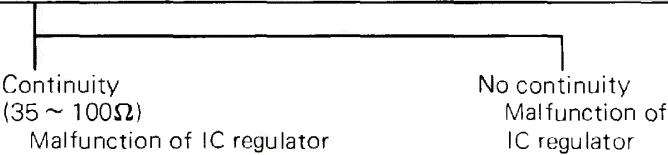
Test 2: With the engine stopped and the key switch ON, measure the voltage of the alternator's L terminal. (In other words, check whether field current is flowing or not.)



Test 3: Short-circuit the B and R terminals of the alternator, using different lead wires, and then repeat test 2.

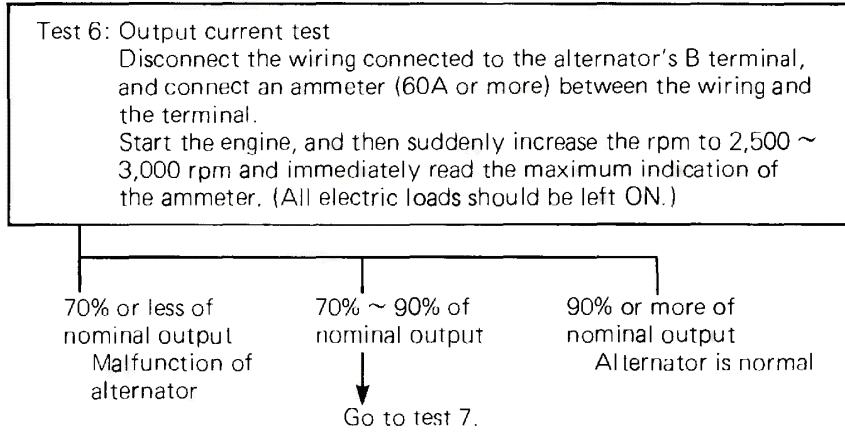
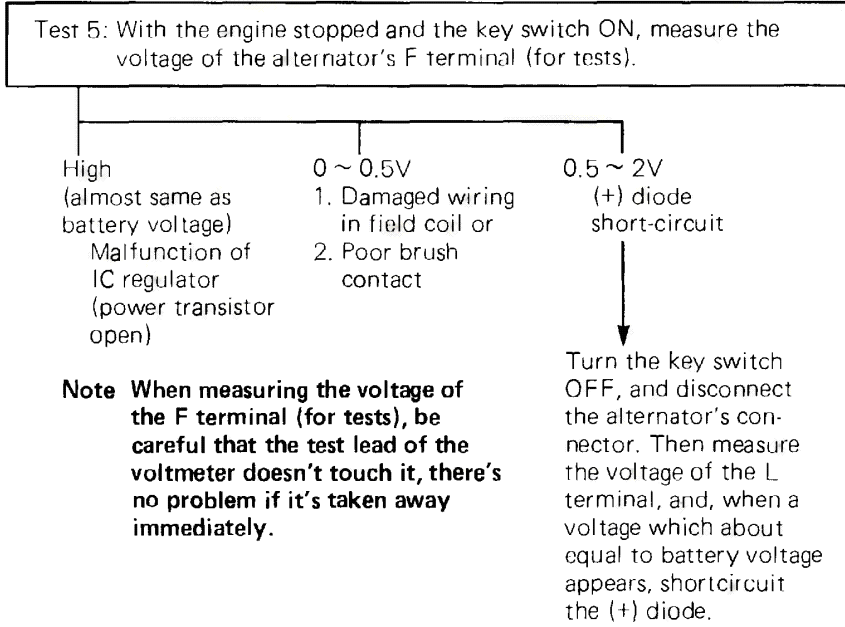


Test 4: Disconnect the alternator's connector, and check continuity between L and R terminals.



57U05X-101

5 ALTERNATOR



47U05X-102

Test 7: Output current test (re-check)

After slightly discharging the battery, repeat test 6. (In other words, the lack of output current flow may be because of a small flow load on load current.) In addition, also carefully check if there is a poor contact somewhere in the wiring between the alternator's B terminal and the battery's (+) terminal.

90% or less of nominal output
Remove the alternator from the engine and inspect it carefully.

90% or more of nominal output
Alternator is normal.

Test 8: Adjustment voltage test (after test 6 or test 7, if needed)

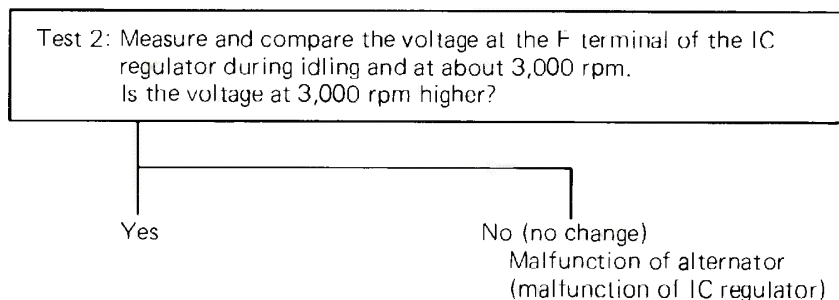
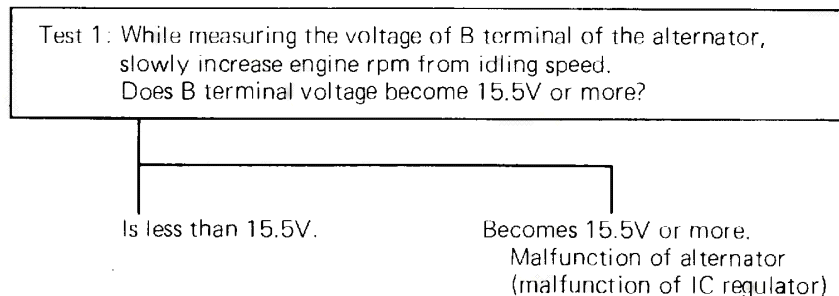
Disconnect the cable from the battery's (+) terminal and connect an ammeter (50A or more) between the cable and the battery. Before starting the engine, short-circuit the ammeter terminals so that starter current will flow to the ammeter. Start the engine and read the ammeter indication (charging current) at about 2,500 rpm. If it is less than 5A, measure the L terminal voltage at that time. This is the adjustment voltage. If it is 5A or more, either charge for a while until it becomes less than 5A, or else replace with a fully charged battery and measure once again.

$14.7 \pm 0.5V$
(At 20°C)
IC regulator is normal.

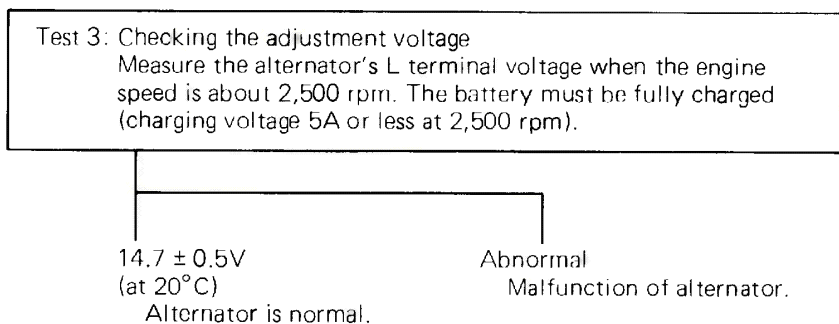
Abnormal
Malfunction of the alternator

5 ALTERNATOR

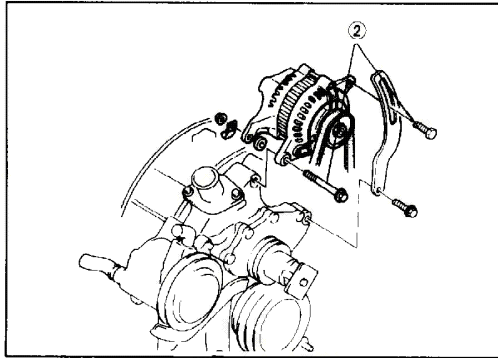
B. BATTERY OVERCHARGED



Note F terminal voltage may not become high when the battery is discharging.



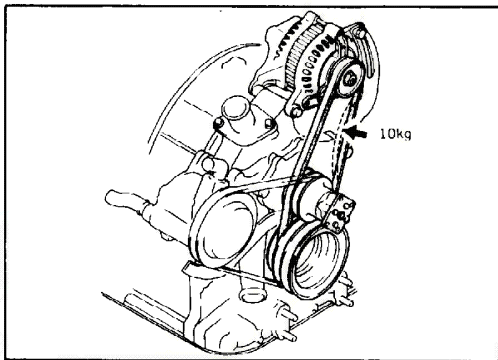
47U05X-104



39G05X-004

REMOVAL

1. Disconnect the negative (-) battery terminal.
2. Remove the bolts (1).
3. Disconnect the wiring and connector from the alternator.
4. Remove the following parts:
 - (1) V-belt
 - (2) Alternator



39G05X-005

INSTALLATION

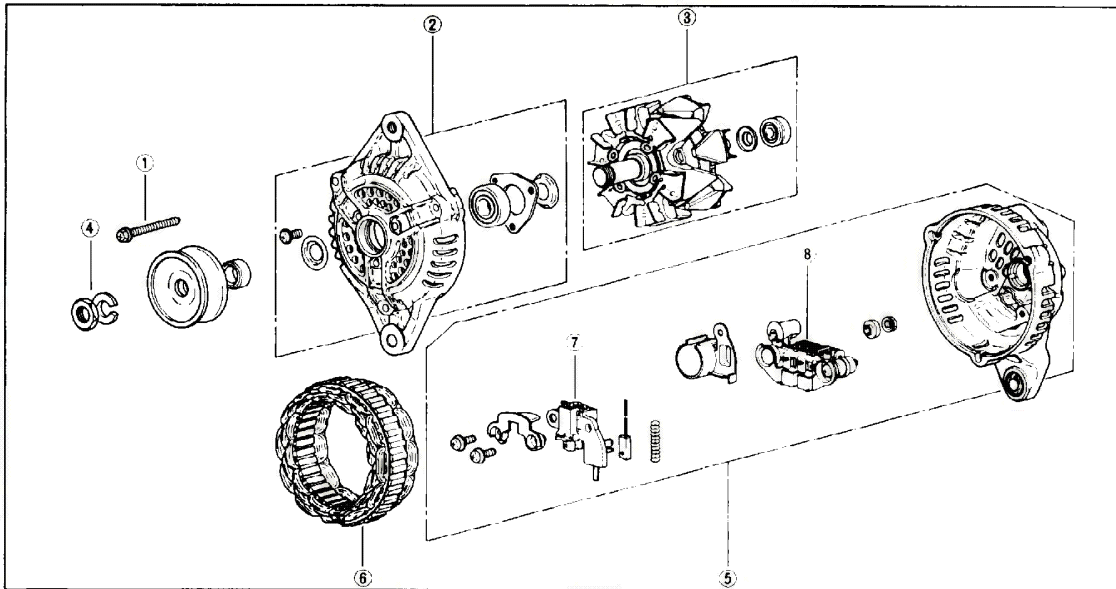
Installation is the reverse order of removal.
Note the following points:

Adjust the tension of the V-belt.

Deflection

New belt	9 ~ 11 mm (0.35 ~ 0.43 in)
Used belt	12 ~ 17 mm (0.47 ~ 0.67 in)

STRUCTURAL VIEW

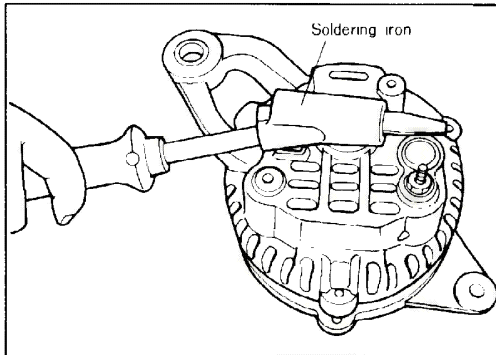


- 1 Bolt
- 2 Front bracket
- 3 Rotor and fan

- 4 Lock-nut
- 5 Rear bracket
- 6 Stator

- 7 Brush-holder assembly
- 8 Rectifier

5 ALTERNATOR



57U05X-001

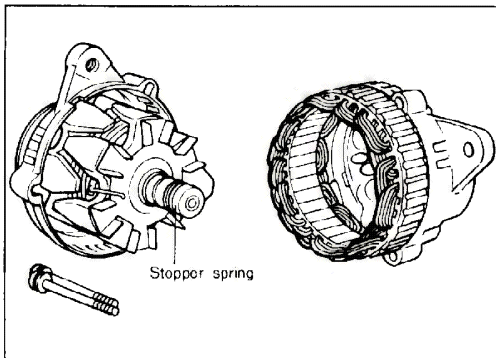
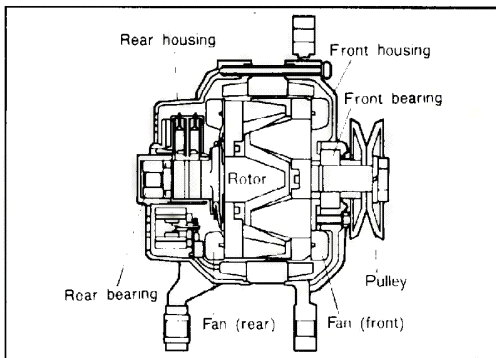
DISASSEMBLY

1. Use a soldering iron (200W class) in the bearing box for **3 or 4 minutes** to heat to about **50 to 60°C (122 ~ 144°F)**.

Next, pull out the three bolts, and then insert a flat-tip screwdriver between the stator core and front bracket and separate them.

Note

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

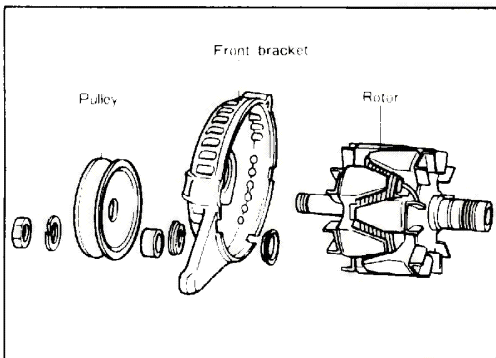


39G05X-007

2. Separate into the rear part and the front part.

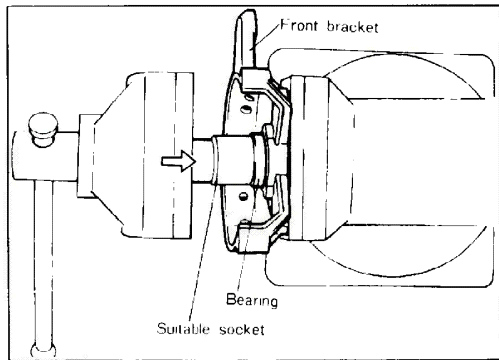
Note

Be careful not to lose the stopper spring the fits around the circumference of the rear bearing.



39G05X-008

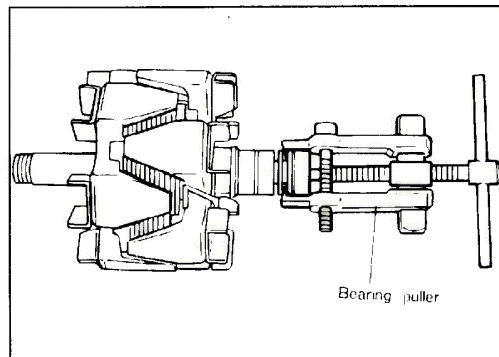
3. When the pulley installation nut is removed, the pulley, rotor and front bracket can be disassembled.



39G05X-009

4. Replacement of the front bearing

With a socket wrench which exactly fits on the outer race of the bearing, carefully press the bearing in, taking care that it is even, by using a hand press or a bias.

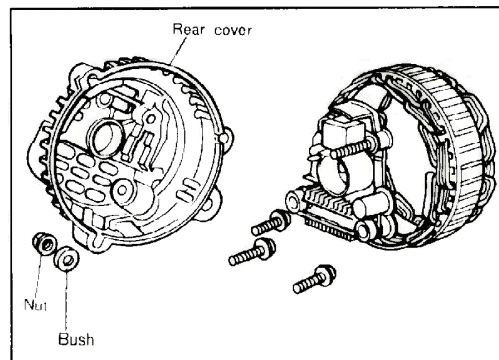


39G05X-010

5. Replacement of the rear bearing

The bearing can be pulled out by using a bearing puller.

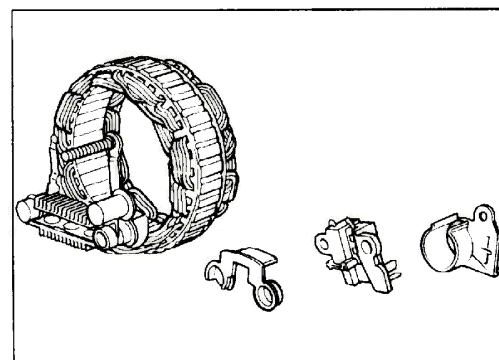
When it is pressed in, press it in so that the groove at the bearing circumference is at the slip ring side.



39G05X-011

6. Remove the nut of the B terminal and the insulation bushing.

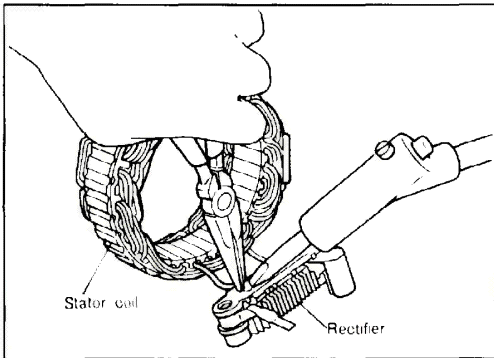
Remove the rectifier holding screws (two) and the brush holder holding screw, and then separate the rear bracket and stator.



39G05X-012

7. Remove the IC regulator.

5 ALTERNATOR

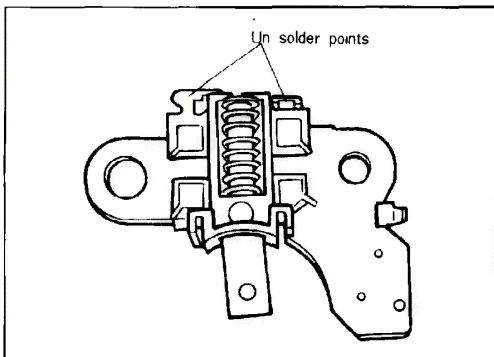


57U05X-002

8. Use a soldering iron to melt the solder of the rectifier and the stator coil lead.

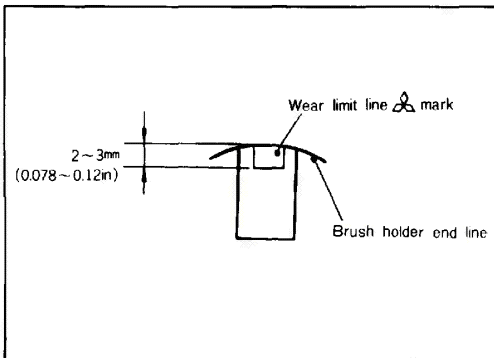
Caution

Do the disconnecting quickly, using the soldering iron no more than about 5 seconds, because the rectifier may become damaged if the inside is overheated.



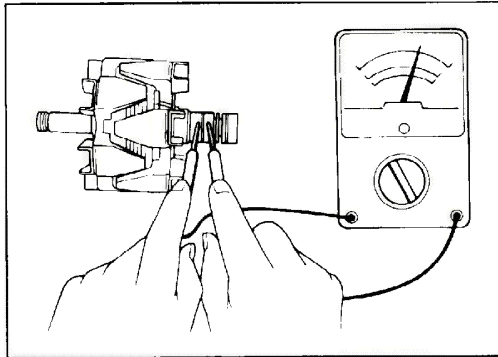
39G05X-014

9. Replacement of the brush
Melt the solder of the pigtail, and then remove the brush.

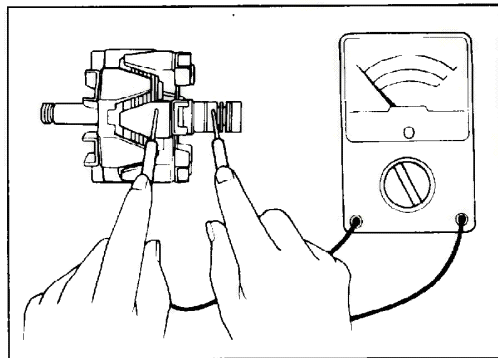


39G05X-015

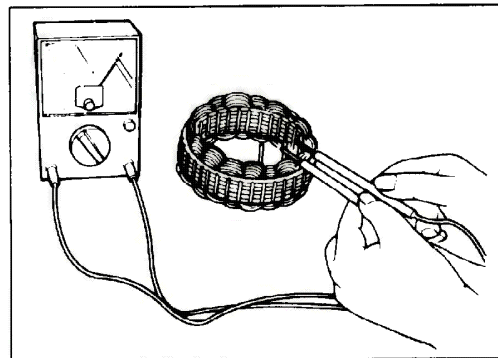
10. When soldering the brush, solder the pigtail so that the wear limit line of the brush projects **2 or 3 mm (0.079 ~ 0.118 in)** out from the end of the brush holder.



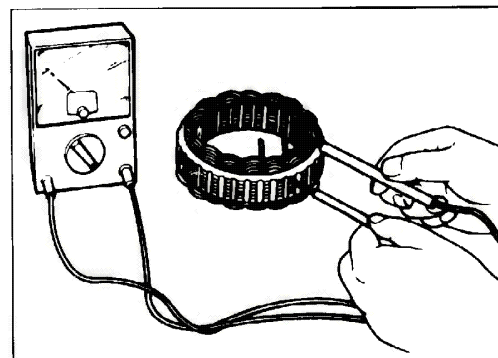
39G05X-016



39G05X-017



39G05X-018



39G05X-019

INSPECTION

1. Checking the rotor coil for wiring damage
Measure the resistance between the slip rings by using a circuit tester. It should be between **2.0 and 2.6 ohms**. If it is not within this range, replace the rotor.

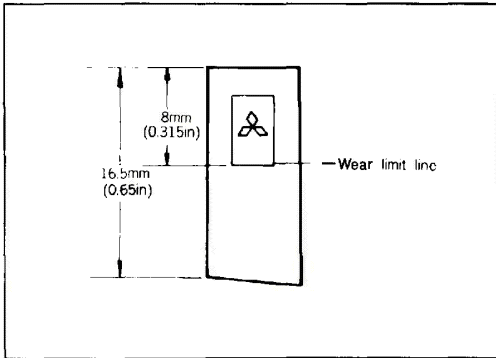
2. Checking the grounding of the rotor coil
Check for continuity between the slip ring and the core by using a circuit tester. Replace the rotor if there is continuity.

3. Checking the slip ring surface for roughness
If the slip ring surface is rough, use a lathe or fine sandpaper to repair it.

4. Checking the stator coil for wiring damage
Check for continuity between the stator coil leads by using a circuit tester. Replace the stator if there is no continuity.

5. Checking the grounding of the stator coil
Check for continuity between the stator coil leads and the core by using a circuit tester. Replace the stator if there is continuity.

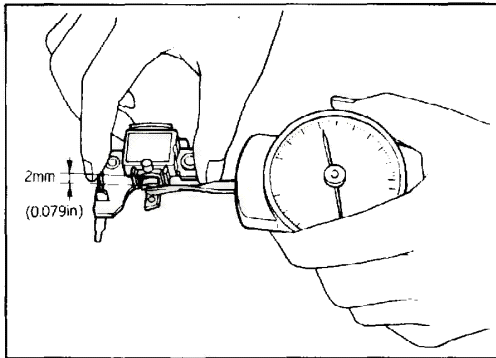
5 ALTERNATOR



39G05X-020

6. Checking for brush wear

If the brush is worn beyond the limit, or if it is worn almost to the limit, replace the brush.



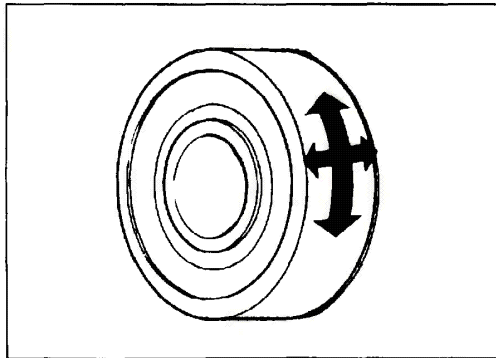
39G05X-021

7. Checking the force of the brush spring

Measure the force of the brush spring by using a spring pressure gauge. Replace the spring if the force is **210g (7.4 oz)** or less. When making the measurement, use the spring pressure gauge to push the brush into the brush holder until the tip projects **2 mm (0.079 in)**, and read the force at that time.

Note

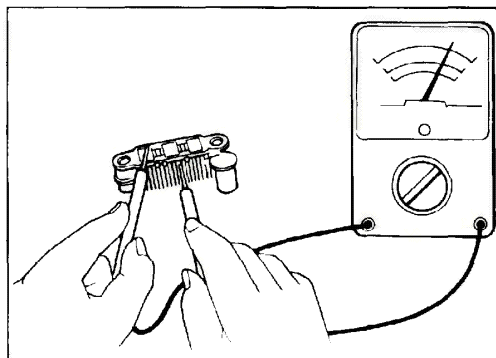
For a new brush the force is **300 to 440g (10.6 ~ 15.5 oz)**.



39G05X-022

8. Checking the bearing

Check for abnormal noise, looseness, insufficient oil, etc. Replace the bearing if there is any abnormality.

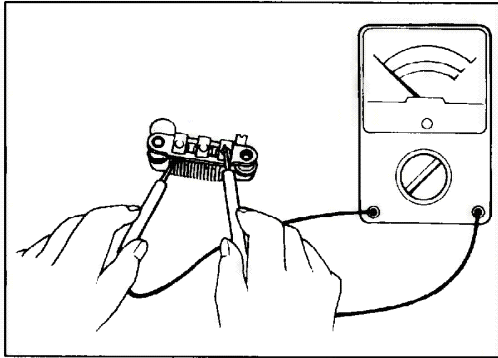


39G05X-023

9. Checking the rectifier

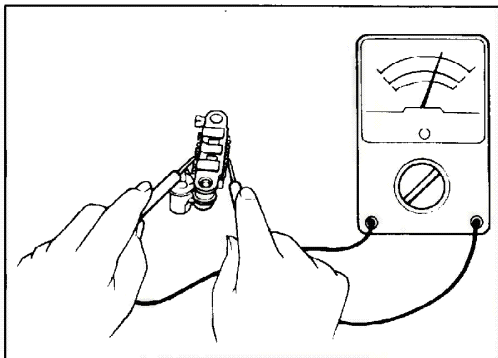
(1) Checking the positive diode

Check for continuity between the diode lead and the heat sink at the positive side. There should be continuity only in the direction from the diode lead to the heat sink.



39G05X-024

- (2) Checking the negative diode
Checking for continuity between the diode lead and the heat sink at the negative side. There should be continuity only in the direction from the heat sink to the diode.



39G05X-025

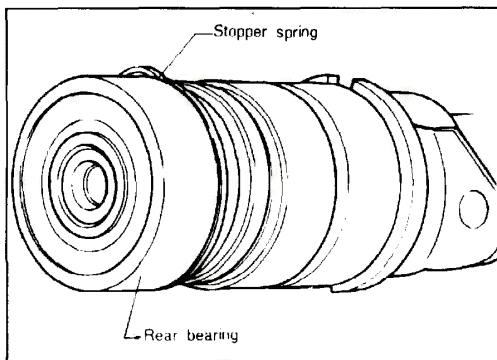
- (3) Checking the trio diode
Check for continuity by using a circuit tester. There should be continuity in one direction only.

5 ALTERNATOR

ASSEMBLY

Basically, assembly is in the reverse order of disassembly. There are no lubrication points.

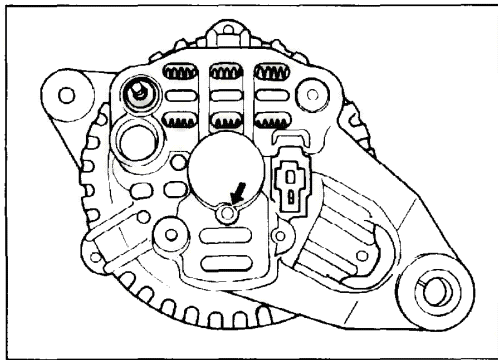
1. Fit the stopper spring into the eccentric groove of the rear bearing circumference. The protruding part of the spring should be fit into the deepest part of the groove. Note that, for easy recognition, the edge of the deepest part of the groove is chamfered.



39G05X-026

Note

By fitting the stopper spring in this way, the amount of spring protruding from the groove is lessened, so that assembly becomes easier. In addition, no strain is exerted upon the spring and thus its stopping effect becomes greater.



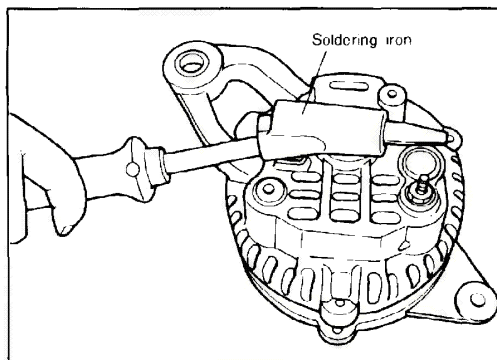
39G05X-027

2. Brush lifting

Before assembly, use a finger to push the brush into the brush holder, pass a wire ($\phi 2$ mm, 4 to 5 cm long) through the hole shown in the figure, and secure the brush in position.

Note

Be sure to pull the wire out after the assembly is completed.

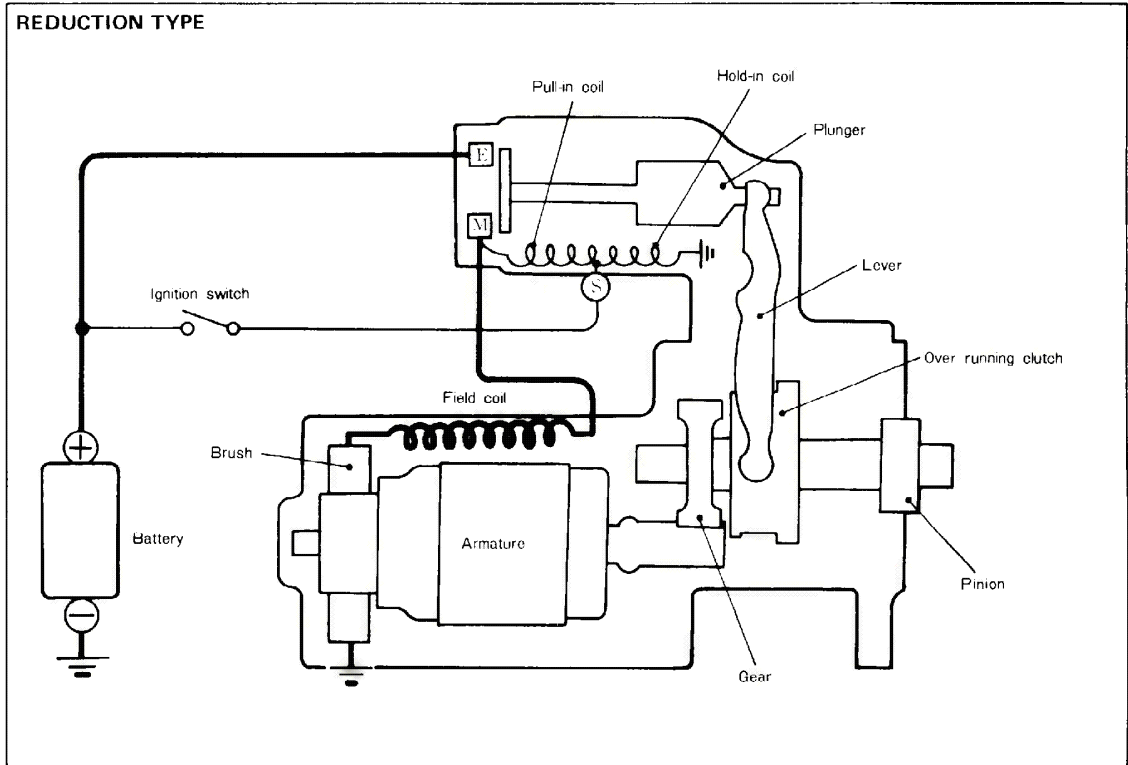
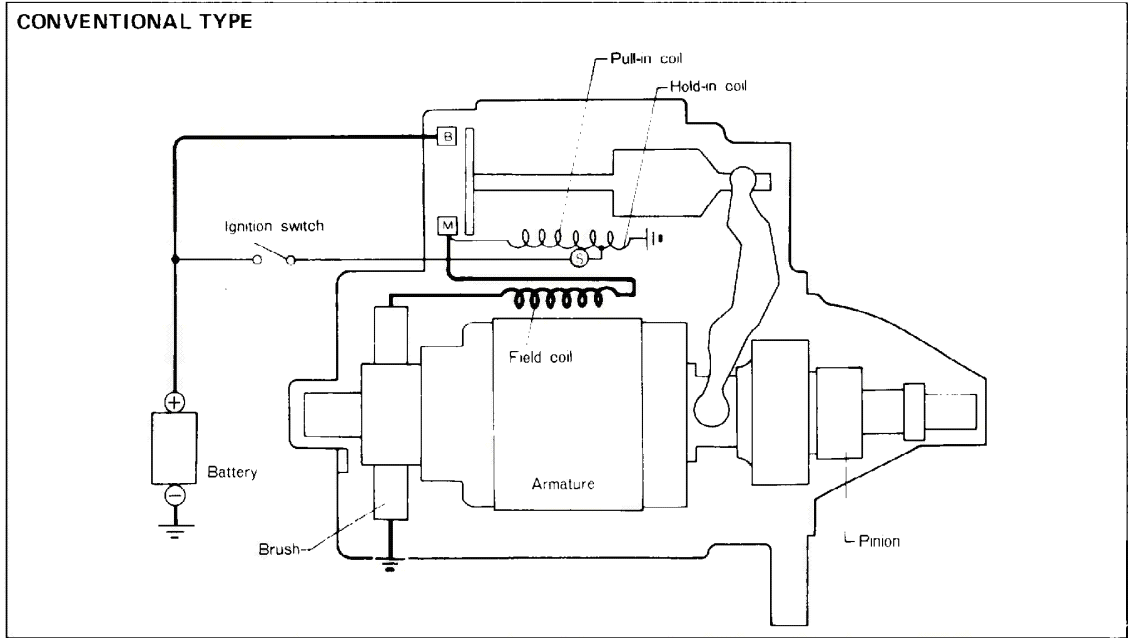


39G05X-028

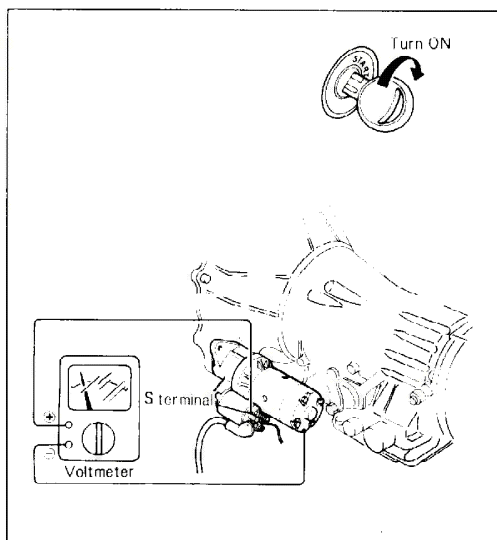
3. When the rear bearing is pressed into the rear bracket, first heat the bracket before pressing it in.
4. After assembly is completed, rotate the pulley manually and check to be sure that the rotor turns lightly.

STARTER MOTOR

STARTING SYSTEM CIRCUIT



5 STARTER MOTOR



39G05X-029

ON-VEHICLE INSPECTION

Before this inspection, measure the specific gravity of the battery, and check to be sure that the value is the full-charge or nearly full-charge value.

A. If the magnet switch doesn't function during starting.

With the ignition key switch at the start position, measure the voltage between the S terminal and ground. If the measure value is 8V or more, there is a starter malfunction; if it is less than 8V, there is a malfunction in the wiring.

Caution

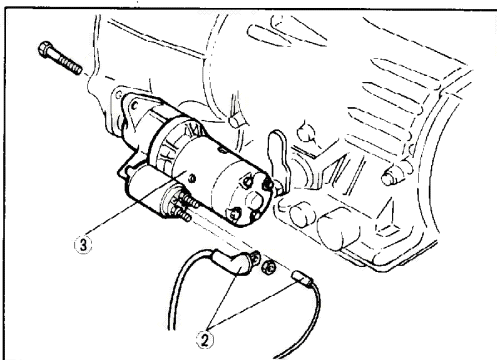
If the magnet switch is hot, it may not function even though the voltage is 8V or more.

B. If the starter won't crank, or if the cranking speed is slow

The problem may be a malfunction of the starter or in the wiring.

Note

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



39G05X-030

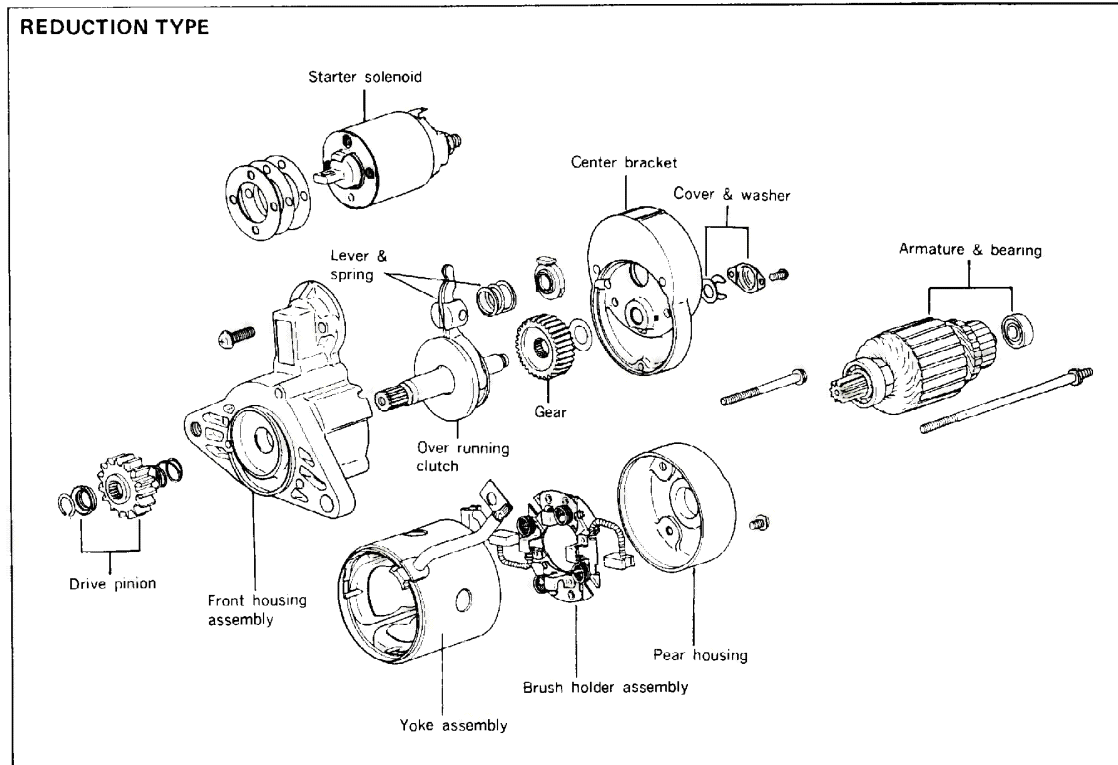
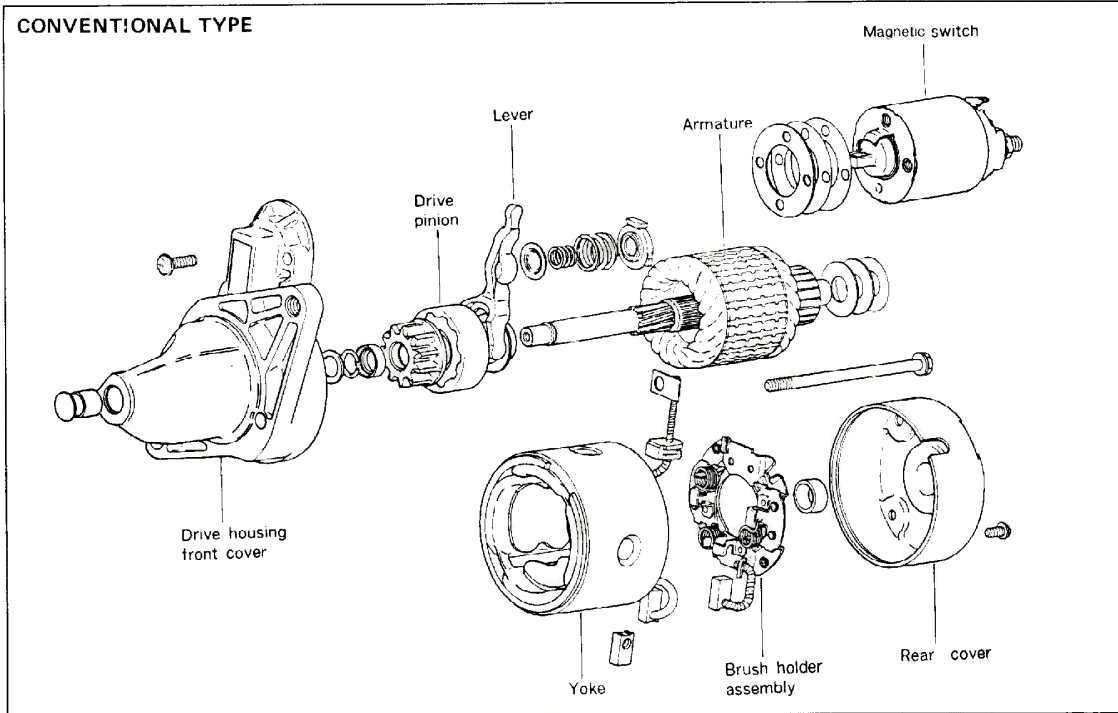
REMOVAL AND INSTALLATION

Removal is at follows;

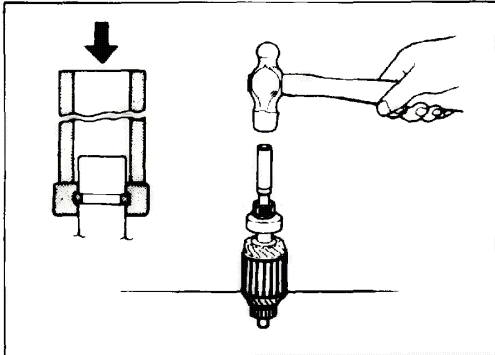
1. Disconnect the negative battery cable.
2. Disconnect the wiring from the starter motor.
3. Remove the starter motor.

Installation is the reverse order of removal.

STRUCTURAL VIEW



5 STARTER MOTOR



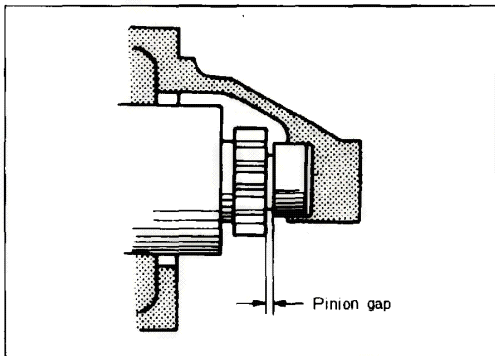
39G05X-032

DISASSEMBLY

< Conventional type >

Drive pinion

Remove the stopper for the overrunning clutch by using a pipe as shown in the figure.

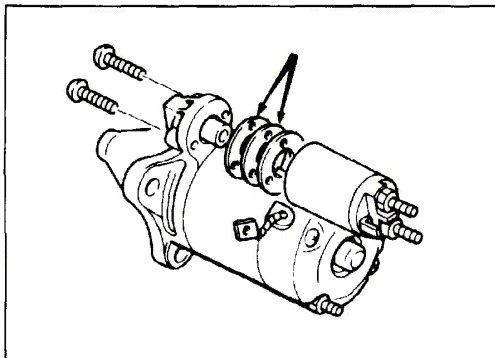


39G05X-033

Adjustment of pinion gap

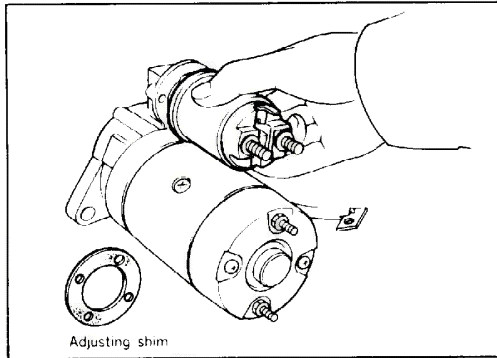
1. Disconnect the wiring from terminal (M).
2. When the battery is connected between terminal (S) and the starter motor body, the pinion will eject outward and then stop. Then measure the clearance (pinion gap) between the pinion and the stopper. Be careful not to let electricity flow continuously for more than 20 seconds.

Pinion gap: 0.5 ~ 2.0 mm (0.020 ~ 0.079 in)



39G05X-034

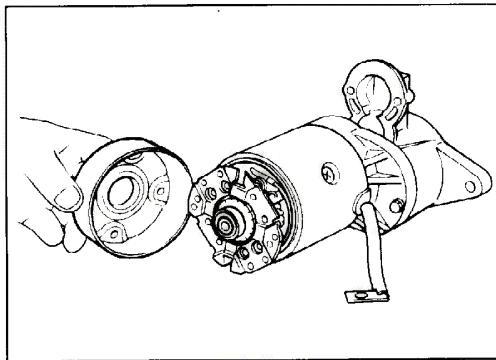
3. If the pinion gap is not within the specified range, make the adjustment by increasing or decreasing the number of washers used between the magnetic switch and the front bracket. The gap will become smaller if the number of washers is increased.



47U05X-005

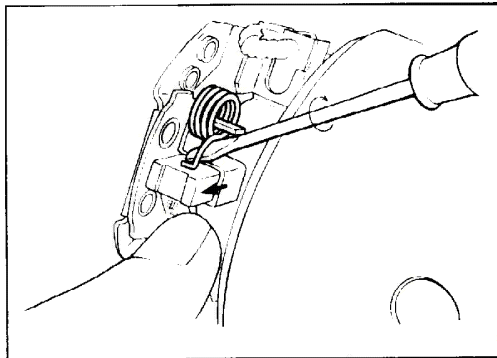
< Reduction type >

1. Remove the nut for the switch M terminal, and then remove the connector. When the two switch installation screws are removed, the switch and the adjustment shim (which may or may not have been used) can be removed.



47U05X-006

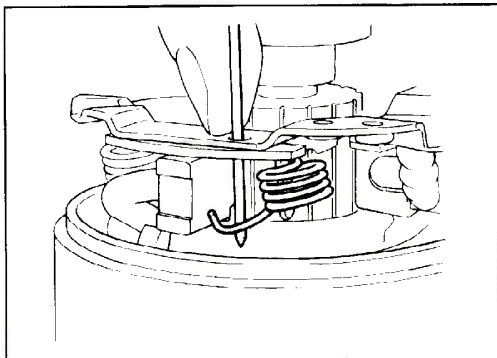
2. Remove the two brush holder installation screws and the two through-bolts, and then remove the rear bracket.



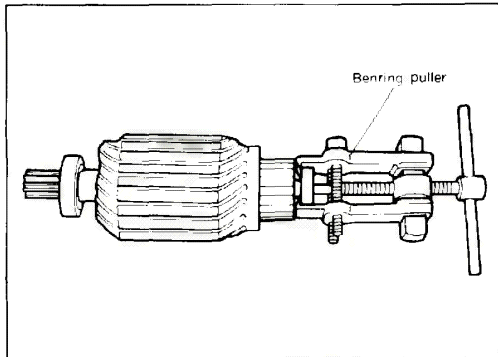
47U05X-007

3. When the brush spring is pulled upward and the two (+) side brushes are removed, the brush holder can then be removed.
To pull the brush spring upward, use a flat-tip screwdriver as shown in figure, or use a piece of piano wire ($\phi 2$), to make the work easier.

Pulling the brush spring upward

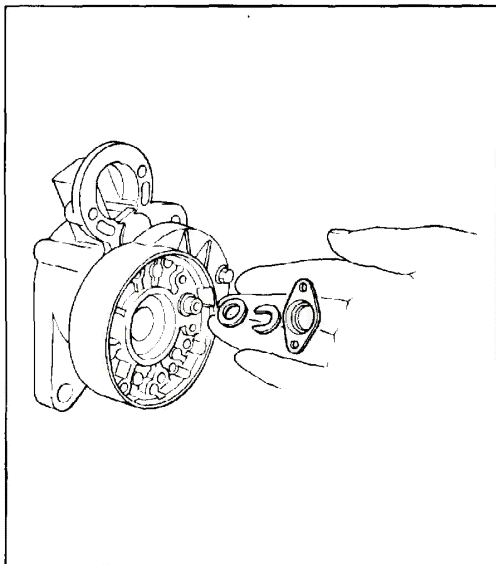


5 STARTER MOTOR



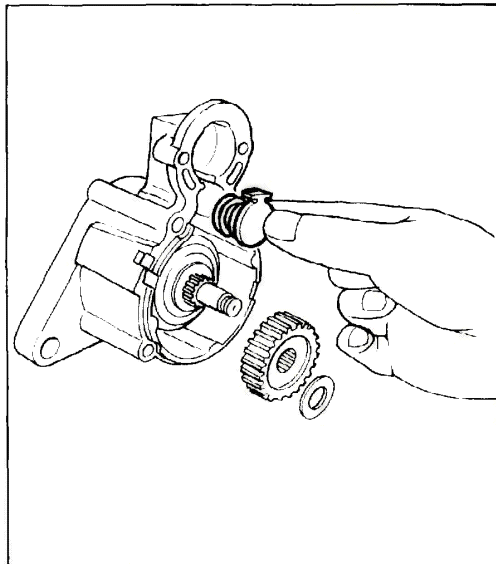
47U05X-008

4. Remove the yoke and armature.
5. The bearing of the armature can be removed by using an ordinary bearing puller.



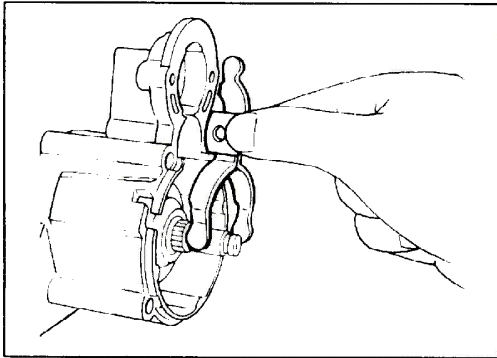
47U05X-009

6. Remove the two cover-tightening screws, the cover, the C washer, and the adjustment washer.
7. Remove the center bracket installation bolt, and then remove the center bracket.



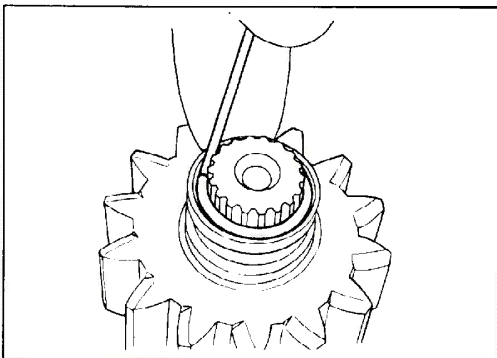
47U05X-011

8. Remove the adjustment washer and the reduction gear.
Remove the packing and spring.



47U05X-012

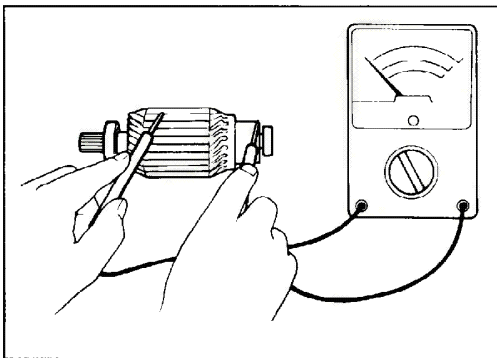
9. Remove the lever.



47U05X-013

10. Tap the stop ring by using a hammer so that the ring which secures the stop ring and the shaft can be seen. Insert a nail into the crack in the ring and pry the ring up.

11. The bearing of the front bracket cannot be replaced as an individual part; replace it together with the front bracket.



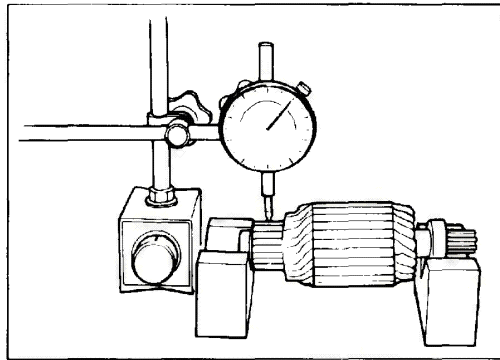
39G05X-035

INSPECTION

1. Checking the grounding of the armature coil

Check for continuity between the commutator and the core by using a circuit tester. Replace the armature if there is continuity.

5 STARTER MOTOR



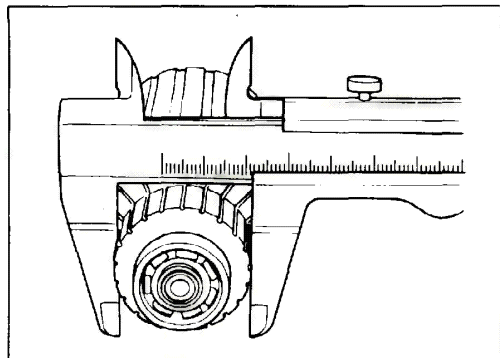
39G05X-036

2. Checking for vibration of the commutator

Hold the armature on top of the V block, and measure the vibration by using a dial gauge. If the vibration is **0.05 mm (0.002 in) or more**, repair it by using a lathe, or replace the armature.

Note

Before checking, check to be sure that there is no play of the bearing.



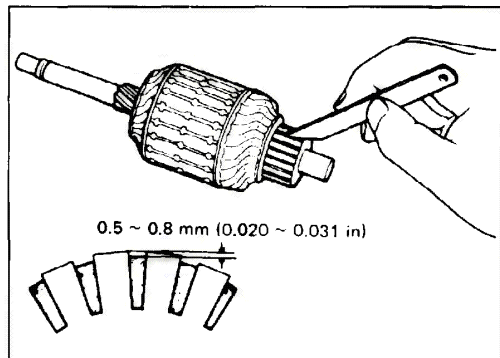
39G05X-037

3. Checking the outer diameter of the commutator

Replace the armature if the outer diameter of the commutator is **31 mm (1.22 in) or less**.

4. Checking for roughness of the commutator surface

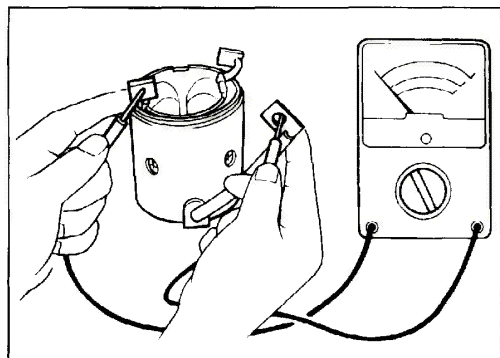
If the commutator surface is dirty, wipe it with a cloth; if it is rough, repair it by using a lathe or fine sandpaper.



39G05X-038

5. Undercutting the segments

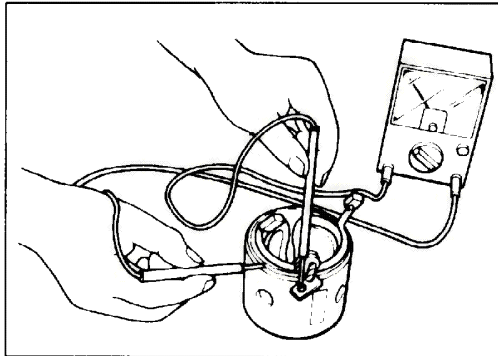
If the shrinkage of the mold between segments is **0.2 mm (0.008 in) or less**, undercut by **0.5 to 0.8 mm (0.02 ~ 0.13 in)**.



39G05X-039

6. Wiring damage of the field coil

Check for continuity between the connector and brush by using a circuit tester. Replace the yoke assembly if there is no continuity.



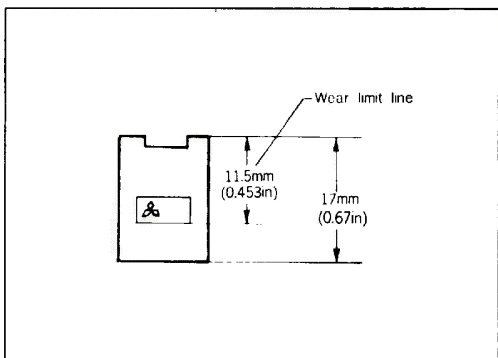
39G05X-040

7. Checking the grounding of the field coil

Check for continuity between the connector and yoke by using a circuit tester. Repair, or replace the yoke assembly if there is continuity.

8. Checking the installation of the field coil and core

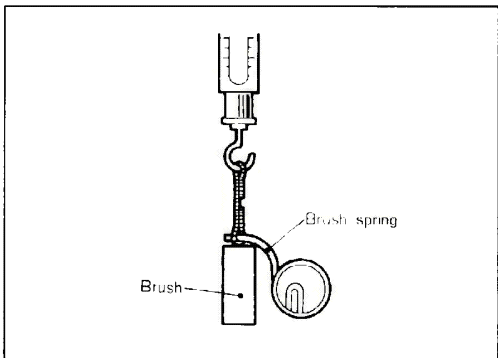
Replace the yoke assembly if the field coil and core are loose.



39G05X-041

9. Checking for brush wear

If there is brush wear beyond the wear limit, or if the wear is near the limit, replace the brush.



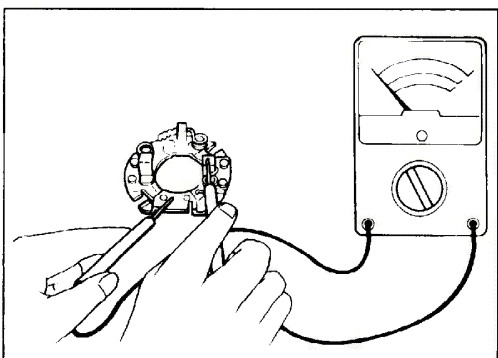
39G05X-042

10. Checking the force of the brush spring

Measure the force of the brush spring by using a spring balance. Replace the brush spring if the force is **0.9 kg (31.75 oz) or less**.

Notes

- a) The force is to be measure at the moment the brush spring separates from the brush.
- b) The force must be 1.4 to 2.6 kg (3.1 lb ~ 5.7 lb) for a new brush.



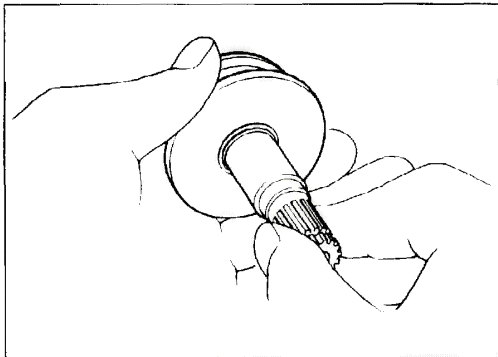
39G05X-043

11. Checking the brush holder

Check for continuity between the insulated brush and the plate by using a circuit tester. Repair or replace if there is continuity.

Also check to be sure that the brush slides smoothly inside the brush holder.

5 STARTER MOTOR

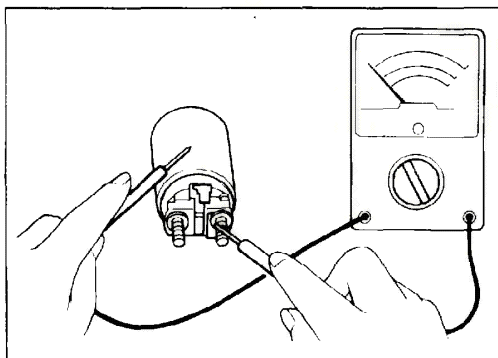


47U05X-015

12. Checking the clutch

Turn the pinion shaft by hand; when it is turned in one direction, it should turn smoothly, but, when turned in the opposite direction, it should lock and turn no farther.

If it turns in both directions, or turns roughly in the direction in which it should turn smoothly, replace the pinion shaft assembly.



39G05X-045

13. Checking the switch coil

Check for continuity between the M terminal and the body by using a circuit tester. Replace the switch if there is no continuity.

14. Checking the pinion gear

Check the pinion gear for unusual wear or damage, and replace it if necessary. If the pinion gear is badly damaged, the ring gear should also be checked.

47U05X-016

15. Checking the bearing of the armature

Check for abnormal noise, play, insufficient lubrication, etc. Replace the bearing if necessary.

The bearing can be removed by using an ordinary bearing puller. When pressing it in, press it in carefully by using a hand press.

47U05X-017

16. Checking the bearing of the front bracket

The bearing only cannot be replaced; if replacement is necessary, replace it together with the front bracket.

47U05X-018

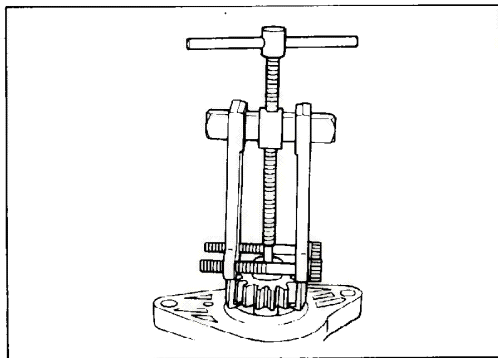
47U05X-019

ASSEMBLY

Basically, assembly is the reverse order of disassembly.

During assembly, the following places should be lubricated.

1. Gear of armature shaft
2. Reduction gear
3. Ball bearings (both ends of the armature)
4. C washer of pinion shaft
5. Lever sliding part
6. Plunger circumference (very slight lubrication)
7. Front bracket metal part



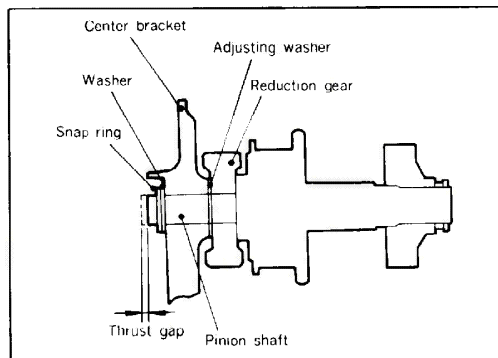
47U05X-020

1. Installation of the pinion

Place the spring, pinion and stop ring on the pinion shaft. Then firmly fit the ring into the groove in the shaft. In order to secure the stop ring to the ring, use an ordinary bearing puller to pull the bearing upward as shown in the figure. If the ring can't be correctly fitted to the stop ring, tap the ring with the tip of a flat-tip screwdriver.

Note

Never re-use a scarred ring.



47U05X-021

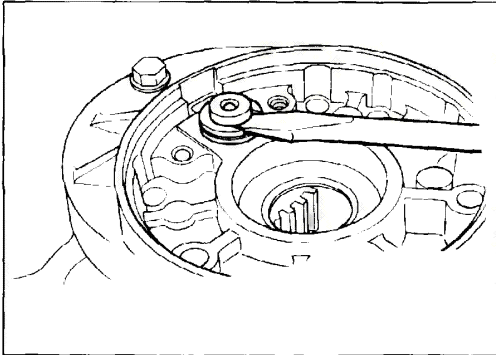
2. Installation of the lever

Be sure the lever faces in the correct direction.

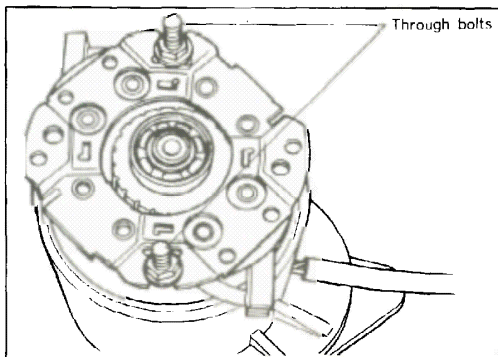
3. Pinion shaft thrust gap adjustment

By this thrust gap is meant the axial play of the shaft which is to be adjusted to **0.5 mm (0.02 in.)** max. by means of adjusting washer. To adjust proceed as follows.

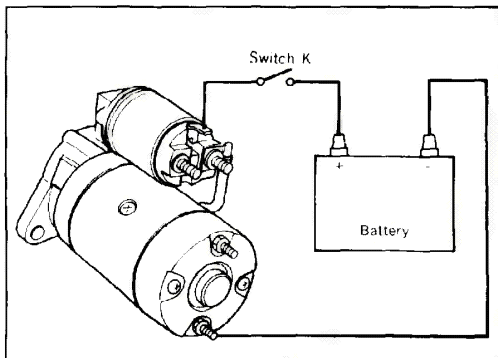
5 STARTER MOTOR



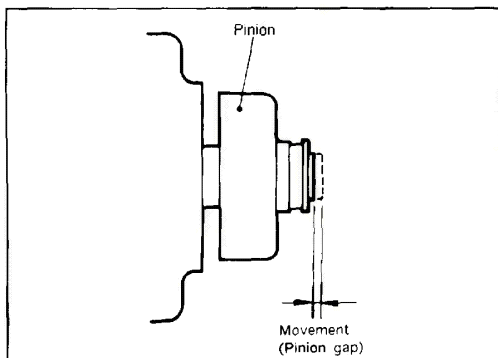
47U05X-022



47U05X-023



47U05X-024



Install washer and C-shaped washer onto the end of pinion shaft.

With bolt securing center bracket tightened, measure end play as shown in the figure.

Move pinion shaft in the axial direction with a screwdriver to see whether a proper end play is obtained. If the play is out of specification, adjust it by means of adjusting washer.

4. Installation of the brush holder and rear bracket

Install the brush holder while carefully checking the position of the through-bolts.

Note

The brush holder and rear bracket are symmetrical, and so can be installed facing in either direction.

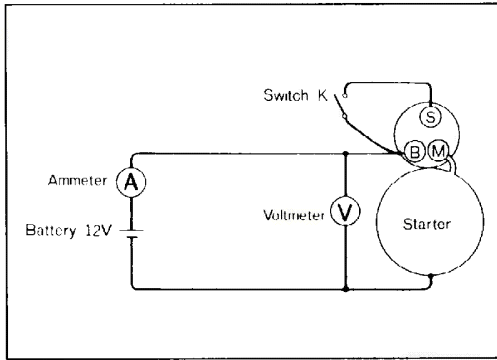
5. Pinion gap adjustment

After completing reassembly, check pinion gap to be sure that it is between **0.5 and 2.0 mm (0.020 and 0.079 in.)**.

To adjust, proceed as follows:

- (1) Connect the starter to a battery, as shown in the figure. Close switch K. This will shift pinion into cranking position.
- (2) Push pinion shaft back by hand and measure the amount of pinion shaft movement. The amount corresponds to pinion clearance of current starters.

If the amount does not fall within limit, adjust it by adding or removing shims which are located between switch and front bracket. Adding shims decreases the amount of the movement.



57U05X-003

NO-LOAD TEST

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

Note

Use wires as thick as possible and tighten each terminal fully.

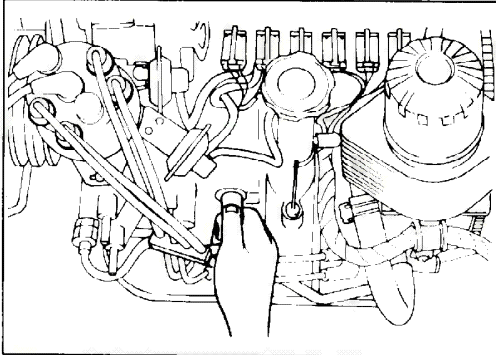
2. Close switch "K" to run the starter until its speed rises to and above **6,500 rpm** (gear shaft rpm). If the voltmeter and ammeter show the following values while the starter is running, it is normal.

Battery voltage 11.5 volts

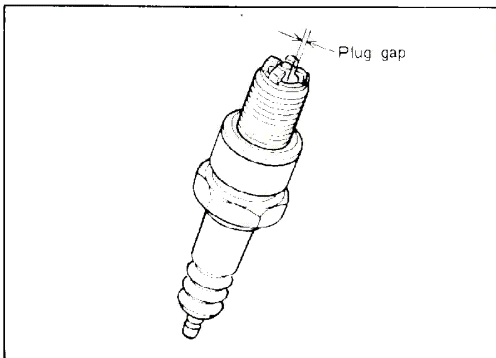
**Current 60 amperes or less...conventional
100 amperes or less...reduction**

3. If any abnormality is noted, check it according to "Inspection".

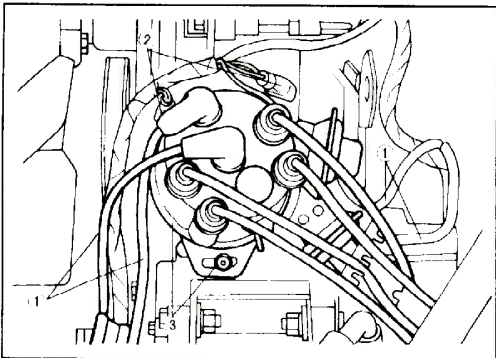
5 SPARK PLUG, DISTRIBUTOR



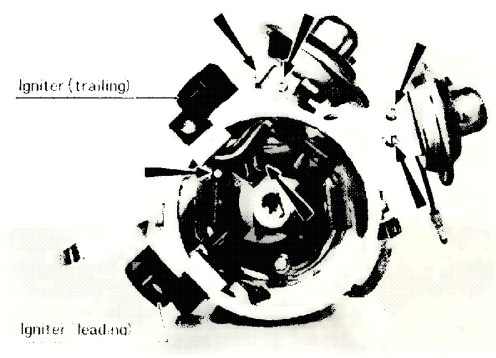
47U05X-025



47U05X-026



47U05X-028



47U05X-029

SPARK PLUG

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 any 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 sprak plug gap (initial):

1.4 ± 0.05 mm (0.055 ± 0.002 in)

INSTALLING SPARK PLUG

Install the sprak 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 **13 ~ 18 N·m (9 ~ 13 ft·lb)**.

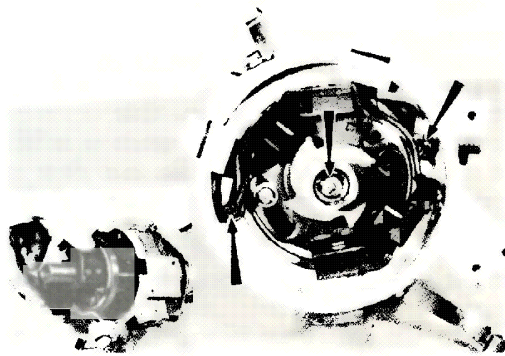
DISTRIBUTOR

REMOVING DISTRIBUTOR

1. Disconnect the hightension cords and vacuum sensing tubes from the distributor.
2. Disconnect the couplers of igniters and condenser lead.
3. Remove the distributor lock nut and pull out the distributor.

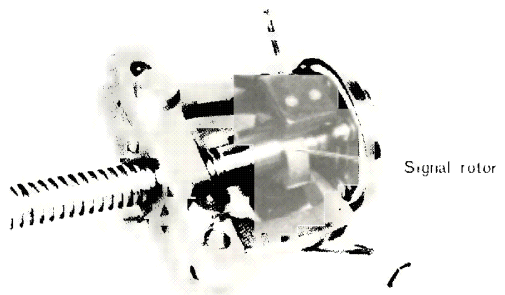
DISASSEMBLY

1. Remove the distributor cap, rotor and seal cover.
2. Remove the screws attaching the igniter to the distributor housing, and remove the igniter.
3. Remove the clips holding the vacuum diaphragm links.
4. Remove the screws attaching the vacuum control units to the distributor housing, and remove the vacuum control units and condenser.



47U05X-030

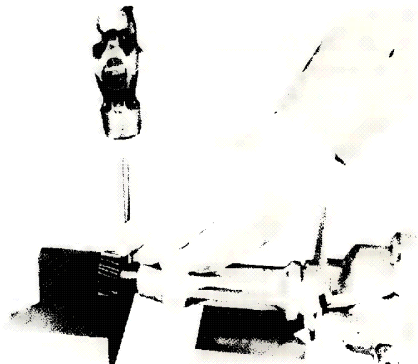
5. Remove the signal rotor shaft attaching screw and coil base bearing attaching screws.
6. Remove the signal rotor, rotor shaft, pick-up coil and coil base bearing assembly through the top of the distributor drive shaft.



Signal rotor

47U05X-031

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



47U05X-032

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

INSPECTION

Inspect the following parts and replace if necessary.

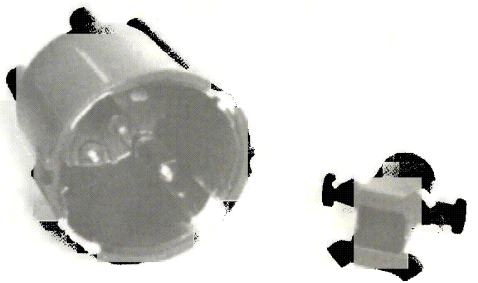
Distributor cap

Inspect the distributor cap for cracks, carbon tracks, burnt and corroded terminals.

Check center contact for wear.

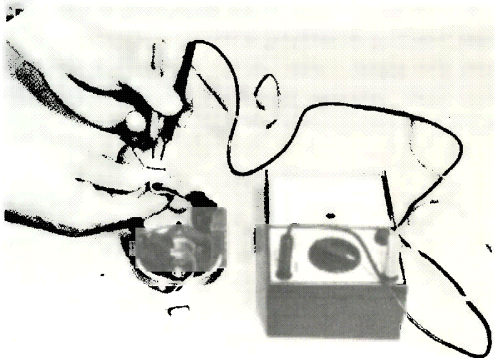
Rotor

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



47U05X-033

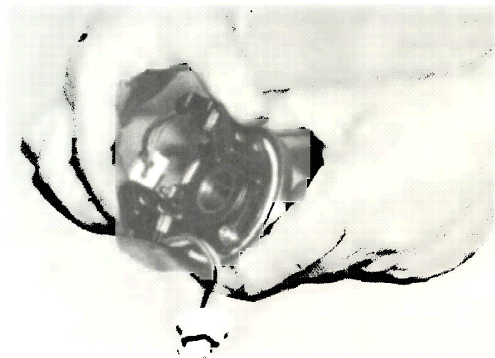
5 DISTRIBUTOR



47U05X-034

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.



47U05X-035

Bearing

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

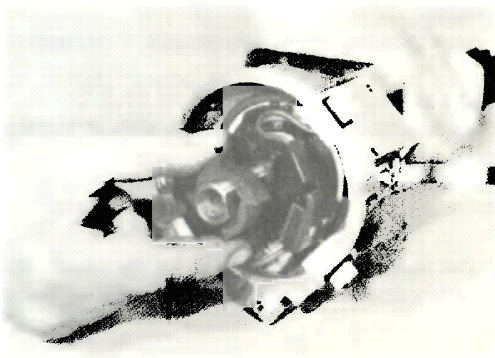


47U05X-036

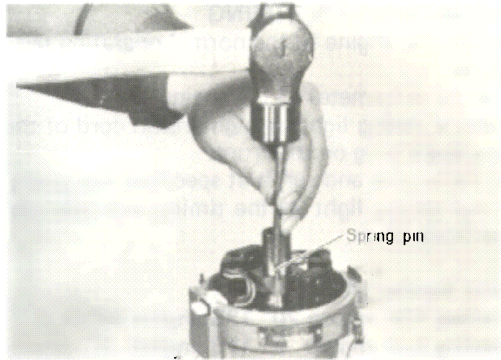
ASSEMBLY

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.



47U05X-037



47U05X-038

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



47U05X-039

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:

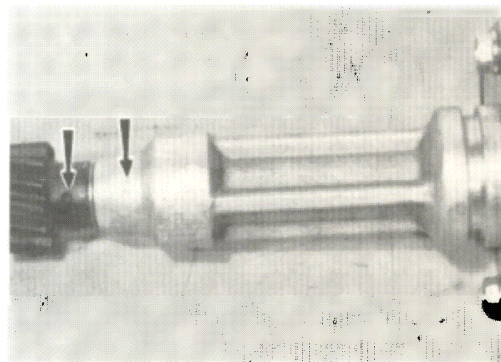
0.5 ~ 0.9 mm (0.020 ~ 0.035 in)



47U05X-040

INSTALLING DISTRIBUTOR

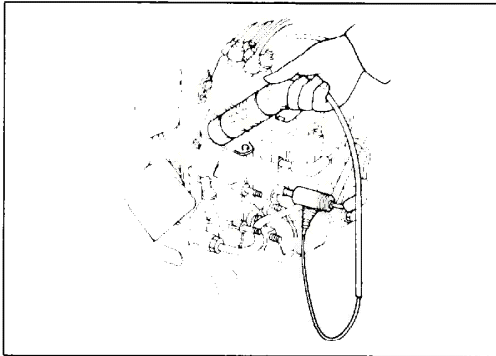
1. Align the leading timing mark (yellow painted) on the eccentric shaft pulley with the indicator pin on the front cover.



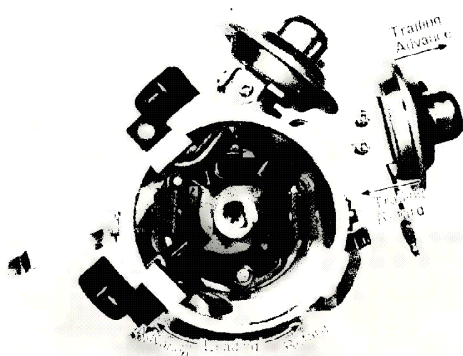
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2. Align the tally marks on the distributor housing and driven gear.
3. Install the distributor and lock nut.
4. Turn the distributor housing until the protrusion of the signal rotor aligns with the core of the pick-up coil.
Tighten the lock nut.
5. Connect the high-tension cords, igniter wiring couplers and condenser lead.
6. Connect the vacuum sensing tubes.

5 DISTRIBUTOR



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47U05X-043

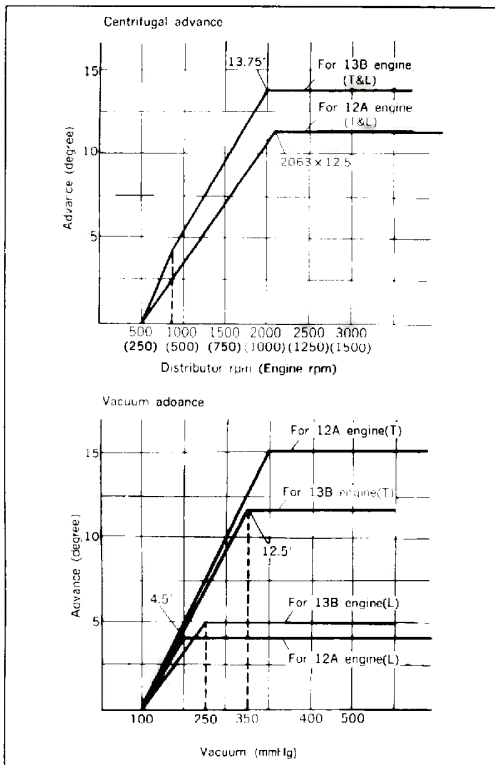
ADJUSTING IGNITION TIMING

1. Warm up the engine to the normal operating temperature.
2. Connect a tachometer to the engine.
3. Connect a timing light to high-tension 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.

Ignition timing: (ATDC)

Trailing 12A engine 20° 13B engine 20°
 Leading 12A engine 0° 13B engine 5°

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 high-tension 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.

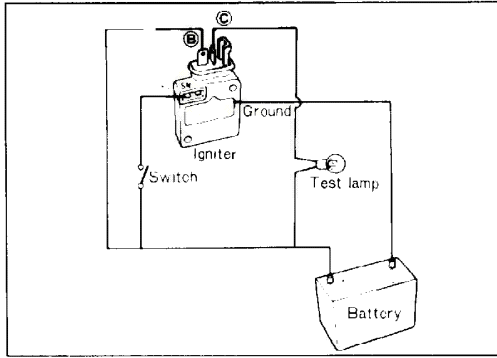


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CHECKING ADVANCE CHARACTERISTIC

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.



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IGNITER

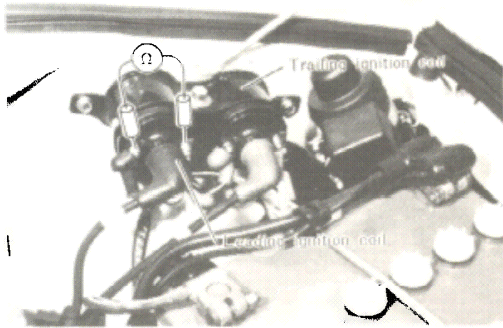
CHECKING IGNITER

To check the igniter, proceed as follows:

1. Remove the igniter.
2. Make a circuit with a suitable wiring and test lamp (use 12 volts and less than 10 watt bulb).
3. Quickly operate the switch to ON and OFF, and make sure that the test lamp is flashing.

If necessary, replace the igniter.

The above test should be done on each trailing and leading igniter.



47U05X 046

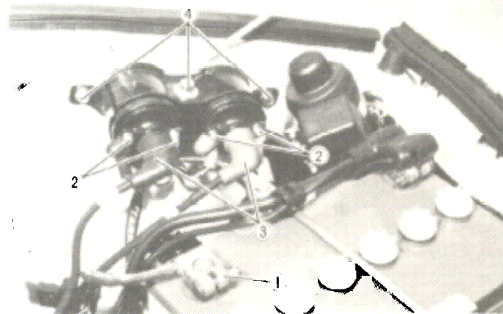
IGNITION COIL

CHECKING IGNITION COIL

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

Check the primary resistance with an ohmmeter.

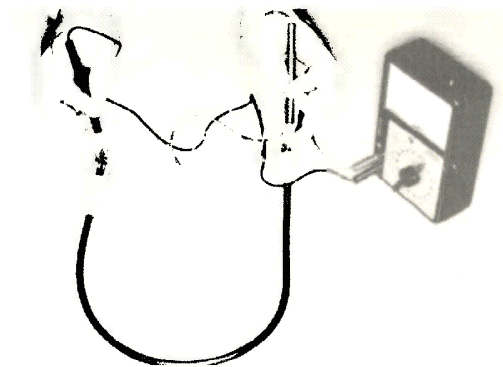
It should be $1.35 \pm 10\%$ ohms on both the leading and trailing ignition coils.



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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 hightension leads 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.



57U05X-006

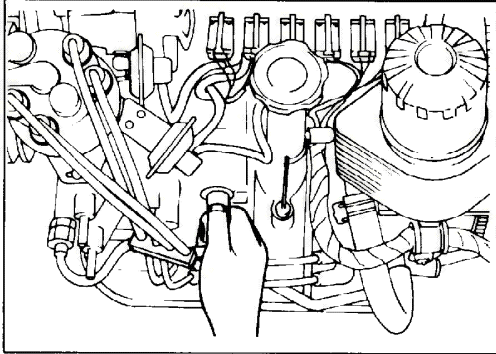
HIGHTENSION LEADS

Check the resistance of each hightension lead. The resistance should not exceed **16,000 ohms \pm 40% per 1 m (39.37 in).**

Note

- a) When checking the resistance of the leads or setting ignition timing, do not puncture the leads with a probe.

5 HIGHTENSION CORD



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- 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.