1975
MAZDA RX-3

WORKSHOP MANUAL

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FOREWORD

This workshop manual was prepared as reference material for the service personnel of authorized Mazda dealers to enable them to correctly carry out the task of delivering services and maintenance on Mazda vehicles.

In order to ensure that the customers are satisfied with Mazda products, proper servicing and maintenance must be provided. For this purpose, the service personnel must fully understand the contents of this workshop manual and at the same time, are recommended to keep the manual in a place where reference can readily be made.

The information, photographs, drawings and specifications entered in this manual were the best available at the time of printing this manual. All alterations to this manual occurring as the result of modifications will be notified by the issuance of Service Informations or supplementary volumes. It is, therefore, requested that the manual be kept up to date by carefully maintaining a follow-up of these materials.

Toyo Kogyo reserves the right to alter the specifications and contents of this manual without any obligation and advance notice.

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ENGINE

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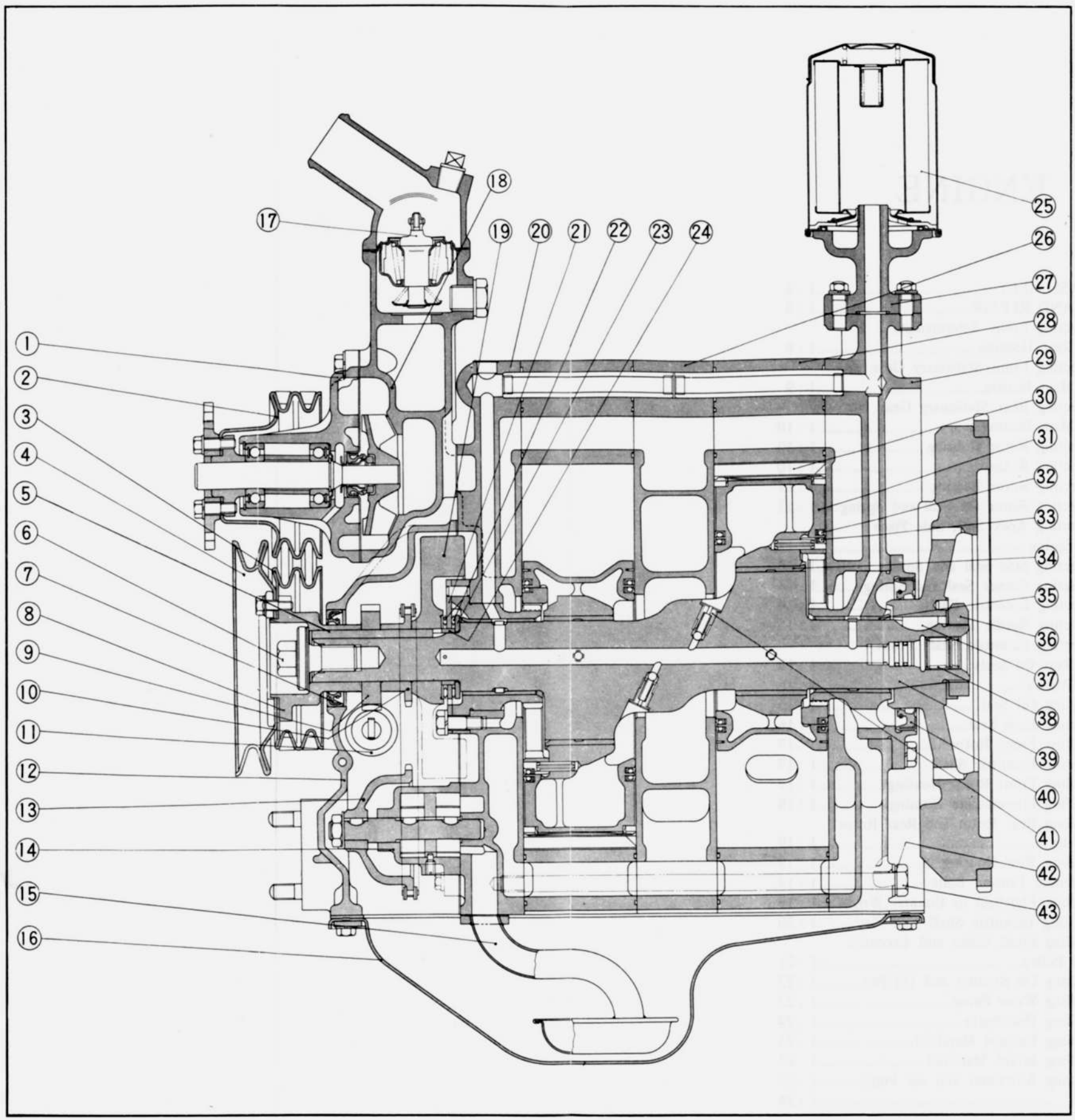

1. Water pump b
2. Water pump p
3. Eccentric shaf
4. Eccentric shaf
5. Key
6. Eccentric shaf
7. Eccentric shaf
8. Eccentric shaf
9. Distributor dri
10. Oil pump drive
11. Driven gear (fo
12. Front cover
13. Oil pump drive
14. Oil pump body
15. Oil strainer
16. Oil pan
17. Thermostat
18. Water pump ca
19. Balance weight
20. Front housing
21. Bearing housin
22. Needle bearing
23. Thrust plate
24. Spacer
25. Oil filter
26. Intermediate h
27. Oil filter cove
28. Rear rotor ho
29. Rear housing
30. Apex seal
31. Rear rotor
32. Oil seal (outer
33. Oil seal (inner
34. Rear rotor bea
35. Rear main bea
36. Flywheel lock
37. Key
38. Needle bearing
39. Eccentric shaf
40. Eccentric shaf
41. Oil jet
42. Sealing washer
43. Tension bolt

Fig. 1–1 Engine cross section (1)

1 : 1

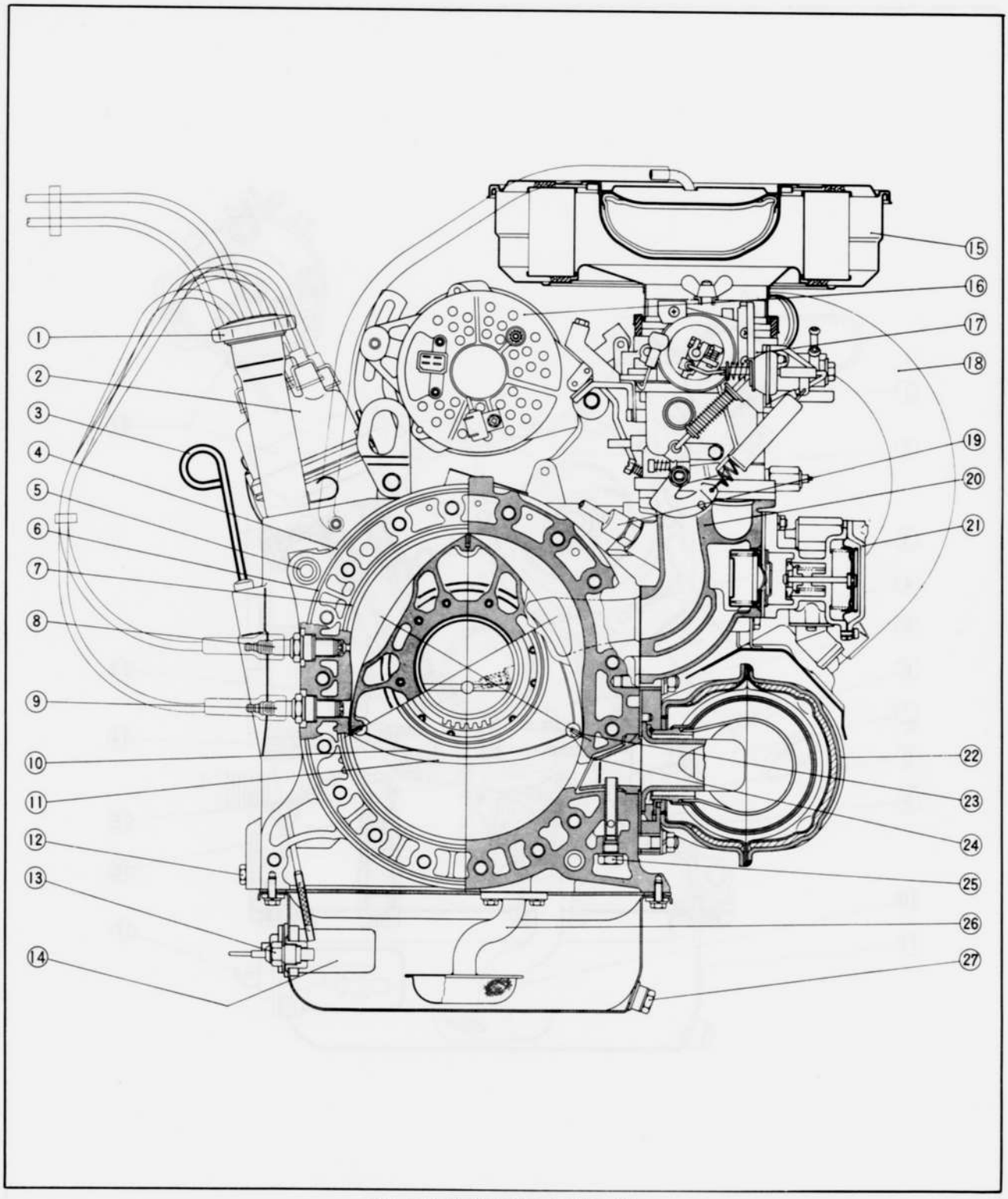

Fig. 1–2 Engine cross section (2)

1. Oil filler cap
2. Distributor
3. Dipstick gauge
4. Rotor housing
5. Tubular dowel
6. Sealing rubber (outer)
7. Sealing rubber (inner)
8. Trailing spark plug
9. Leading spark plug
10. Side seal
11. Rotor
12. Coolant drain plug
13. Oil thermo unit
14. Oil level sensor
15. Air cleaner
16. Alternator
17. Carburetor
18. Hot air hose
19. PCV valve
20. Intake manifold
21. Air control valve
22. Thermal reactor
23. Apex seal (side piece)
24. Corner seal
25. Air injection nozzle
26. Oil strainer
27. Oil drain plug

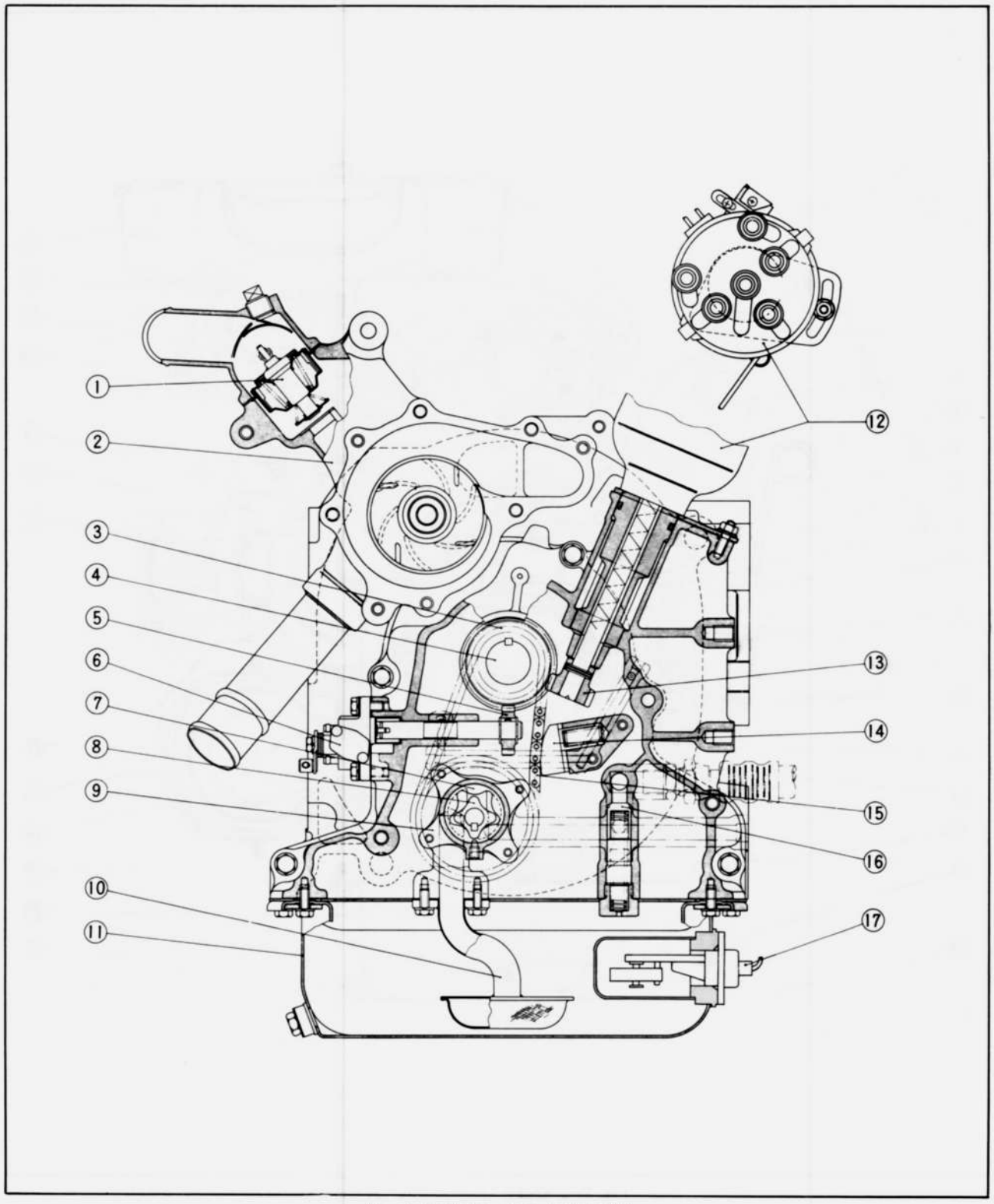

Fig. 1–3 Engine cross section (3)

1. Thermostat
2. Water pump casing
3. Distributor drive gear
4. Eccentric shaft
5. Metering pump drive gear
6. Metering pump
7. Oil pump outer gear
8. Oil pump inner gear
9. Oil pump body
10. Oil strainer
11. Oil pan
12. Distributor
13. Distributor driven gear
14. Oil pump chain adjuster
15. Oil pump chain
16. Pressure control valve
17. Oil level sensor

1–A. ENGINE DISASSEMBLY

Engine disassembly should be done in the following order after removing the engine from the vehicle.

Note:
Henceforth, on this occasion when the '74 year-type of rotary engine is being introduced, we have adopted the method of supporting the front housing by using the **engine hanger** (49 1114 005) for the purpose of facilitating the working procedure. The **engine hanger** can be used for any type of engine now in service.

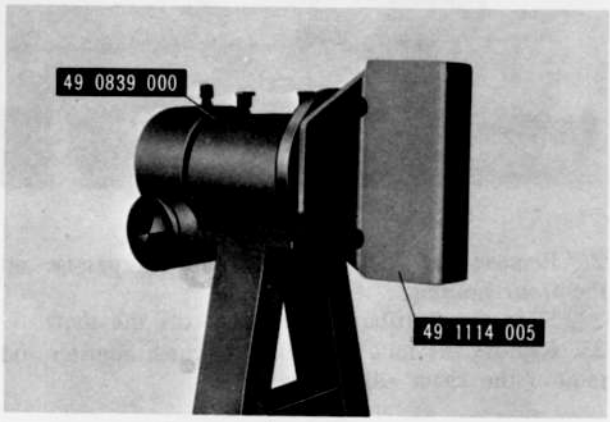

Fig. 1–4 Engine work stand

1. Remove the oil hose support bracket from the front housing.
2. Mount the engine on the **engine work stand** (49 0839 000) with the **engine hanger** (49 1114 005).
3. Remove the engine mounting bracket from the front cover.
4. Disconnect the vacuum hoses, air hoses and wires, then remove the valves.
5. Remove the air pump attaching bolts and bar, and remove the air pump and V-belt.
Remove the alternator attaching bolts, and remove the alternator and V-belt.
6. Disconnect the metering oil pump connecting rod and oil tubes from the carburetor.
7. Remove the intake manifold attaching nuts, and remove the carburetor and intake manifold assembly.

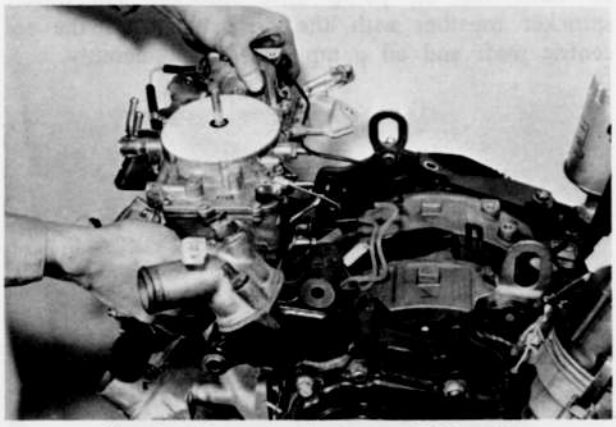

Fig. 1–5 Removing intake manifold ass'y

Then remove the gasket and two rubber rings.
8. Remove the thermal reactor attaching nuts and remove it with gaskets.
9. Remove the distributor securing nut and pull it out from the front cover.

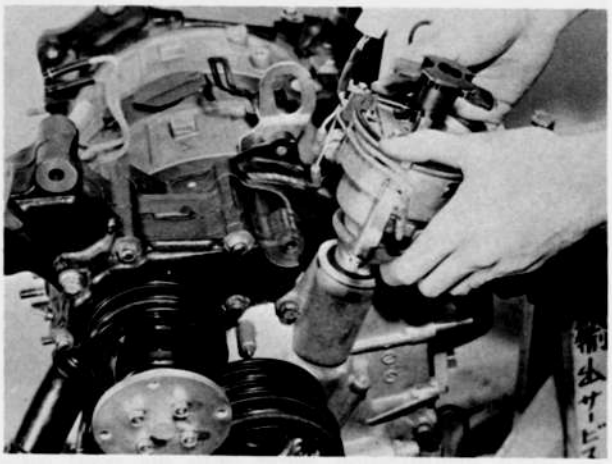

Fig. 1–6 Removing distributor

10. Remove the eccentric shaft pulley (for compressor) from the pulley boss.
11. Remove the water pump attaching bolts, and remove the pump and gasket.

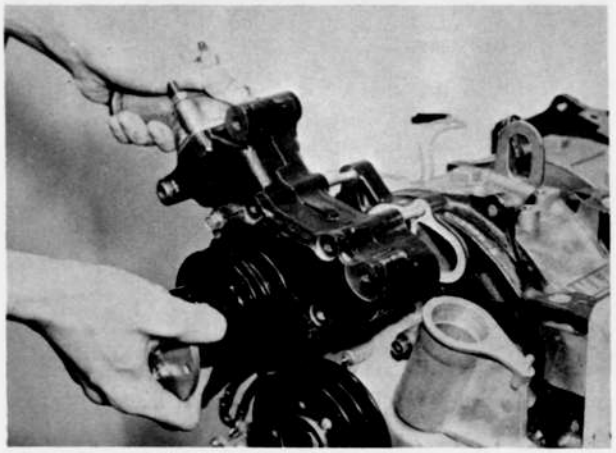

Fig. 1–7 Removing water pump

12. Invert the engine on the work stand.
13. Remove the bolts attaching the oil pan, and remove the oil pan and gasket.

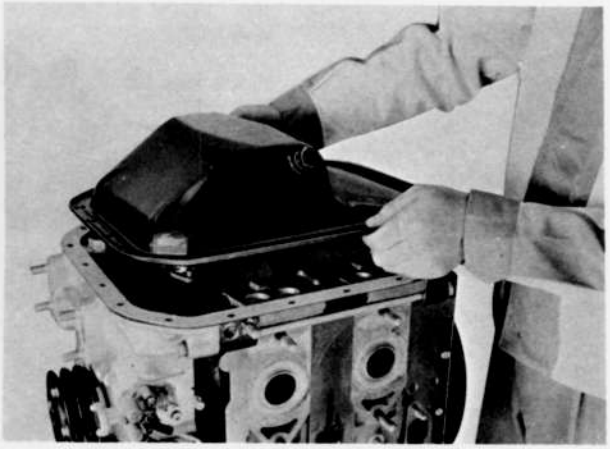

Fig. 1–8 Removing oil pan

14. Remove the bolts attaching the oil strainer, and remove the oil strainer and gasket.

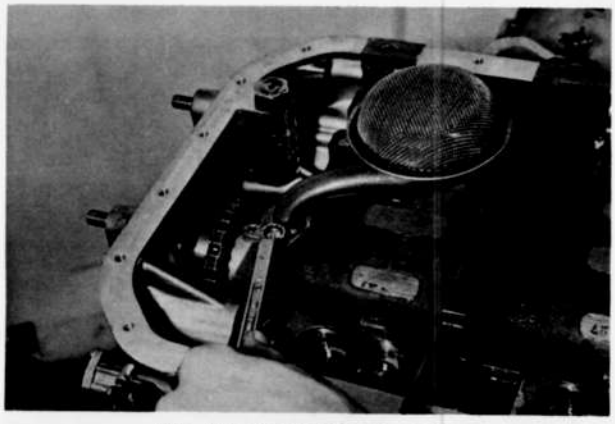

Fig. 1–9 Removing oil strainer

15. Apply identification marks onto the front rotor housing and rear rotor housing, which are common parts, so that they will be as they were when re-assembling the engine.

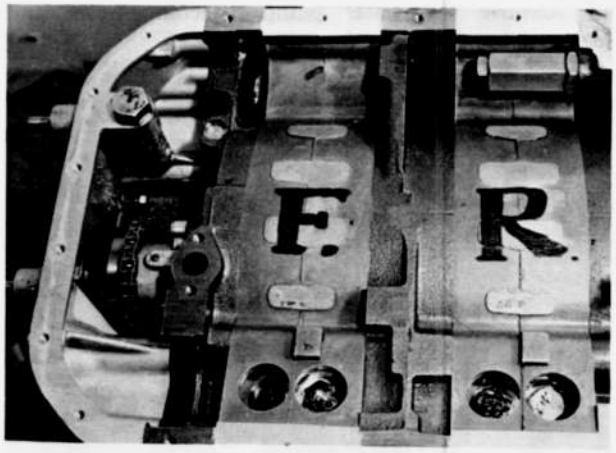

Fig. 1–10 Putting identification marks

16. Turn the engine on the work stand so that the top of the engine is up.
17. Attach the **ring gear brake** (49 1881 060) to the flywheel or drive plate.
18. Remove the eccentric shaft pulley bolt and remove the pulley.

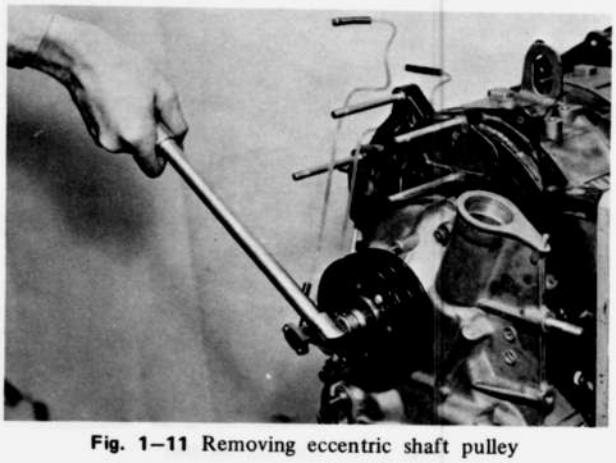

Fig. 1–11 Removing eccentric shaft pulley

19. Turn the engine on the work stand so that the front end of the engine is up.
20. Remove the front cover attaching bolts, and remove the front cover and gasket.

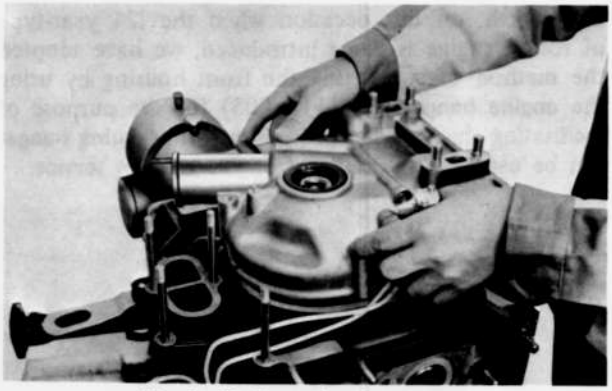

Fig. 1–12 Removing front cover

21. Remove the "O" ring from the oil passage on the front housing.
22. Slide the distributor drive gear off the shaft.
23. Remove the nuts attaching the chain adjuster and remove the chain adjuster.

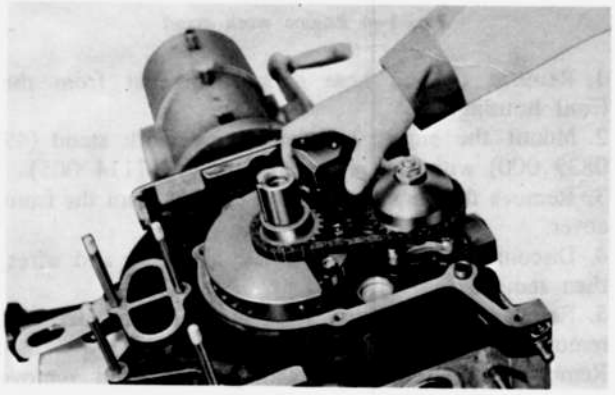

Fig. 1–13 Removing chain adjuster

24. Straighten the tab of the lock washer and remove the nut and lock washer from the oil pump driven sprocket.
25. Slide the oil pump drive sprocket and driven sprocket together with the drive chain off the eccentric shaft and oil pump shaft simultaneously.

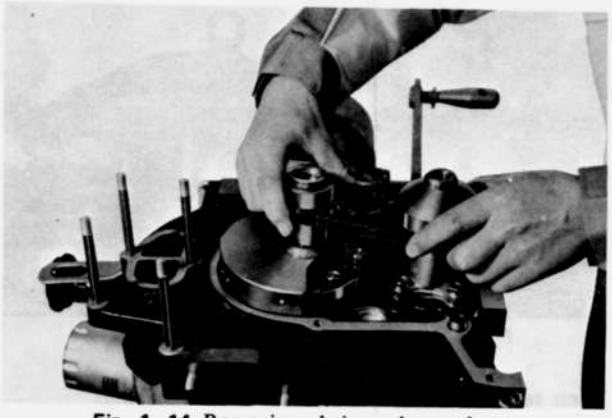

Fig. 1–14 Removing chain and sprockets

26. Remove the keys on the eccentric shaft and oil pump shaft.
27. Slide the balance weight, thrust washer and needle bearing off the shaft.
28. Remove the bolts attaching the bearing housing, and slide the bearing housing, needle bearing, spacer and thrust plate off the shaft.
29. Turn the engine on the work stand so that the top of the engine is up.
30. To remove the flywheel in case of engine mounted with manual transmission, proceed as follows:
1) Remove the clutch pressure plate assembly attaching bolts, and remove the pressure plate assembly and clutch disk.
2) Straighten the tab of the lock washer and remove the flywheel nut using the **special wrench** (49 0820 035).

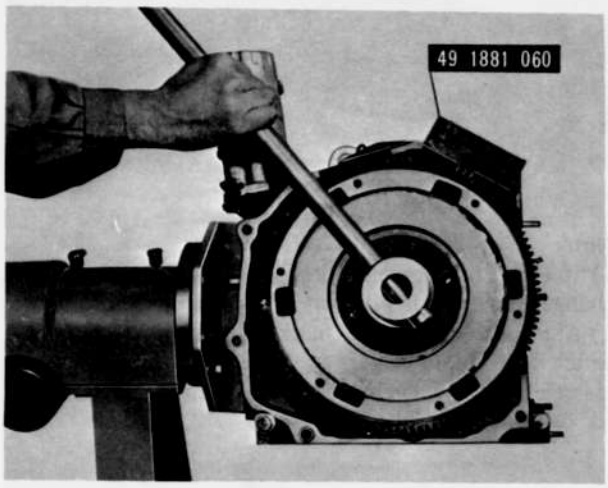

Fig. 1–15 Removing flywheel nut

3) Remove the flywheel by using the **flywheel puller** (49 0823 300A), turning the handle of the puller and lightly hitting the head of the puller.



Fig. 1–16 Removing flywheel

31. To remove the counter weight in case of engine mounted with automatic transmission, proceed as follows.
1) Remove the drive plate, and then remove the **ring gear brake** (49 1881 060).
2) Attach the **counter weight brake** (49 1881 055). Then straighten the tab of the lock washer and remove the counter weight nut using the **special wrench** (49 0820 035).
3) Remove the counter weight by using the **counter weight puller** (49 0839 305A), turning the handle of the puller and lightly hitting the head of the puller.
32. Remove the key on the eccentric shaft and turn the engine on the work stand so that the rear of the engine is up.
33. Loosen the tension bolts in the sequence shown in Fig. 1–17, and remove the tension bolts.

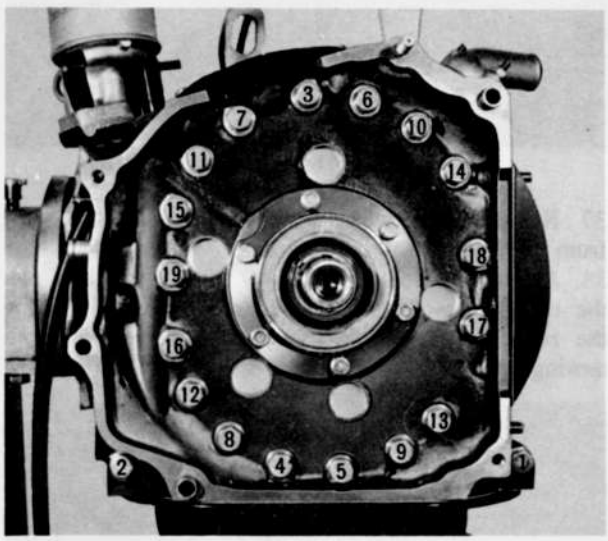

Fig. 1–17 Tension bolts loosening order

Note:
Do not loosen the tension bolts at one time. Perform the removal in two or three procedures.

34. Lift the rear housing off the shaft.

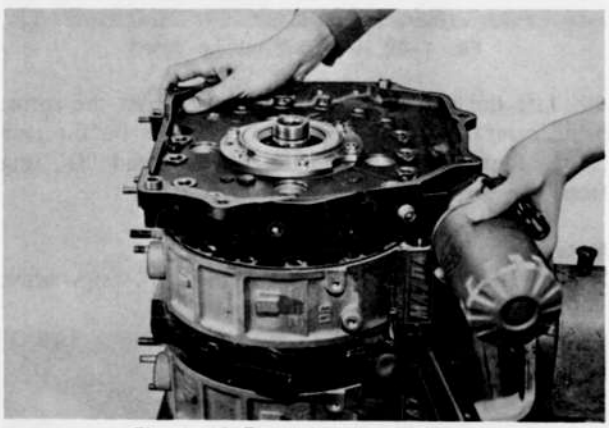

Fig. 1–18 Removing rear housing

35. Remove any seals stuck to the rotor sliding surface of the rear housing and place them back into their respective original positions.
36. Remove the all corner seals, corner seal springs, side seals, side seal springs and side pieces from the rear side of the rotor, and place them in the **seal case** (49 0813 250), in accordance with the numbers near each respective groove on the face of the rotor. These marks are made in order to prevent each seal from

changing its original position in reassembling.

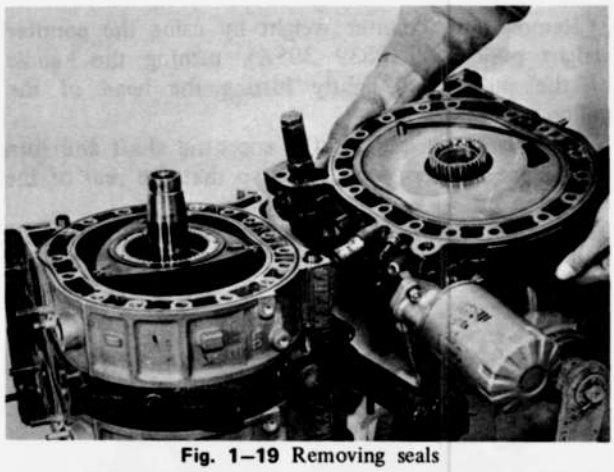

Fig. 1–19 Removing seals

37. Remove the two sealing rubbers and "O" ring from the rear rotor housing.
38. Attach the **dowel puller** (49 0813 215), and pull the tubular dowels off the rear rotor housing holding the rotor housing down by hand to prevent it from moving up.

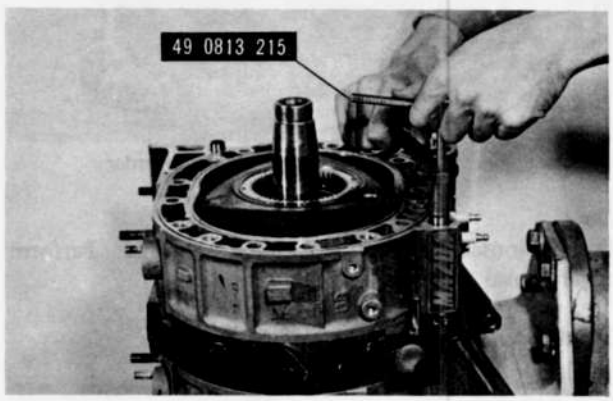

Fig. 1–20 Removing tubular dowel

39. Lift the rear rotor housing away from the rotor, being careful not to drop the apex seals on the rear rotor. Remove the two sealing rubbers and "O" ring from the rear rotor housing.

Note:
Replace the sealing rubbers and the "O" rings when the engine is overhauled.

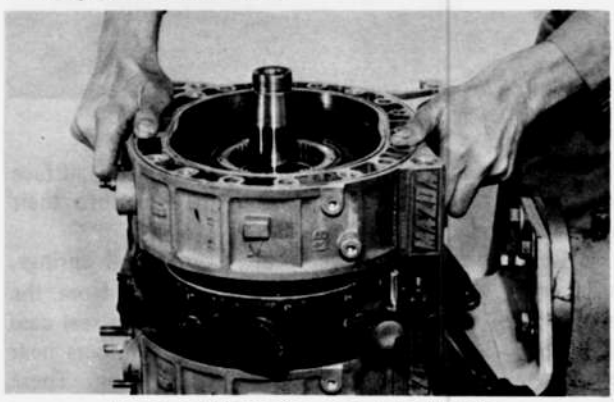

Fig. 1–21 Removing rear rotor housing

40. Remove the each apex seal and spring from the rear rotor and place them in the seal case.
41. Remove the rear rotor away from the eccentric shaft and place it upside down on a clean sheet of cloth.
42. Remove each seal and spring on the other side of the rear rotor, and place them in the seal case as shown in Fig. 1–22.



Fig. 1–22 Removing seals

Note:
1) If some of the seals drop off, be careful not to change the original position of each seal on the rotor.
2) Apply identification mark onto the rear rotor, which is a common part to front rotor, so that when reassembling the engine the rotor can be installed in its original position.

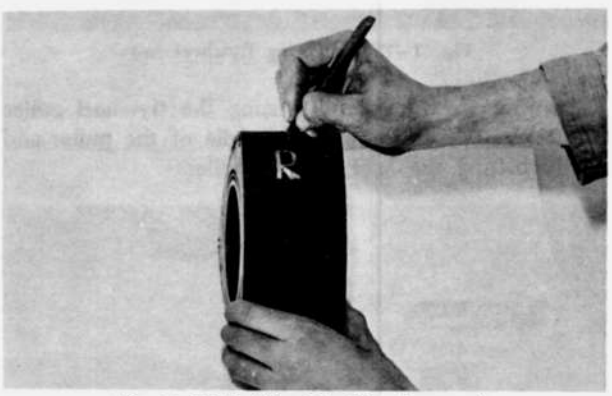

Fig. 1–23 Putting identification mark

43. Remove the oil seals and springs, first the outer oil seal then the inner oil seal, using the **oil seal remover** (49 0813 225).

Note:
1) Do not exert strong pressure at only one place to prevent deformation of the oil seal.
2) Be careful not to damage the oil seal lip. Use a suitable protector shown in Fig. 1–24.
3) Replace the "O" rings in the oil seals when the engine is overhauled.
4) Apply identification mark onto rear oil seal springs of each rotor so that, when reassembling the engine, oil seal springs can be installed in their respective face of the rotor as described in Par. 1–C–1.



Fig. 1–24 Removing oil seal

44. Holding the intermediate housing down by hand, pull the tubular dowel off the intermediate housing using the **dowel puller** (49 0813 215).
45. Lift the intermediate housing off the shaft being careful not to damage the shaft. The intermediate housing should be removed by sliding it beyond the rear rotor journal on the eccentric shaft while holding the intermediate housing up and at the same time pushing up the eccentric shaft.

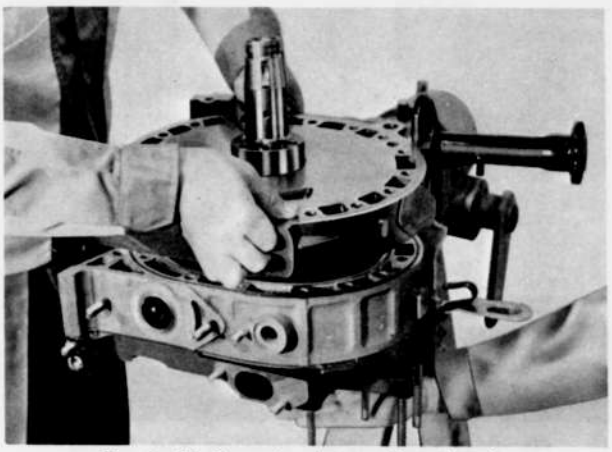

Fig. 1–25 Removing intermediate housing

46. Lift out the eccentric shaft.
47. Repeat the above procedures to remove the front rotor housing and the front rotor assembly.

1–B. INSPECTION AND REPAIR

1–B–1. Inspecting Front, Intermediate and Rear Housing

1. Remove all carbon on the housings with an extra-fine emery paper. When using a carbon scraper, be careful not to damage the finished surfaces of the housings.
2. Remove the sealing agent on the housings by using a cloth or a brush soaked in a solution of ketone or thinner.

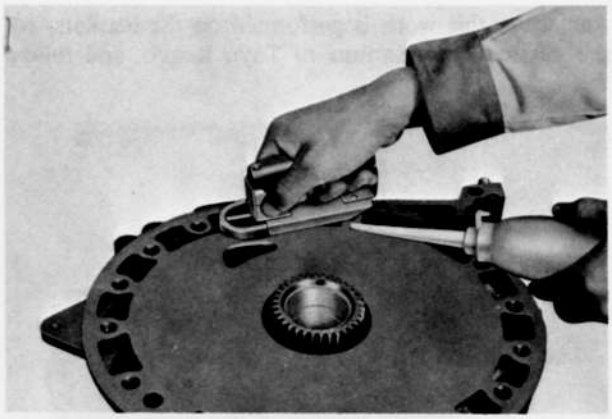

Fig. 1–26 Removing sealing agent

3. Check for housing distortion by placing a straight edge on the housing surface. Measure the clearance between the straight edge and the housing surface with a feeler gauge, as shown in Fig. 1–27. If the distortion exceeds **0.04 mm (0.0016 in)**, reface or replace the housing.

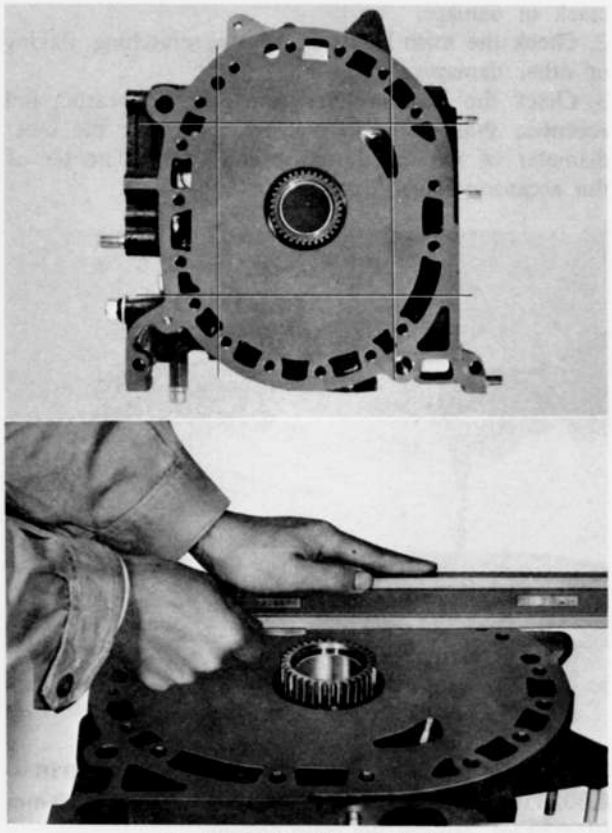

Fig. 1–27 Checking distortion

4. Check for wear on the rotor sliding surfaces of the housing and joint surfaces with rotor housing as shown in Fig. 1–28.
If the wear exceeds 0.10 mm (0.0039 in), reface or replace the housing.

Caution:
The side housings (front housing, intermediate housing and rear housing) can be reused by grinding them if the required finish can be maintained.

And when this work is performed on the markets, ask the detailed informations of Toyo Kogyo, and follow them.

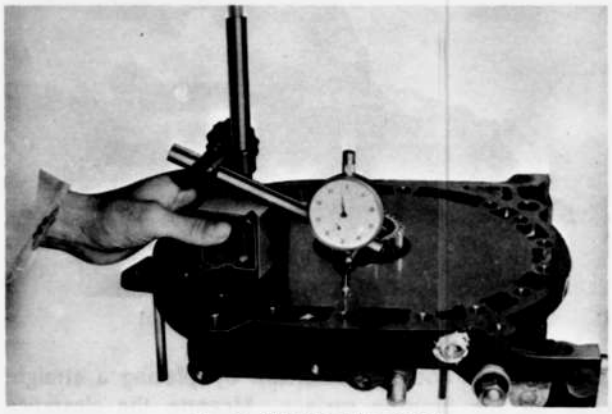

Fig. 1–28 Checking wear

1–B–2. Inspecting Front Stationary Gear and Main Bearing

1. Check the teeth on the stationary gear for wear, crack or damage.
2. Check the main bearing for wear, scratching, flaking or other damages.
3. Check the clearance between the main bearing and eccentric shaft main journal by measuring the inner diameter of the main bearing and outer diameter of the eccentric shaft main journal.

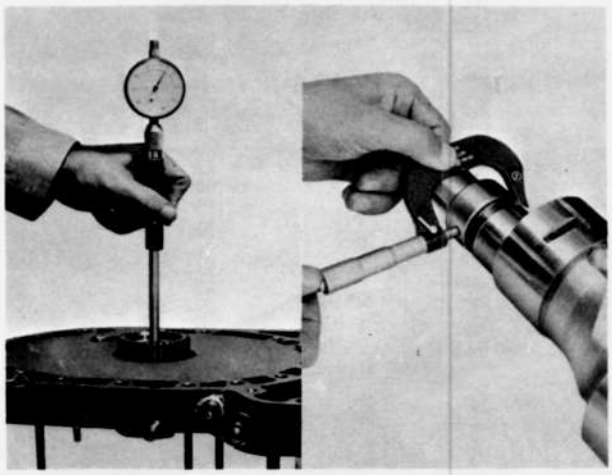

Fig. 1–29 Checking main bearing clearance

The standard clearance is **0.04 ~ 0.07 mm (0.0016 ~ 0.0028 in)**. If the bearing clearance exceeds **0.10 mm (0.0039 in)**, replace the main bearing.

Note:

To replace the main bearing, proceeds as follows:

1) Remove the stationary gear and main bearing assembly from the housing, using the **main bearing replacer** (49 0813 235), shown in Fig. 1–30.

2) Remove the adaptor on the main bearing replacer and press the main bearing out of the stationary gear by using the **main bearing replacer** (49 0813 235), as shown in Fig. 1–31.

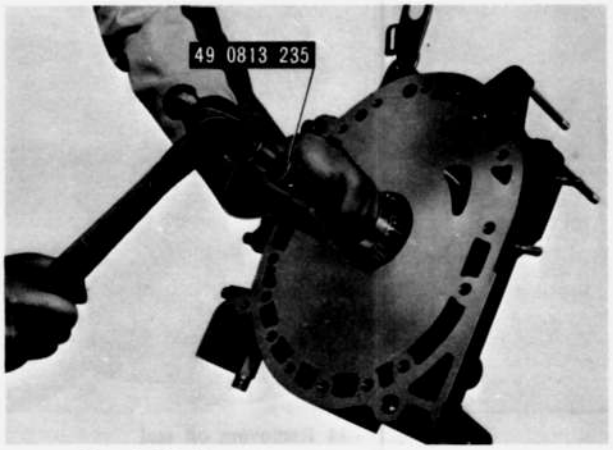

Fig. 1–30 Removing stationary gear assembly

3) Attach the adaptor onto the **main bearing replacer** (49 0813 235), aligning the tang of the bearing and the slot of the stationary gear, and press fit the main bearing into the stationary gear until the adaptor touches the stationary gear flange.

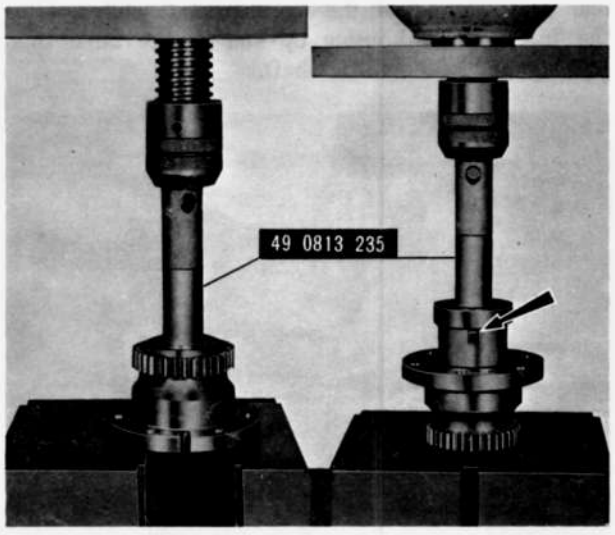

Fig. 1–31 Removing and installing main bearing

4) Press in the stationary gear to the housing with the **main bearing replacer** (49 0813 235), aligning the slot of the stationary gear flange and the dowel pin on the housing, as shown in Fig. 1–32.

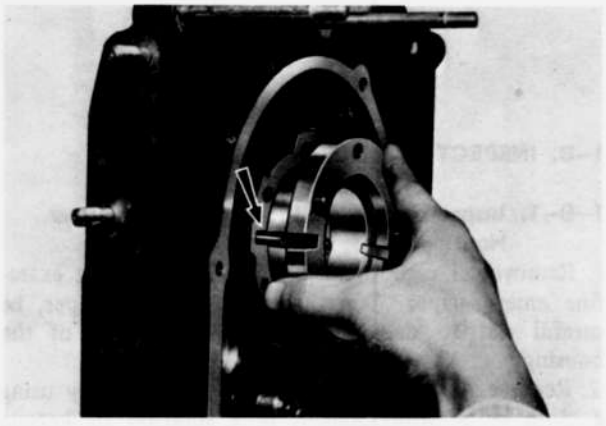

Fig. 1–32 Aligning stationary gear

1–B–3. Inspecting Rear Stationary Gear and Main Bearing

Check the rear stationary gear and main bearing according to Par. 1–B–2.

To remove and install the stationary gear, proceed as follows:

1) Remove the bolts attaching the stationary gear to the rear housing.
2) Using the **main bearing replacer** (49 0813 235), remove the stationary gear from the rear housing.
3) Check the "O" ring in the stationary gear for a damage. Replace the "O" ring if necessary.
4) Apply a thin coat of vaseline on the "O" ring and place it in the groove of the stationary gear.

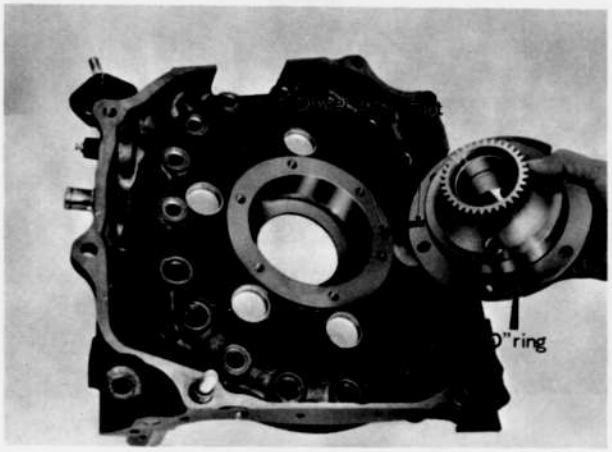

Fig. 1–33 Assembling stationary gear

5) Apply sealing agent onto the stationary gear flange.
6) Install the stationary gear to the rear housing being careful not to damage the "O" ring and aligning the slot of the stationary gear with the dowel pin on the rear housing.
7) Tighten the bolts attaching the stationary gear.

1–B–4. Inspecting Rotor Housing

1. Check for traces of gas or water leakage along the inner margin of each side face of the rotor housing.
2. Remove all carbon from the inner surface of the rotor housing by wiping with cloth. Soak the cloth in a solution of ketone or thinner if the carbon is difficult to remove.

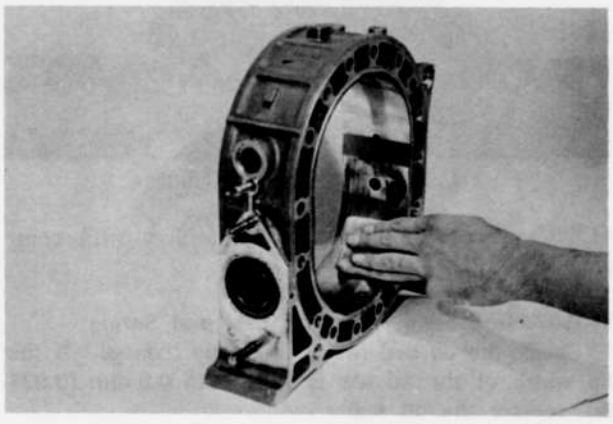

Fig. 1–34 Removing carbon

3. Remove all deposits and rust from the cooling water passages on the housing.
4. Remove sealing agent by wiping with a cloth or brush soaked in a solution of ketone or thinner.
5. Check the chromium plated surface on the rotor housing for scoring, flaking or any other damage. If any of these excessive condition exists, replace the rotor housing.
6. Check the rotor housing width at points close to the trochoid surface by using a micrometer. The measurements should be taken at least at 4 points. If the difference between the value of Ⓐ point and the minimum value of the points ⒷⒸⒹ, exceeds **0.06 mm (0.0024 in)**. the rotor housing should be replaced with a new one.

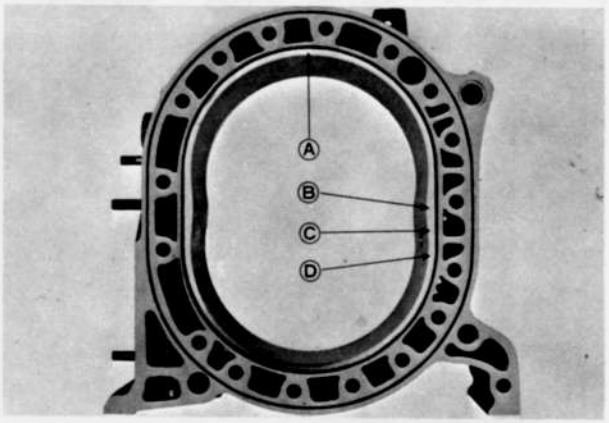

Fig. 1–35 Checking points

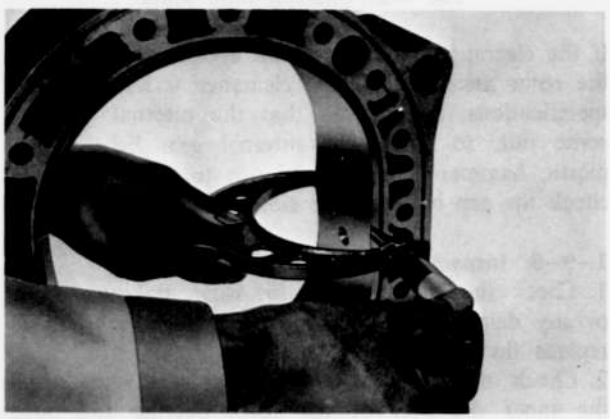

Fig. 1–36 Checking rotor housing width

1–B–5. Inspecting Rotor

1. Check the combustion condition and gas leakage. To a certain extent, the combustion condition can be judged as in the case of reciprocating engines by the color and quantity of carbon on the rotor. Combustion can be said to be good if the color of carbon is brown. Generally carbon on the leading side seen from the direction of rotation is brown, while the trailing side shows black color. It should be noted that this color varies according to operating conditions just before the engine is removed.
The gas leakage can be judged by checking the color of the rotor side surface for blow-by traces originating from the side seals and corner seals.
2. Remove the carbon on the rotor by using a carbon

remover or emery paper. Carbon in the seal grooves of the rotor should be removed with a carbon remover being careful not to damage the grooves. Wash the rotor in cleaning solution and dry by blowing with compressed air.

3. Carefully inspect the rotor and replace if it is severely worn or damaged.

4. Check the internal gear for cracks, score, worn or chipped teeth.

5. Check the gap between the side housing and the rotor by measuring the rotor housing width and rotor width. The rotor width should be measured at 3 points as shown in Fig. 1–37.

The difference between the minimum width of rotor housing and the maximum width of the rotor should be within **0.10 ~ 0.21 mm (0.0039 ~ 0.0083 in).**

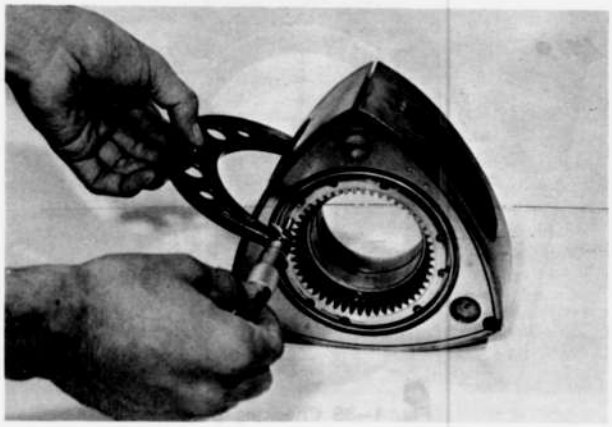

Fig. 1–37 Checking rotor width

If the clearance is more than the specifications, replace the rotor assembly. If the clearance is less than the specifications, it indicates that the internal gear has come out, so strike the internal gear lightly with plastic hammer being careful not to damage and re-check the gap between the side housing and the rotor.

1–B–6. Inspecting Rotor Bearing

1. Check the rotor bearing for wear, flaking, scoring or any damage. If any of these conditions is found, replace the bearing.

2. Check the rotor bearing clearance by measuring the inner diameter of the rotor bearing and outer diameter of the eccentric shaft rotor journal.

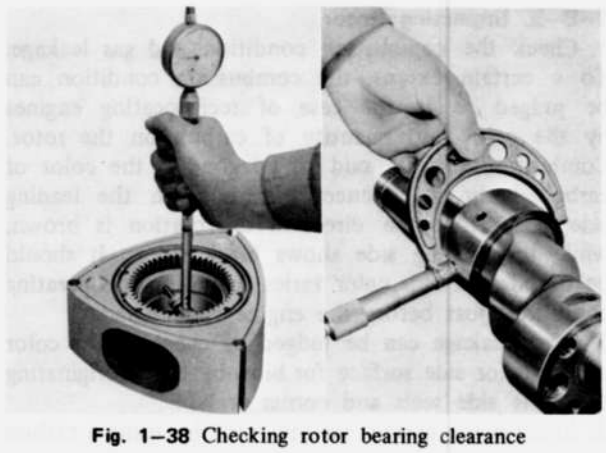

Fig. 1–38 Checking rotor bearing clearance

The standard clearance is **0.04 ~ 0.08 mm (0.0016 ~ 0.0031 in)**. Replace the bearing if it is more than **0.10 mm (0.0039 in)**.

Note:

To replace the rotor bearing, proceed as follows:

1) Place the rotor on the support so that the internal gear is facing downward. Using the **rotor bearing replacer** (49 0813 240) without the adaptor ring, press the bearing out of the rotor, being careful not to damage the internal gear. If the bearing bore in the rotor is damaged, finish the bore with emery paper and blow with compressed air.

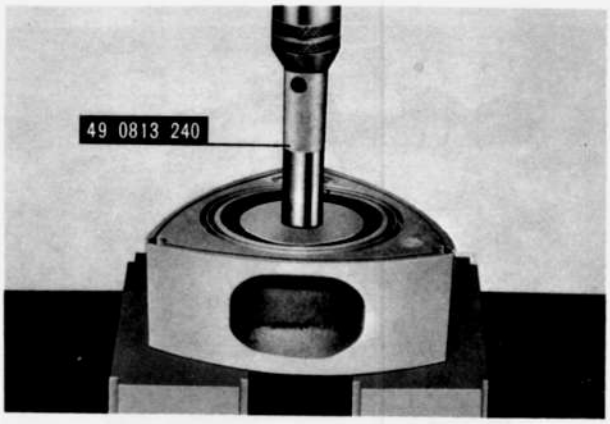

Fig. 1–39 Removing rotor bearing

2) Place the rotor on the support with internal gear faced upward. And place the new rotor bearing on the rotor so that the rotor bore is in line with the bearing lug.

3) Press fit the new bearing using the **rotor bearing replacer** (49 0813 240) with the adaptor removed attaching screws, until the bearing is flush with the rotor boss.

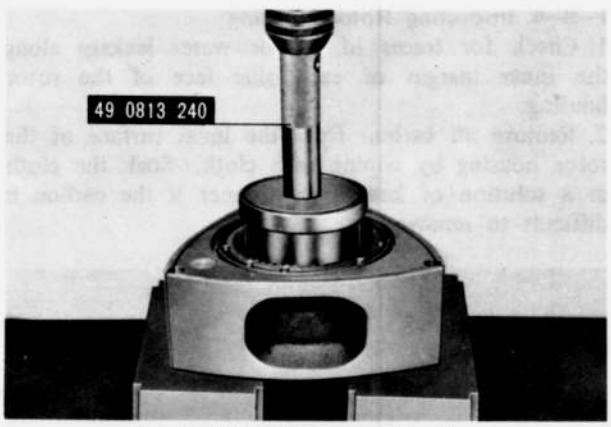

Fig. 1–40 Installing rotor bearing

4) Wash the rotor thoroughly and blow with compressed air.

1–B–7. Inspecting Rotor Oil Seal and Spring

1. Check the oil seal for wear or any damage. If the lip width of the oil seal is more than **0.8 mm (0.031 in)**, replace the oil seal.

2. Check the oil seal protrusion as shown in Fig.

1–41 and confirm the free movement by pressing with finger. The protrusion should be more than **0.5 mm (0.02 in)**.

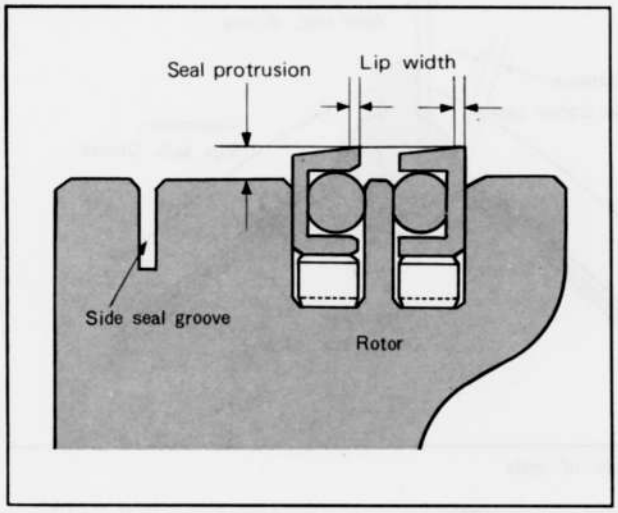

Fig. 1–41 Checking oil seal

1–B–8. Inspecting Apex Seal, Side Piece and Spring

1. Remove all carbon from the apex seal, side piece and spring, being careful not to damage the apex seal. **Never use** emery paper as it will damage the apex seal. Wash them with cleaning solution.
2. Check the apex seal and side piece for wear, crack on any damage. If any of these conditions is found, replace the seal. Check the spring for wear.
3. Measure the height of the apex seal with a micrometer at two positions shown in Fig. 1–42. Replace if the height is less than **7.0 mm (0.275 in)**.

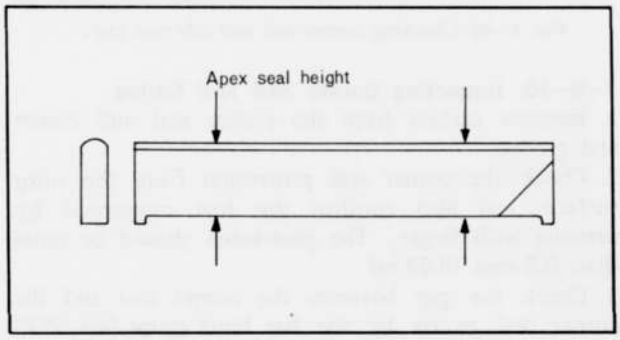

Fig. 1–42 Apex seal height

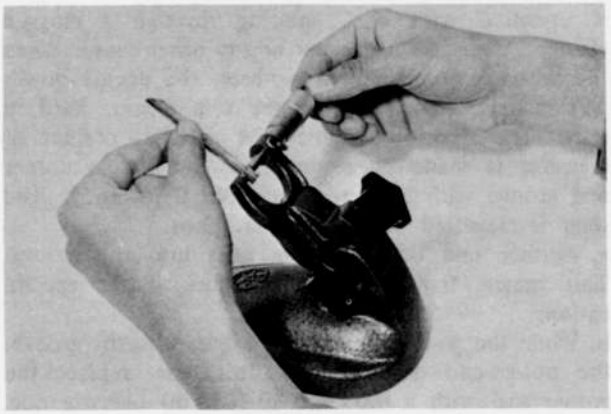

Fig. 1–43 Checking apex seal

4. Check the gap between the apex seal and the groove. To check the gap, place the apex seal in its respective groove on the rotor and measure the gap between the apex seal and the groove with a feeler gauge. The feeler gauge should be inserted until the tip of the gauge reaches the bottom of the groove. The standard gap is **0.05 ~ 0.09 mm (0.0020 ~ 0.0035 in)**. If the gap is more than **0.15 mm (0.0059 in)**, replace the apex seal.

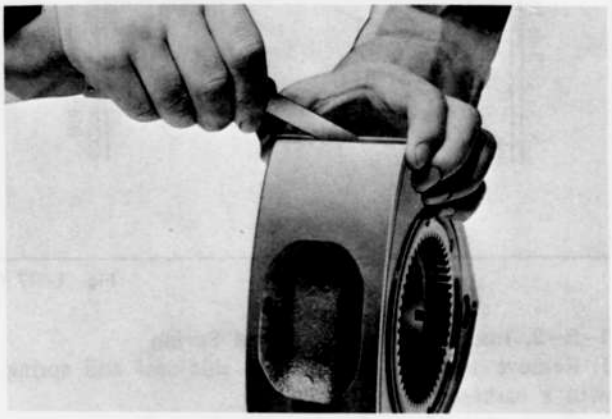

Fig. 1–44 Checking apex seal and groove

5. Check the gap between the apex seal and side housing. To check, measure the length of the apex seal with a micrometer.
Compare the measured apex seal length with the minimum value among Ⓑ Ⓒ and Ⓓ points of the rotor housing (see Fig. 1–35). The standard gap is **0.13 ~ 0.17 mm (0.0051 ~ 0.0067 in)**.
If it is more than **0.30 mm (0.0118 in)**, replace the apex seal. If necessary, correct the apex seal length with emery paper.

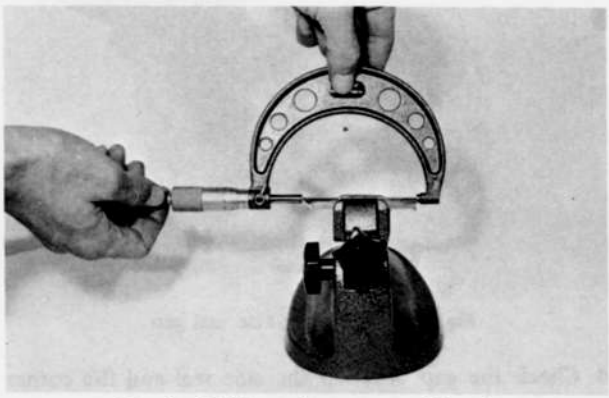

Fig. 1–45 Measuring apex seal length

6. Check the free height of the apex seal spring as shown in Fig. 1–46. It should be more than **5.5 mm (0.22 in)**.

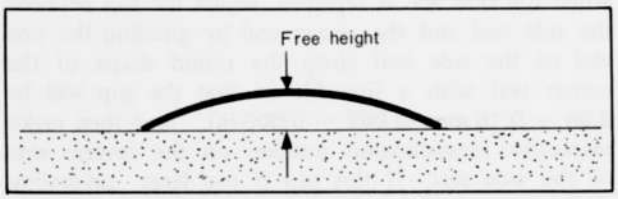

Fig. 1–46 Apex seal spring

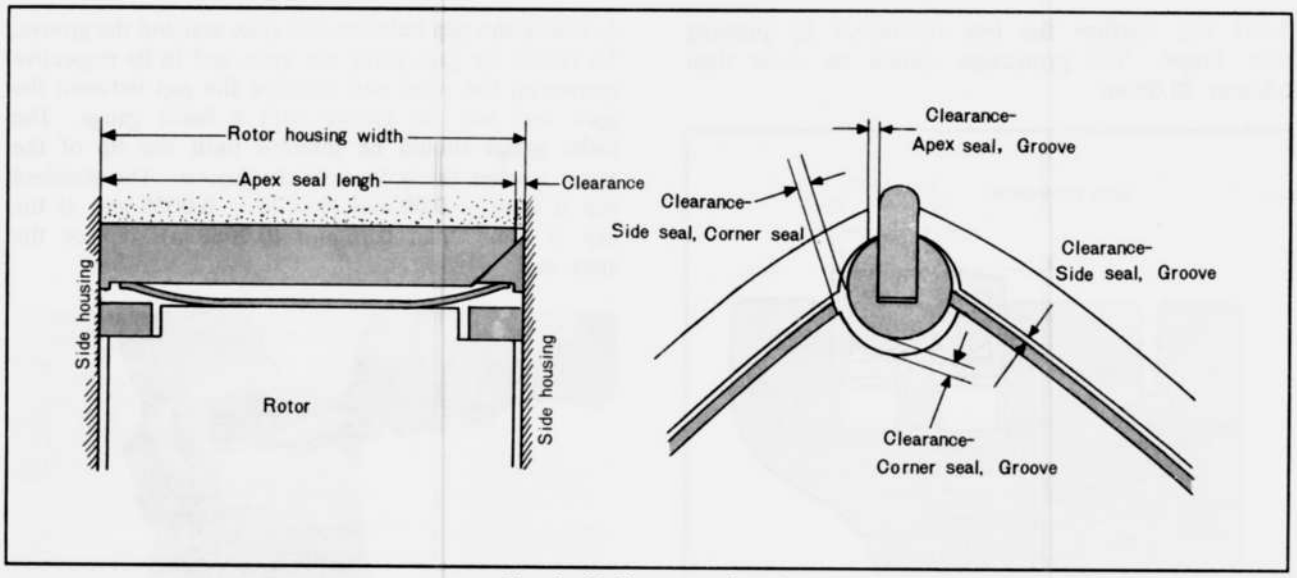

Fig. 1–47 Clearance of seals

1–B–9. Inspecting Side Seal and Spring

1. Remove all carbon from the side seal and spring with a carbon remover.
2. Check the side seal protrusion from the rotor surface, and also confirm the free movement by pressing with finger. The protrusion should be more than **0.5 mm (0.02 in)**.
3. Check the gap between the side seal and the groove with a feeler gauge as shown in Fig. 1–48. The standard gap is **0.04 ~ 0.07 mm (0.0016 ~ 0.0028 in)**. If the gap exceeds **0.10 mm (0.0040 in)**, replace the side seal.

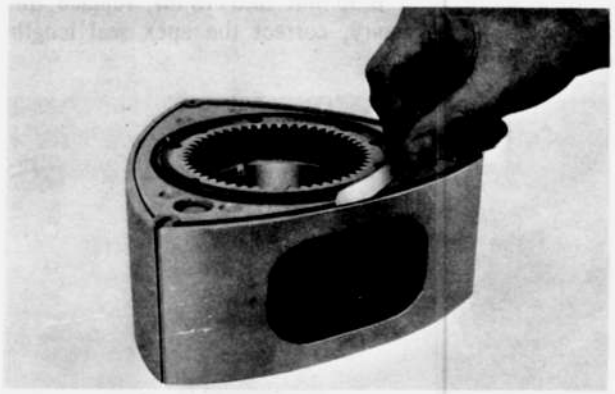

Fig. 1–48 Checking side seal gap

4. Check the gap between the side seal and the corner seal with these seals installed on the rotor.

To check, insert a feeler gauge between the end of the side seal (against the rotating direction of rotor) and the corner seal. If the gap exceeds **0.4 mm (0.016 in)**, replace the side seal.

When the side seal is replaced, adjust the gap between the side seal and the corner seal by grinding the one end of the side seal along the round shape of the corner seal with a fine file so that the gap will be **0.05 ~ 0.15 mm (0.002 ~ 0.006 in)**. And then make respective identification notches on the reverse side of the side seal. If this gap is too large, gas-sealing performance will deteriorate.

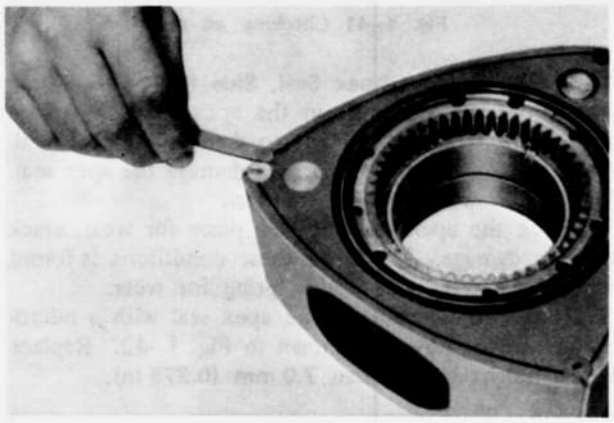

Fig. 1–49 Checking corner seal and side seal gap

1–B–10. Inspecting Corner Seal and Spring

1. Remove carbon from the corner seal and corner seal groove.
2. Check the corner seal protrusion from the rotor surface, and also confirm the free movement by pressing with finger. The protrusion should be more than **0.5 mm (0.02 in)**.
3. Check the gap between the corner seal and the corner seal groove by the **bar limit gauge** (49 0839 165). This gap enlargement shows uneven wear of the corner seal groove, which occurs when the engine is operated with dust entering through a clogged element, damaged air cleaner or any other cause. When the wear is permitted to increase, the engine power will be reduced and the engine will become hard to start. The decision whether the gap has correct dimension is made by examining wear of the corner seal groove with **bar limit gauge** (49 0839 165). The wear is classified into three conditions.

a. Neither end of the gauge goes into the groove. This means that the gap conforms to the specifications.

b. While the go-end of the gauge goes into the groove, the not-go-end does not. In this case, replace the corner seal with a **0.03 mm (0.0012 in)** oversize one. **Do not** rebore the groove.

c. If the both ends of the gauge go into the bore, it means that the gap exceeds the limit of **0.08 mm (0.0031 in). Rebore** the corner seal groove with the **Jig and reamer** (49 2113 030 and 49 0839 170) to 11.2 mm (0.4410 in) diameter and use a **0.2 mm (0.0079 in)** oversize corner seal.

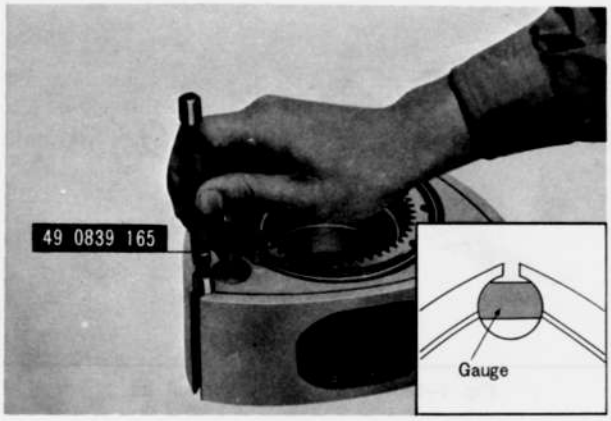

Fig. 1–50 Checking corner seal groove

Note:

a. As the corner seal groove tends to show a heavy wear in the direction of the rotation, the side arcs on the gauge are partially cut off. Be sure to take the measurement in the direction of the maximum wear of the groove.

b. The dimensions of the outer diameter of the gauge are as follows:

Go-end	$11.0\ ^{+0.019}_{+0.021}$ mm (0.4331 $^{+0.0007}_{+0.0008}$ in)
Not-go-end	$11.0\ ^{+0.044}_{+0.046}$ mm (0.4331 $^{+0.0017}_{+0.0018}$ in)

c. If the bar limit gauge is not available, use a feeler gauge. The standard gap is **0.020 ~ 0.048 mm (0.0008 ~ 0.0019 in)** and the limit is **0.08 mm (0.0031 in).**

To rebore the corner seal groove, proceed as follows:

1) Remove carbon, rust and other deposits from the groove, being careful not to damage.

2) Install the **jig** (49 2113 030) onto the rotor and tighten the correct bar being careful not to damage the rotor bearing and apex seal groove.

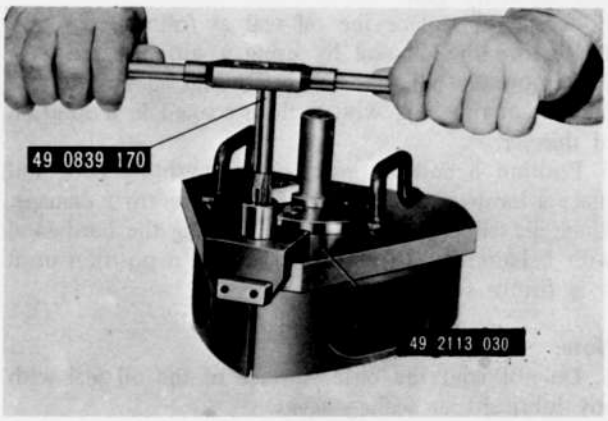

Fig. 1–51 Reaming corner seal groove

3) Ream the groove with the **Reamer** (49 0839 170) by hand applying sufficient engine oil as a coolant. When feeding the reamer, it must be turned by about 20 rotations or over before the reaming work is accomplished completely.

4) Remove the reamer and jig from the rotor.

5) Repeat the same procedure when reaming the other grooves of the rotor.

6) Thoroughly clean the rotor, and check and confirm by visual inspection the condition of the reaming groove and to see if there is any damage to the rotor.

7) Fit a **0.2 mm (0.0079 in)** oversize corner seal and a spring into the groove, and check the corner seal protrusion from the rotor surface, and also confirm the free movement by pressing with finger.

8) Recheck the gap between the side seal and the corner seal. The standard gap is **0.05 ~ 0.15 mm (0.002 ~ 0.006 in).**

Note:

a. When installing or removing the jig, be careful not to hit the rotor.

b. If the reaming is carried out without applying oil, it will be difficult to obtain the proper surface roughness no matter how many times the reaming may be repeated.

c. Avoid two stage reaming, that is, drawing the reamer halfway during the reaming work and then resuming the reaming, because chips may affect the surface roughness.

d. Before starting the reaming work, it must be confirmed that the reamer diameter is up to specifications, because the reamer could be worn in excess of the limit if it was used many times.

1–B–11. Inspecting Eccentric Shaft

1. Wash the shaft in a cleaning solution and blow the oil passage with compressed air.

2. Check the shaft for cracks, scratches, wear or any other damage. Be sure that the oil passages are open.

3. Check the shaft run-out. To check, mount the shaft on "V"-blocks and apply a dial indicator. Slowly rotate the shaft and note the reading on the indicator. If the run-out is more than **0.06 mm (0.0024 in)**, replace the shaft with a new one.

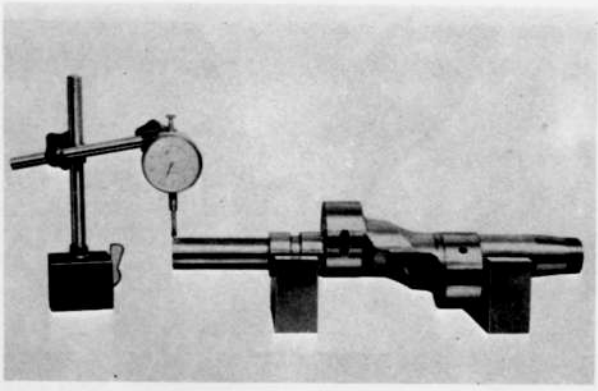

Fig. 1–52 Checking run-out

4. Check the blind plug in the shaft end for oil leakage or looseness. If any oil leakage is found,

remove the blind plug with a hexagonal Allen key and replace the "O" ring.

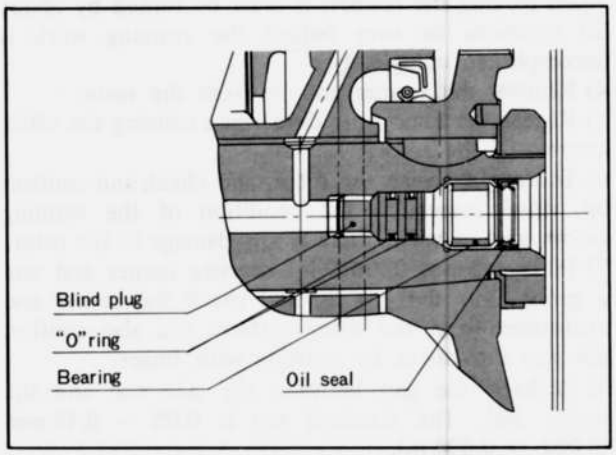

Fig. 1–53 Blind plug

5. Check the needle roller bearing in the shaft end for wear or any damage. If any of these conditions is found, replace the needle roller bearing. If necessary, supply a lithium grease onto the roller bearing. (Only the car with manual transmission)

Note:
To replace the bearing, use the **bearing replacer** (49 0823 070A).

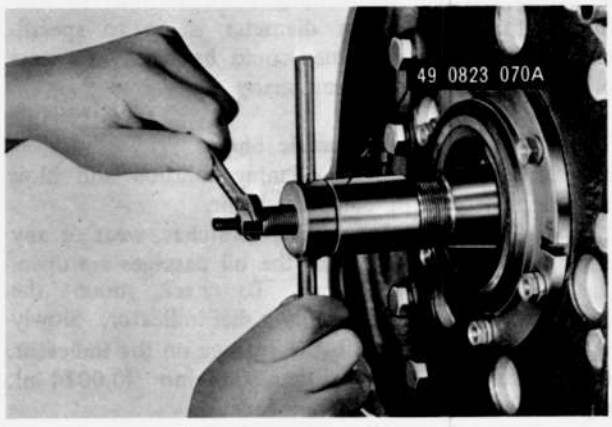

Fig. 1–54 Removing roller bearing

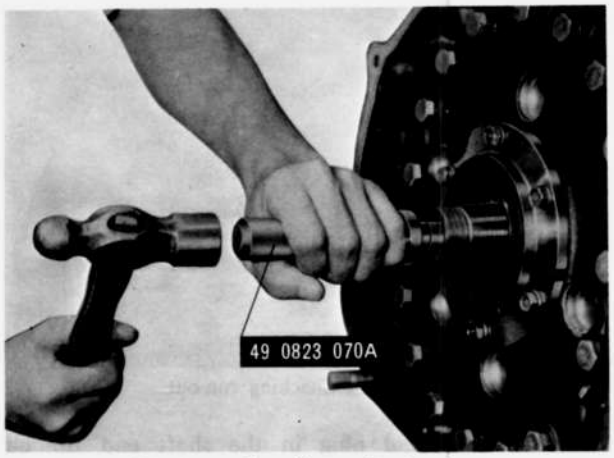

Fig. 1–55 Installing roller bearing

6. The oil jets are installed in the eccentric shaft. The oil jets open when the number of engine revolutions increases and the oil pressure rises. Check for spring weakness, stick or damage of the steel ball.

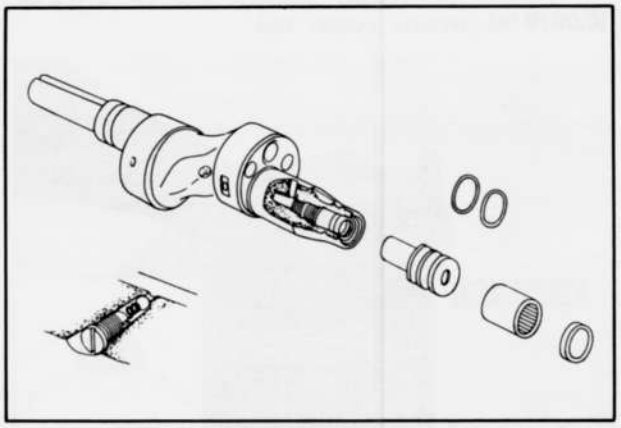

Fig. 1–56 Roller bearing and oil jet

1–B–12. Inspecting Needle Bearing

Check the needle bearing for wear or damage.
Inspect the bearing housing and thrust plate for wear or any damage.

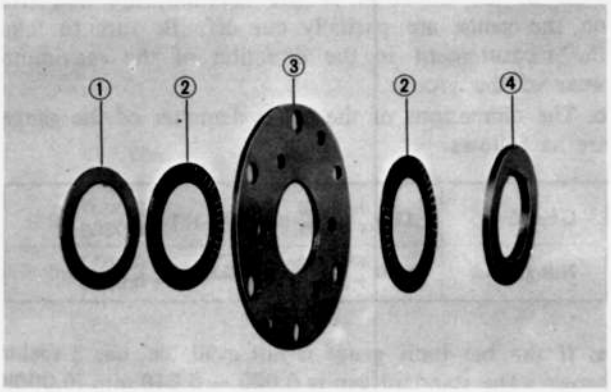

Fig. 1–57 Needle bearings

1. Thrust washer
2. Needle bearing
3. Bearing housing
4. Thrust plate

1–B–13. Inspecting Eccentric Shaft Front and Rear Oil Seals

Check for oil leaks of the front oil seal fitted into the front cover and the rear oil seal fitted into the rear staionary gear.
If necessary, replace the oil seal as follows:
1. Remove the oil seal by using a suitable tool.
2. Remove the oil that adheres to the oil seal mounting bore by wiping with a cloth soaked in a solution of thinner.
3. Position a new oil seal on its mounting bore and place a hardwood on the oil seal to prevent a damage. Then, install the oil seal while tapping the hardwood with a hammer. Drive the oil seal into position until it is firmly seated.

Note:
1. Do not coat the outer surface of the oil seal with any lubricant or sealing agent.
2. Do not tap the oil seal directly with a hammer.

3. When installing the flywheel or front pulley, apply a small amount of engine lubricant to the oil seal lip.

1–C. ENGINE ASSEMBLY

The procedures for assembling the engine when the engine is to be completely overhauled are as follows:

1–C–1. Installing Oil Seal

1. Place the rotor on a rubber pad or cloth.
2. Install the oil seal springs in their respective grooves on the rotor with each round edge of the spring fitted in the stopper hole shown in Fig. 1–58.

Caution:

a. The oil seal springs have been painted in cream or blue color. The **cream-colored** springs must be fitted on the front faces of both front and rear rotors. While the **blue-colored** springs should be on the rear faces of the rotors.

b. When installing each oil seal spring, the painted side of spring must be faced to the oil seal (upward), that is the square edge of spring faces to the oil seal (upward).

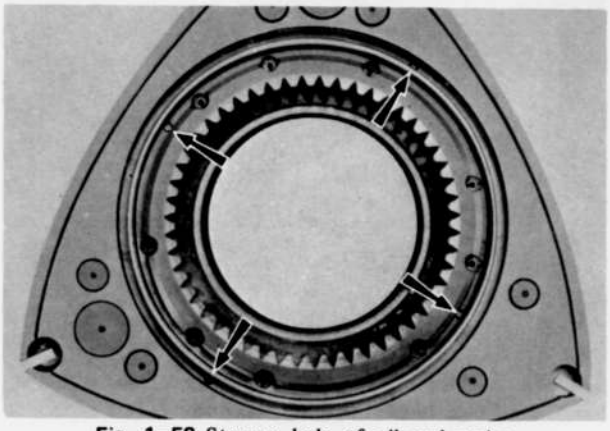

Fig. 1–58 Stopper hole of oil seal spring

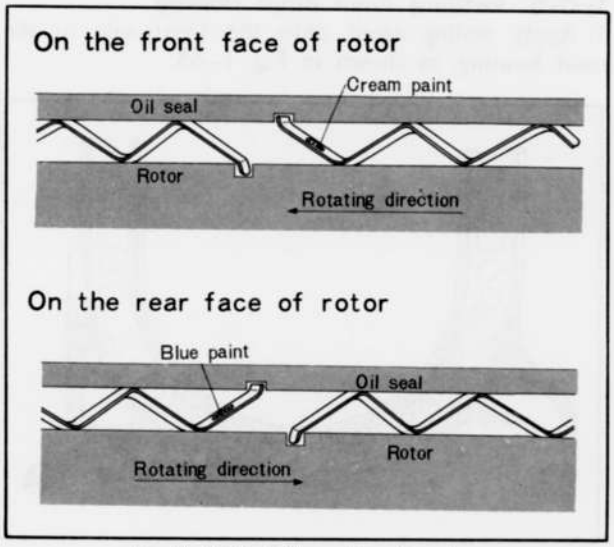

Fig. 1–59 Installing oil seal springs

3. Insert a new "O" ring in each oil seal. For each side of the rotor, install the oil seals, first the inner oil seal then the outer oil seal.

To install the inner oil seal, the following steps should be taken:

1) Place the oil seal to the groove so that the square edge of spring fits in the stopper notch of the oil seal.
2) Press the inner oil seal by using a used inner oil seal so that the lip surface of the inner oil seal sinks into a position approximately 0.4 mm (0.016 in) below the surface of the rotor as shown in Fig. 1–60.

Caution:

Apply the above method to the inner oil seal only.

To install the outer oil seal, proceed as follows.

1) Place the oil seal to the groove so that the square edge of spring fits in the stopper notch of the oil seal.
2) Push the head of the oil seal slowly with fingers.

Note:

a. When replacing the oil seal, confirm the smooth movement of oil seal by placing the oil seal on the oil seal spring in the groove before inserting the "O" ring.

b. Be careful not to deform the lip of the oil seal.

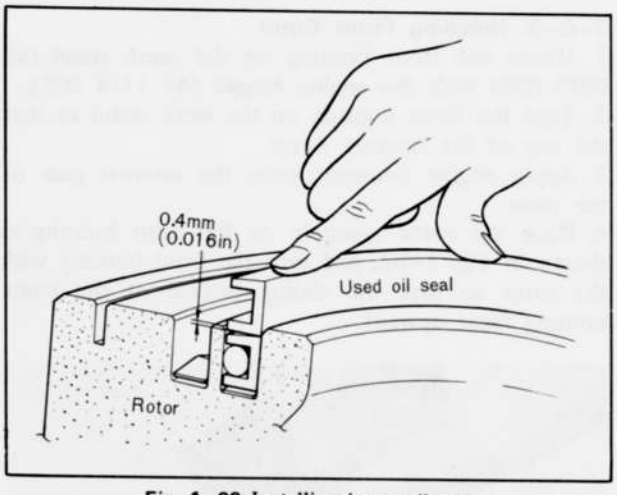

Fig. 1–60 Installing inner oil seal

4. Apply sufficient engine lubricant onto each oil seal and groove, and confirm the smooth movement of each oil seal by pressing the head of oil seal.
5. Check the oil seal protrusion. (Ref. Par. 1–B–7)
6. Install the oil seal springs and oil seals on the other side of the rotor.

1–C–2. Installing Each Seal

1. Place the rotor which has been fitted with the oil seals on the rubber pad or cloth.
2. Fit the apex seals without springs and side pieces into their respective grooves so that each side piece positions on the rear side of each rotor.
Hold the apex seals by using the used "O" ring to keep the apex seals in position.
3. Place the corner seal springs and corner seals into their respective grooves.
4. Fit the side seal springs and side seals into their respective grooves as shown in Fig. 1–61.

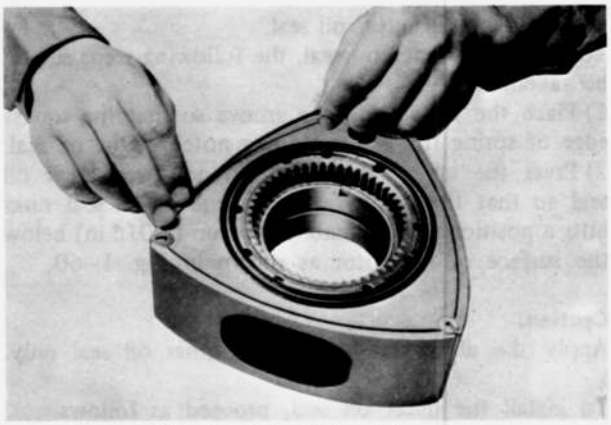

Fig. 1–61 Installing side seal

5. Apply engine lubricant onto each seal, and confirm the smooth movement of each seal by pressing its head.
6. Check each seal protrusion. (Ref. Par. 1–B–9, 10)
7. Invert the rotor, being careful not to drop the seals on the rubber pad or cloth, and install the corner seals, side seals and springs on the other side in the same manner as above.

1–C–3. Installing Front Rotor

1. Mount the front housing on the **work stand** (49 0839 000) with the **engine hanger** (49 1114 005).
2. Turn the front housing on the work stand so that the top of the housing is up.
3. Apply engine lubricant onto the internal gear of the rotor.
4. Place the rotor assembly on the front housing as shown in Fig. 1–62, and turn the front housing with thr rotor so that the sliding surface of the front housing faces upward.

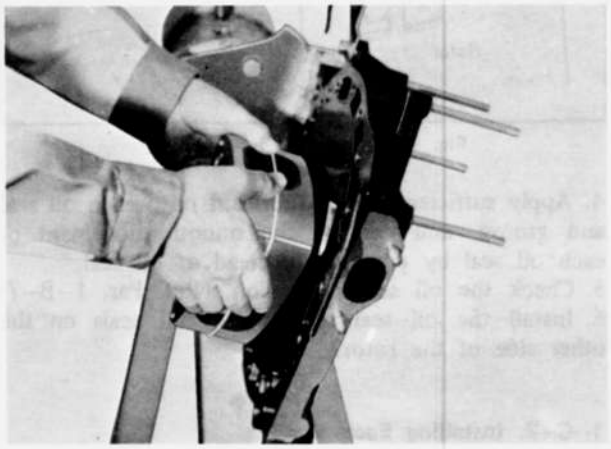

Fig. 1–62 Install front rotor assembly

5. Mesh the internal gear and stationary gear so that one of the rotor apexes is set to any one of the four places shown in Fig. 1–63, and remove the used "O" ring.

Note:
In this case, be careful not to drop the corner seal into the port.

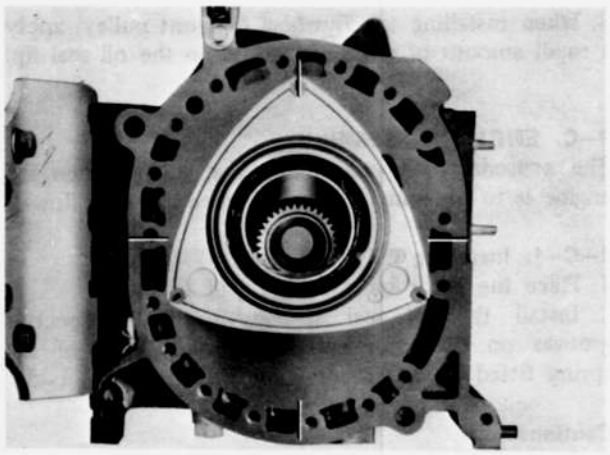

Fig. 1–63 Positioning front rotor

1–C–4. Installing Eccentric Shaft

1. Lubricate the front rotor journal and main journal on the shaft with engine lubricant.
2. Insert the eccentric shaft being careful not to damage the rotor bearing and main bearing.

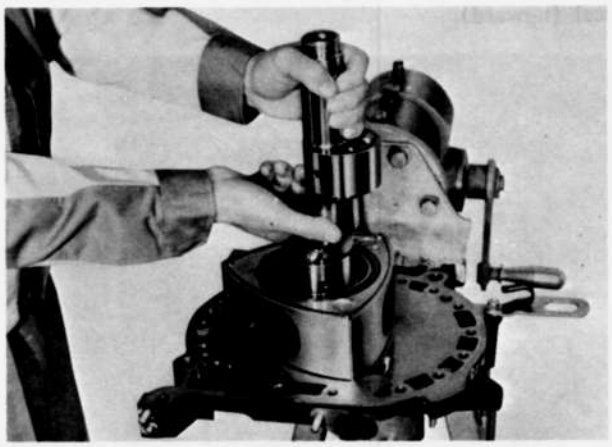

Fig. 1–64 Installing eccentric shaft

1–C–5. Installing Front Rotor Housing

1. Apply sealing agent onto the front side of the rotor housing, as shown in Fig. 1–65.

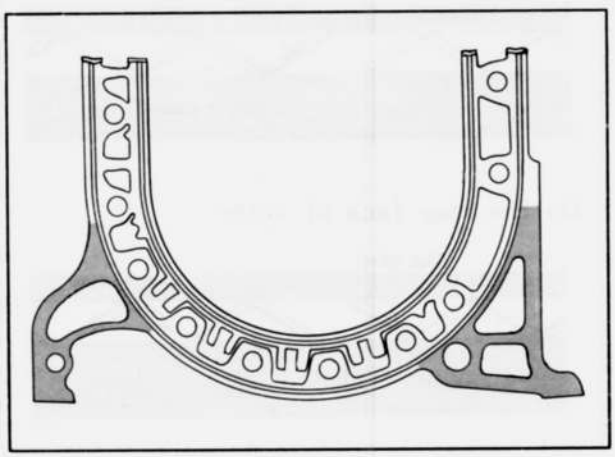

Fig. 1–65 Applying sealing agent

2. Slightly apply vaseline or petrolatum onto new "O" ring and sealing rubbers to prevent them from coming

off, and place the "O" ring and sealing rubbers on the front side of the rotor housing.

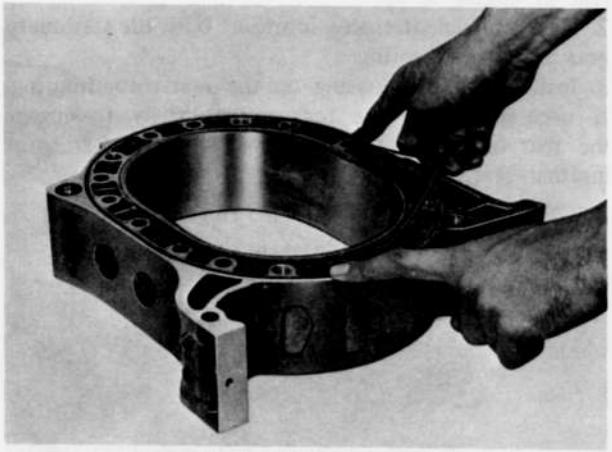

Fig. 1–66 Installing sealing rubber

Note:
The inner and outer sealing rubbers are square type. The wider line of the inner sealing rubber should face with combustion chamber and the seam of the sealing rubber should be placed at the position as shown in Fig. 1–67.
Do not stretch the inner sealing rubber.

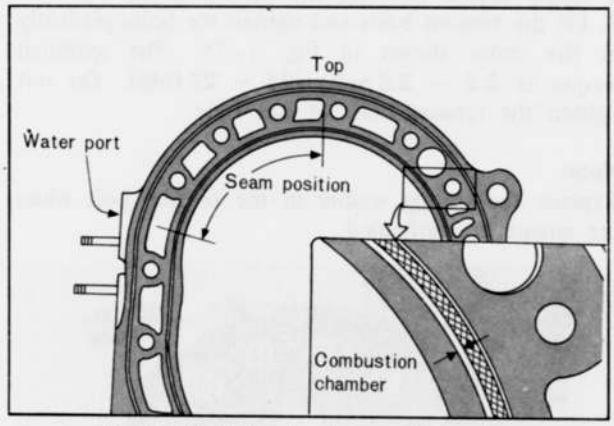

Fig. 1–67 Positioning inner sealing rubber

Note:
When engine overhauling, install the protector to only inner sealing rubber as shown in Fig. 1–68 to improve the durability of the sealing rubber.

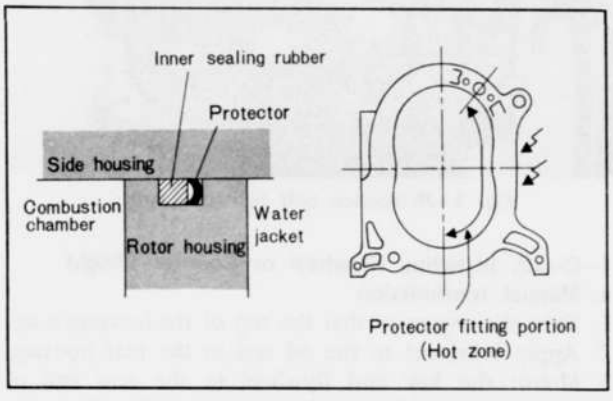

Fig. 1–68 Installing sealing rubber protector

3. Invert the front rotor housing being careful not to let the sealing rubbers and "O" ring drop out of the grooves, and mount it on the front housing.
4. Apply engine lubricant onto the tubular dowels and insert the tubular dowels through the front rotor housing holes into the front housing holes as shown in Fig. 1–69.

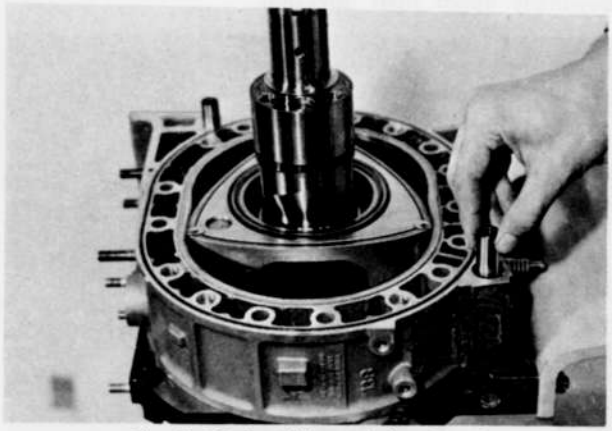

Fig. 1–69 Installing tubular dowel

5. Apply the sealing agent on the rear side of the rotor housing referring to the other side.
6. Place new "O" ring, sealing rubbers and protector on the front rotor housing in the same manner as on the other side.
7. Insert the each apex seal spring confirming the spring direction as shown in Fig. 1–47.
8. Fit the each side piece to its original position. And confirm that the spring should be set correctly on the side piece.

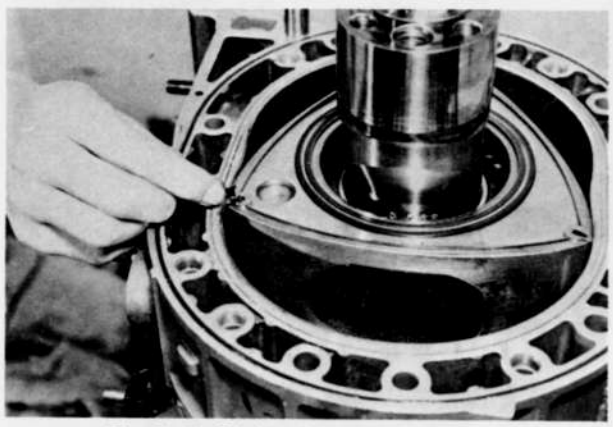

Fig. 1–70 Fitting side piece and spring

9. Apply engine lubricant on the side pieces. And make sure that the front rotor housing is free from any foreign matter and apply some engine lubricant onto the sliding surface of the front rotor housing.

1–C–6. Installing Intermediate Housing

1. Turn the front housing with rotor assembly so that the top of the housing inclines to upward, and pull the eccentric shaft about 25 mm (1 in), but do not pull over 35 mm (1.5 in).

2. Install the intermediate housing through the eccentric shaft on the front rotor housing, and turn the engine on the work stand so that the rear of engine is up.

Note:
As the easy way of installation of the intermediate housing, position the eccentric portion of shaft in diagonally upper right direction.

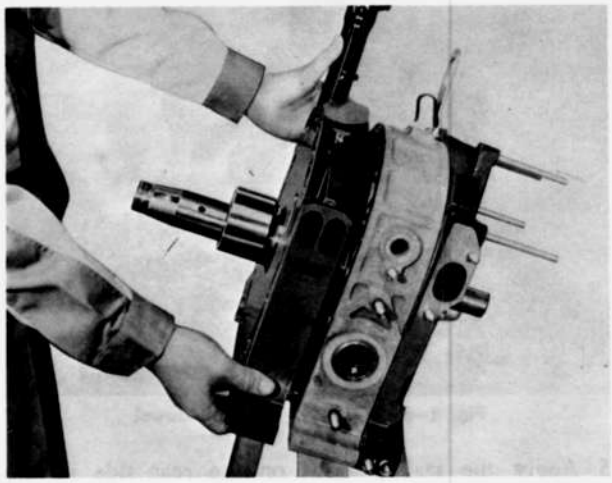

Fig. 1–71 Installing intermediate housing

1–C–7. Installing Rear Rotor and Rear Rotor Housing

Refer to steps 1–C–1 to 1–C–5 and install the rear rotor and rear rotor housing.

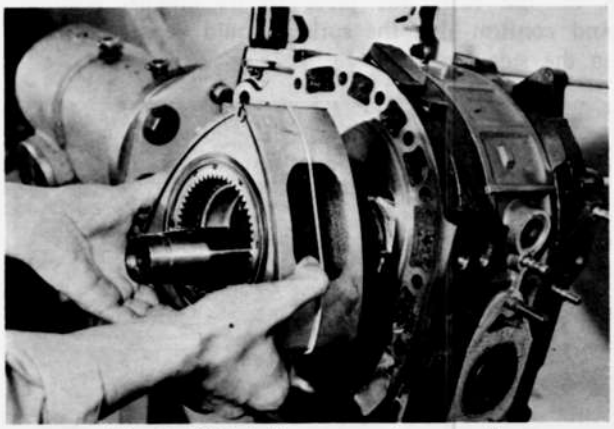

Fig. 1–72 Installing rear rotor assembly

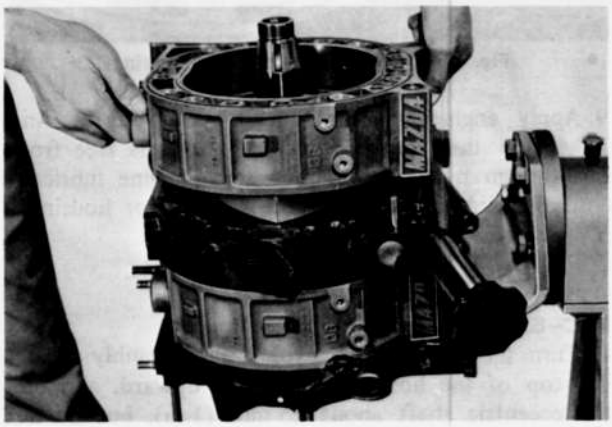

Fig. 1–73 Installing rear rotor housing

1–C–8. Installing Rear Housing

1. Turn the engine on the work stand so that the rear of engine is up.
2. Apply sufficient engine lubricant onto the stationary gear and main bearing.
3. Install the rear housing on the rear rotor housing. If necessary, turn the rear rotor slightly to engage the rear housing stationary gear with the rear rotor internal gear.

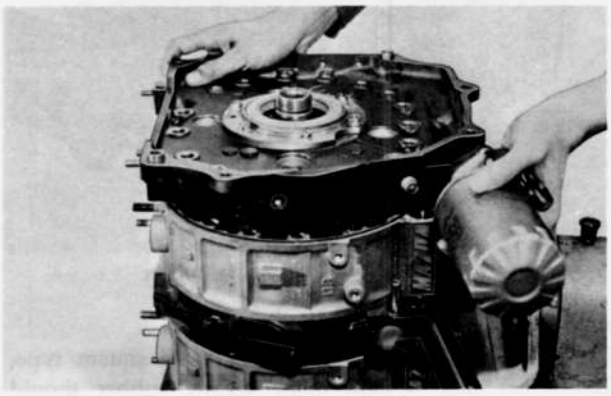

Fig. 1–74 Installing rear housing

1–C–9. Tightening Tension Bolts

1. Place a new sealing washer in each tension bolt.
2. Apply engine oil onto the thread of the bolt.
3. Fit the tension bolts and tighten the bolts gradually in the order shown in Fig. 1–75. The specified torque is **3.2 ~ 3.8 m-kg (23 ~ 27 ft-lb)**. Do not tighten the tension bolts at one time.

Note:
Replace the sealing washer in the tension bolt when the engine is overhauled.

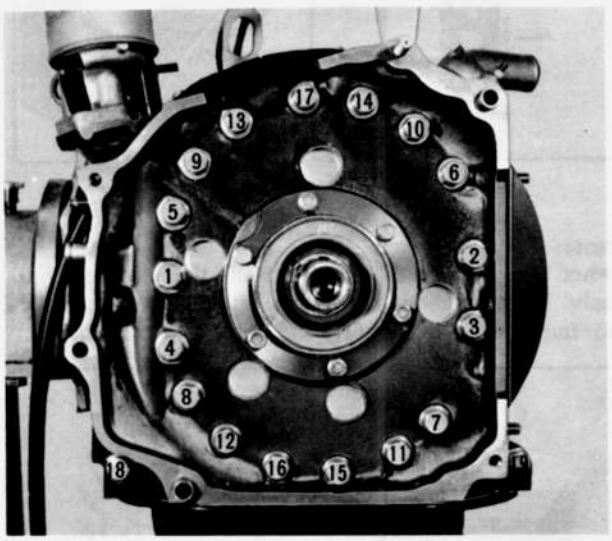

Fig. 1–75 Tension bolt tightening order

1–C–10. Installing Flywheel or Counter Weight

a. Manual transmission

1. Turn the engine so that the top of the housing is up.
2. Apply lubricant to the oil seal in the rear housing.
3. Mount the key and flywheel to the rear end of the eccentric shaft so that the key fits into the

keyway of the flywheel.

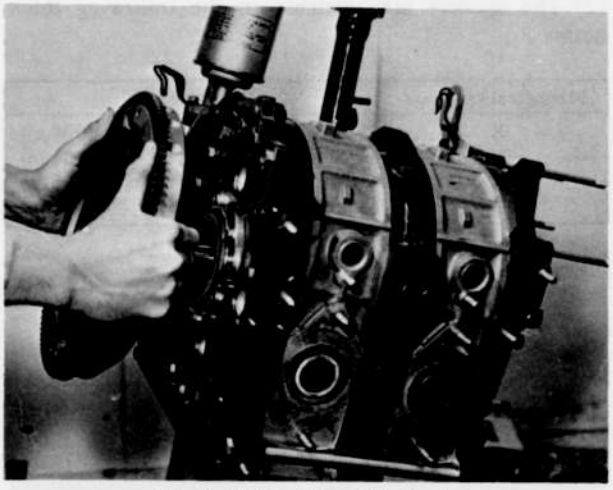

Fig. 1–76 Installing flywheel

4. After mounting, turn the eccentric shaft and make sure that the rotation is light and smooth.
5. Apply sealing agent to both sides of the flywheel lock washer and place the lock washer in position.
6. Fit the flywheel lock nut by the fingers. Hold the flywheel with the **ring gear brake** (49 1881 060) and tighten the lock nut to **45.0 m-kg (350 ft-lb)** using the **special wrench** (49 0820 035).

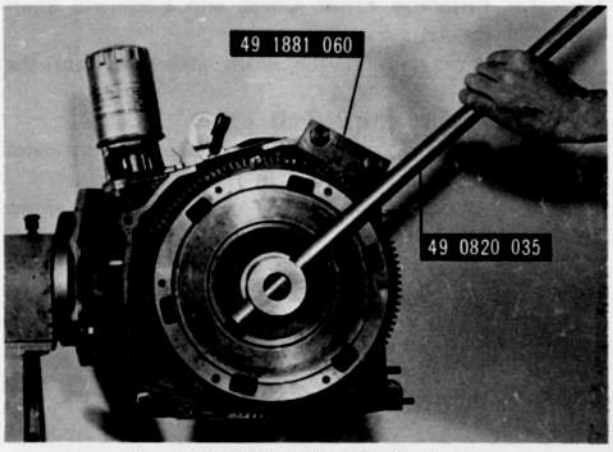

Fig. 1–77 Tightening flywheel nut

7. Bent the tab of the lock washer.
8. Hold the clutch disc in its mounting position with the **clutch disc arbor** (49 0813 310). If the arbor is not available, use a spare main drive shaft.
9. Mount the clutch cover and pressure plate assembly on the flywheel, and align the "O" mark on the clutch cover with the reamed hole of the flywheel. Install the attaching bolts and tighten the bolts to 2.0 m-kg (15 ft-lb), using the ring gear brake. Use the two reamer bolts in the reamed holes.

b. Automatic transmission

1. Referring to the above manners (1–C–10. a), fit the key, counter weight, lock washer and nut on the eccentric shaft.
2. Hold the counter weight with the **counter weight brake** (49 1881 055) and tighten the lock nut to **45.0 m-kg (350 ft-lb)** using the **special wrench** (49 0820 035).
3. Fit the drive plate on the counter weight and tighten attaching nuts. After installing the flywheel or counter weight, leave the ring gear brake or counter weight brake on the engine alone.

1–C–11. Adjusting Eccentric Shaft End Play

1. Turn the engine on the work stand so that the front of the engine is up.
2. Fit the thrust plate with the tapered face down, and slide the spacer and needle bearing onto the eccentric shaft. Then apply sufficient engine lubricant onto them.

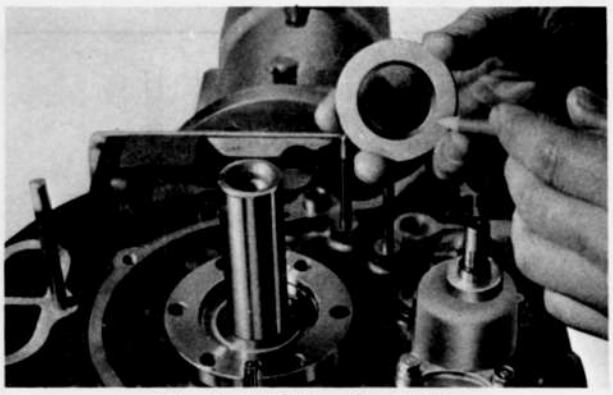

Fig. 1–78 Fitting thrust plate

3. Place the bearing housing on the front housing. Tighten the attaching bolts with washers.

Note :

If the bearing housing has been installed to the front housing, special care should be taken when installing the spacer.
Install the spacer so that the center of the needle bearing in the bearing housing comes to the center of eccentric shaft, and the spacer should be seated to the thrust plate.

4. Slide the needle bearing onto the shaft, and apply engine lubricant onto it.
5. Slide the balance weight together with the thrust washer onto the shaft.

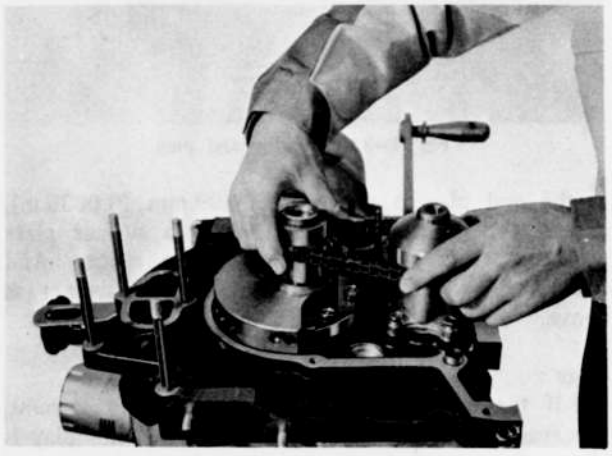

Fig. 1–79 Installing chain and sprockets

6. Engage the oil pump drive chain with the driven sprocket and drive sprocket, and then slide the sprockets with chain onto the eccentric shaft and oil pump shaft simultaneously aligning the keyway of the driven gear sprocket with the key on the oil pump shaft. Fit the key onto the eccentric shaft.
7. Slide the distributor drive gear onto the eccentric shaft with "F" mark on the gear faced the front of engine.
8. Install the eccentric shaft pulley onto the shaft aligning the keyway of the pulley with the key.
9. Tighten the pulley bolt with washer to **7.5 ~ 9.5 m-kg (54 ~ 69 ft-lb).**
10. Turn the engine on the work stand so that the top of the engine is up.

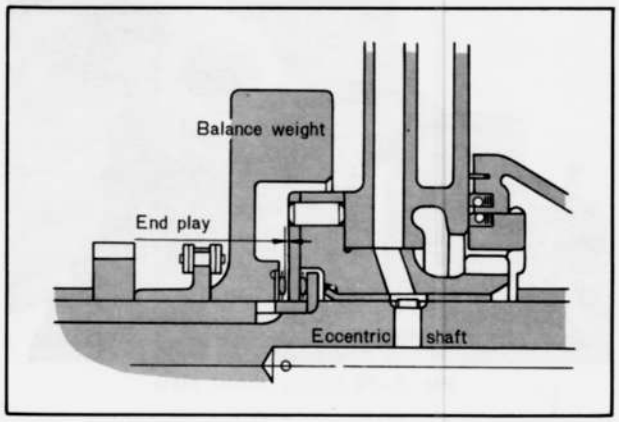

Fig. 1–80 Eccentric shaft end play

11. Apply a dial indicator onto the flywheel as shown in Fig. 1–81. Move the flywheel fore and aft, and note the reading of the indicator. The standard end play is **0.04 ~ 0.07 mm (0.0016 ~ 0.0028 in).**

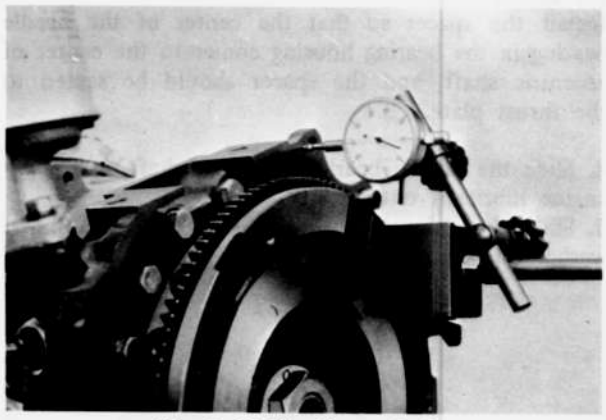

Fig. 1–81 Checking end play

If the end play is more than **0.09 mm (0.0035 in),** adjust it by grinding the spacer on a surface plate using an emery paper or replace the spacer. And then recheck the end play in the same manner as above.

Note :
(1) If the end play is below the specified amount, the spacer thickness is too small. If the end play is above the specified amount, the spacer thickness is too big.
(2) The spacers are available in the following thicknesses :

Identification Mark	Thickness
X	8.08 ± 0.01 mm (0.3181 ± 0.0004 in)
Y	8.04 ± 0.01 mm (0.3165 ± 0.0004 in)
V	8.02 ± 0.01 mm (0.3158 ± 0.0004 in)
Z	8.00 ± 0.01 mm (0.3150 ± 0.0004 in)



Fig. 1–82 Adjusting spacer

12. If the end play is 0.04 ~ 0.09 mm (0.0016 ~ 0.0035 in), proceed as follows to install the front cover.

1–C–12. Installing Front Cover and Eccentric Shaft Pulley

1. Turn the engine on the work stand so that the front of the engine is up.
2. Remove the eccentric shaft pulley.
3. Tighten the oil pump driven sprocket nut and bend the tab of the lock washer.
4. Place the chain adjuster in position and tighten the attaching nuts.
5. Place a new "O" ring on the oil passage of the front housing.

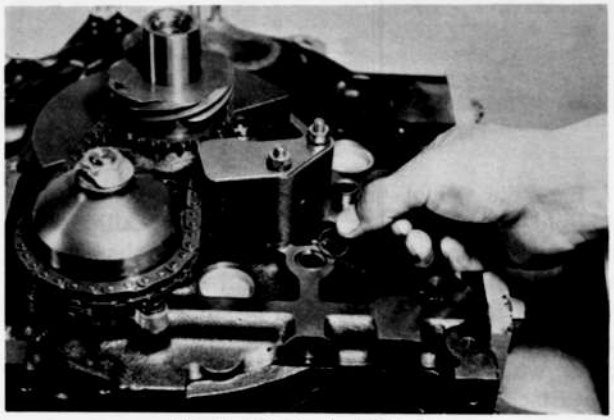

Fig. 1–83 Placing "O" ring

6. Place the gasket and front cover on the front housing, and tighten the attaching bolts.
7. Apply engine lubricant onto the oil seal in the front cover.
8. Install the eccentric shaft pulley onto the shaft and tighten the pulley bolt with washer to 7.5 ~ 9.5 m-kg (54 ~ 69 ft-lb).

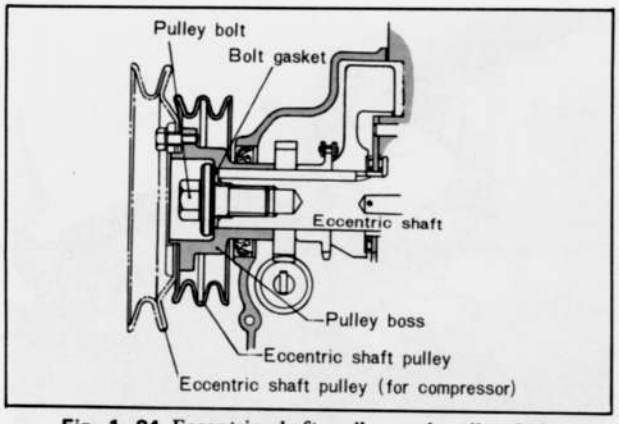

Fig. 1–84 Eccentric shaft pulley and pulley bolt

Note:
When tightening the pulley bolt, be careful not to slip the washer from the bolt.

1–C–13. Installing Oil Strainer and Oil Pan

1. Turn the engine on the work stand so that the bottom of the engine is up.
2. Cut off the excess gasket on the front cover along the mounting surface of the oil pan.

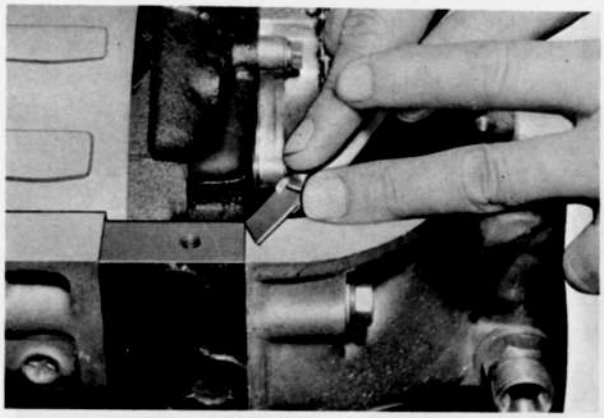

Fig. 1–85 Cutting off excess gasket

3. Place the oil strainer gasket and strianer on the front housing and tighten the attaching bolts.

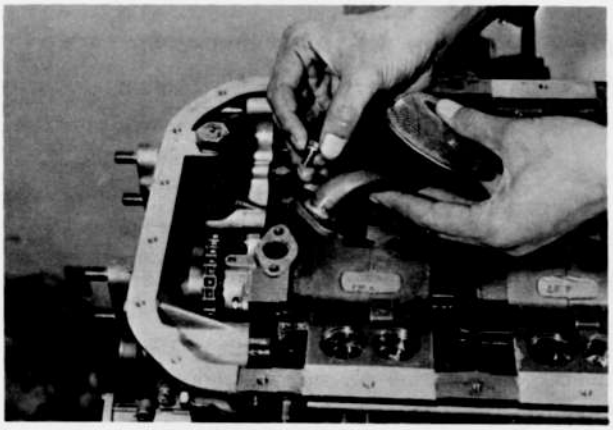

Fig. 1–86 Installing oil strainer

4. Apply the sealing agent onto the joint surfaces of each housing.

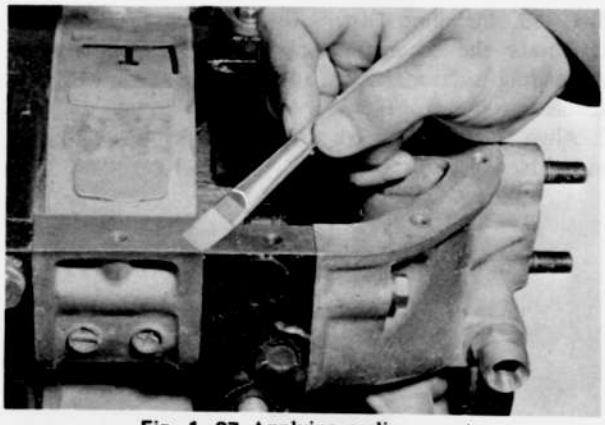

Fig. 1–87 Applying sealing agent

5. Place the gasket and oil pan in position.
6. Insert the bolts through the stiffeners, and tighten the bolts little by little in turn until the torque becomes 0.85 m-kg (6.1 ft-lb) evenly.

1–C–14. Installing Water Pump

1. Turn the engine on the work stand so that the top of the engine is up.
2. Place the gaskets and water pump on the front housing, and tighten the attaching nuts evenly to 2.75 m-kg (20 ft-lb) in the sequence shown in Fig. 1–89.

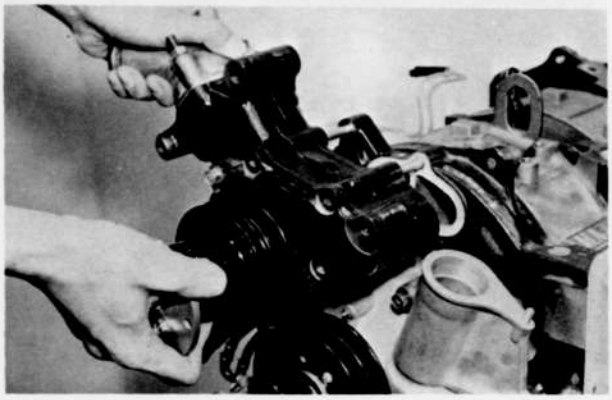

Fig. 1–88 Installing water pump

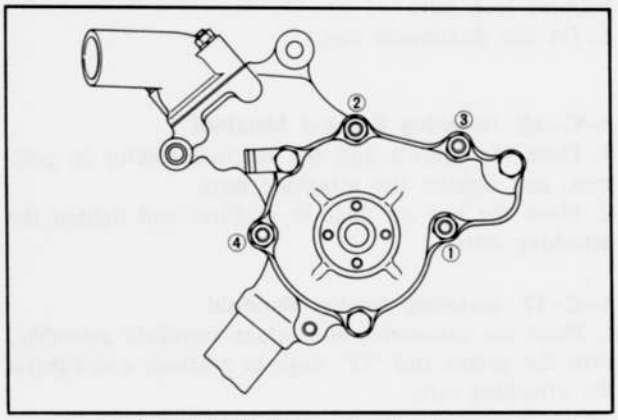

Fig. 1–89 Tightening order of water pump

3. Install the eccentric shaft pulley (for compressor) to the pulley boss.

1–C–15. Installing Distributor

1. Rotate the eccentric shaft until the yellow mark or leading side mark on the pulley aligns with the needle on the front cover.
2. Align the tally mark on the distributor housing and driven gear as shown in Fig. 1–90.

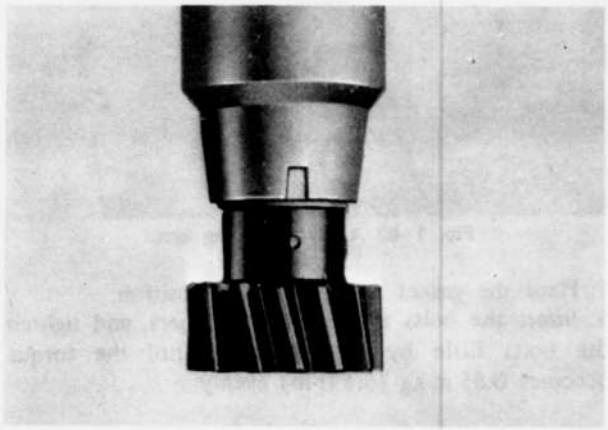

Fig. 1–90 Aligning tally mark

3. Insert the distributor so that the distributor lock bolt is located in the center of the slit, and engage the gears.

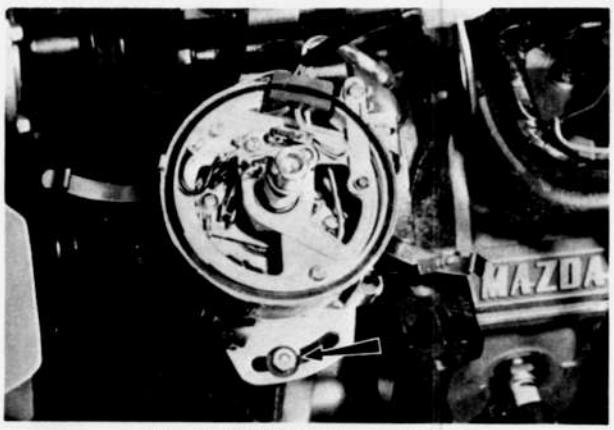

Fig. 1–91 Installing distributor

4. Rotate the distributor clockwise until the leading contact point starts to separate, and tighten the distributor lock nut.
5. Fit the distributor cap.

1–C–16. Installing Exhaust Manifold

1. Place the gaskets and the thermal reactor in position, and tighten the attaching nuts.
2. Place the hot air duct in position and tighten the attaching nuts.

1–C–17. Installing Intake Manifold

1. Place the carburetor and intake manifold assembly, with the gasket and "O" rings in position and tighten the attaching nuts.

Note:
Slightly apply vaseline onto "O" rings to prevent them from coming off.

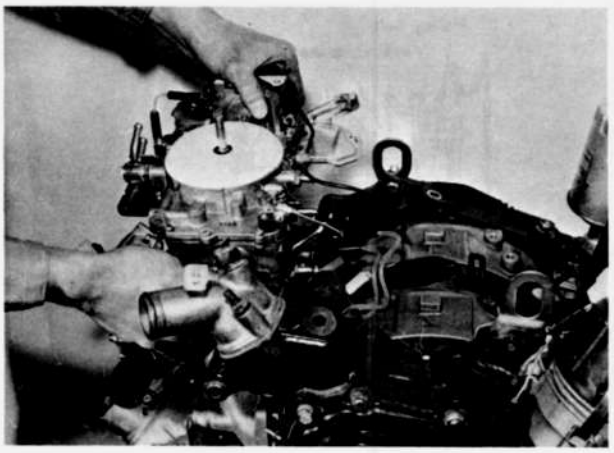

Fig. 1–92 Installing intake manifold assembly

2. Connect the oil tubes and metering oil pump connecting rod with the carburetor as described in Par. 2–I–2.
3. Install the deceleration valve, altitude compensator and evapo compensator valve and connect the vacuum hoses, air hoses and wires with the carburetor.

1–C–18. Installing Alternator and Air Pump

1. Place the alternator to the bracket with the bolt, and check the clearance as shown in Fig. 1–93.

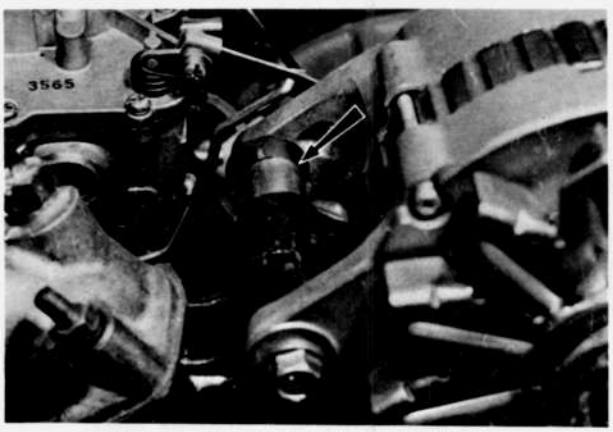

Fig. 1–93 Adjusting alternator fitting

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

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

2. Attach the upper end of the alternator flange to the adjusting bar, and fit the "V" belt.
3. Adjust the belt deflection.
The belt deflection should be **15 ± 2 mm (0.60 ± 0.08 in)** when thumb pressure of about 10 kg (22 lb) is applied to the middle of the belt between the alternator pulley and eccentric shaft pulley.
After adjusting, tighten the bolts and nuts.
4. Install the air pump with the attaching bar and bolts. Fit the "V" belt.

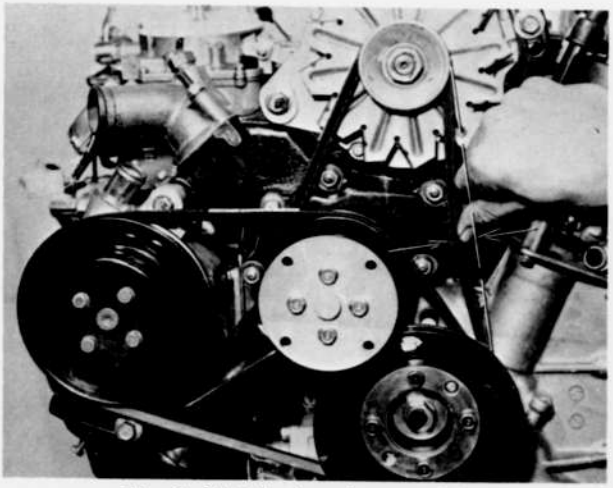

Fig. 1–94 Adjusting alternator belt

5. To adjust the "V" belt tension, push the "V" belt with about 10 kg (22 lb) as shown in Fig. 1–95. The belt deflection should be **10 ± 1 mm (0.40 ± 0.04 in).**

After adjusting, tighten the bolts and nuts.

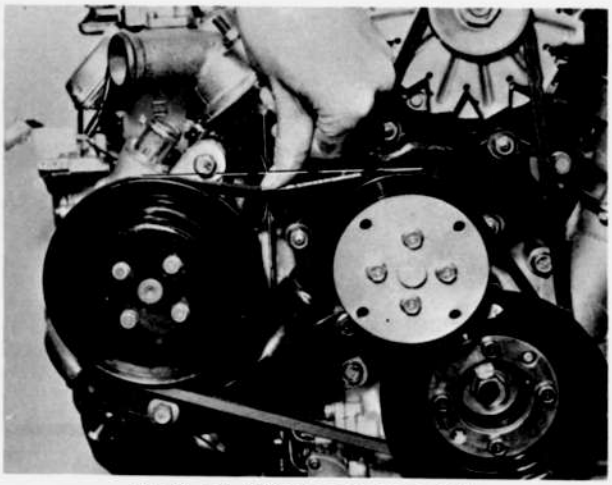

Fig. 1–95 Adjusting air pump belt

6. Before removing the engine from the work stand, install the engine mounting bracket to the front cover.

SPECIAL TOOLS

49 0839 000	Engine work stand
49 1114 005	Engine hanger
49 0820 035	Special wrench
49 0823 300	Flywheel puller
49 0839 305A	Counter weight puller
49 0813 250	Seal case
49 0813 215	Tubular dowel puller
49 0813 235	Main bearing replacer
49 0813 240	Rotor bearing replacer
49 0813 225	Oil seal remover
49 0839 165	Bar limit gauge (for corner seal groove)
49 2113 030	Reboring jig (for corner seal groove)
49 0839 170	Reamer (for corner seal groove)
49 1881 060	Ring gear brake
49 1881 055	Counter weight brake
49 0877 435	Special wrench (for automatic transmission)
49 0813 310	Clutch disk arbor
49 0823 070A	Eccentric shaft bearing replacer
49 1881 135	Special wrench (for P.C.V. valve)
49 1881 125	Special wrench (for thermal reactor)

EMISSION CONTROL SYSTEM

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EMISSION CONTROL SYSTEM

This section explains the procedures for checking, adjusting and replacing the parts of the emission control system.

1A–A. MAINTENANCE PROCEDURE

1A–A–1. Air Pump

a. Checking air pump

1. Check for cracks or damages on the body of the air pump and for looseness of the attaching bolts and nuts.
2. Check to see that the air pump belt tension is proper.
3. Run the engine at idle speed.
4. Check to see that the air hoses are free of air leaks.
5. Stop the engine.
6. Attach the **air pump gauge set** (49 2113 010A) as shown in Fig. 1A–1.

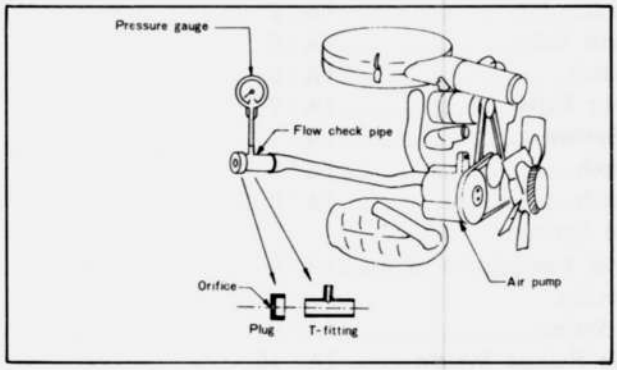


Fig. 1A–1 Checking air pump

7. Run the engine.
8. If the pressure gauge reading is not within the range of each of the following specifications, replace the air pump.

M.T.	more than 0.039 kg/cm² (0.55 lb/in²) at 800 rpm
A.T.	more than 0.034 kg/cm² (0.48 lb/in²) at 750 rpm

b. Removing air pump

1. Remove the hot air duct for the air cleaner.
2. Disconnect the air inlet hose (air cleaner ~ air pump) and outlet hose (air pump ~ air control valve) from the air pump.
3. Remove the air pump mounting and adjusting bolts.
4. Remove the air pump drive belt and air pump.

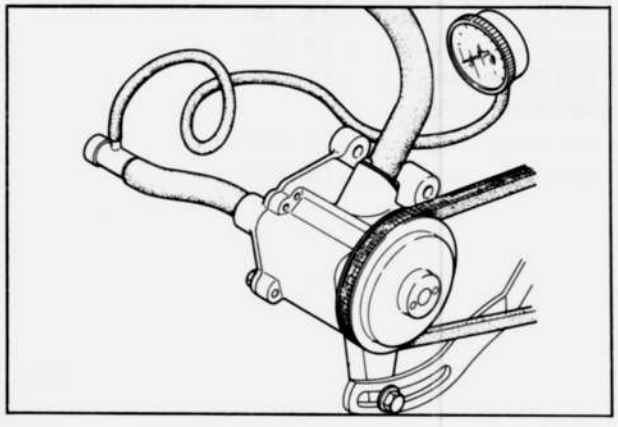


Fig. 1A–2 Air pump gauge set

c. Installing air pump

Follow the removal procedures in the reverse order.

d. Adjusting air pump drive belt

When a **10 kg (22 lb) pressure** is given to a spot midway between the air pump pulley and water pump pulley, belt deflection should be **10 ± 1 mm (0.40 ± 0.04 in).**

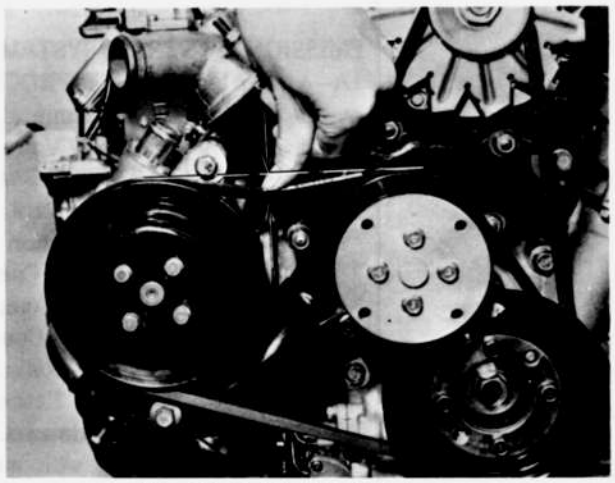


Fig. 1A–3 Adjusting belt tension

1A–A–2. Check Valve (Air Injection System)

a. Checking check valve

1. Disconnect the air hose (air pump ~ air control valve) from the air control valve.
2. Run the engine at 1,500 rpm.
3. Hold a finger over the inlet of the air control valve. If exhaust gas flow is felt, replace the check valve, spring and gasket.

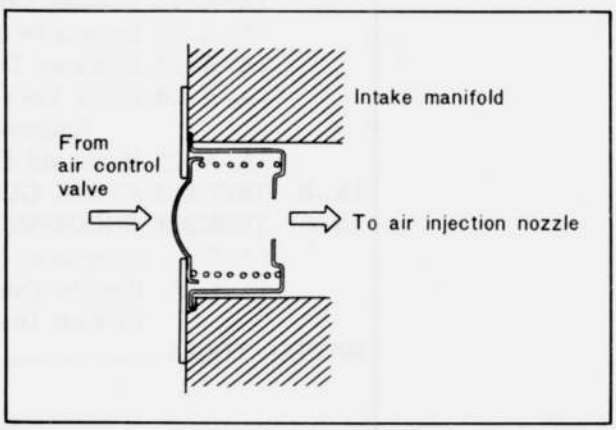


Fig. 1A–4 Check valve

b. Replacing check valve

1. Remove the air control valve, as described in Par. 1A–A–4.
2. Remove the gasket, valve and spring.
3. Install the check valve by following the removal

procedures in the reverse order.

1A–A–3. Thermal Reactor

a. Checking thermal reactor

1. Check to see that the appearance of the thermal reactor is not damaged or cracked by visual inspection or striking it with the hammer lightly.
2. Remove the air pipe (thermal reactor ~ air control valve) from the thermal reactor.
3. Check to see that the non-return valve works smoothly. If the foreign substance or sludge exists, remove it. If the sticking exists, replace the thermal reactor.

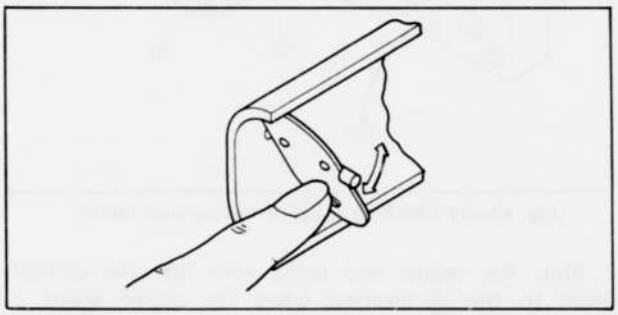


Fig. 1A–5 Checking non-return valve

4. Connect the air pipe to the thermal reactor.
5. Start the engine and keep it running at idle speed.
6. Make sure that most exhaust gas is not released from the tail of cooling air pipe. If the most exhaust gas releases, replace the thermal reactor.

b. Replacing thermal reactor

1. Remove the air control valve, as described in Par. 1A–A–4.
2. Remove the bolts attaching the heat insulator to the intake manifold and remove the heat insulator.
3. Raise the front of vehicle and support with stands.
4. Remove the bolts attaching the engine under cover and remove the cover.
5. Remove the bolts attaching the thermal reactor cover and remove the cover.

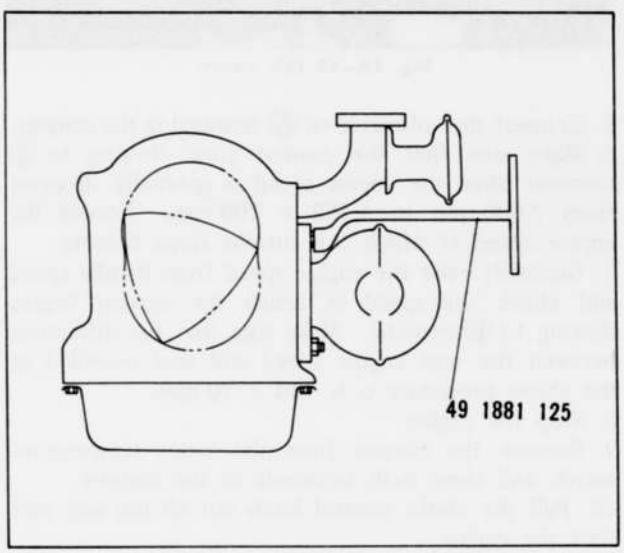


Fig. 1A–6 Removing thermal reactor

6. Disconnect the exhaust pipe from the thermal reactor.
7. Remove the nuts attaching the thermal reactor to the engine.

Note:
The upper nuts should be removed with the **thermal reactor remover** (49 1881 125).

8. Remove the thermal reactor.
9. Install the thermal reactor by following the removal procedures in the reverse order.

1A–A–4. Air Control Valve

a. Checking air control valve

Manual transmission:

1. Disconnect the coupler from the air control valve.
2. Apply the voltage (12V) of the battery on each of the terminals in the coupler. If the clicking sound is audible from each solenoid, the solenoid is in good conditions. If the solenoid is defective, replace it.

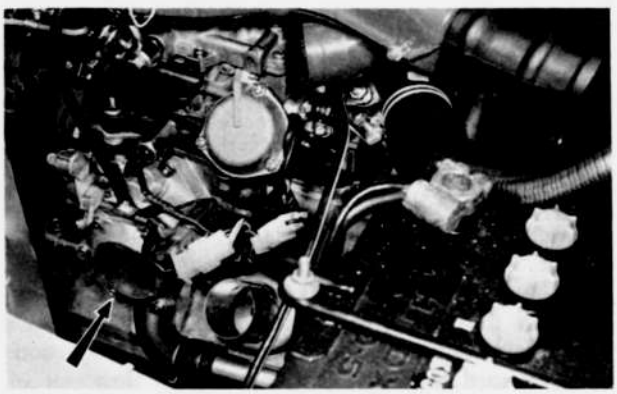


Fig. 1A–7 Air control valve

3. Connect the coupler to the air control valve.
4. Remove the air pipe (air control valve ~ thermal reactor) from the thermal reactor.

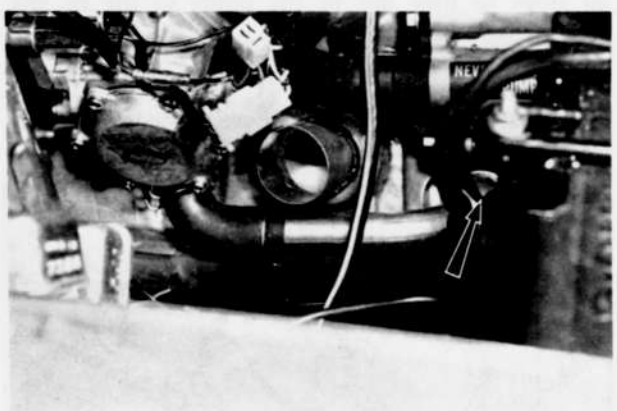


Fig. 1A–8 Removing air pipe

5. Start the engine and keep it running at idle speed.
6. Hold a finger over the outlet of the air pipe and make sure that the air hardly flows out of the air pipe.
7. Disconnect the coupler from the air control valve.

8. Apply the voltage (12V) of the battery on Ⓐ terminal in the coupler. Make sure that the air flows out of the outlet of the air pipe on that occasion.
9. Apply the voltage (12V) of the battery on Ⓑ terminal in the coupler. Make sure that the air flows out of the outlet of the air pipe on that occasion.

Note:
1. If the air flow is noted in the above procedure 6, check every part according to Par. 1A–B. Trouble Check Guide.
2. If the air does not flow out in the above procedures 8 and 9, replace the air control valve.

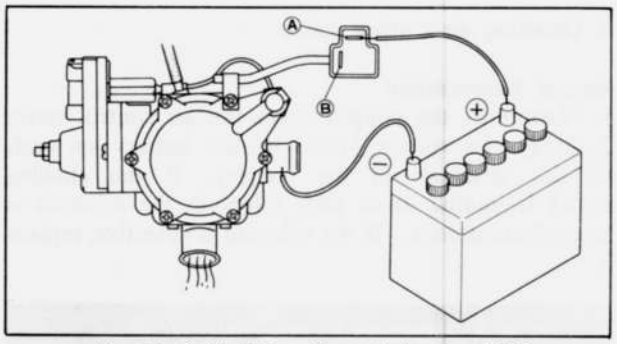


Fig. 1A–9 Checking air control valve (M/T)

Automatic transmission:
1. Take the same procedures as those of 1 ~ 7 indicated in the item of Manual Transmission.
2. Apply the voltage (12V) of the battery on Ⓐ terminal in the coupler. Make sure that the air flows out of the outlet of the air pipe on that occasion.
3. Apply the voltage (12V) of the battery on Ⓑ terminal in the coupler. Make sure that the air flows out of the outlet of the air pipe on that occasion.
4. Make sure that the air continues to flow out of the outlet of the air pipe even when it is stopped to apply the voltage of the battery in the above procedure 3.
5. Apply the voltage (12V) of the battery directly on Ⓒ terminal in the coupler. Make sure that the air stops to flow out of the outlet of the air pipe on that occasion.

Note:
If a trouble is found in the above procedures 2 ~ 5, replace the air control valve.

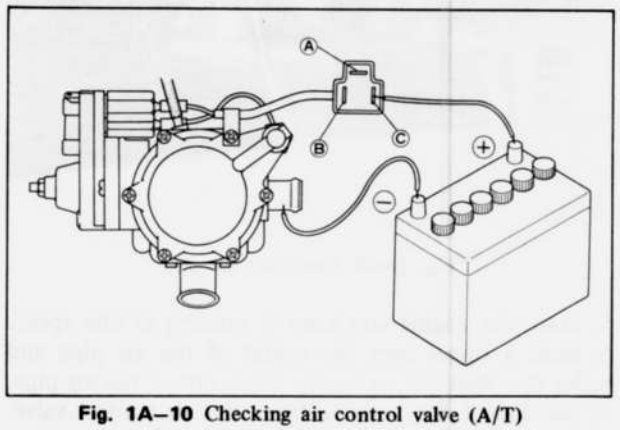


Fig. 1A–10 Checking air control valve (A/T)

b. Checking signal of control unit

Manual transmission:
1. Disconnect the coupler from the air control valve.
2. Connect the voltmeter to Ⓐ terminal in the coupler.

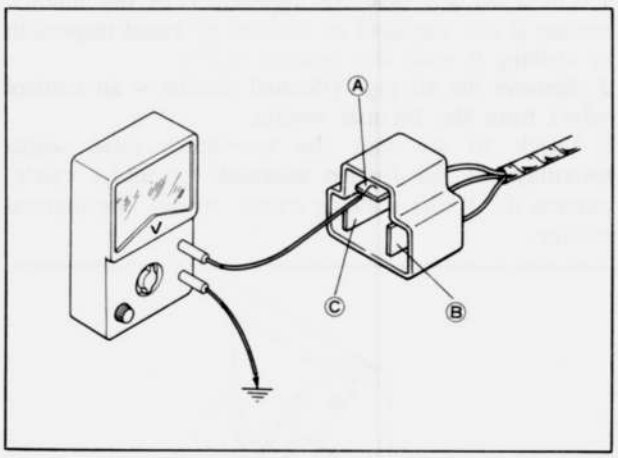


Fig. 1A–11 Checking signal of control unit (M/T)

3. Start the engine and make sure that the current flows to the Ⓐ terminal when the engine speed is **more than 4,000 ± 400 rpm.**
4. Make sure that the current stops flowing to Ⓐ terminal when the idle switch is pushed with the fingers in the above procedure 3.

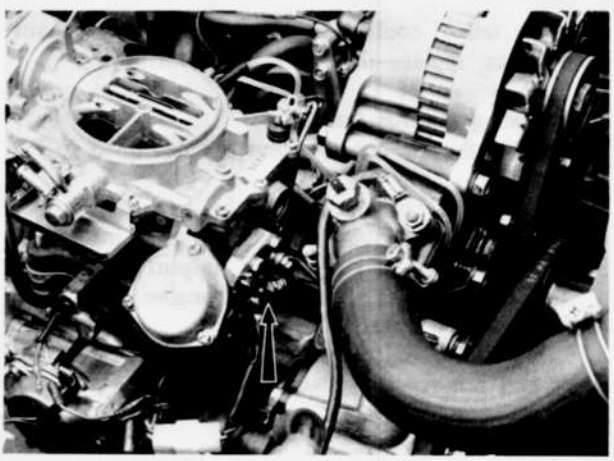


Fig. 1A–12 Idle switch

5. Connect the voltmeter to Ⓑ terminal in the coupler.
6. Make sure that the current stops flowing to Ⓑ terminal when the engine speed is gradually dropped from 2,000 rpm to **1,150 ± 100 rpm.** Record the engine speed at which the current stops flowing.
7. Gradually raise the engine speed from its idle speed and check the speed at which the current begins flowing to Ⓑ terminal. Make sure that the difference between the said engine speed and that recorded in the above procedure 6 is **150 ± 70 rpm.**
8. Stop the engine.
9. Remove the coupler from the water temperature switch and close both terminals in the coupler.
10. Pull the choke control knob out all the way and start the engine.
11. Make sure that the current does not flow to Ⓑ

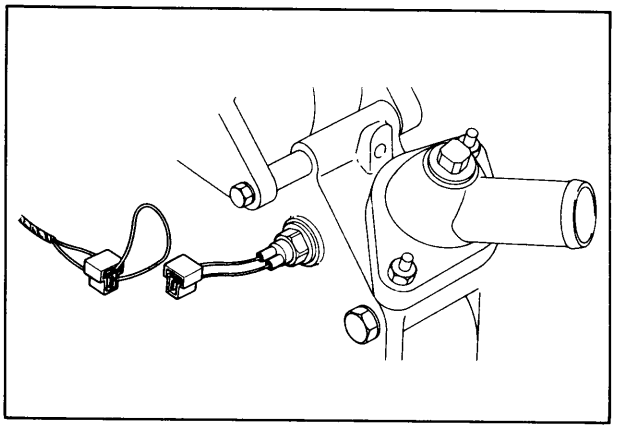


Fig. 1A–13 Closing both terminals

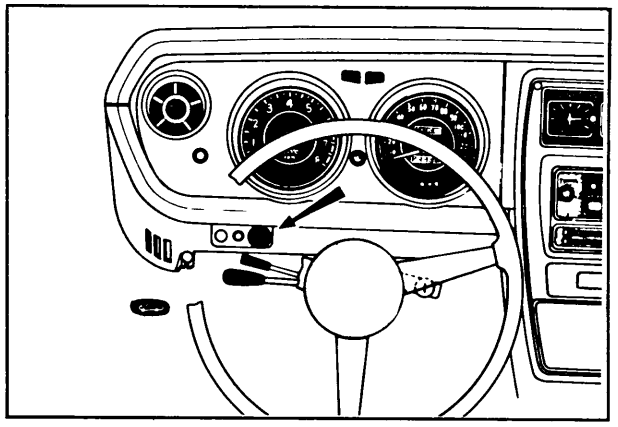


Fig. 1A–14 Choke control knob

terminal when the engine speed is set to **2,000 rpm** by adjusting the choke control knob.

Note:

1. This check should be completed **within 130 seconds** after the engine was started in the above procedure 10.
2. If a trouble is found in the above procedures 3, 4 and 11, check every part according to Par. 1A–B. Trouble Check Guide.
3. If a trouble is found in the above procedures 6 and 7, replace the control unit.

Automatic transmission:

1. Disconnect the coupler from the air control valve.

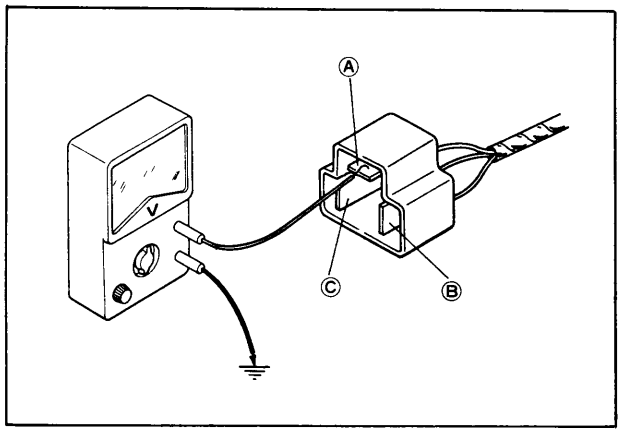


Fig. 1A–15 Checking signal of control unit (A/T)

2. Connect the voltmeter to Ⓐ terminal in the coupler.
3. Start the engine and make sure that the current flows to the Ⓐ terminal when the engine speed is **more than 4,000 ± 400 rpm.**
4. Connect the voltmeter to Ⓑ terminal in the coupler.
5. Make sure that the current stops flowing to Ⓑ terminal when the engine speed is gradually dropped from 2,000 rpm to **1,150 ± 100 rpm.** Record the engine speed at which the current stops flowing.
6. Gradually raise the engine speed from its idle speed and check the speed at which the current begins flowing to Ⓑ terminal. Make sure that the difference between the said engine speed and that recorded in the above procedure 5 is **150 ± 70 rpm.**
7. Connect the voltmeter to Ⓒ terminal in the coupler. Gradually raise the engine speed and make sure that the current stops flowing to Ⓒ terminal when the engine speed rises up to **2,500 ± 200 rpm.**
8. Stop the engine.
9. Remove the coupler from the water temperature switch and close both terminals in the coupler.
10. Pull the choke control knob out all the way and start the engine.

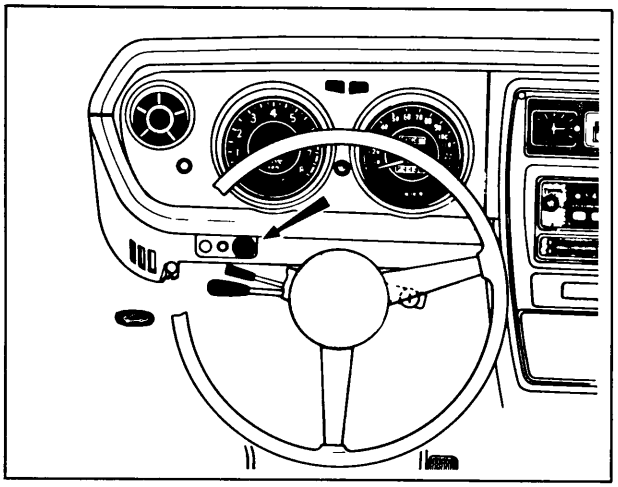


Fig. 1A–16 Choke control knob

11. Set the engine speed to **2,000 rpm** by adjusting the choke control knob.
Make sure that, when the engine speed is raised up to 3,000 rpm by operating the throttle, the current does not flow to Ⓑ terminal but flows to Ⓒ terminal.

Note:

1. This check should be completed **within 130 seconds** after the engine was started in the above procedure 10.
2. If a trouble is found in the above procedures 3 and 11, check every part according to Par. 1A–B. Trouble Check Guide.
3. If a trouble is found in the above procedures 5, 6 and 7, replace the control unit.

c. Replacing air control valve

1. Remove the hot air duct for the air cleaner.
2. Disconnect the air hose (air pump ~ air control valve) from the air control valve.
3. Disconnect the air hose (air control valve ~ ther-

mal reactor) from the air control valve.
4. Disconnect the atmospheric sensing tube from the air control valve.
5. Disconnect the coupler from the air control valve.
6. Remove the nuts attaching the air control valve and remove the air control valve.
7. Install the air control valve by following the removal procedures in the reverse order.

1A–A–5. Deceleration Control Valve

a. Checking deceleration control valve
1. Disconnect the air hose (air cleaner ~ deceleration control valve) from the air cleaner.

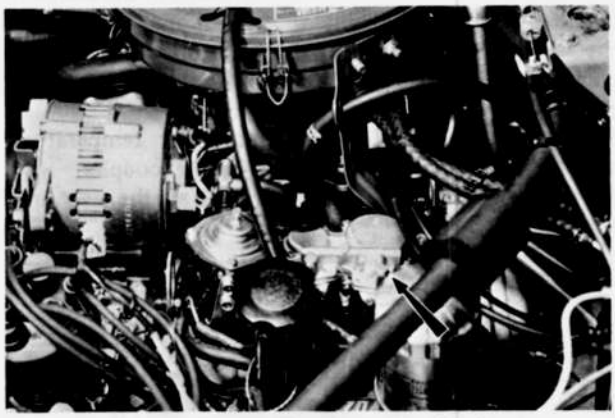


Fig. 1A–17 Deceleration control valve

2. Turn the ignition switch on.
3. Open and close repeatedly the terminal of each solenoid of the deceleration control valve, and make sure that the clicking sound from each solenoid is audible on that occasion.

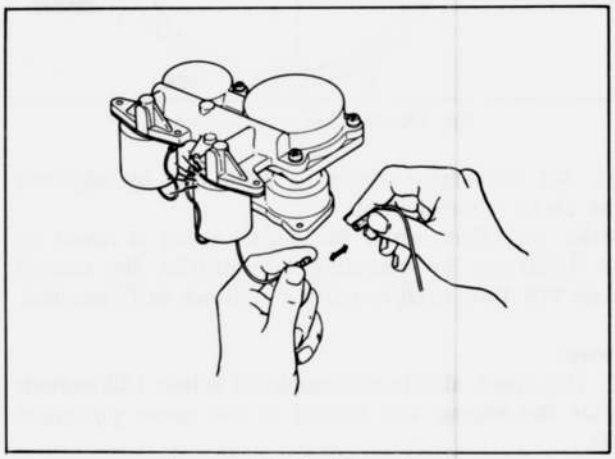


Fig. 1A–18 Checking solenoid

4. Start the engine and keep it running at idle speed.
5. Close with the fingers the air hose removed in the above procedure 1 and make sure that the engine speed hardly varies.
6. Make sure that the air is drawn into the air hose removed in the above procedure 1 when the terminal of the solenoid for the coasting valve is removed. Check the anti-afterburn valve in the same procedure.
7. Close with the fingers three-fourth of the opening

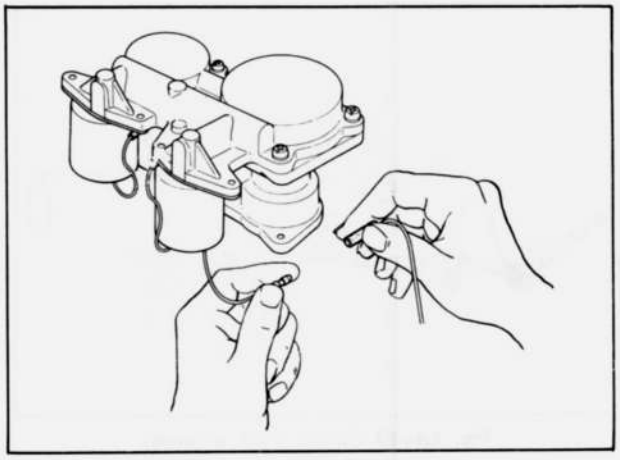


Fig. 1A–19 Removing terminal

of the air hose removed in the above procedure 1. Raise the engine speed up to about 4,000 rpm rapidly and then release the acceleration abruptly. Make sure that the fingers feel a large amount of air being drawn into the air hose for **1 ~ 1.5 seconds** just after the engine speed begins to drop and afterwards feel less amount of air being drawn until the speed drops to 1,150 rpm.

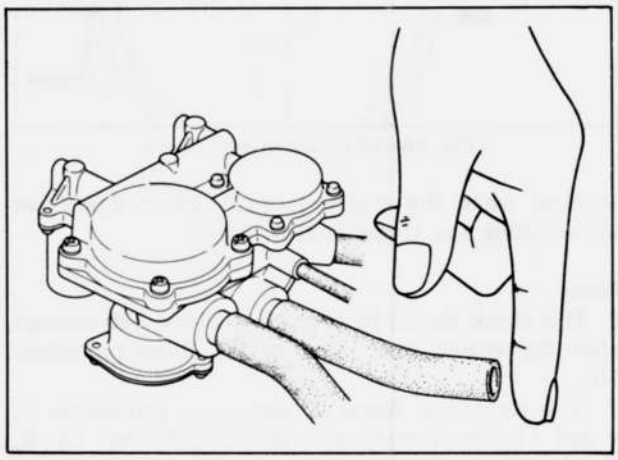


Fig. 1A–20 Checking deceleration control valve

It is only on the car with manual transmission that a small amount of air being drawn into the air hose is felt.

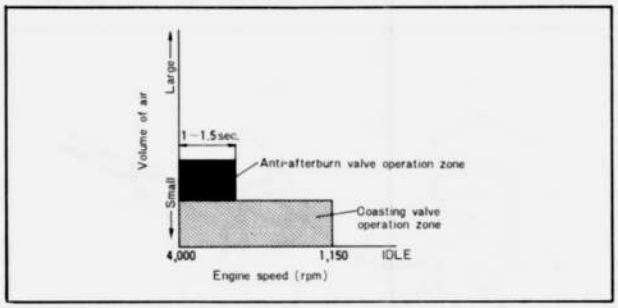


Fig. 1A–21 Volume of air

Note:
1. If a trouble is found in the above procedures 3, 5 and 7, check every part according to Par. 1A–B. Trouble Check Guide.

2. If a trouble is found in the above procedure 6, replace the deceleration control valve.

b. Checking signal of control unit (car with manual transmission only)

2. Remove the terminal of the solenoid for the coasting valve and apply the voltage (12V) of the battery directly on the terminal.

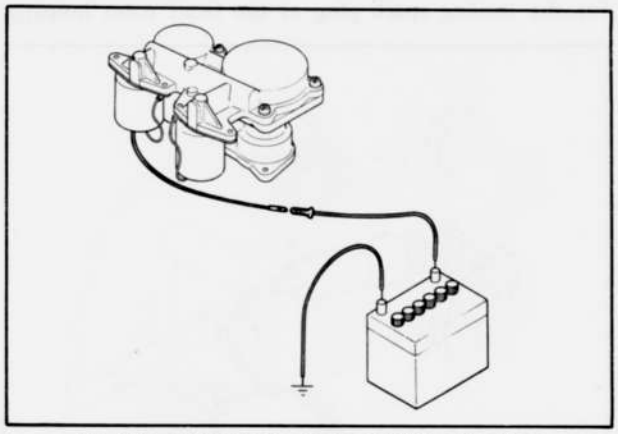


Fig. 1A–22 Applying voltage (12V) of battery

3. Remove the coupler of the idle switch and connect the voltmeter to the power lead of the coasting valve solenoid. Make sure that the current begins to flow to the voltmeter when the engine speed is gradually dropped from 2,000 rpm to **1,150 ± 100 rpm** and continues to flow even when the speed is dropped to the idle speed. Record the engine speed at which the current begins to flow.

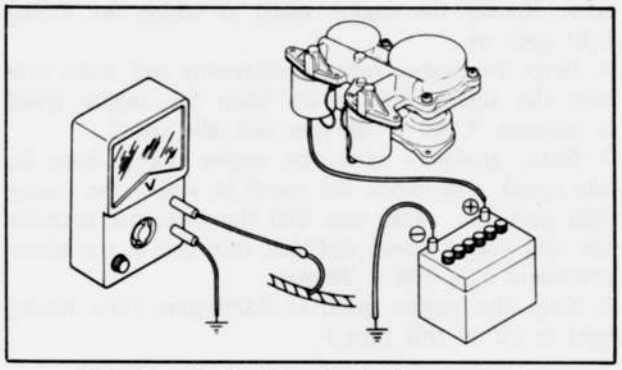


Fig. 1A–23 Checking signal of control unit

4. Gradually raise the engine speed from its idle speed and check the speed at which the current stops flowing to the voltmeter. Make sure that the difference between the said engine speed and that recorded in the above procedure 3 is **150 ± 70 rpm.**

Note:
If a trouble is found in the above procedures 3 and 4, replace the control unit.

c. Replacing deceleration control valve

1. Disconnect the hoses and lead wires from the deceleration control valve.
2. Remove the bolts attaching the deceleration control valve and remove the deceleration control valve.
3. Install the deceleration control valve by following the removal procedures in the reverse order.

1A–A–6. Altitude Compensator

a. Checking altitude compensator

1. Disconnect the hoses (carburetor ~ altitude compensator, altitude compensator ~ evapo compensator valve) from the altitude compensator.
2. Start the engine and keep it running at idle speed.
3. Close with the fingers the mouths of the altitude compensator from which the hoses indicated in the above procedure 1 are disconnected.

If the engine speed drops on that occasion, the altitude compensator is in normal conditions.

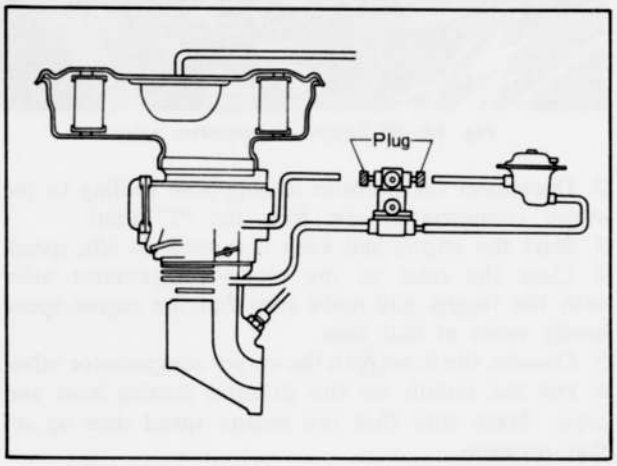


Fig. 1A–24 Checking altitude compensator

b. Replacing altitude compensator

1. Disconnect the hoses from the altitude compensator.
2. Remove the bolts attaching the altitude compensator and remove the altitude compensator.
3. Install the altitude compensator by following the removal procedures in the reverse order.



Fig. 1A–25 Altitude compensator

1A–A–7. Evapo Compensator Valve

a. Checking evapo compensator valve

1. Disconnect the hose Ⓐ (altitude compensator ~ evapo compensator valve) from evapo compensator valve.



Fig. 1A–26 Evapo compensator valve

2. Disconnect the pressure sensing hose leading to the evapo compensator valve from the "T" joint.
3. Start the engine and keep it running at idle speed.
4. Close the inlet of the evapo compensator valve with the fingers and make sure that the engine speed hardly varies at that time.
5. Connect the hose Ⓐ to the evapo compensator valve.
6. Put the mouth on the pressure sensing hose and blow. Make sure that the engine speed rises up on that occasion.

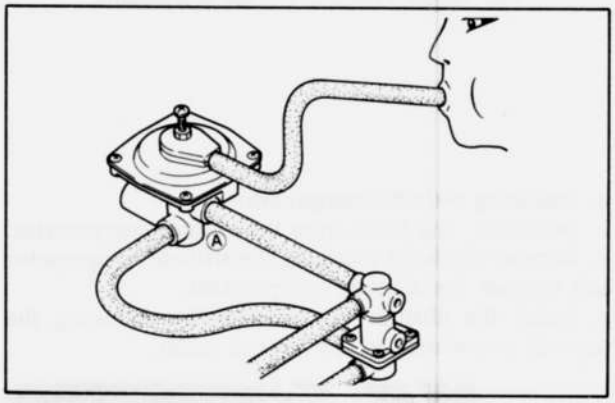


Fig. 1A–27 Checking evapo compensator valve

b. Replacing evapo compensator valve

1. Disconnect the hoses from the evapo compensator valve.
2. Remove the bolts attaching the evapo compensator valve and remove the evapo compensator valve.
3. Install the evapo compensator valve by following the removal procedures in the reverse order.

1A–A–8. Ignition Control System

In this item, inspect the operation of each of the idle switch, kick-down switch, No. 1 choke switch, No. 2 choke switch, control unit and No. 1 and No. 2 retard switches relating to the ignition control system. If a trouble is found, check defective parts according to Par. 1A–B. Trouble Check Guide.

Note:
Before this inspection, warm up the engine sufficiently and make sure that the ignition timing is as specified.

a. Checking ignition control system (trailing side)

1. Connect a timing light to the high tension cord for the trailing spark plug of the front rotor housing.

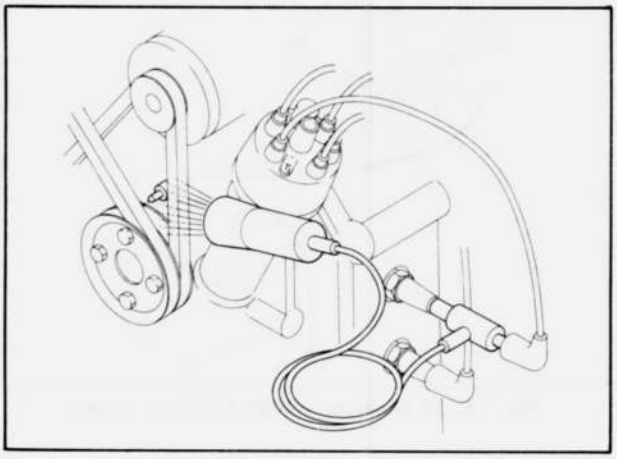


Fig. 1A–28 Timing light

2. Start the engine.
3. Gradually drop the engine speed from 4,500 rpm.
4. Make sure that the timing light goes out when the engine speed drops to **4,000 ± 400 rpm.**
5. Make sure that the timing light goes on again when the engine speed further drops to **1,150 ± 100 rpm**. Record the engine speed at which the timing light goes on.
6. Drop the engine speed furthermore and make sure that the timing light is on when the engine speed is between **1,150 ± 100 rpm** and idle speed.
7. Next, gradually raise the engine speed from its idle speed, and check the speed at which the timing light goes out. Make sure that the difference between the said engine speed and that recorded in the above procedure 5 is **150 ± 70 rpm.**
8. Keep the engine speed **at 2,000 rpm.** (The timing light is off at this time.)

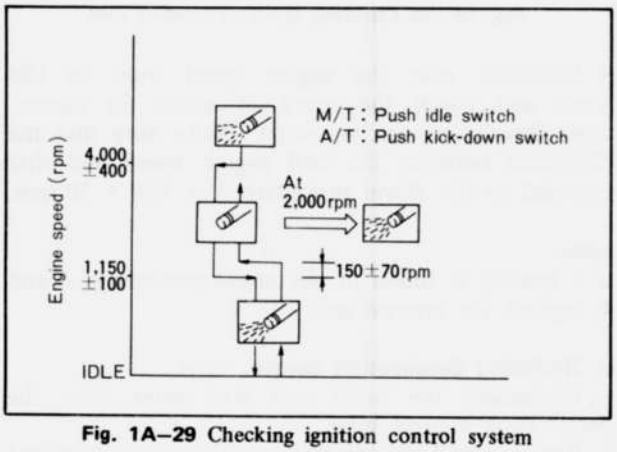


Fig. 1A–29 Checking ignition control system (trailing side)

(1) Manual transmission:
Make sure that the timing light goes on when the idle switch is pushed.

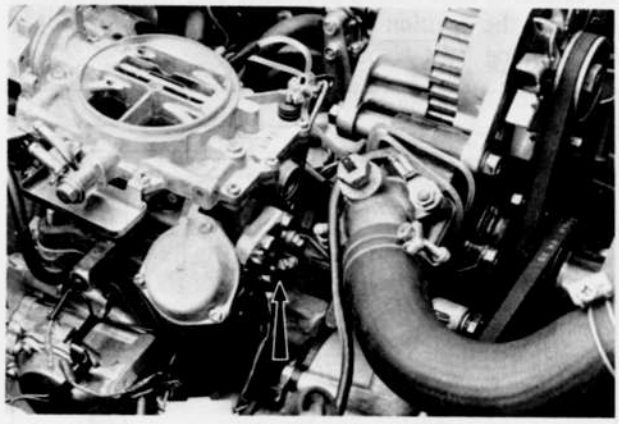


Fig. 1A–30 Idle switch

(2) Automatic transmission:
Make sure that the timing light goes on when the kick-down switch is pushed.

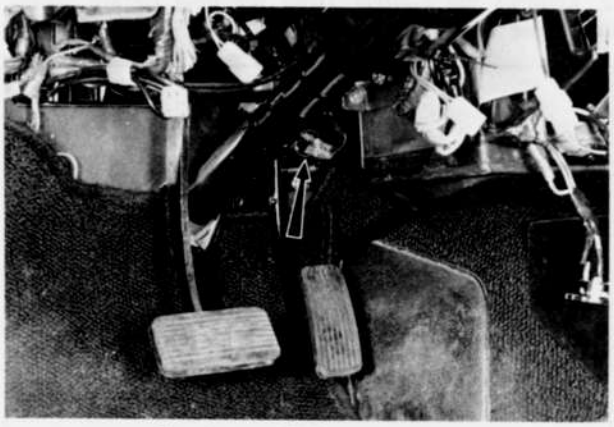


Fig. 1A–31 Kick-down switch

b. Checking ignition control system (leading side)
1. Connect a timing light to the high tension cord for the leading spark plug of the front rotor housing.
2. Remove the coupler from the water temperature switch and close both terminals in the coupler.

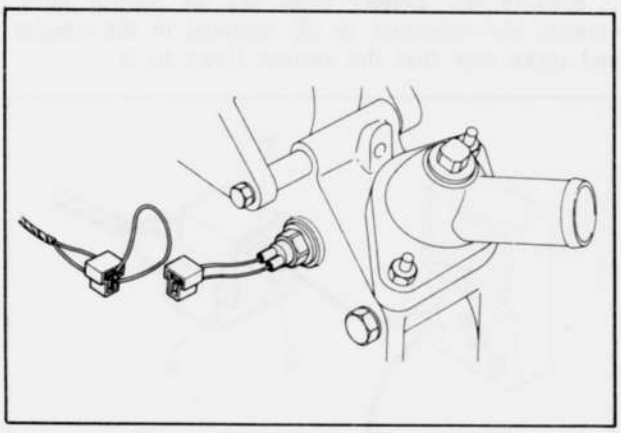


Fig. 1A–32 Closing both terminals

3. Pull the choke control knob out all the way and

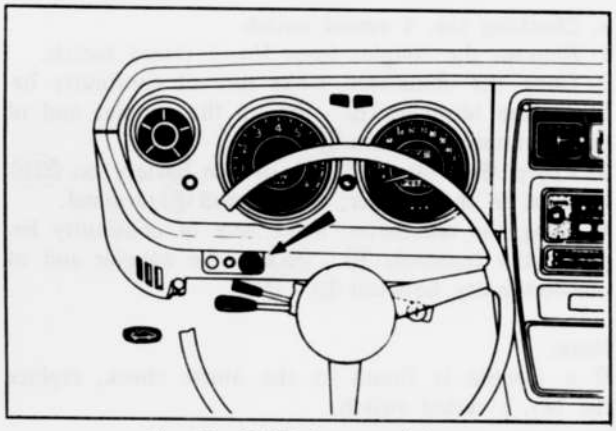


Fig. 1A–33 Choke control knob

start the engine.
4. Keep the engine speed at 2,000 rpm by adjusting the choke control knob.
Make sure that the timing indicator pin points between the **yellow and red marks** notched on the eccentric shaft pulley.

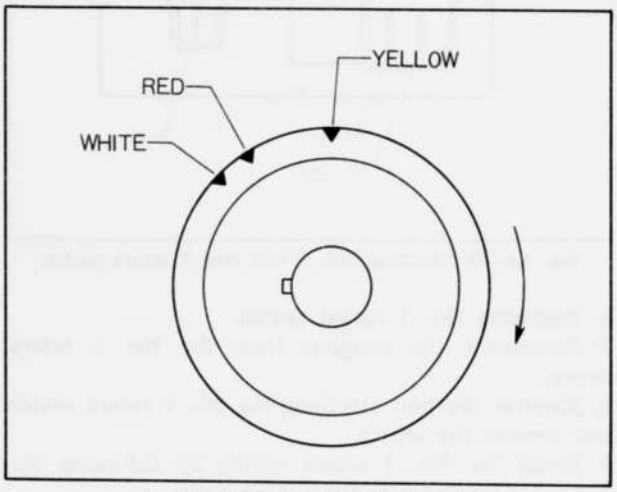


Fig. 1A–34 Eccentric shaft pulley

5. Make sure that the engine speed rises up by several hundred rpm when it is **130 ± 26 seconds** since the engine was started.

1A–A–9. No. 1 Retard Switch

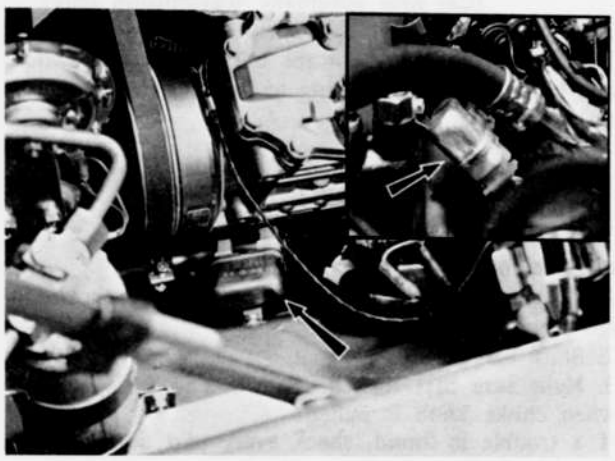


Fig. 1A–35 No. 1 and No. 2 retard switch

a. Checking No. 1 retard switch

1. Remove the coupler from No. 1 retard switch.
2. Using the ohmmeter, make sure of continuity between the terminals Ⓑ – ⓃⒸ in the coupler and of non-continuity between Ⓑ – ⓃⓄ.
3. Apply the voltage (12V) of the battery on ⓈⒹ₁ terminal in the coupler, and ground Ⓔ terminal.
4. Using the ohmmeter, make sure of continuity between the terminals Ⓑ – ⓃⓄ in the coupler and of non-continuity between Ⓑ – ⓃⒸ.

Note:
If a trouble is found in the above check, replace the No. 1 retard switch.

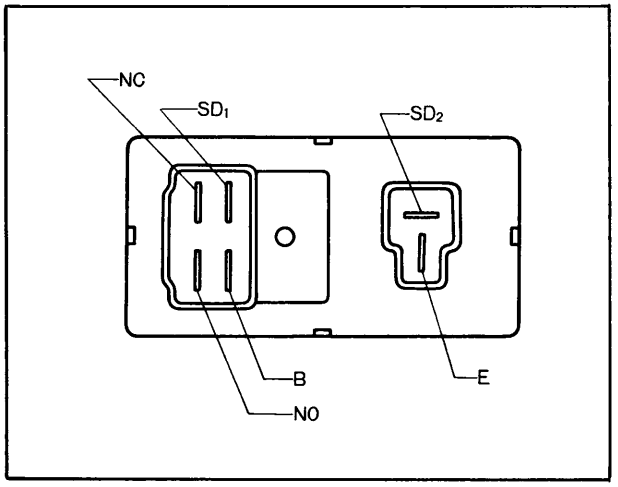


Fig. 1A–36 Checking No. 1 and No. 2 retard switch

b. Replacing No. 1 retard switch

1. Disconnect the couplers from the No. 1 retard switch.
2. Remove the bolt attaching the No. 1 retard switch and remove the switch.
3. Install the No. 1 retard switch by following the removal procedures in the reverse order.

1A–A–10. No. 2 Retard Switch

Both checking and replacing procedures of this switch are the same as those of the No. 1 retard switch.

1A–A–11. Kick-down Control System (Car with automatic transmission only)

In this item, inspect the operation of each of the No. 1 choke switch, control unit, kick-down switch and kick-down relay relating to the kick-down control system.

a. Checking kick-down control system

1. Disconnect the terminal from the kick-down solenoid and connect the voltmeter.
2. Start the engine.
3. Make sure that the current flows to the voltmeter when choke knob is pulled.

If a trouble is found, check every part according to Par. 1A–B. Trouble Check Guide.

1A–A–12. Heat Hazard Protective and Warning System

a. Checking heat hazard protective and warning system

1. Turn the ignition switch on and make sure that the warning light is on.

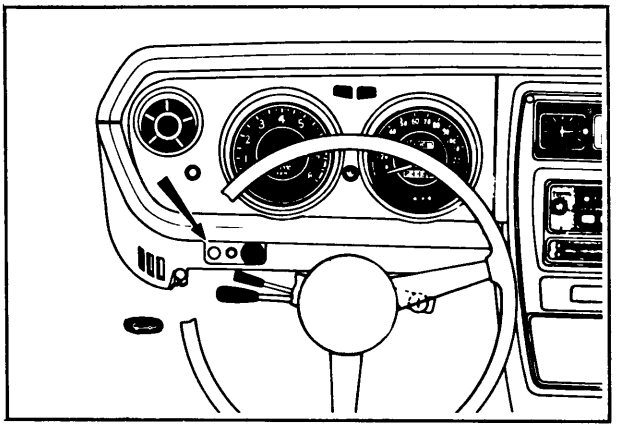


Fig. 1A–37 Heat hazard warning light

2. Remove the coupler from the heat hazard sensor and close both terminals in the coupler.

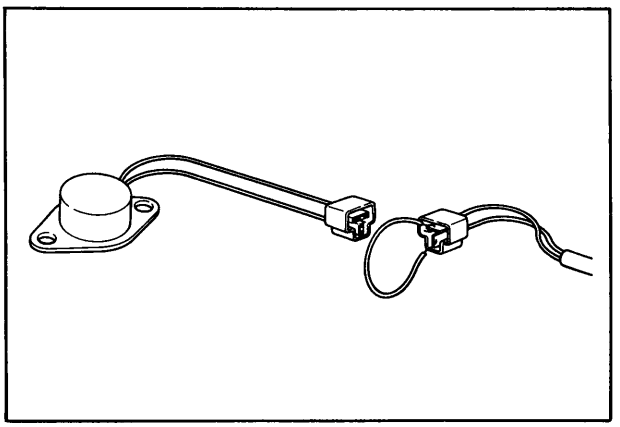


Fig. 1A–38 Closing both terminals

3. Start the engine and keep it running at idle speed.
4. Make sure that the warning light is on at this time.
5. Remove the coupler from the air control valve, connect the voltmeter to Ⓐ terminal in the coupler and make sure that the current flows to it.

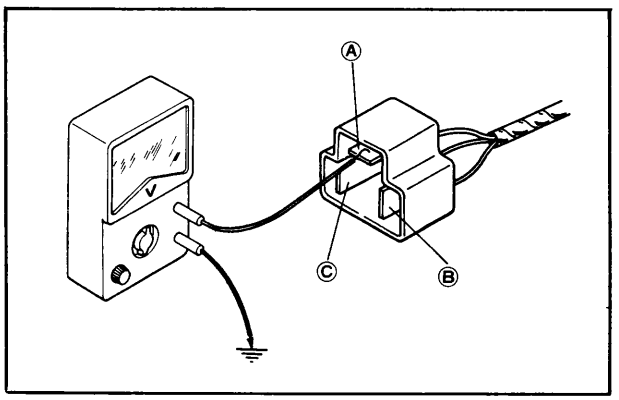


Fig. 1A–39 Connecting voltmeter

6. Connect a timing light to the high tension cord for the trailing spark plug of front rotor housing.
7. Make sure that the timing light is on when the engine speed is set to **2,000 rpm.**

Note:
1. If a trouble is found in the above procedure 1, check every part according to Par. 1A–B. Trouble Check Guide.
2. If a trouble is found in the above procedures 4 and 5, check for breaking of the wire harness and faulty contact of the terminals in the coupler; in case they are in normal conditions, replace the control unit.

b. Checking heat hazard sensor
Inspect the operating temperature of the heat hazard sensor as follows:
1. Remove the heat hazard sensor.
2. Wrap the sensor together with the thermometer in aluminum foil to prevent oil ingress.
3. Attach the test lamp to the sensor as shown in Fig. 1A–40.
Submerge the wrapped sensor and thermometer in oil and gradually heat the oil.

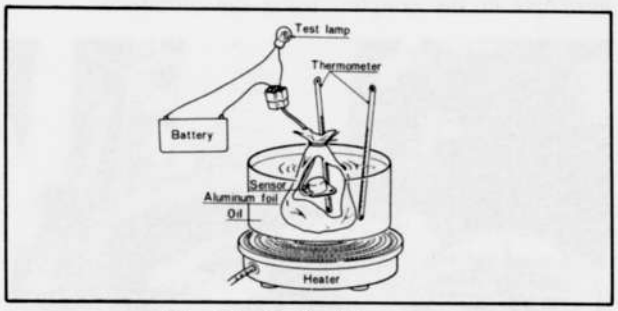


Fig. 1A–40 Checking sensor

4. Measure the temperature at which the lamp attached to the sensor lights up. The sensor should operate at **120 ± 10°C (248 ± 18°F).** If the sensor should operate at a temperature deviating from the standard temperature, replace the sensor.

Note:
Avoid heating the oil to **more than 130°C (266°F).**

c. Replacing heat hazard sensor

Coupé:
1. Open the trunk and remove the mat.
2. Disconnect the coupler from the heat hazard sensor.
3. Remove the screws attaching the heat hazard sensor and remove the heat hazard sensor.
4. Install the sensor by following the removal procedures in the reverse order.

Rotary wagon:
1. Fold the rear seat back forward.
2. Disconnect the coupler from the heat hazard sensor.
3. Remove the screws attaching the heat hazard sensor and remove the heat hazard sensor.
4. Install the sensor by following the removal procedures in the reverse order.

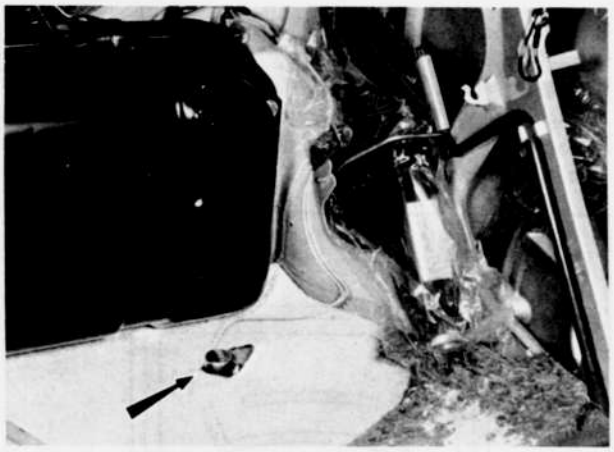


Fig. 1A–41 Hazard sensor (Coupé)

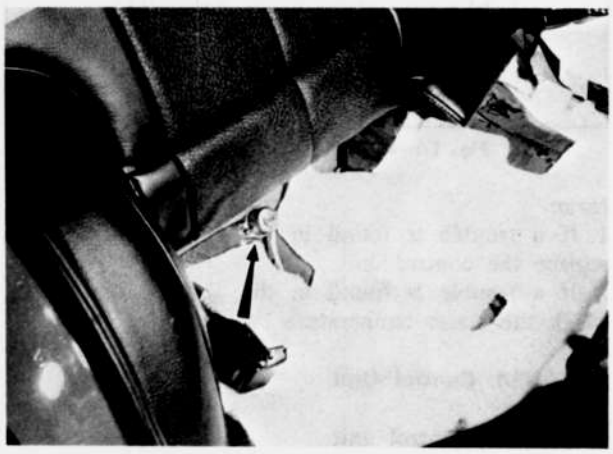


Fig. 1A–42 Hazard sensor (Wagon)

1A–A–13. Automatic Throttle Release System

a. Checking automatic throttle release system
1. Make sure that the engine is cold.
Pull the choke control knob out all the way with the ignition switch off, and make sure that the knob returns automatically. If the trouble is found, check choke wire and choke return spring, replace if necessary.

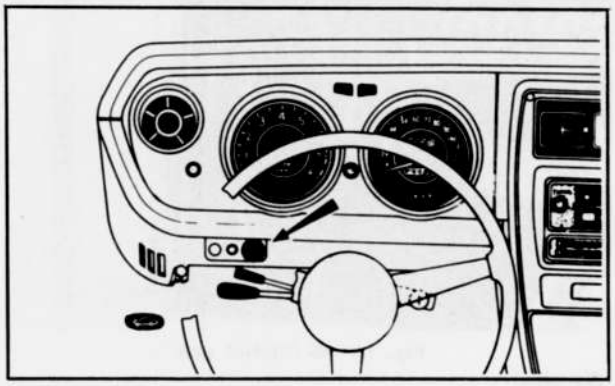


Fig. 1A–43 Choke control knob

2. Pull the choke control knob out all the way and start the engine.
3. Make sure that the choke control knob returns automatically when it is **30 ± 10 seconds** since the engine was started.

4. Pull the choke control knob to set the engine speed to **2,000 rpm.**
Warm up the engine under the above condition.
5. Make sure that the choke control knob returns automatically when the needle of the water temperature gauge indicates the point shown in Fig. 1A–44.

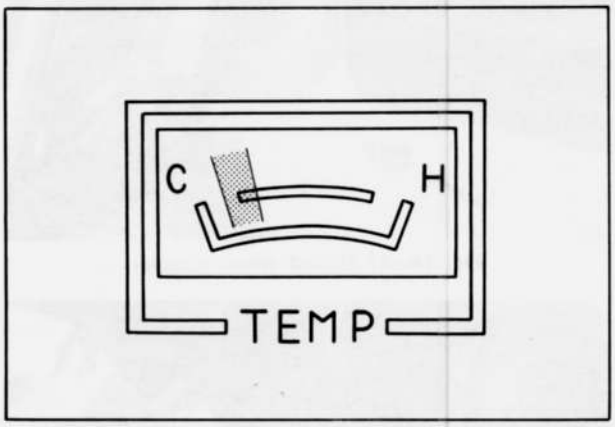


Fig. 1A–44 Position of gauge needle

Note:
1. If a trouble is found in the above procedure 3, replace the control unit.
2. If a trouble is found in the above procedure 5, check the water temperature switch.

1A–A–14. Control Unit

a. Checking control unit

The control unit controls the air control valve, deceleration control valve, ignition system, solenoid of the carburetor, automatic throttle release system, heat hazard warning system and kick-down control system. So the checking procedure of the control unit is described together in the item of each part and each system.

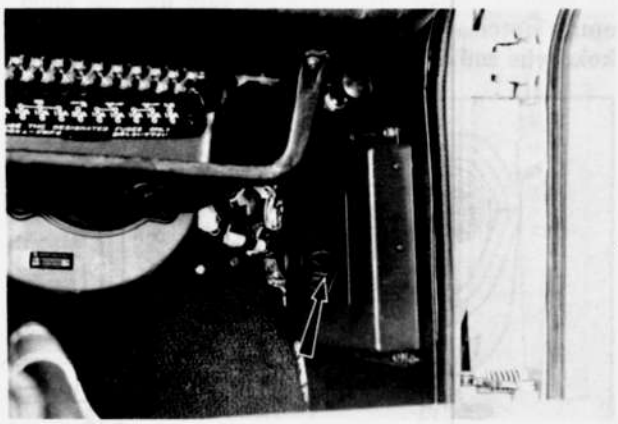


Fig. 1A–45 Control unit

Warning:
1. The choke warning light on the instrument panel goes on when the fuse of the control unit is burnt out. Use a **5-amp. fuse** *when replacing.*
2. If, in checking the signal of the control unit, there is any terminal in the coupler to which the signal does not come, check first for breaking of the wire harness and faulty contact of the terminal.

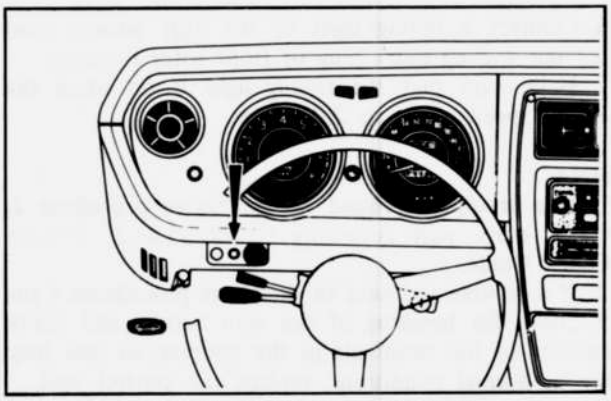


Fig. 1A–46 Choke warning light

3. **Do not use more than 3.4 watt lamp** *when checking the signal of the control unit, using test lamp.*

1A–A–15. Water Temperature Switch

a. Checking operation of water temperature switch

1. Make sure that the engine is cold.
2. Remove the coupler from the water temperature switch, and make sure of continuity between both terminals in the coupler, using the ohmmeter.

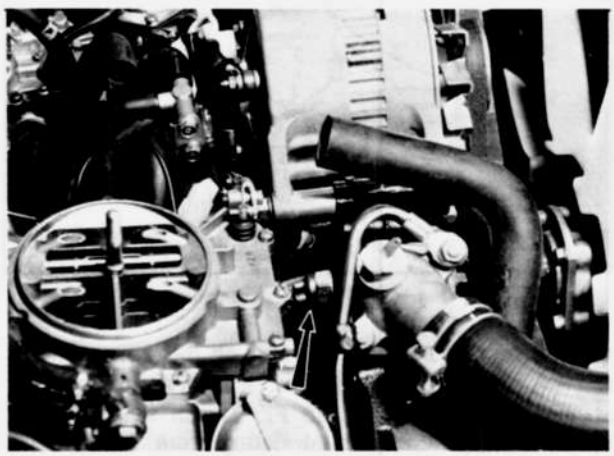


Fig. 1A–47 Water temperature switch

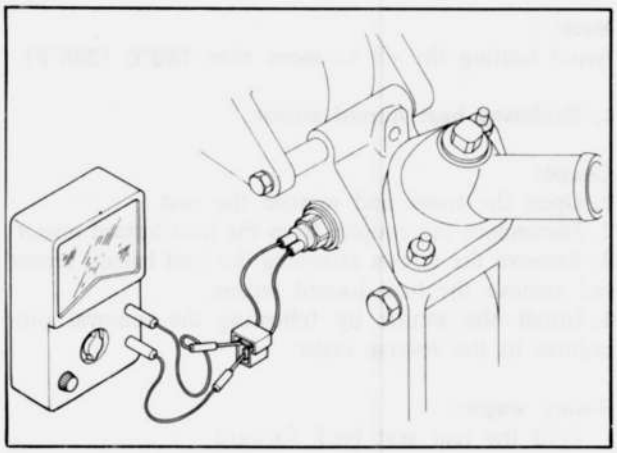


Fig. 1A–48 Checking water temperature switch

3. Connect the coupler to the water temperature switch.
4. Fully warm up the engine.

5. Remove the coupler from the water temperature switch and make sure of non-continuity between both terminals in the coupler, using the ohmmeter.

Note:
If a trouble is found in the above procedures 2 and 5, replace the water temperature switch.

b. Checking operating temperature of water temperature switch
1. Remove the water temperature switch.
2. Place the water temperature switch in water with a thermometer and gradually heat the water.
3. Make sure, using the ohmmeter, that there is no continuity between both terminals in the coupler of the water temperature switch when the water temperature rises up to **67 ± 6°C (153 ± 11°F)** (automatic transmission: **60 ± 7°C (140 ± 13°F)**). If there is, replace the switch.

c. Replacing water temperature switch
1. Drain the coolant from the radiator by 1.7ℓ to reduce its level below the water temperature switch.
2. Remove the alternator and "V" belt if necessary.
3. Disconnect the coupler from the water temperature switch.
4. Loosen and remove the water temperature switch.
5. Install the water temperature switch by following the removal procedures in the reverse order.
6. Refill the radiator with the coolant. Check to see that the level of the subtank is proper, add the coolant if necessary.

1A–A–16. Idle Switch

a. Checking idle switch
1. Start the engine and keep it running at idle speed.
2. Disconnect the coupler from the idle switch.
3. Using the ohmmeter, make sure of continuity between the terminals Ⓐ – Ⓑ in the coupler and of non-continuity between Ⓒ – Ⓑ.
4. Next, gradually raise the engine speed up to **1,000 ± 50 rpm** (with the gear shift lever in "N" range in case of the car with automatic transmission). Make sure that continuity between the terminals Ⓐ – Ⓑ stops but continuity between Ⓒ – Ⓑ begins.

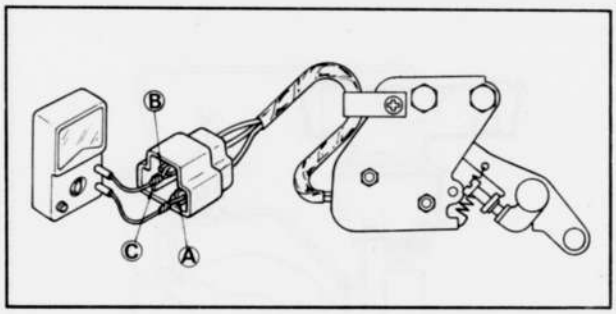


Fig. 1A–49 Checking idle switch

Note:
If a trouble is found in the above procedures 3 and 4, adjust or replace the idle switch.

b. Adjusting idle switch
Adjust the idle switch, using the adjusting screw, so as to turn from "ON" to "OFF" (between Ⓐ terminal and Ⓑ terminal) when the engine speed is gradually raised up to **1,000 ± 50 rpm** (with the gear selector lever in "N" range in case of the car with automatic transmission).

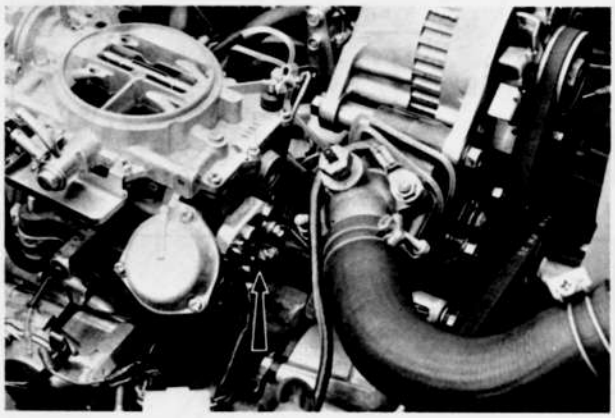


Fig. 1A–50 Idle switch

Note:
1. Turn the adjusting screw counter-clockwise when the setting revolution is higher than specified rpm.
2. Turn it clockwise when the setting revolution is lower than specified rpm.

c. Replacing idle switch
1. Remove the air cleaner.
2. Disconnect the coupler from the idle switch.
3. Remove the bolts attaching the idle switch and remove the idle switch.
4. Install the idle switch by following removal procedures in the reverse order.

Note:
When the idle switch is replaced, be sure to adjust the new one.

1A–A–17. No. 1 Choke Switch

a. Checking No. 1 choke switch
1. Remove the coupler from the water temperature switch and close both terminals in the coupler.

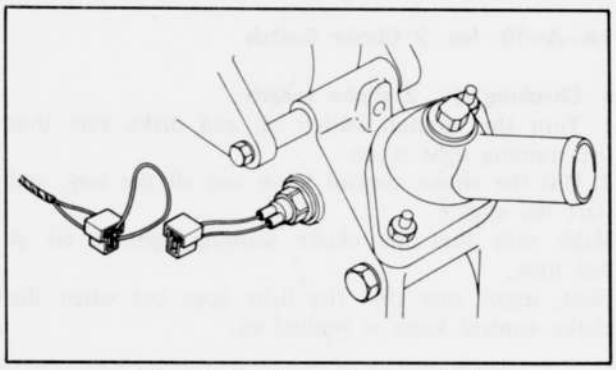


Fig. 1A–51 Closing both terminals

2. Pull the choke control knob out all the way and

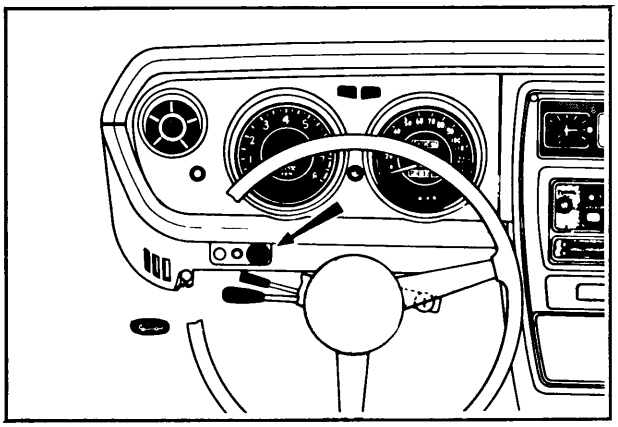


Fig. 1A–52 Choke control knob

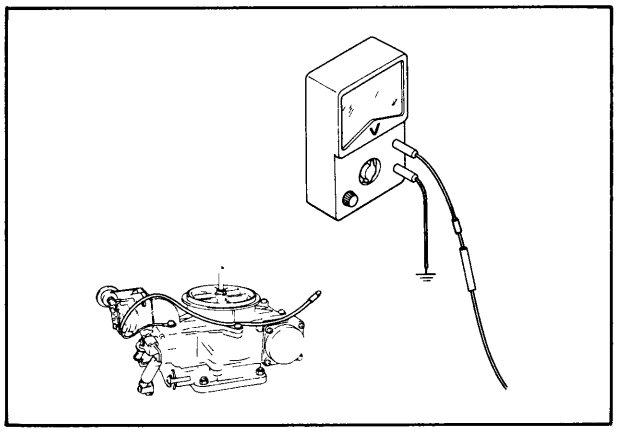


Fig. 1A–53 Checking No. 1 choke switch

start the engine.
3. Make sure, using the voltmeter, that the current flows to the bimetal of the carburetor when the engine speed is set to **2,000 rpm** by adjusting the choke control knob.
4. Push the choke control knob in to idle the engine.
5. Make sure that the current does not flow to the bimetal of the carburetor.

Note:
1. If a trouble is found in the above procedure 3, check the choke relay; in case the choke relay is in normal conditions, replace the choke switch.
2. If a trouble is found in the above procedure 5, replace the No. 1 choke switch.

1A–A–18. No. 2 Choke Switch

a. Checking No. 2 choke switch
1. Turn the ignition switch on and make sure that the warning light is on.
2. Pull the choke control knob out all the way, and start the engine.
Make sure that the choke warning light is on at this time.
Next, make sure that the light goes out when the choke control knob is pushed in.

Note:
If a trouble is found in the above procedures 1 and 2, replace the No. 2 choke switch.

1A–A–19. Choke Relay

a. Checking choke relay
1. Disconnect the coupler from the choke relay.
2. Using the ohmmeter, make sure of continuity between the terminals Ⓑ – (NC) in the coupler and of non-continuity between Ⓑ – (NO).
3. Apply the voltage (12V) of the battery on (SD1) terminal in the coupler, and ground Ⓔ terminal.
4. Using the ohmmeter, make sure of continuity between the terminals Ⓑ – (NO) in the coupler and of non-continuity between Ⓑ – (NC).

Note:
If a trouble is found in the above procedures 2 and 4, replace the choke relay.

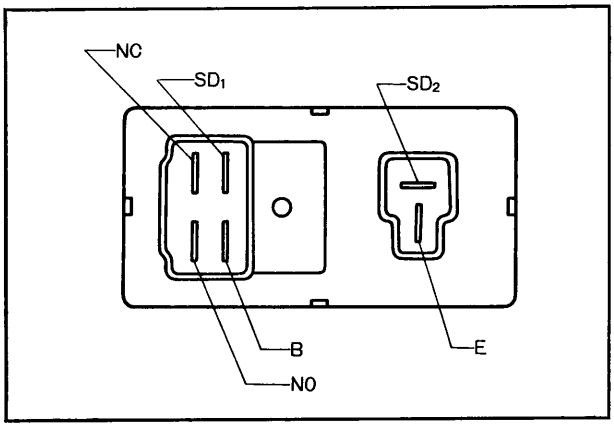


Fig. 1A–54 Checking choke relay

1A–A–20. Ventilation Valve

a. Checking ventilation valve
1. Start the engine and keep it running at idle speed.
2. Disconnect the ventilation hose from the filler pipe.
3. Make sure that the engine speed drops when the evaporative hose is squeezed by hand as shown in Fig. 1A–55 and then the ventilation hose removed in the above procedure 2 is closed with the fingers. If the engine stalls on that occasion, replace the ventilation valve.

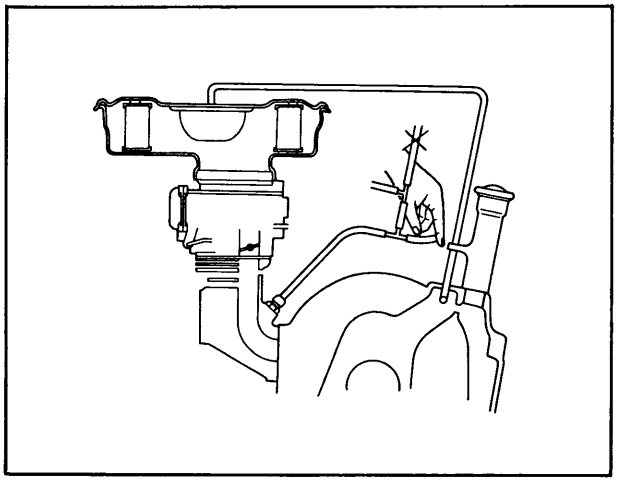


Fig. 1A–55 Checking ventilation valve

b. Replacing ventilation valve

1. Remove the deceleration control valve.
2. Disconnect the ventilation hose at the ventilation valve.
3. Loosen and remove the ventilation valve with the **wrench** (49 1011 120).

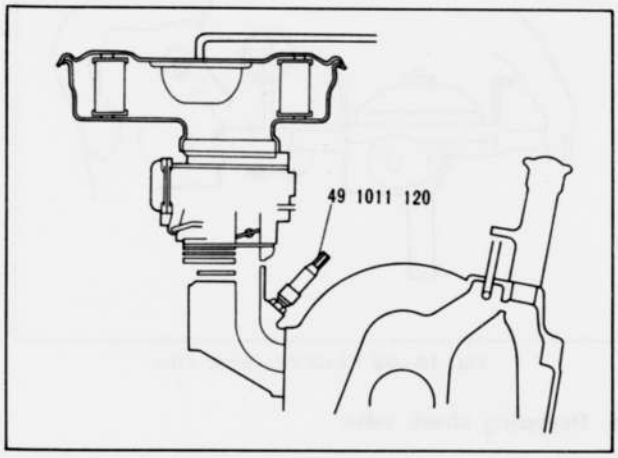


Fig. 1A–56 Removing ventilation valve

4. Install the ventilation valve by following the removal procedures in the reverse order.

1A–A–21. Carcoal Canister

a. Checking charcoal canister



Fig. 1A–57 Charcoal canister

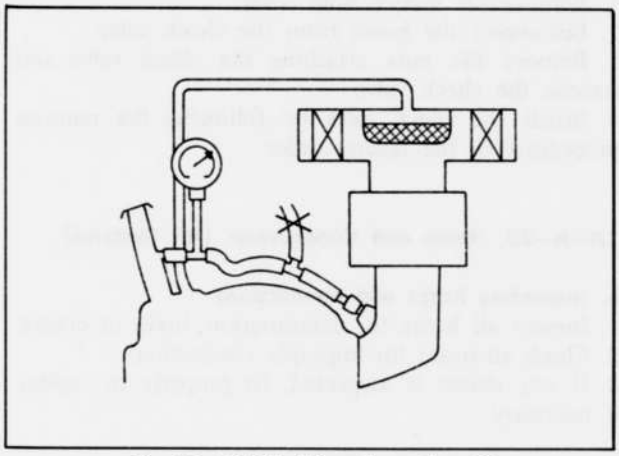


Fig. 1A–58 Checking charcoal canister

1. Check by sight for stains of the charcoal canister due to oil, etc. and for leakage of active carbon.
2. Install the vacuum gauge as shown in Fig. 1A–58 and check for clogging of the canister.

The vacuum gauge reading is as follows:

– 60 ~ 0 mm-Hg/2,500 rpm

Note:

If a trouble is found in the above procedures 1 and 2, replace the canister and air cleaner cover assembly.

1A–A–22. Evaporative Line

a. Checking evaporative line

1. Remove the "T" joint from the evaporative hose and install the pressure gauge on the hose.
2. Disconnect the ventilation hose from the evapo compensator valve.
3. Apply compressed air gradually into the "U" tube pressure gauge so that the difference of water level should be **356 ± 12 mm (14 ± 0.5 in).** After that, blind the inlet of the "U" tube pressure gauge.
4. Leave the "U" tube pressure gauge stand for five minutes, with the inlet blind. If the water level is within the hatched lines shown in Fig. 1A–59, the evaporative line is in good condition. If it is not within limits, inspect the following parts, and repair or replace as required.

(1) Leaky or loose hoses
(2) Leaky condense tank
(3) Leaky fuel tank
(4) Leaky or loose fuel line
(5) Leaky filler cap
(6) Leaky fuel gauge unit

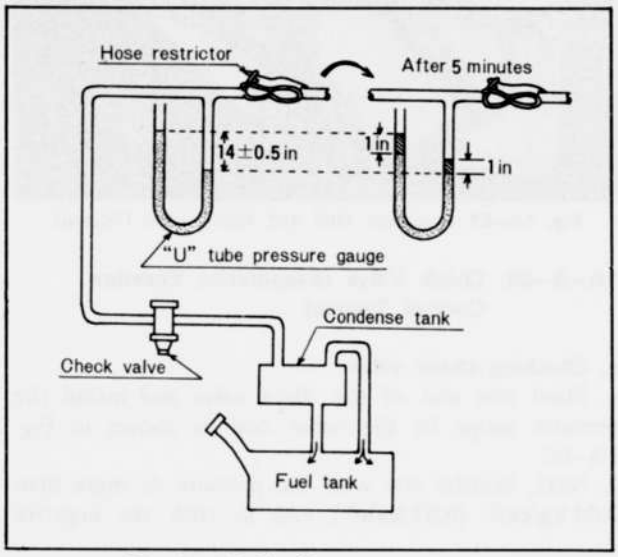


Fig. 1A–59 Checking evaporative line

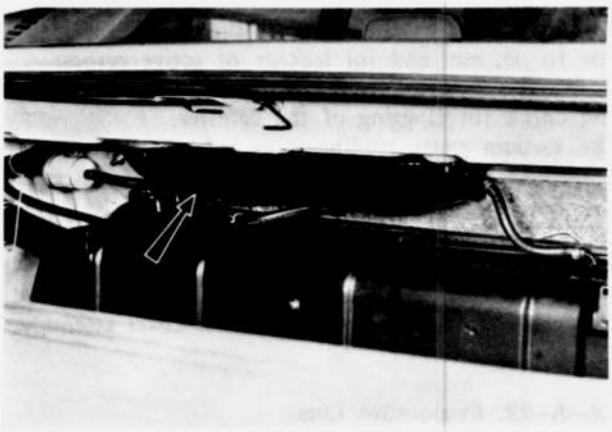


Fig. 1A–60 Condense tank (Coupé)

1A–A–23. Condense Tank

a. Replacing condense tank

Coupé:
1. Disconnect the hoses from the condense tank.
2. Remove the partition board.
3. Remove the screws attaching the condense tank and remove the condense tank.
4. Install the condense tank by following the removal procedures in the reverse order.

Rotary wagon:
1. Remove the service hole cover.
2. Disconnect the hoses from the condense tank.
3. Remove the screws attaching the condense tank and remove the condense tank.
4. Install the condense tank by removal procedures in the reverse order.

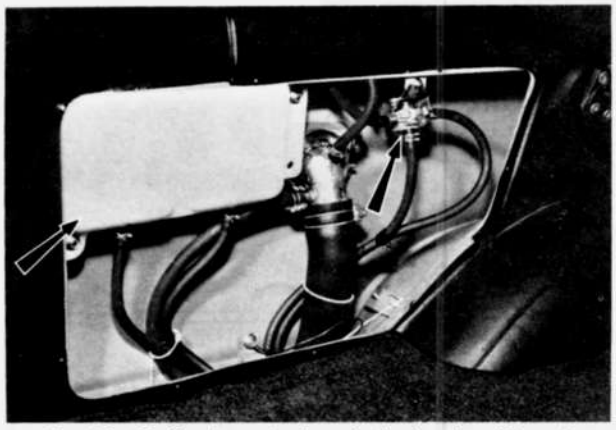


Fig. 1A–61 Condense tank and check valve (Wagon)

1A–A–24. Check Valve (Evaporative Emission Control System)

a. Checking check valve
1. Blind one end of the check valve and install the pressure gauge to the other end as shown in Fig. 1A–62.
2. Next, breathe out with the pressure of **more than 0.04 kg/cm² (0.57 lb/in²)** and in with the negative pressure of **more than 0.01 kg/cm² (0.14 lb/in²)** and make sure that the check valve operates then. If a trouble is found, replace the valve.

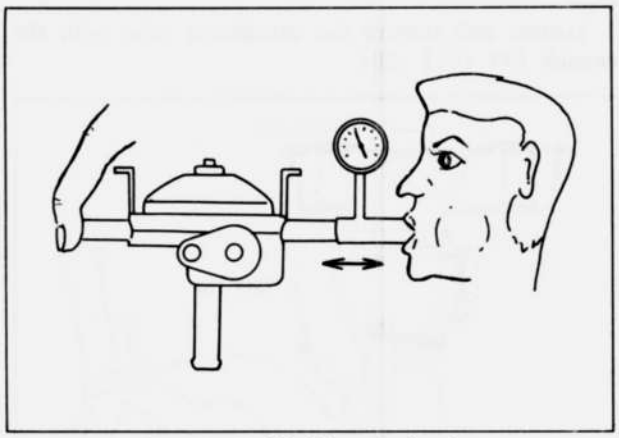


Fig. 1A–62 Checking check valve

b. Replacing check valve

Coupé:
1. Disconnect the hoses from the check valve.
2. Remove the nuts attaching the check valve and remove the check valve.
3. Install the check valve by following the removal procedures in the reverse order.

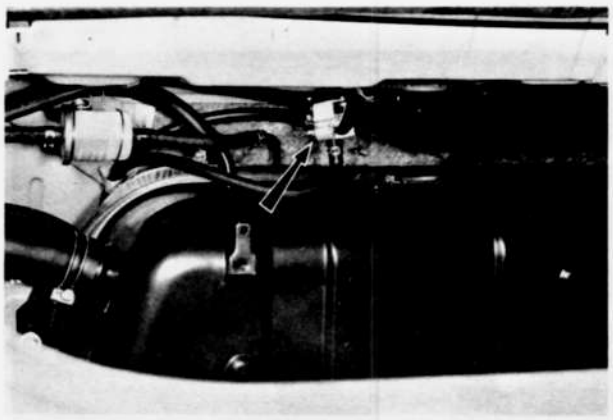


Fig. 1A–63 Check valve (Coupé)

Rotary wagon:
1. Remove the service hole cover.
2. Disconnect the hoses from the check valve.
3. Remove the nuts attaching the check valve and remove the check valve.
4. Install the check valve by following the removal procedures in the reverse order.

1A–A–25. Hoses and Connections (All Systems)

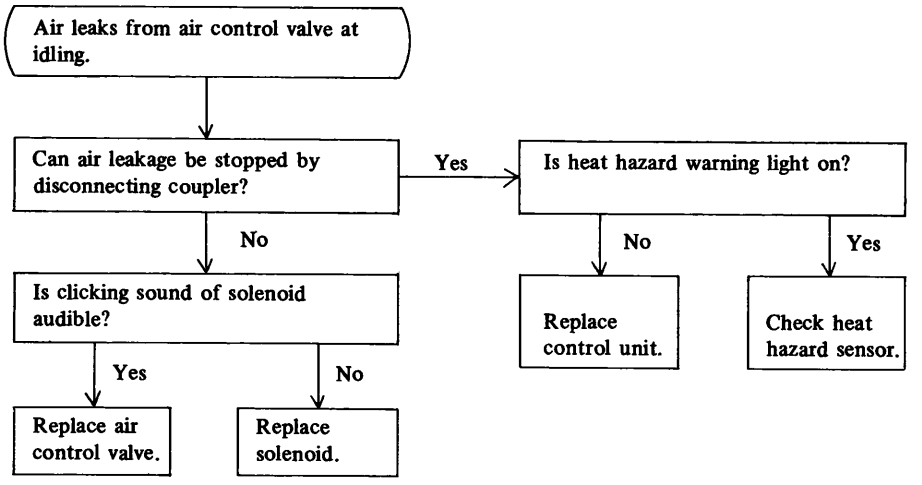
a. Inspecting hoses and connections
1. Inspect all hoses for deterioration, holes or cracks.
2. Check all hoses for improper connection.
3. If any defect is suspected, fit properly or replace if necessary.

1A–B. TROUBLE CHECK GUIDE

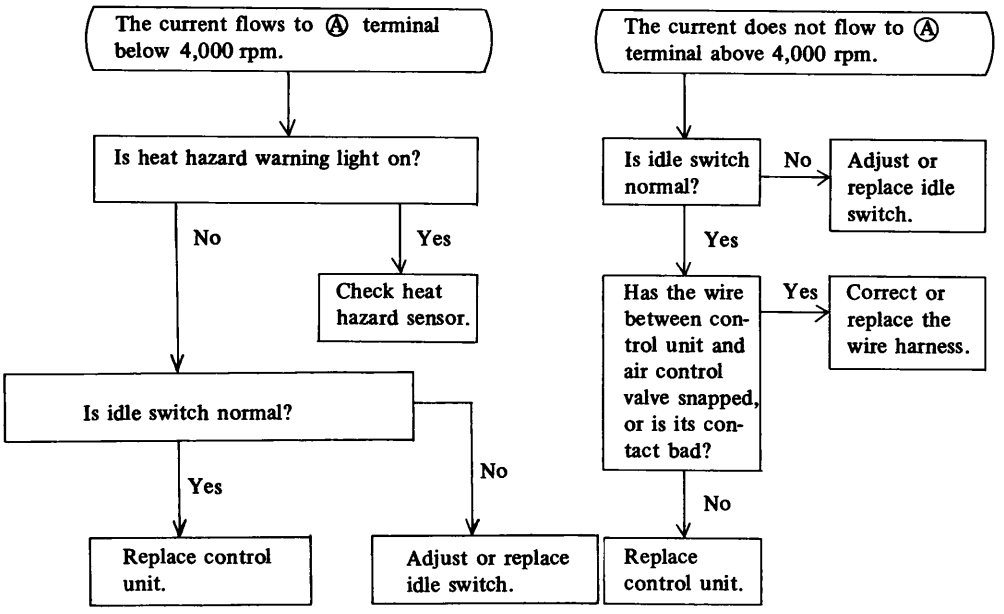
Trouble Check Guide should be used following instructions in Par. 1A–A. Maintenance Procedure.

AIR CONTROL VALVE

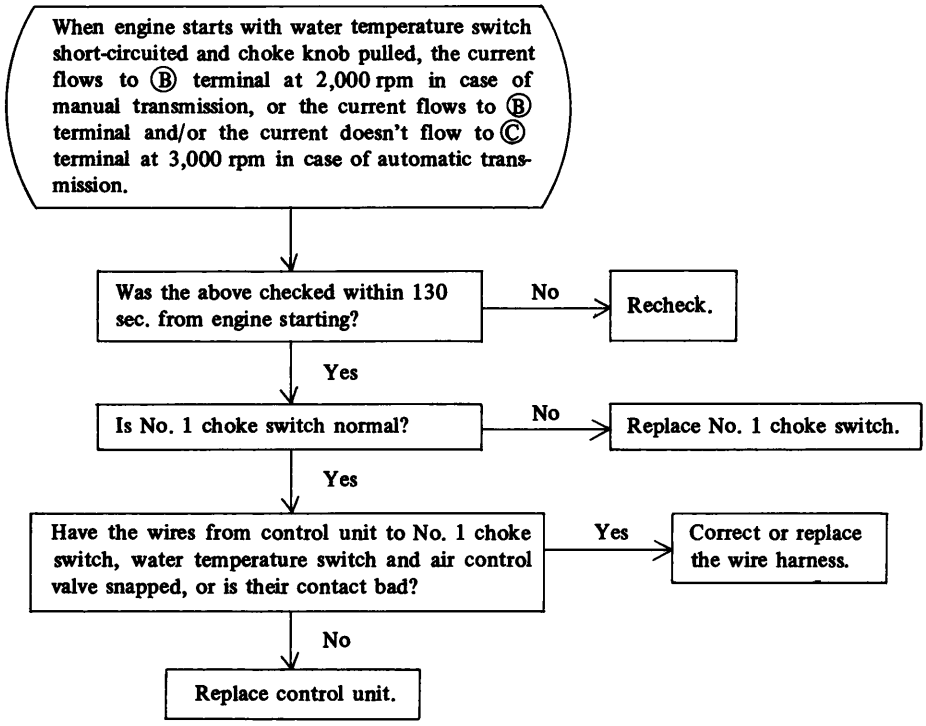
Checking Air Control Valve



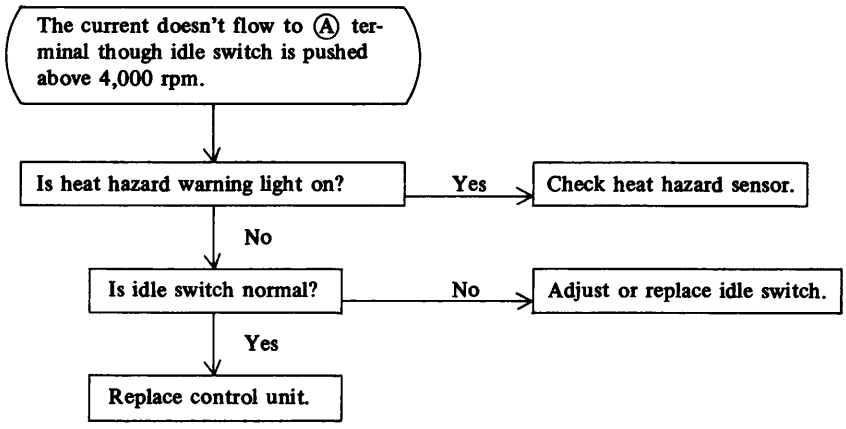
Checking Signal of Control Unit



Checking Signal of Control Unit

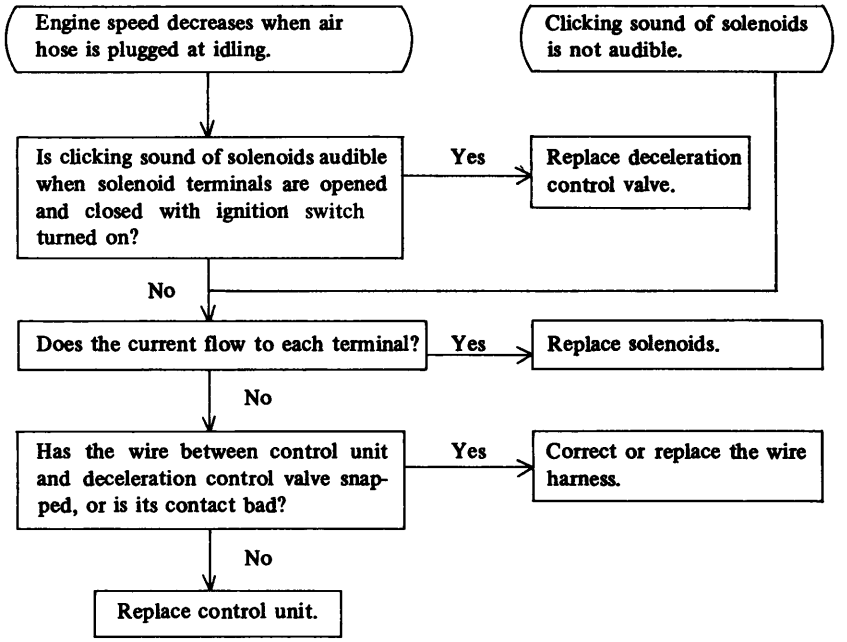


Only for manual transmission

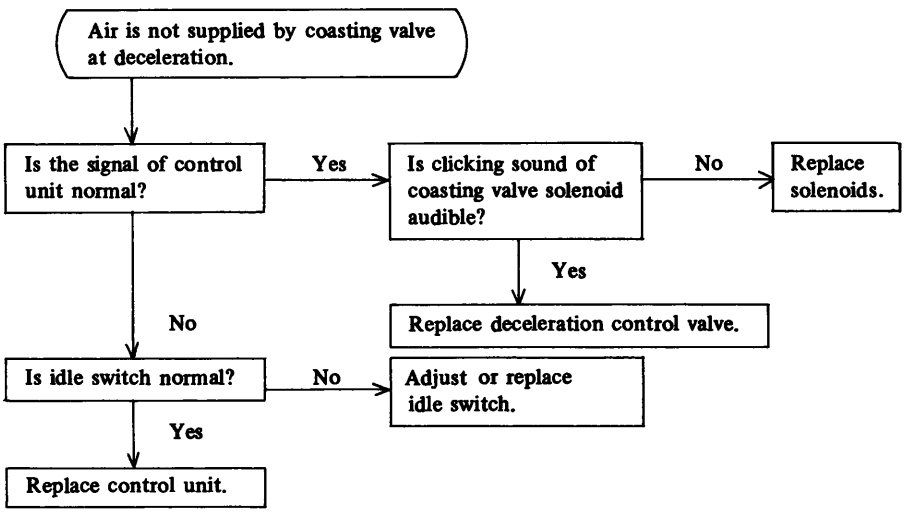


DECELERATION CONTROL VALVE

Checking Deceleration Control Valve

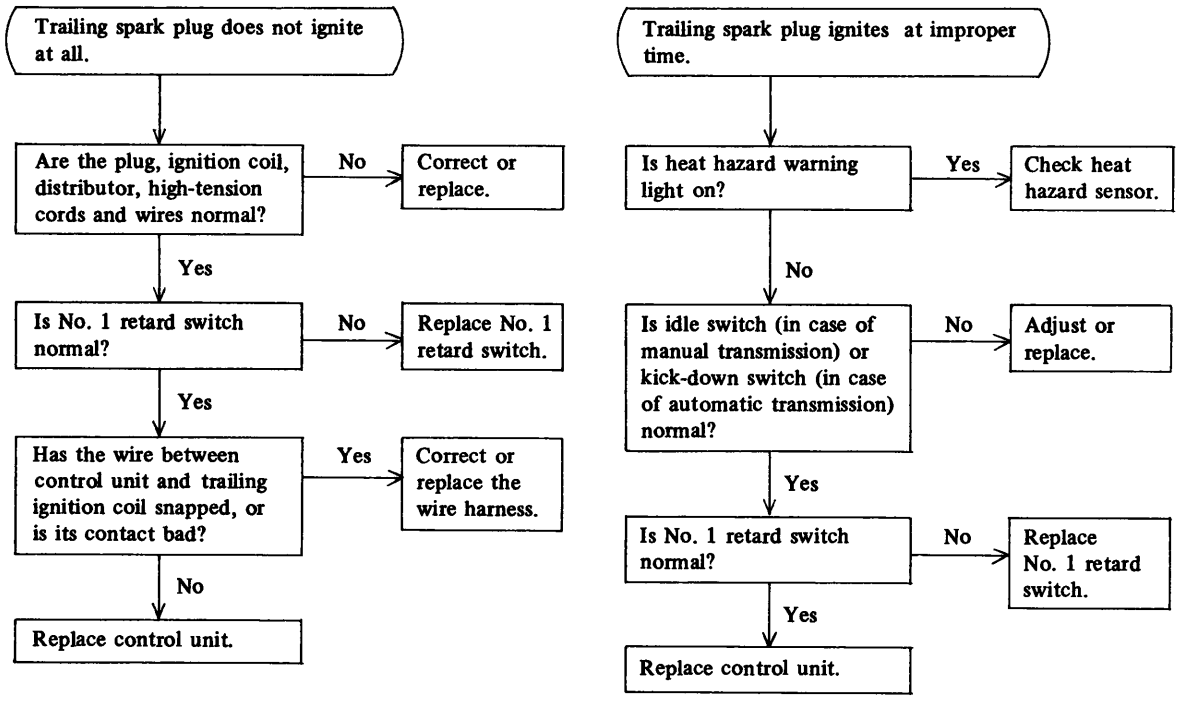


Only for manual transmission

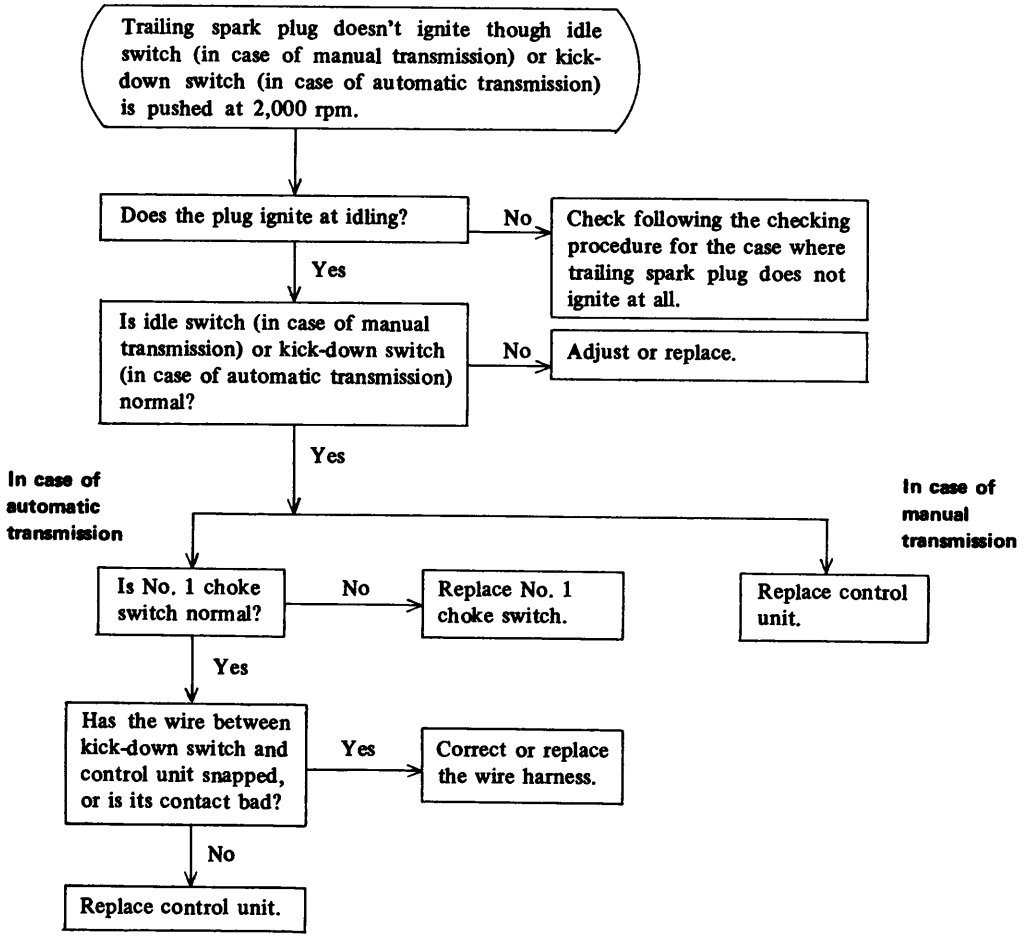


IGNITION CONTROL SYSTEM

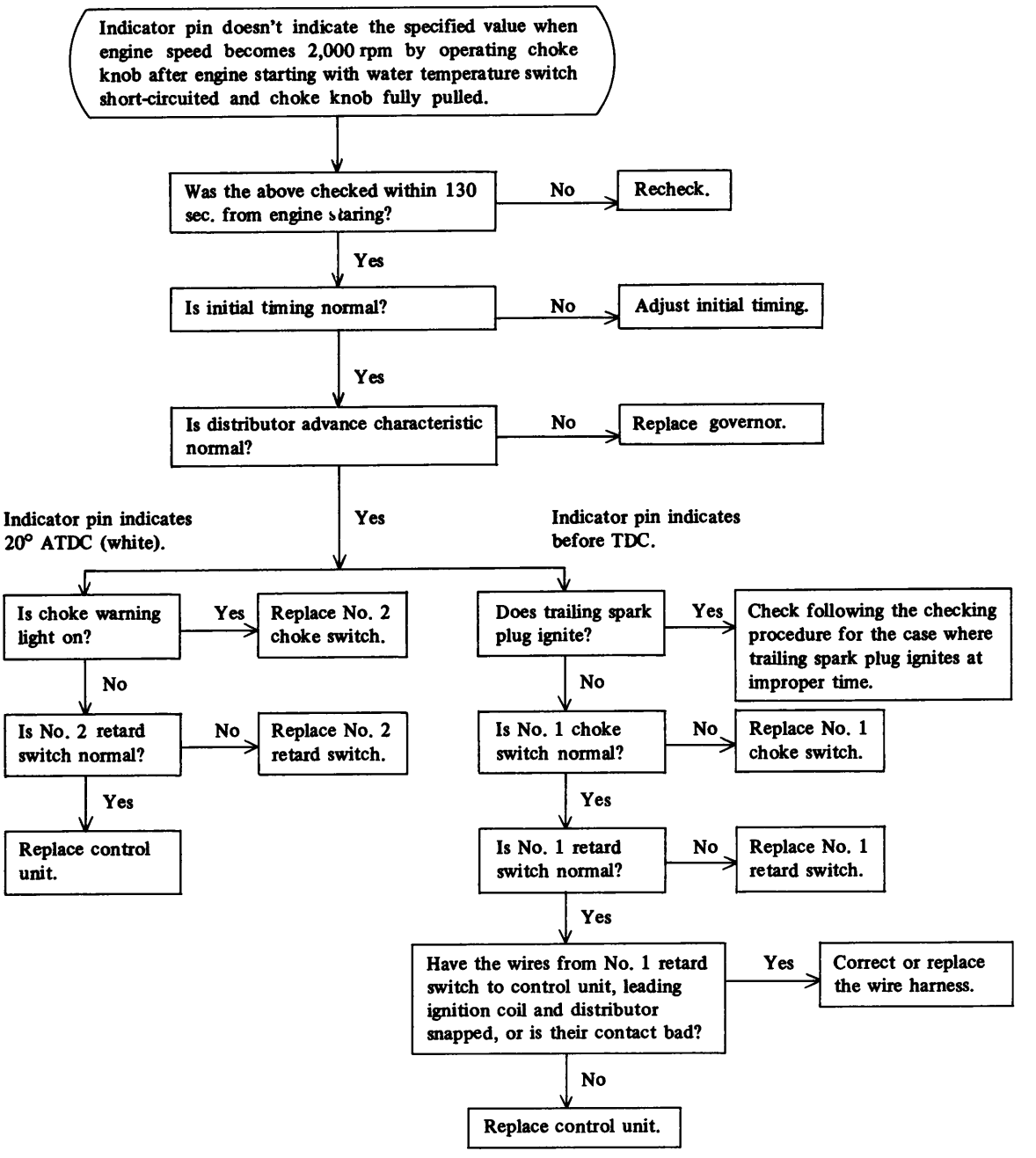
Checking Trailing Side Ignition



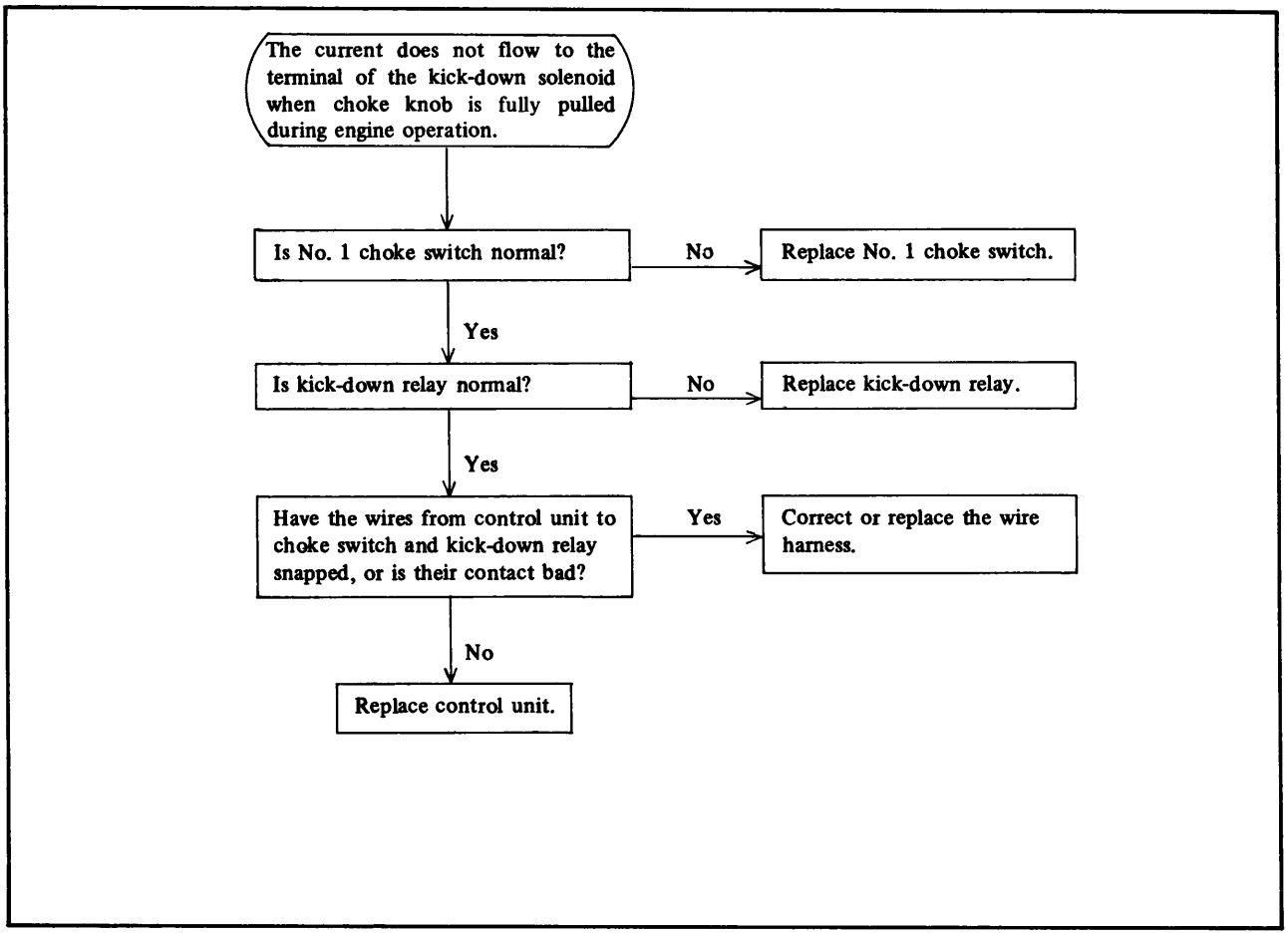
Checking Trailing Side Ignition



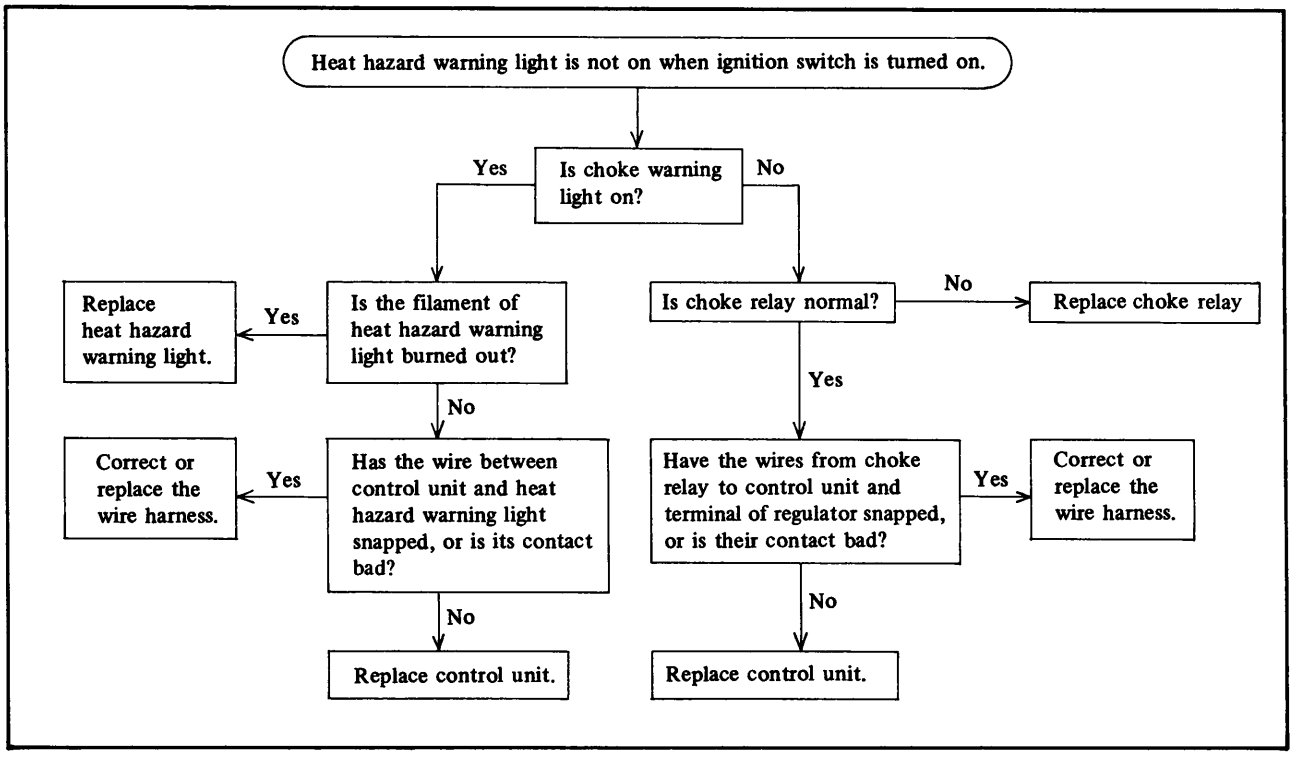
Checking Leading Side Ignition



KICK-DOWN CONTROL SYSTEM
(only for automatic transmission)



HEAT HAZARD PROTECTIVE AND WARNING SYSTEM



1A–C. TROUBLE SHOOTING

1A–C–1. Symptoms, Causes and Remedies

The possible faults and their remedies are listed in the following table. When the symptoms of troubles are detected, proper care must be taken immediately. (It would be better to check the ignition timing, spark plug and idle setting at first.)

Symptoms and probable causes	Remedies
1. Poor acceleration and poor engine power	
* The engine does not fully respond to the depression of the accelerator pedal.	
* The accelerative force is poor.	
* The climbing capacity is insufficient.	
* The max. speed can not be obtained.	
A. Defect of air intake system	
1) Clogging of air cleaner	Clean or replace
2) Defect of intake air temperature control valve	See 4–F–2 Replace if necessary
B. Defect of fuel system	
1) Improper injection of carburetor accelerator pump	See 4–A–5 Adjust or replace
2) Clogging of carburetor jets	Clean or replace
3) Improper opening of throttle valve and choke valve	Repair
4) Lack of fuel supply at high speed running	See 4–B Replace if necessary
C. Defect of ignition system	
1) Improper ignition timing and ignition advance	See 5–C–3, 5–C–5 Adjust
2) Defect of ignition control system (control unit, retard switch etc.)	See 1A–A–8 Replace if necessary
3) Burned or improperly adjusted distributor contact point	See 5–C–1, 5–C–2 Adjust or replace
4) Fouling and excessive gap of spark plugs	See 5–E Clean or replace
D. Air leak from each hose and each valve	Repair or replace
E. Low compression pressure	Repair
F. Collapse of exhaust system	Repair or replace
G. Defect of kick-down control system	See 1A–A–11
..... only in case of automatic transmission	
2. Rough engine idling and hard starting	
* The idling speed cannot be lowered.	
* Too much engine vibration at idling.	
* The engine starting is too hard.	
* The engine stalls immediately even if it starts.	
A. Defect of air intake system	
1) Clogging of air cleaner	Clean or replace
2) Defect of intake air temperature control valve	See 4–F–2 Replace if necessary
B. Defect of fuel system	
1) Improper idle setting	See 4–A–1 Adjust
2) Clogging of carburetor jets	Clean or replace
3) Clogging of fuel return passage	Clean or replace
4) Improper seating of carburetor secondary throttle valve	Repair
5) Defect of choke system	See 4–A–4 Adjust
6) Defect of richer or improper signal from control unit ..... only in case of manual transmission (Richer is continuously opened)	See 4–A–6 Replace if necessary
C. Defect of ignition system	
1) Improper ignition timing and ignition advance	See 5–C–3, 5–C–5 Adjust
2) Defect of ignition control system (control unit etc.)	See 1A–A–8 Replace if necessary
3) Burned or improperly adjusted distributor contact point	See 5–C–1, 5–C–2 Adjust or replace
4) Fouling and excessive gap of spark plugs	See 5–E Clean or replace
5) Internal disconnection of ignition coils	See 5–D Replace
6) Electric leak from high tension cords, distributor, ignition coil etc.	Repair
D. Defect of deceleration control valve or improper signal from control unit (Deceleration control valve is continuously opened)	See 1A–A–5 Replace if necessary

Symptoms and probable causes	Remedies
E. Defect of altitude compensator	See 1A–A–6 Replace if necessary
F. Defect of evapo compensator valve	See 1A–A–7 Replace if necessary
G. Defect of ventilation valve	See 1A–A–20 Replace if necessary
H. Defect of secondary air control system (Secondary air is not injected properly)	
1) Defect of air pump and/or "V" belt	See 1A–A–1 Replace if necessary
2) Defect of air control valve	See 1A–A–4 Replace if necessary
3) Improper signal from control unit	See 1A–A–4 Replace if necessary
I. Air leak from each hose and each valve	Repair or replace
J. Low compression pressure	Repair
K. Defect of sub-zero starting assist device (extremely cold weather)	See 4–A–8 Replace if necessary
3. Improper fuel connection between slow and main zones (Flat Spot)	
* Shock is felt when depressing the accelerator pedal to accelerate from the low speed cruising condition.	
A. Defect of fuel system	
1) Improper idle setting	See 4–A–1 Adjust
2) Clogging of carburetor jets	Clean or replace
3) Improper fuel level	See 4–A–3 Adjust
4) Improper injection of carburetor accelerator pump	See 4–A–5 Adjust, replace if necessary
B. Defect of ignition system	
1) Fouled spark plug	See 5–E Clean or replace
2) Burned or improperly adjusted distributor contact point	See 5–C–1, 5–C–2 Adjust or replace
C. Defect of deceleration control valve or improper signal from control unit	See 1A–A–5 Replace if necessary
4. Improper fuel connection between primary and secondary zones	
* Shock is caused when accelerating from running at around 3,000 rpm by depressing the accelerator pedal fully.	
A. Serious clogging of air cleaner	Clean or replace
B. Defect of fuel system	
1) Clogging of carburetor jets	Clean of replace
2) Excessively low fuel level	See 4–A–3 Adjust
3) Lack of fuel supply	See 4–B Replace if necessary
4) Improper opening of carburetor secondary throttle valve	Repair
C. Defect of ignition system	
1) Fouled spark plug	See 5–E Clean or replace
2) Burned or improperly adjusted distributor contact point	See 5–C–1, 5–C–2 Adjust or replace
D. Defect of deceleration control valve or improper signal from control unit	See 1A–A–5 Replace if necessary
5. Abnormally large engine knocking	
A. Too poor fuel (Octane number is low)	
B. Defect of ignition system	
1) Improper ignition timing	See 5–C–3 Adjust
2) Excessive ignition advance	See 5–C–5 Replace if necessary
3) Insufficcient heat range or extreme gap erosion of spark plug	See 5–E Clean or replace
6. Pre-ignition or spit back	
* Large noises comes from the engine compartment at high speed running, e.g. on the free way, and the engine horsepower falles.	
NOTE: If the car runs on under the condition mentioned above, the insulator of the spark plug in broken and bites into the combustion chamber, causing the vehicle to be inoperable.	

Symptoms and probable causes	Remedies	
A. Defect of ignition system		
Pre-ignition — 1) Excessive ignition advance	See 5–C–5	Replace if necessary
Pre-ignition — 2) Insufficient heat range of spark plug	See 5–E	Replace
Spit-back — 3) Excessive spark plug gap	See 5–E	Replace
Spit-back — 4) Improper alignment of high tension cords	Correct	
B. Insufficient metering oil		
C. Sticky apex seal	Clean	
7. Large car bucking (deceleration surging)		
* Large car bucking occurs at deceleration.		
A. Defect of fuel system		
1) Improper idle setting	See 4–A–1	Adjust
2) Defect of richer or improper signal from control unit ..... only in case of manual transmission (Richer does not operate properly at deceleration)	See 4–A–6	Replace if necessary
B. Defect of ignition system		
1) Improper ignition timing and ignition advance	See 5–C–3, 5–C–5	Adjust or replace
2) Fouled spark plug	See 5–E	Clean or replace
3) Burned or improperly adjusted distributor contact point	See 5–C–1, 5–C–2	Adjust or replace
C. Defect of deceleration control valve or improper signal from control unit (Deceleration control valve does not operate properly at deceleration)	See 1A–A–5	Replace if necessary
D. Defect of secondary air control system (Secondary air is not injected properly)		
1) Defect of air pump and/or "V" belt	See 1A–A–1	Adjust or replace
2) Defect of air control valve	See 1A–A–4	Replace if necessary
3) Improper signal from control unit	See 1A–A–4	Replace if necessary
E. Air leak from each hose and each valve	Repair or replace	
8. Afterburning (Back fire)		
* Extremely annoying afterburning occurs during deceleration.		
* Afterburning occurs when turning off the ignition switch.		
A. Defect of fuel system		
1) Improper idle setting	See 4–A–1	Adjust
2) Defect of richer or improper signal from control unit ..... only in case of manual transmission (Richer does not operate properly at deceleration)	See 4–A–6	Replace if necessary
B. Defect of ignition system		
1) Improper ignition timing and ignition advance	See 5–C–3, 5–C–5	Adjust or replace
2) Fouled spark plug	See 5–E	Clean or replace
3) Burned or improperly adjusted distributor contact point	See 5–C–1, 5–C–2	Adjust or replace
C. Defect of deceleration control valve or improper signal from control unit (Deceleration control valve does not operate properly at deceleration or when ignition switch is turned off.)	See 1A–A–5	Replace if necessary
D. Defect of secondary air control system (Secondary air is not injected properly)		
1) Defect of air pump and/or "V" belt	See 1A–A–1	Adjust or replace
2) Defect of air control valve	See 1A–A–4	Replace if necessary
3) Improper signal from control unit	See 1A–A–4	Replace if necessary
E. Defect of altitude compensator	See 1A–A–6	Replace if necessary
F. Defect of evapo compensator valve	See 1A–A–7	Replace if necessary
G. Defect of ventilation valve	See 1A–A–20	Replace if necessary
H. Air leak from each hose and each valve	Repair or replace	
I. Gas leak from exhaust system	Repair or replace	
9. Overflow from carburetor		
A. Defect of fuel system		
1) Dust biting into needle valve	See 4–A–3	Clean

Symptoms and probable causes	Remedies
2) Improper seating of needle valve	See 4–A–3 Clean or replace
3) Improper movement of float	See 4–A–3 Adjust or replace
4) Clogging of fuel return passage	See 4–A–9 Clean or replace
5) Large fuel pressure of fuel pump	See 4–B Replace if necessary
10. The engine brake does not work even if the accelerator pedal is released.	
* Even if the accelerator pedal is released when running, the engine brake does not work, which causes the overrunning and makes the driver uneasy.	
A. Clogging of air cleaner	Clean or replace
B. Defect of fuel system	
1) Improper returning of carburetor primary throttle valve	Repair
2) Improper returning of carburetor secondary throttle valve	Repair
C. Defect of deceleration control valve (The opening period of anti-afterburn valve is too long.)	See 1A–A–5 Replace if necessary
11. Overheat	
* Indicating "H" of the thermometer on the instrument panel denotes overheating. Running on with such an overheated engine may lead to serious damage of the engine.	
A. Defect of cooling system	
1) Lack of coolant	Replenish
2) Coolant leak from water pump, radiator, car heater, water hose etc.	Repair or replace if necessary
3) Defect of fan drive	Replace if necessary
4) Defect of thermostat	Replace if necessary
5) Clogging of radiator	Clean
B. Loosening or breakage of "V" belt	Adjust or replace
C. Lack of engine oil	Replenish if necessary
D. Defect of water thermo switch for car cooler	Replace if necessary
E. Defect of thermometer or heat gauge unit	Replace if necessary
12. Improper operation of choke control knob	
* Choke knob cannot remain pulled.	
* Choke knob does not return automatically.	
A. Defect of choke relay	See 1A–A–19 Replace if necessary
B. Defect of water temperature switch	See 1A–A–15 Replace if necessary
C. Defect of control unit	See 1A–A–14 Replace if necessary
D. Defect of choke wire (electromagent, choke switch etc.)	See 1A–A–9, 1A–A–10, 1A–A–13 Replace if necessary
E. Defect of choke return spring	See 1A–A–13 Replace if necessary
13. Abnormal fast idle speed	
* Fast idle speed is abnormally high or low.	
A. Defect of No. 1 choke switch and/or No. 2 choke switch.	See 1A–A–9, 1A–A–10 Replace if necessary
B. Defect of ignition system	
1) Improper ignition timing and ignition advance	See 5–C–3, 5–C–5 Adjust or replace
2) Defect of ignition control system (control unit, No. 2 retard switch etc.)	See 1A–A–8 Replace if necessary
C. Defect of fuel system	
1) Improper opening of carburetor throttle valve	Repair
2) Defect of choke system	See 1A–A–13 Replace if necessary

Symptoms and probable causes	Remedies
14. Abnormal exhaust emissions under proper procedure	
A. Defect of air intake system	
1) Serious clogging of air cleaner	Clean or replace
2) Defect of intake air temperature control valve	See 4–F–2 Replace if necessary
B. Defect of fuel system	
1) Improper idle setting	See 4–A–1 Adjust
2) Improper fuel level	See 4–A–3 Adjust
3) Clogging of jets	Clean or replace
4) Defect of choke system	See 4–A–4 Adjust
5) Defect of richer..... only in case of manual transmission	See 4–A–6 Replace if necessary
6) Defect of power valve..... only in case of automatic transmission	See 4–A–7 Replace if necessary
C. Defect of ignition system	
1) Improper ignition timing and ignition advance	See 5–C–3, 5–C–5 Adjust or replace
2) Defect of ignition control system (control unit etc.)	See 1A–A–8 Replace if necessary
3) Burned or improperly adjusted distributor contact point	See 5–C–1, 5–C–2 Adjust or replace
4) Fouled spark plug etc.	See 5–E Clean or replace
D. Defect of secondary air control system	
1) Defect of air pump and/or "V" belt	See 1A–A–1 Adjust or replace
2) Defect of air control valve	See 1A–A–4 Replace if necessary
3) Improper signal from control unit	See 1A–A–4 Replace if necessary
E. Defect of deceleration control valve or improper signal from control unit	See 1A–A–5 Replace if necessary
F. Defect of altitude compensator	See 1A–A–6 Replace if necessary
G. Defect of evapo compensator	See 1A–A–7 Replace if necessary
H. Defect of ventilation valve	See 1A–A–20 Replace if necessary
I. Defect of evaporative emission control system	See 1A–A–22, 1A–A–23, 1A–A–24 Replace if necessary
J. Defect of thermal reactor	See 1A–A–3 Replace if necessary
K. Air leak from each hose and each valve	Repair or replace
L. Defect of heat hazard sensor	See 1A–A–12 Replace if necessary

1A–C–2. Possible Troubles Caused by Defects of Each Device

Air control valve

* Exhaust emission becomes unfavourable.
* Rough engine idling
* Afterburning
* Car bucking (deceleration surging)
* Damage is liable to occur on reactor.

Deceleration control valve

* Extremely annoying afterburning occurs during deceleration or after turning off the ignition switch.
* Hard engine starting
* Rough engine idling
* Engine speed becomes high.
* Exhaust emission becomes unfavourable.
* Car bucking (deceleration surging)
* Flat spot occurs during driving.
* Flat spot occurs during light acceleration from low speed running or deceleration condition.

Altitude compensator

* Hard engine starting
* Rough engine idling
* Afterburning
* Car bucking (deceleration surging)
* Exhaust emission becomes unfavourable.

Evapo compensator valve
* Hard engine starting
* Rough engine idling
* Afterburning
* Car bucking (deceleration surging)
* Exhaust emission becomes unfavourable.

Ventilation valve
* Misfiring frequently occurs during idling.
* Rough engine idling
* Afterburning
* Car bucking (deceleration surging)
* Dilution of engine oil with gasoline increases.
* Defective purging occurs in charcoal canister.
* Exhaust emission becomes unfavourable.

Air pump
* Exhaust emission becomes unfavourable.
* Noisy air pump

Richer (Manuall transmission only)
* Exhaust emission becomes unfavourable
* Rough engine idling
* Afterburning
* Car bucking (deceleration surging)

Power valve (Automatic transmission only)
* Exhaust emission becomes unfavourable.
* Poor acceleration

Kick-down switch (Automatic transmission only)
* Improper operation of kick-down control system

Water temperature switch
* Improper operation of automatic throttle release system
* Improper operation of ignition control system
* Improper operation of air control valve

Idle switch (Manual transmission only)
* Improper operation of deceleration control valve
* Improper operation of ignition control system
* Improper operation of air control valve
* Improper operation of richer

No. 1 retard switch
* Improper operation of ignition control system

No. 2 retard switch
* Improper operation of ignition control system

No. 1 choke switch
* Improper operation of automatic throttle release system
* Improper operation of ignition control system
* Improper operation of air control valve
* Improper operation of kick-down control system (Automatic transmission only)
* Improper operation of choke system

No. 2 choke switch
* Improper operation of automatic throttle release system
* Improper operation of ignition control system

Control unit
* Improper operation of deceleration control valve

* Improper operation of air control valve
* Improper operation of ignition control system
* Improper operation of fuel system (Richer or power valve)
* Improper operation of automatic throttle release system
* Improper operation of heat hazard protective and warning system
* Improper operation of kick-down control system (Automatic transmission only)

Fuse of control unit

* Hard starting, rough idling and large car knocking may be caused by leaving deceleration control valve open.

SPECIAL TOOLS

49 2113 010	Air pump gauge set
49 1881 125	Thermal reactor remover
49 1011 120	Ventilation valve wrench

LUBRICATING SYSTEM

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2

2–A. LUBRICATING CIRCUIT

1. The oil pump which is driven by the eccentric shaft, draws up the oil from the oil pan through the strainer and sends it to the oil cooler through the pressure control valve.
2. The pressure control valve sends the surplus oil back to the oil pan when the oil pressure exceeds 11 kg/cm² (156 lb/in²) in order to prevent the oil cooler and the oil hose from damage by the exceeding pressure which is generated at the starting in the very cold weather.
3. The by-pass valve is installed on the oil cooler in order to prevent drop of oil supply which is caused by resistance of oil cooler in the cold weather and regulate the temperature of the oil circulating in the engine. The oil is sent directly to the engine without passing through the oil cooler when the difference of the oil pressure of inlet and outlet pipes is more than 3.56 kg/cm² (50.7 lb/in²) at 70°C (158°F) and/or the temperature of the oil is under 60°C (140°F).
4. The oil from the oil cooler is forced to the pressure regulator on the rear housing.
5. The oil of which pressure is regulated to 5 kg/cm² (71.1 lb/in²), is forced to the oil filter.
6. The oil that has been filtered by the oil filter is forced to the front main bearing through the tubular dowel and to the rear main bearing through the passage of the rear housing.
7. The oil that has passed through the oil holes of the bearings, lubricate the front and rear main bearings and enters the oil passage provided in the eccentric shaft.
8. The oil passing through the eccentric shaft passage lubricates the rotor bearings.
9. Needle bearings which are provided in front of the front housing are lubricated by the oil forced through the little hole led to the oil passage of the eccentric shaft and the oil coming after lubricating the front main bearing.
10. The eccentric shaft is equipped with two oil jets. The oil in the passage of the eccentric shaft is injected through the oil jets into the front and rear rotors and cools the rotors.
11. Stationary gears and internal gears are lubricated by the oil coming after cooling the rotors and after lubricating the main bearings.
12. The oil passing through the tubular dowel is sent to the front cover and led to the metering oil pump.
13. From the metering oil pump, the oil is forced to the carburetor and is supplied into the combustion chambers together with the air-fuel mixture to lubricate the apex seals, corner seals, side seals and housings.

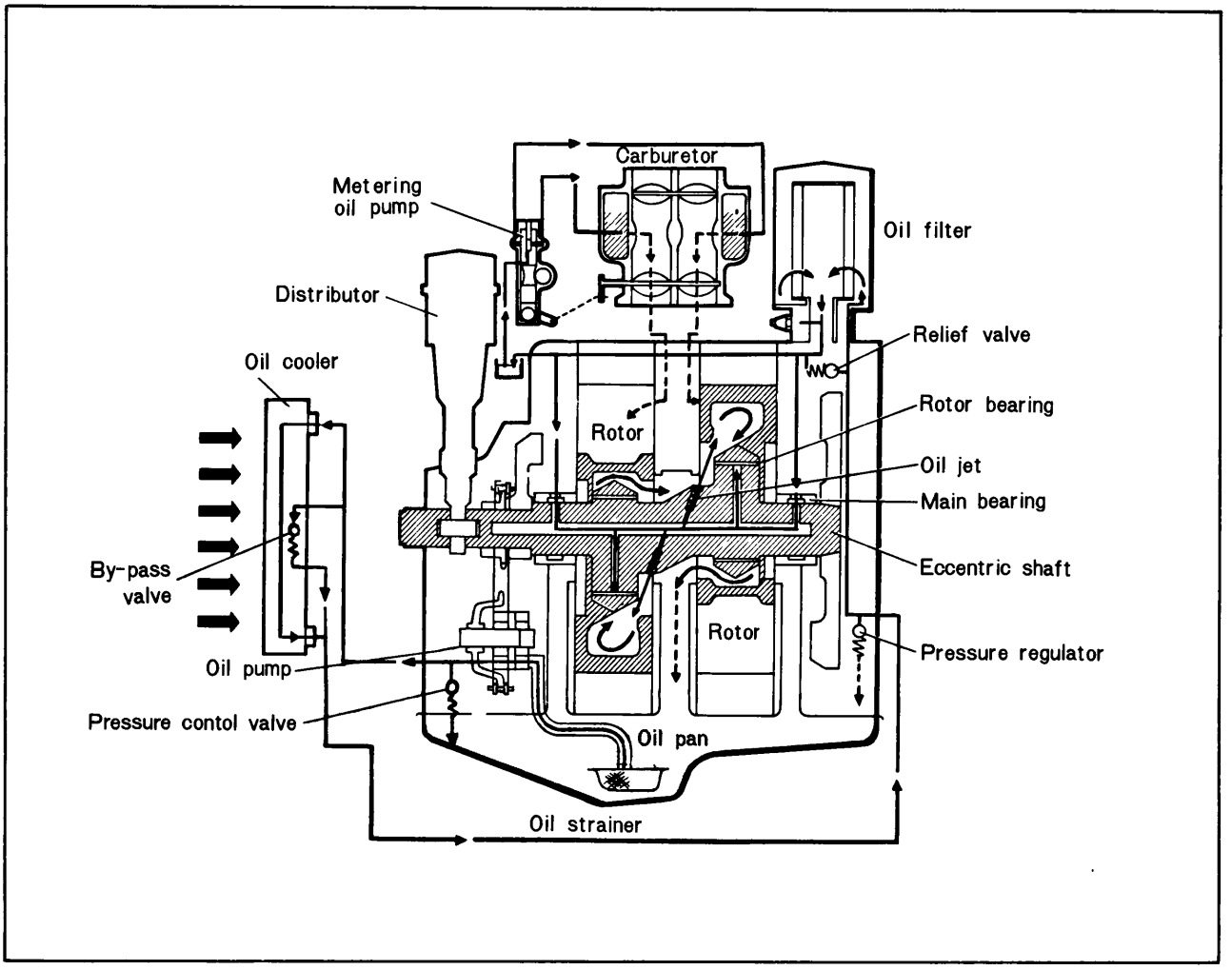

Fig. 2–1 Lubricating circuit

2–B. OIL PUMP

The oil pump is of a rotor type based on a trochoid curve and consists of the parts as shown in Fig. 2–5. The feeding capacity is 6 liters/min. (1.56 U.S. gal/min.) at 1,000 rpm of engine speed.

2–B–1. Disassembling Oil Pump

1. Remove the oil pump from the front housing.
2. Remove the snap ring from the shaft, and remove the rear rotors and key.
3. Remove the middle plate attaching screw and remove the middle plate.
4. Remove the front rotors and key from the shaft.

2–B–2. Inspecting Oil Pump

1. Check the clearance between the lobes of the rotors with a feeler gauge, as shown in Fig. 2–3. The standard clearance is 0.01 ~ 0.09 mm (0.0004 ~ 0.0035 in). If the clearance exceeds **0.15 mm (0.006 in)**, replace both inner rotor and outer rotor.

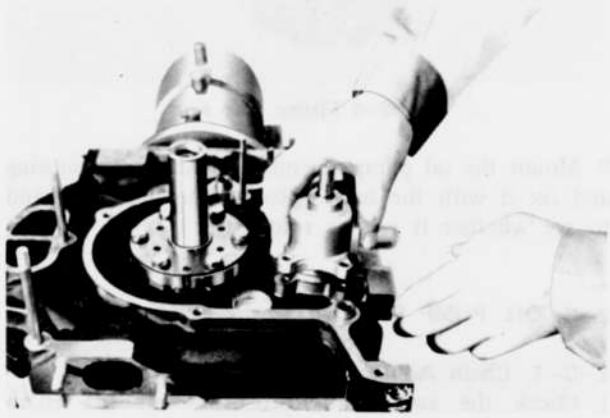

Fig. 2–2 Removing oil pump

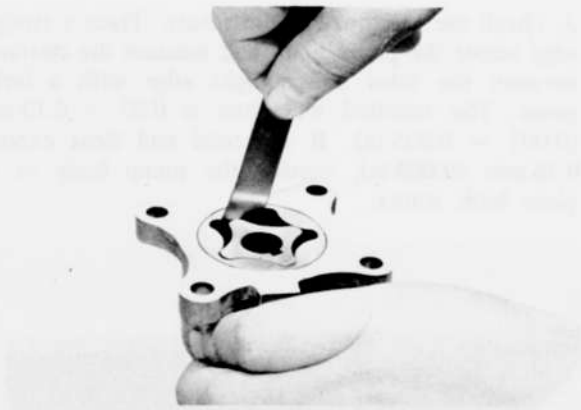

Fig. 2–3 Checking rotor clearance

2. Check the clearance between the outer rotor and pump body with a feeler gauge as shown in Fig. 2–4. The specified clearance is 0.20 ~ 0.25 mm (0.008 ~ 0.01 in). If the clearance is more than **0.30 mm (0.012 in)**, replace the rotor(s) or body.



Fig. 2–4 Checking outer rotor clearance

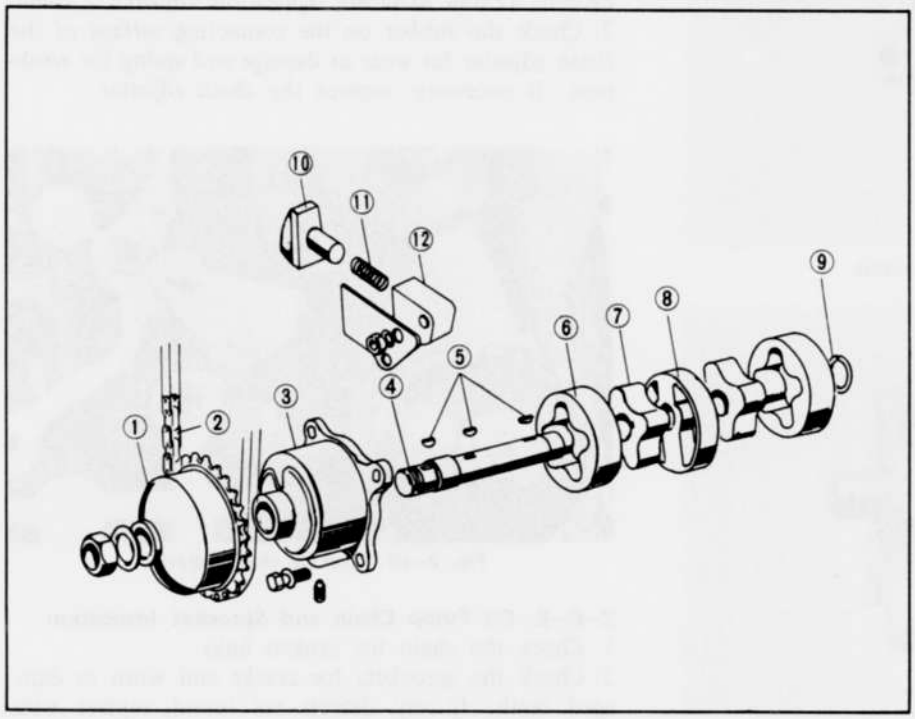

Fig. 2–5 Oil pump components

1. Oil pump driven sprocket
2. Oil pump chain
3. Pump body
4. Shaft
5. Keys
6. Outer rotor
7. Inner rotor
8. Middle plate
9. Snap ring
10. Adjuster
11. Spring
12. Body

3. Check the end float of the rotors. Place a straight edge across the pump body and measure the clearance between the rotor and straight edge with a feeler gauge. The standard end float is 0.03 ~ 0.13 mm (0.001 ~ 0.005 in). If the total end float exceeds **0.15 mm (0.006 in)**, correct the pump body or replace both rotors.

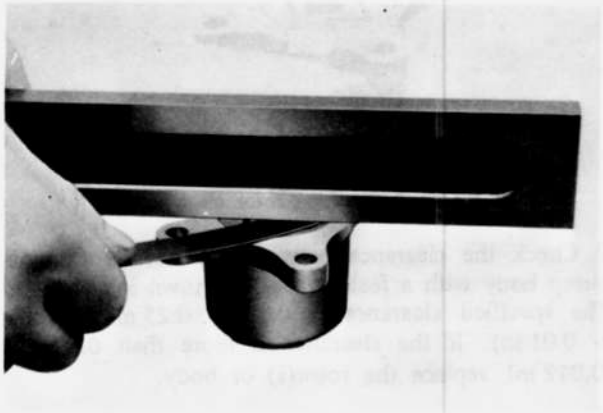

Fig. 2–6 Checking end float

2–B–3. Assembling Oil Pump

1. Attach the key of the front side rotor to the shaft.
2. Install the front side inner rotor to the shaft so as to align the key groove of the inner rotor with the key on the shaft.
3. Mount the inner rotor and shaft assembly to the pump body.
4. Install the outer rotor to the body so as to see the identification marks of triangle. Apply oil to the rotors. (Fig. 2–7)
5. Install the middle plate to the body. Tighten the set screw. (Fig. 2–8)
6. Attach the key of the rear side rotor to the shaft.
7. Install the rear side inner rotor and outer rotor.
8. Fit the snap ring on the shaft. Apply oil to the rotors.

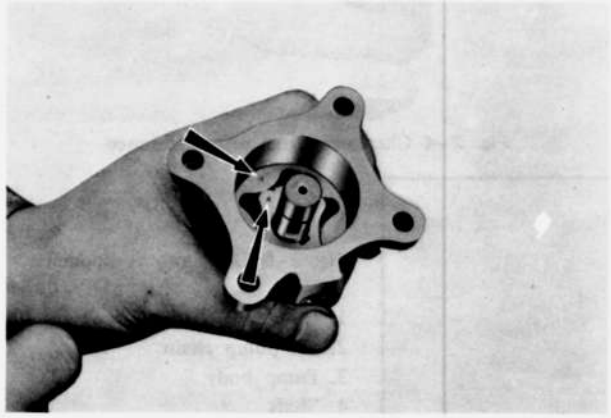

Fig. 2–7 Installing rotors

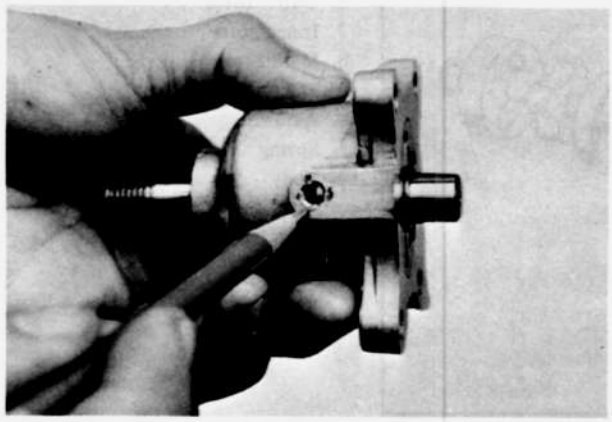

Fig. 2–8 Tightening intermediate plate

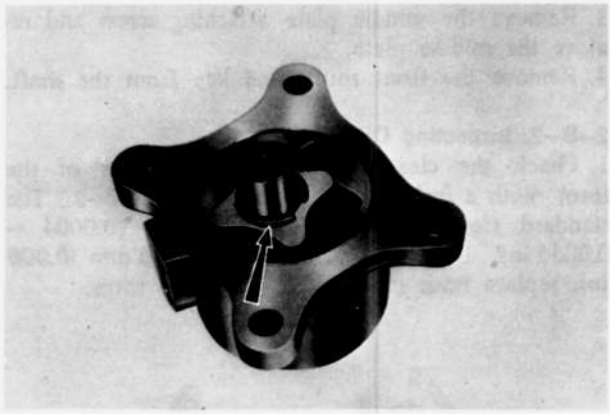

Fig. 2–9 Fitting snap ring

9. Mount the oil pump assembly on the front housing and fix it with the bolts. Rotate the shaft by hand to see whether it rotates smoothly.

2–C. OIL PUMP DRIVING

2–C–1. Chain Adjuster Inspection

1. Check the amount of protrusion of the chain adjuster, as shown in Fig. 2–10. If the protrusion exceeds **12 mm (0.47 in)**, replace the adjuster or chain.
2. Check the rubber on the contacting surface of the chain adjuster for wear or damage and spring for weakness. If necessary, replace the chain adjuster.

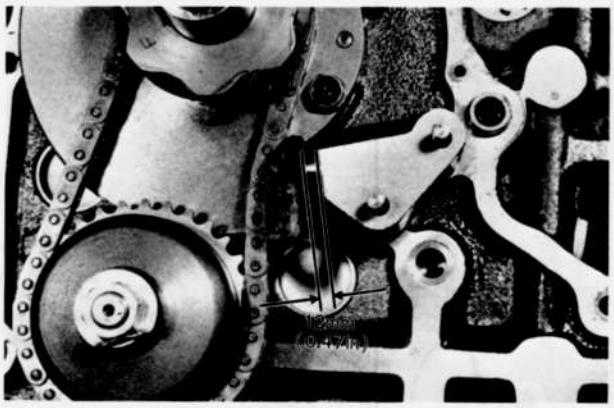

Fig. 2–10 Checking chain adjuster

2–C–2. Oil Pump Chain and Sprocket Inspection

1. Check the chain for broken links.
2. Check the sprockets for cracks and worn or damaged teeth. If any defects are found, replace with new parts.

2–D. PRESSURE CONTROL VALVE

The pressure control valve mounted on the front cover sends the surplus oil back to the oil pan when the pressure exceeds 11 kg/cm² (156 lb/in²) in order to prevent the oil cooler and the oil hose from damage by the exceeding pressure which is generated at the starting in the very cold weather.

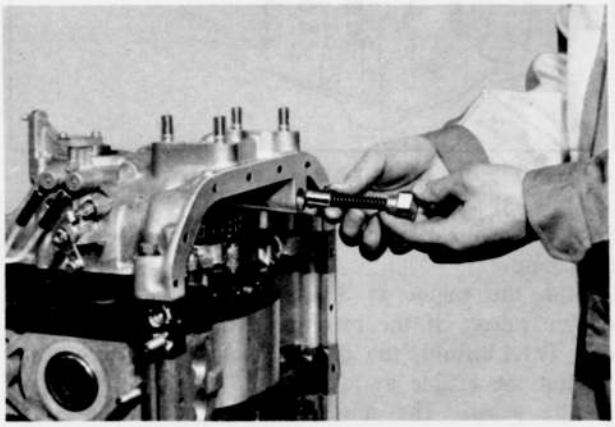

Fig. 2–11 Pressure control valve

2–D–1. Checking Pressure Control Valve

Remove the cap of the pressure control valve from the front cover.
Examine the spring and the plunger for corrosion or any damage. If it is severe, replace with new ones. Measure the free length and replace with new spring if these are not in the specification.

2–E. OIL COOLER

The rotor is cooled by the lubricating oil, and the oil cooler is employed to cool the oil.
The oil cooler is of the corrugated fin type like a water radiator and is mounted under the radiator through insulation rubber. The oil cooler is made of aluminum which has outstanding cooling efficiency.

2–E–1. Repairing Oil Cooler

The inner pressure of the oil cooler is much higher than the cooling radiator, so it should be repaired by **aluminum welding** when damaged.

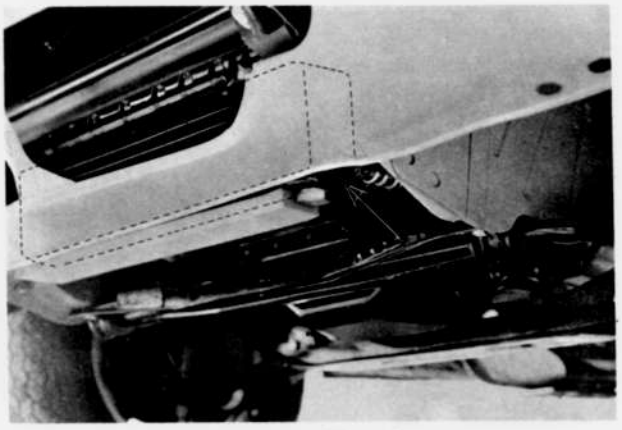

Fig. 2–12 Oil cooler

2–F. BY-PASS VALVE

The by-pass valve is installed on the oil cooler in order to prevent drop of oil supply which is caused by the resistance of the oil cooler in the cold weather and regulate the temperature of the oil circulating in the engine. The oil is sent directly to the engine without passing through the oil cooler when the difference of the oil pressure of inlet and outlet pipes is more than 3.56 kg/cm² (50.7 lb/in²) at 70°C (158°F) and/or the temperature of the oil is under 60°C (140°F).

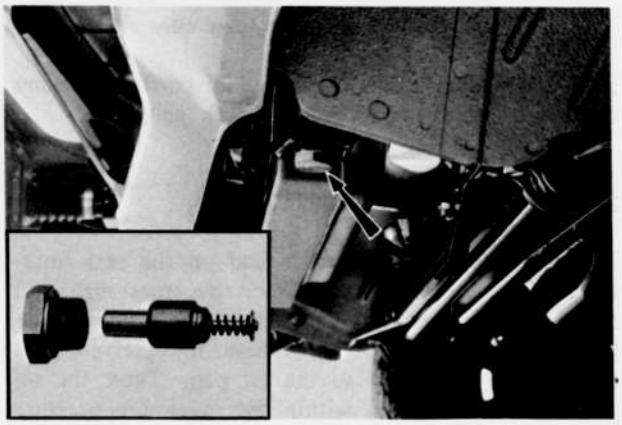

Fig. 2–13 By-pass valve

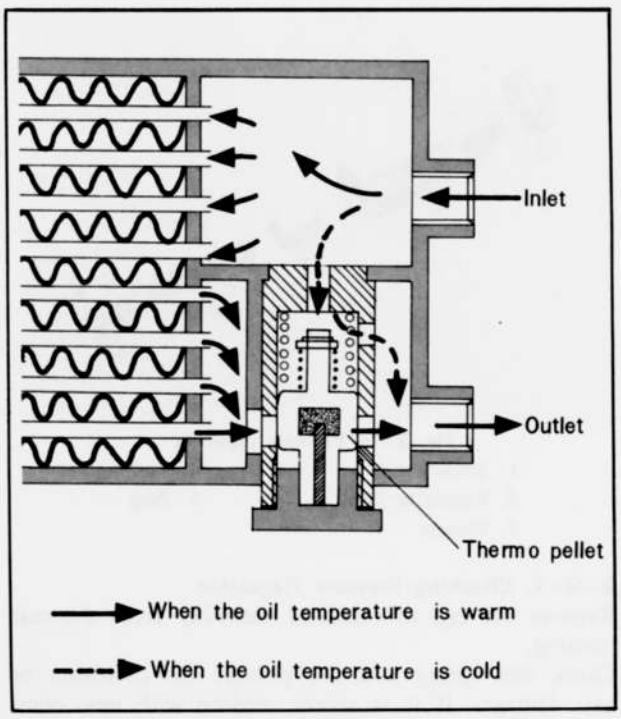

Fig. 2–14 By-pass valve

2–F–1. Checking By-pass Valve

1. Remove the cap nut and pull out the by-pass valve.
2. Soak the by-pass valve in hot oil of 75°C ~ 80°C (167°F ~ 176°C). If the protrusion of piston is more than 5 mm (0.2 in), the by-pass valve is normal. (Fig. 2–15)

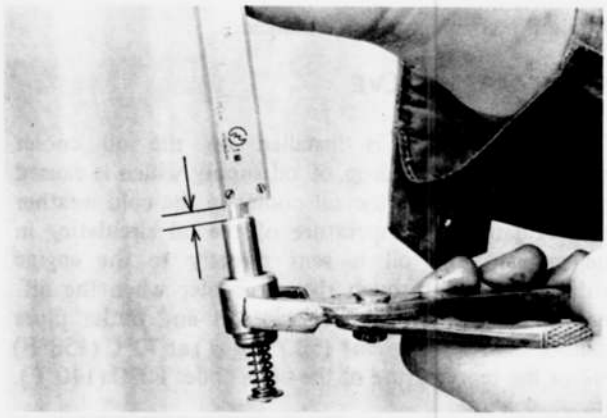

Fig. 2–15 Checking by-pass valve

3. Check the spring and the valve for corrosion or any damage. If it is severe, replace with new ones.

2–G. PRESSURE REGULATOR

The pressure regulator is provided on the rear housing. When the engine revolution becomes high and excessive oil pressure develops in the system, the pressure regulator opens to relieve the pressure and to send the excess oil to the oil pan. Thus, the oil pressure is maintained within the maximum pressure of 5 kg/cm² (71.1 lb/in²).

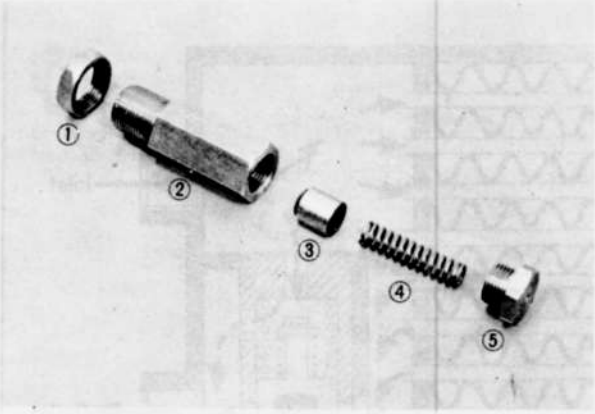

Fig. 2–16 Pressure regulator

1. Lock nut
2. Regulator body
3. Plunger
4. Spring
5. Plug

2–G–1. Checking Pressure Regulator

Remove the cap or regulator assembly from the rear housing.

Check the spring and the plunger for corrosion or any damage. If it is severe, replace with new ones. Measure the free length, set length and set pressure. Replace with new spring if these are not in specifications.

2–G–2. Checking Oil Pressure

To check the oil pressure, proceed as follows:

1. Remove the blind plug under the oil filter of rear housing and install an **oil pressure gauge** (Part No. 49 0187 280) in its place.

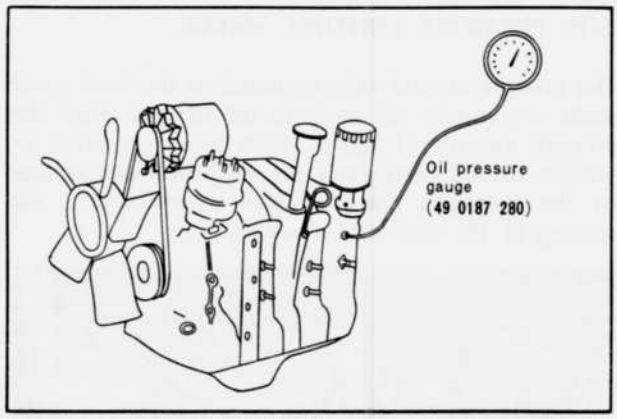

Fig. 2–17 Checking oil pressure

Start and warm up the engine to the normal operating temperature.

2. Run the engine at **3,000 rpm** and take a reading of the gauge. If the reading of the gauge is **5.0 kg/cm² (71.1 lb/in²)**, the oil pressure is normal.

3. Run the engine at idling speed and take a reading of the gauge. The normal idling pressure is about **2.4 kg/cm² (34.1 lb/in²)**.

If the oil pressure is less than **1 kg/cm² (14.2 lb/in²)**, check the following points:

a. Ensure that the oil level is between the "F" and "L" marks of the dipstick gauge.

b. Check the oil pump, as described in **Par. 2–B–2.**

c. Check the pressure regulator for wear on the plunger and fatigue on the spring. The free length of the spring is **46.4 mm (1.827 in).**

2–H. OIL FILTER

The oil filter is of a cartridge type. The element of the filter is sealed in the container as a unit. The oil filter is provided with a relief valve. If the oil filter is clogged by impurities in the oil and the filtering resistance reaches **0.8 ~ 1.2 kg/cm² (11 ~ 17 lb/in²)**, the oil can not pass through the element. In this case, the oil pushes the relief valve open and unfiltered oil is supplied to the engine.

2–H–1. Replacing Oil Filter

1. Remove the oil filter cartridge with a suitable oil filter wrench.

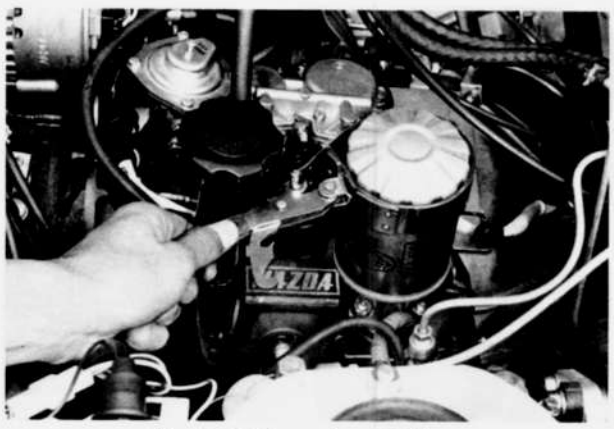

Fig. 2–18 Removing oil filter

2. Apply oil onto the rubber gasket on the new filter cartridge.
3. Place the cartridge on the cover and screw it on until it just touches the cover.
Then tighten the cartridge fully by hand.
4. Start the engine and check to see that the oil is not leaking from the joints.
5. After the engine has been stopped, ensure that the oil level is between the "F" and "L" marks of the dipstick gauge. Top up with oil if necessary.

2–I. METERING OIL PUMP

The oil enters the metering oil pump from the lubricating oil passage in the front cover and the oil which is measured and discharged from the metering oil pump enters the carburetor through a hose. The oil entering the carburetor is discharged from a portion of venturi to the working chamber to lubricate the gas seals. The plunger type metering oil pump is provided to send the proper amount of oil to the carburetor and is driven by the distributor drive gear.

2–I–1. Checking Metering Oil Pump

As sufficient consideration is being given on the performance and durability of the metering oil pump in its production process, generally there is no need of adjustment.
But as previously mentioned, the metering oil pump is the heart of the operation of the gas seals and insufficient amount of oil discharge could cause troubles such as drop in engine power and development of noise, because of insufficient lubrication, while excessive amount of oil discharge could cause problems as white smoke.
Therefore, the amount of oil discharge should always be within the proper range.
In case the engine tends to show any of the above troubles, the amount of oil discharge should be checked, proceeding as follows.
1. Disconnect the connecting rod by removing the cotter pin.
2. Disconnect the 2 metering oil hoses from the carburetor.
3. Install the tachodwell tester and set the engine at a constant speed of **2,000 rpm.** Wait until the oil discharge from the end of the metering oil hoses becomes steady and, when it is steady receive the oil in the measuring cylinder and start measuring the time simultaneously.
4. Stop the engine after **6 minutes** and check the amount of oil discharge. If it is within the proper range shown below, the discharge is satisfactory. Otherwise, adjust the oil metering pump.

2.0 ~ 2.5 cc/6 min. at 2,000 rpm

Note :
As lubricating oil is not being supplied to the gas seals while the measurements are being taken, a proper amount of clean engine oil should be added into the carburetor or the engine should be run on mixed gasoline into which oil has been mixed at the ratio of 100 : 1.

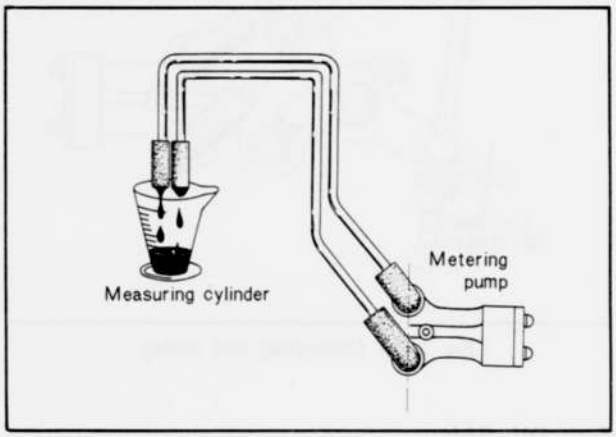

Fig. 2–19 Checking oil discharge

2–I–2. Adjusting Metering Oil Pump

If the amount of oil discharge measured by the procedure shown in the previous paragraph is not proper it would be adjusted by the adjusting screw.

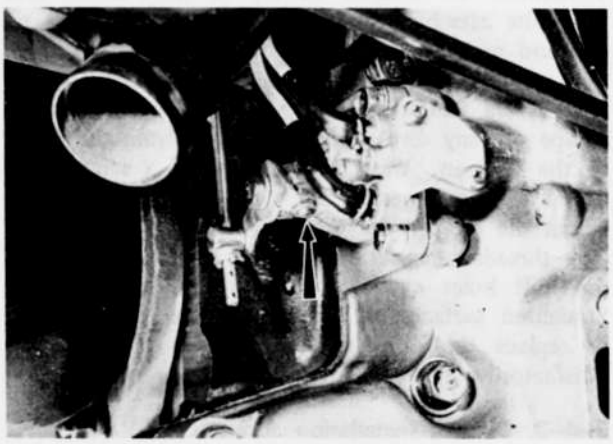

Fig. 2–20 Adjusting screw of metering oil pump

The amount of oil discharge increases when the adjusting screw is tightened, and decreases when loosened. As the amount of oil discharge changes by **0.2 ~ 0.3 cc/6 min./2,000 rpm** per rotation of the screw, adjust the screw after calculating the number of rotations necessary to obtain the proper adjustment.
Also check to ensure that the lock nut of the adjusting screw will lock without fail and be sure not to bend the lever when adjusting. After adjustment has been completed, measure the amount of oil discharge again and make sure that it is within the proper range.
In case the metering oil pump cannot be adjusted, check the oil leakage from pump body or tubes.
If the oil leakage cannot be found, replace a pump assembly.

Connecting rod setting
Set the clearance of connecting rod stopper pin and metering oil pump lever to **0 ~ 1.0 mm (0 ~ 0.04 in)** by using a suitable washer.

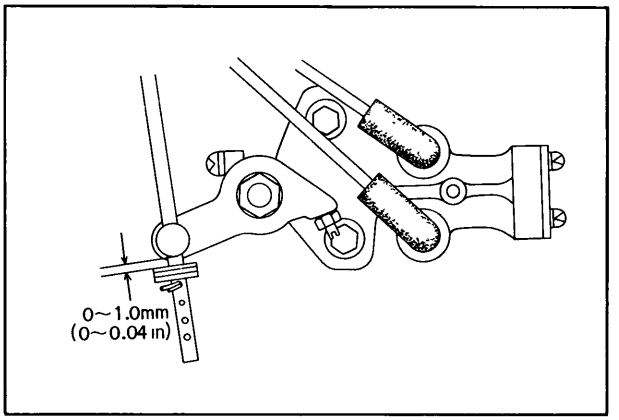

Fig. 2–21 Connecting rod setting

2–J. OIL PAN

2–J–1. Oil Pan Removal
1. Raise the vehicle and support with stands.
2. Drain the engine lubricant.
3. Remove the bolts attaching the engine under cover, and remove the engine under cover.
4. Remove the coupler of the oil level sensor and the bolts attaching the oil pan, and remove the oil pan and gasket.

2–J–2. Oil Pan Inspection
Scrape off any dirt or metal particles from the inside of the oil pan. Wash the oil pan in a solvent and dry it with compressed air.
Check the oil pan for any cracks and damaged drain plug threads. Inspect for damage (uneven surface) at the bolt holes caused by over-torqueing the bolts. Straighten surfaces as required. Repair any damage, or replace the oil pan if repairs can not be made satisfactorily.

2–J–3. Oil Pan Installation
Follow the removal procedures in the reverse order.

2–K. OIL LEVEL SENSOR

The oil level sensor fitted to the oil pan is connected by the wiring to the oil level warning lamp.
The oil level sensor is switched on to light the warning lamp when the engine lubricant level in the oil pan goes down to around "L" mark of the dipstick gauge.
When the ignition is switched on, the warning lamp goes on to check for its failure even under the normal lubricant level, but the lamp goes out under the normal level when the engine is started. So if the lamp comes on while the engine is operating, it means a drop of the engine lubricant level and warns necessity of replenishment of the engine lubricant.

2–K–1. Removing Oil Level Sensor
1. Remove the bolts attaching the engine under cover, and remove the engine under cover.
2. Remove the drain plug, and drain the lubricant from the oil pan. Refit the drain plug after draining lubricant.
3. Disconnect the coupler from the oil level sensor.
4. Remove the screws attaching the oil level sensor to the oil pan, and remove the oil level sensor.

2–K–2. Checking Oil Level Sensor
1. Connect the circuit tester to the level sensor as shown in Fig. 2–22, and check the continuity by moving the float up and down. When the float is on the upper side, the circuit tester should not show any continuity, and when moved to the lower side, it should show a continuity of the circuit. If it is found not to be so, replace the oil level sensor.
2. Check the oil chamber with finger that deposits aren't piled up and the oil hole isn't clogged.

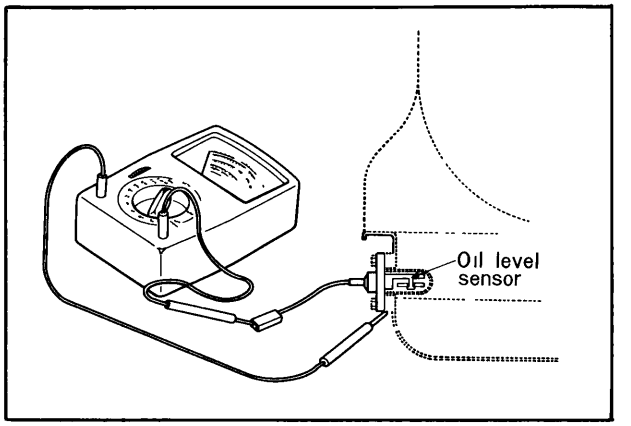

Fig. 2–22 Checking oil level sensor

Note:
1. If the oil hole should be clogged, the float of the oil level sensor can't work correctly, so take care to clean up the oil chamber.
2. To check the function of the oil level sensor on the car, the following steps should be taken:
a. Disconnect the coupler from the oil level sensor.
b. Connect the circuit tester to the level sensor as shown in Fig. 2–22.
c. Make sure that the oil level is between "F" and "L" marks of the dipstick gauge, and check to see that there is no continuity of the circuit.
d. Drain the lubricant from the oil pan, and check to see that there is a continuity of the circuit tester.

2–K–3. Installing Oil Level Sensor
Follow the removal procedures in the reverse order. Fill the lubricant in the engine and check to see that the oil is not leaking from the joining faces of the level sensor.

SPECIAL TOOL

49 0187 280	Oil pressure gauge

COOLING SYSTEM

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3–B. FLUSHING COOLING SYSTEM ..... 3 : 1
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3

DESCRIPTION

The completely sealed cooling system consists of a radiator with a pressure cap, an expansion chamber (sub-tank), centrifugal water pump, a thermostat and a fan.

The radiator and the expansion chamber are connected by hose. When the engine is heated sufficiently, the coolant in the radiator flows out and is led into the expansion chamber through the hose. The coolant is then returned to the radiator by negative pressure which builds up in the cooling system when the engine cools down.

3–A. COOLANT CIRCULATION

The water pump is driven by the eccentric shaft pulley over a V-belt and discharges the cooling water to the front housing. The water circulates from the front housing through the water passage provided in each housing and flows to the rear housing. From the rear housing, the water is returned to the front housing. At low engine temperature, the thermostat is closed to keep the water from entering the radiator. The water is then recirculated directly to the water pump and discharged to each housing. As the thermostat opens when the engine is warmed up, the water flows into the radiator. The cooled water flows from the radiator to the water pump through the connecting hose and cools the engine by circulation.

3–B. FLUSHING COOLING SYSTEM

Caution:

Avoid injury when checking a hot engine. Muffle the radiator cap in a thick cloth and turn it slowly counter-clockwise only until the pressure starts to escape. After the pressure has completely dissipated finish removing the cap.

The flushing procedures are as follows:

1. Remove the radiator cap.
2. Remove the engine under cover.
3. Open the drain plugs in base of radiator and left-hand side of engine.



Fig. 3–2 Radiator drain plug

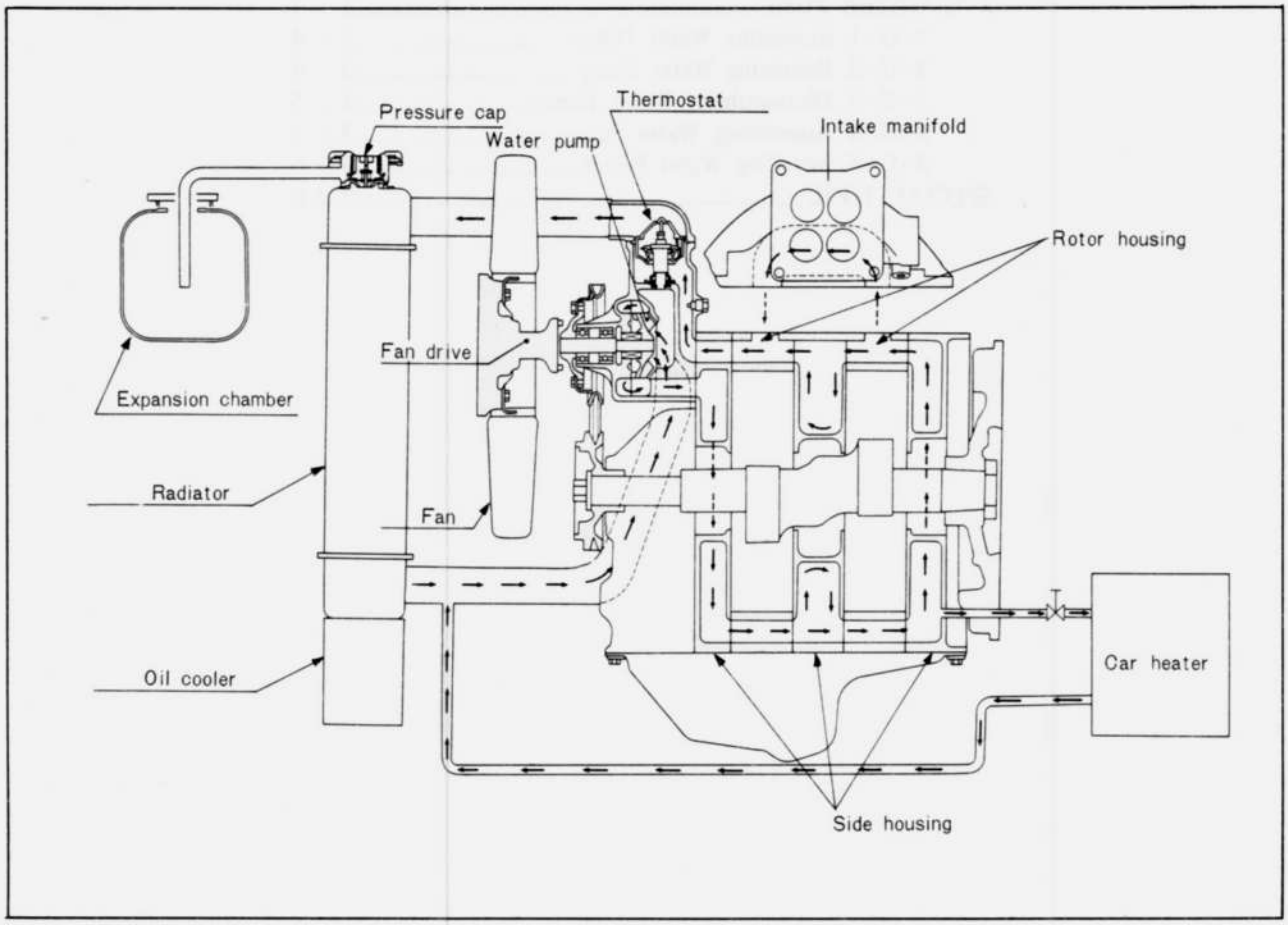

Fig. 3–1 Cooling circuit

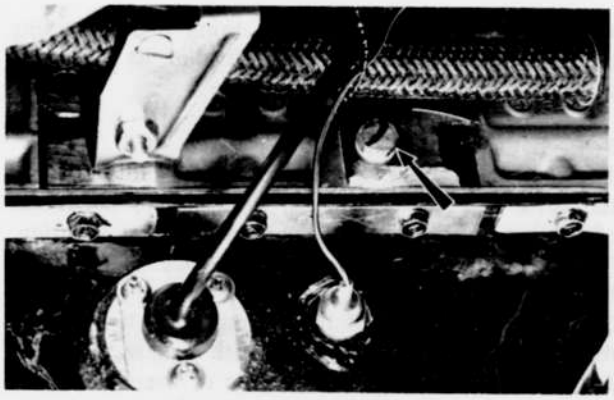

Fig. 3–3 Engine drain plug

4. Drain the coolant and close the drain plugs.
5. Supply clean soft water and install the cap.
6. Run the engine for about one hour, at the normal operating temperature.

Note:
If necessary, use cleaning solution to loosen rust and scale, by following the instructions given by the maker of the cleaning solution.

7. Drain the water completely.
8. Fill with soft water (demineralized water) and high quality ethylene glycol anti-freeze, referring to **Par. 3–C.**
9. Run the engine at idle with the radiator cap removed and slowly add coolant in accordance with drop of coolant level.
10. When the engine reaches normal operating temperature, pump the accelerator pedal 2 or 3 times and add coolant as required. Install the radiator cap.
11. Inspect all connections for leaks and stop the engine to recheck the coolant level.

3–C. COOLANT

The high quality ethylene glycol anti-freeze which is suitable for aluminum engine is used in the cooling system.

Use recommended mixture of 50% anti-freeze solution (Ethylene glycol base for aluminum engine) and 50% water.

For proper system protection in regions where the temperature goes below −20°F, add the amount of ethylene glycol base coolant recommended by the coolant manufacturer. However, be careful so that the proportion of ethylene glycol anti-freeze contained in the coolant may not exceed 60%; higher proportion than that only has a bad effect upon the engine.

Note:
Always use soft water (demineralized water) in the cooling system.

3–C–1. Checking Coolant Leakage

Carefully check the various parts for any leakage of cooling water by using a radiator cap tester. Refill the coolant, full in the radiator and between the "F" and "L" marks on the expansion tank.

Run the engine until it reaches normal operating temperature. With the engine running and tester installed, pump up the system to approximately 0.9 kg/cm² (13 lb/in²).

Note: Never allow the pressure to build up to more than 1.1 kg/cm² (14 lb/in²).

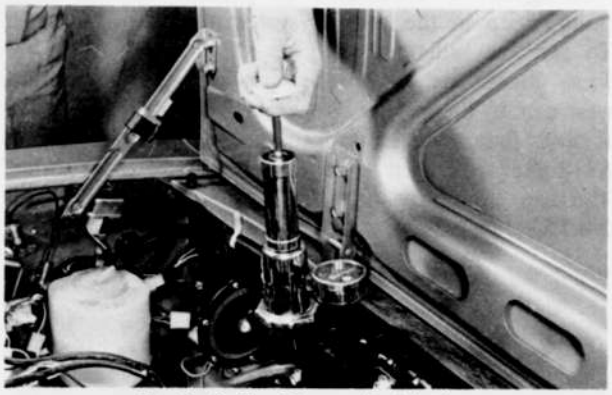

Fig. 3–4 Checking coolant leakage

If pressure drops rapidly, visually inspect all external parts for leaks. If no external leaks appear and pressure continues to drop, inspect the engine oil to determine whether or not coolant is leaking into the rotor housing due to a cracked rotor housing or leaking sealing rubbers.

3–D. RADIATOR

The radiator is of the corrugated fin type with a pressure cap, and an expansion tank is adopted.

3–D–1. Checking Radiator

Carefully check the radiator for water leakage. (Refer to Par. 3–C–1.) A clogged radiator badly influences the cooling effect and should be cleaned with the compressed air.

3–D–2. Repairing Radiator

The radiator used on this model is made of copper. Any minor leakage must be completely eliminated by soldering.

3–D–3. Checking Radiator Pressure Cap

The pressure cap is provided on the radiator.

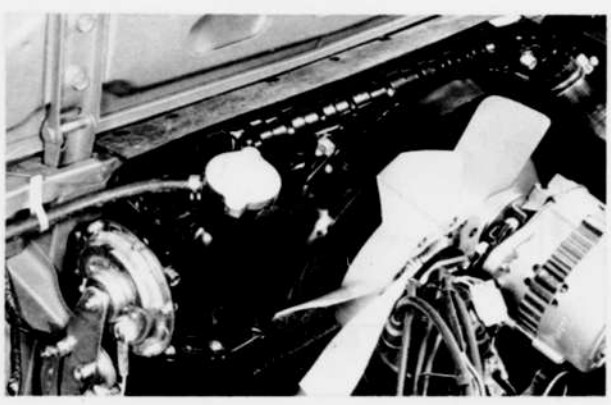

Fig. 3–5 Radiator pressure cap

When the cooling water is pressurized, the boiling point rises and this prevents overheating and minimizes the loss of water. When the pressure in the cooling system exceeds 0.9 kg/cm² (12.8 lb/in²), the cap opens to prevent the radiator and water hose from damage by the excessive pressure. When the coolant temperature falls, the vacuum release valve opens at −0.1 kg/cm² (−1.4 lb/in²) to prevent vacuum from building up in the cooling system.
To test the radiator cap;
First check the cap rubber gasket. Replace with a new cap if the rubber gasket is damaged.
If not, first wet the cap rubber gasket to insure an air tight seal then attach the radiator cap tester. The cap should be capable of retaining pressure 0.9 ± 0.15 kg/cm² (12.8 ± 2.13 lb/in²).

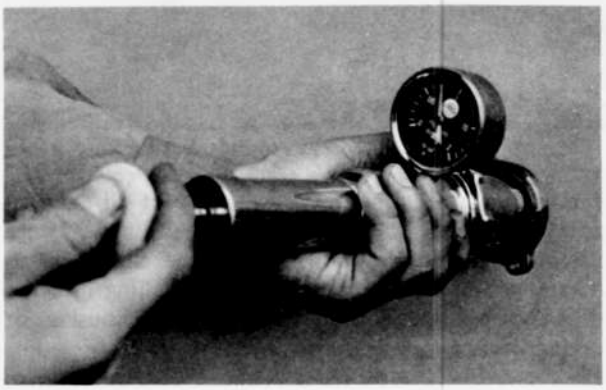

Fig. 3–6 Checking radiator pressure cap

3–E. FAN DRIVE

The fan drive is driven with the water pump pulley. The fan speed is adjusted by the work of the silicon oil to prevent the fan from making more than a certain number of rotations. In addition, the fan speed is changed into two steps, as shown in Fig. 3–7, according to operation of the bimetal which senses the temperature of the air passing through the radiator.
The temperature of the air passing through the radiator becomes higher with rise of the temperature of engine coolant; when the temperature of this air becomes higher than about 80°C (176°F), the bimetal opens the silicon oil passage and, as a result, the contacting area of the fan drive and silicon oil is extended and the fan speed is increased, to bring higher cooling efficiency of the engine at the time of its high temperature.

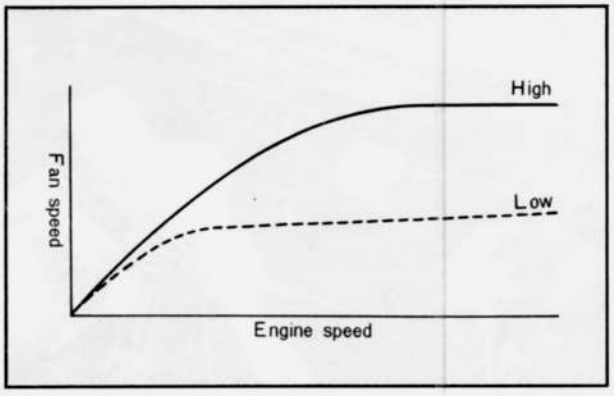

Fig. 3–7 Rotating characteristic of the fan

3–E–1. Checking Fan and Fan Drive

1. Check for damage and deformation of the fan and fan drive and also check for looseness or deflection of the fan by shaking it by hand in the axial direction; if such troubles are so serious, replace the fan and fan drive assembly with new ones.
2. Check for seepage of the silicon oil; if it is found, replace the fan drive assembly with a new one.
3. Check the rotating characteristic of the fan according to the following procedure, using the photoelectric revolution counter and tachodwell tester.
a. Apply scotch tape to the positions on the fan.
b. Set the tachodwell test to the engine. Then start and warm up the engine for about a minute at engine speed of 3,000 rpm.
c. Then turn the photoelectric revolution counter toward the fan and read the speed of the fan rotation at engine speed of 4,200 rpm. The fan speed should be within the standards shown in the following table.

Prescribed Revolution	
Engine	Fan
4,200 rpm	1,500 ± 200 rpm

If the reading is below the standard, replace the fan drive assembly.

Note:
When the photoelectric revolution counter is not prepared, the revolution of the fan will be also checked by the procedure as follows:
1. Prepare another car, and set the tachodwell tester and the timing light to the engine.
2. Regulate the engine speed of the car to make the timing light coincide with the fan speed, and read the engine speed on the tachodwell tester, which is the speed of fan revolution.

3–F. THERMOSTAT

To regulate the temperature of the cooling water circulating in the engine, a wax type thermostat is adopted.



Fig. 3–8 Thermostat

The thermostat is of a bottom by-pass type, which has outstanding cooling efficiency, and is different from the conventional in-line type thermostat in the undermentioned points. Therefore, it should be handled with particular care.

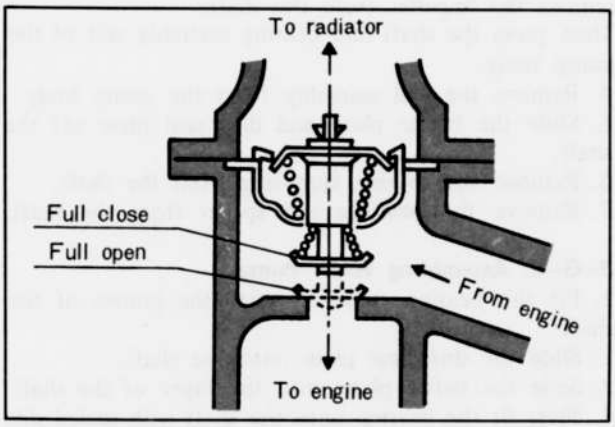

Fig. 3–9 Thermostat and by-pass hole

As shown in Fig. 3–9, a by-pass hole is provided at the bottom of the thermostat. The by-pass hole on the bottom by-pass type thermostat is larger than that on the in-line type. The bottom by-pass type thermostat, therefore, has the following advantages : when the thermostat is fully closed, a large amount of cooling water circulates, thus preventing any local rise in the cooling water temperature, and, when the thermostat is fully opened, the valve of the thermostat closes the by-pass hole and so all of the cooling water flows into the radiator, making effective use of the radiator. But, if the thermostat is removed, a large amount of cooling water flows through the by-pass hole because the hole is large, and so the amount of cooling water flowing into the radiator decreases to half, causing the cooling water temperature to rise.
Therefore, **the thermostat should never be removed** and **no other type of thermostat should be used.**

3–F–1. Removing Thermostat

1. Drain the cooling system.
2. Remove the bolts attaching the thermostat cover to the water pump and remove the cover.
3. Lift out the thermostat.

3–F–2. Inspecting Thermostat

To inspect the thermostat, place it in water with a thermometer and gradually heat the water.
Check the temperature when the thermostat starts to open and when it is fully opened, and also, measure the lift height when the thermostat is fully opened. If the reading shows a large difference from the standard specifications, replace the thermostat. The specifications of the thermostat are shown in the following table :

Starts to open	82°C (180°F)
Fully opens	95°C (203°F)
Lift height	8 mm (0.31 in) or more

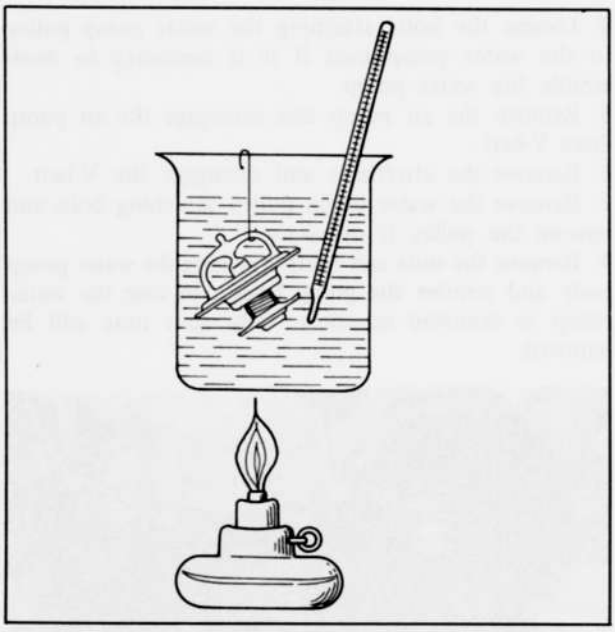

Fig. 3–10 Checking thermostat

3–G. WATER PUMP

The water pump employs a centrifugal impeller. In the pump body, the shaft is supported by two bearings. The impeller is fitted to the rear end of the shaft. The seal assembly prevents water leakage.

3–G–1. Inspecting Water Pump

Check the water pump for leaks and excessive end play or looseness of the shaft and bearings. If there is evidence of excessive play when the pulley is manually moved up and down, this indicates that the bearings are rough. If water leaks from the hole located on the body, this is an indication of a defective seal necessitating overhaul of the pump and check of the seal and seat surface. If defective, replace the seal assembly.

3–G–2. Removing Water Pump

1. Drain the cooling system.
2. Remove the air cleaner.
3. Remove the bolts attaching back of the fan drive and remove the fan drive assembly.

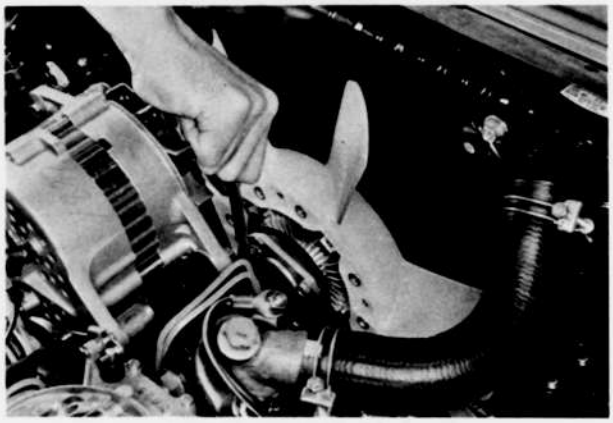

Fig. 3–11 Removing fan drive assembly

4. Loosen the bolts attaching the water pump pulley to the water pump boss if it is necessary to disassemble the water pump.
5. Remove the air pump and disengage the air pump drive V-belt.
6. Remove the alternator and disengage the V-belt.
7. Remove the water pump pulley attaching bolts and remove the pulley if necessary.
8. Remove the nuts and bolts attaching the water pump body and remove the pump body. In case the water pump is removed assembly, only four nuts will be removed.

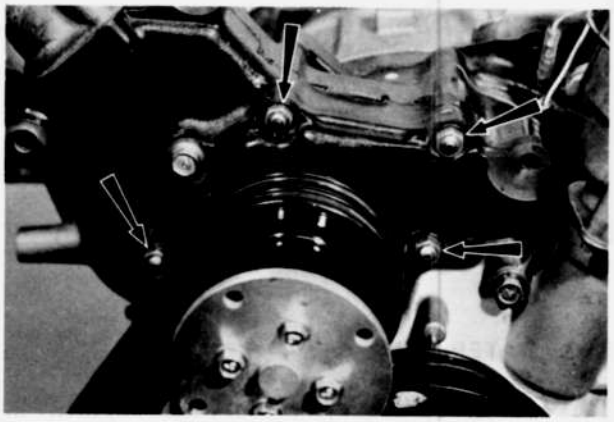

Fig. 3–12 Pump body attaching bolts

3–G–3. Disassembling Water Pump

1. Using the suitable support, press the shaft slowly, and remove the pulley boss.

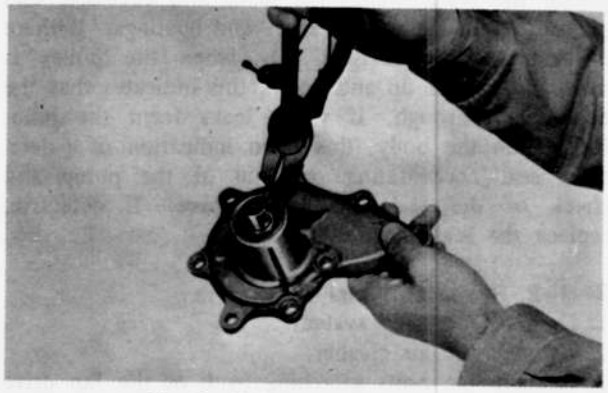

Fig. 3–13 Removing snap ring

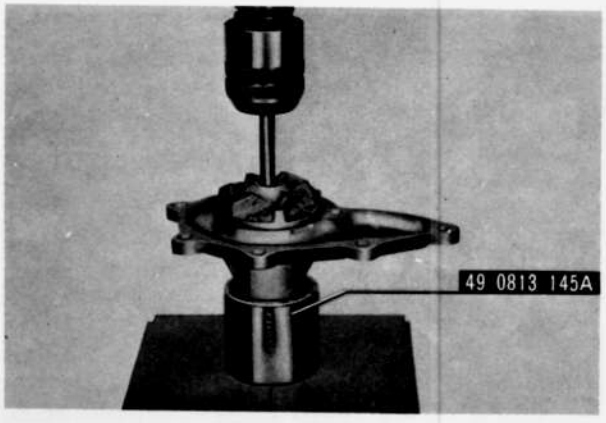

Fig. 3–14 Removing impeller

2. Remove the snap ring retaining the shaft and bearing assembly in the pump body.
3. Place the front side of the pump body on the **support** (Part No. 49 0813 145A) and apply pressure to the rear end of the shaft to press the shaft and remove the impeller from the shaft.
Then press the shaft and bearing assembly out of the pump body.
4. Remove the seal assembly from the pump body.
5. Slide the baffle plate and dust seal plate off the shaft.
6. Remove the bearing stop ring from the shaft.
7. Remove the bearings and spacer from the shaft.

3–G–4. Assembling Water Pump

1. Fit the bearing stop ring onto the groove of the shaft.
2. Slide the dust seal plate onto the shaft.
3. Slide the baffle plate onto the taper of the shaft.
4. Press fit the bearing onto the shaft with sealed side rearward.
5. Press the shaft and bearing into the pump body.
6. Slide the spacer onto the shaft and **fill 1/3 of the space** between the two bearings with grease.
7. Press fit the bearing onto the shaft with the sealed side forward until the snap ring can be installed.
8. Install the snap ring onto the groove of the pump body to retain the shaft and bearing assembly in position.
9. Press the pulley boss onto the shaft until it is flush with the front end of the shaft.

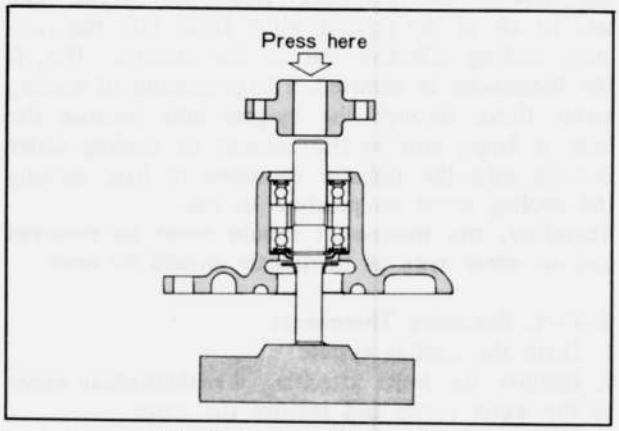

Fig. 3–15 Assembling pulley

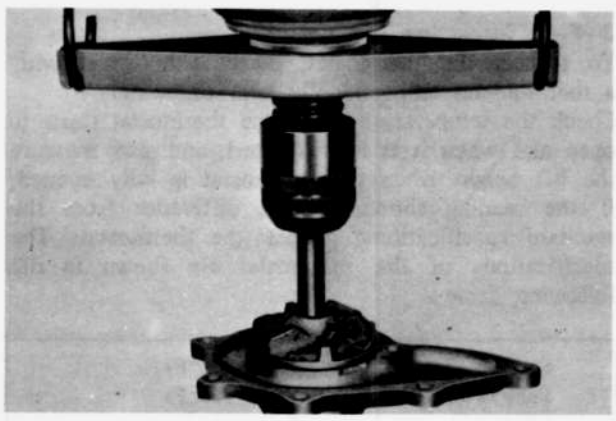

Fig. 3–16 Assembling impeller

10. Apply lubricant onto the seal assembly and install the seal assembly into the pump body.
11. Press the impeller onto the shaft until it is flush with the end of the shaft.

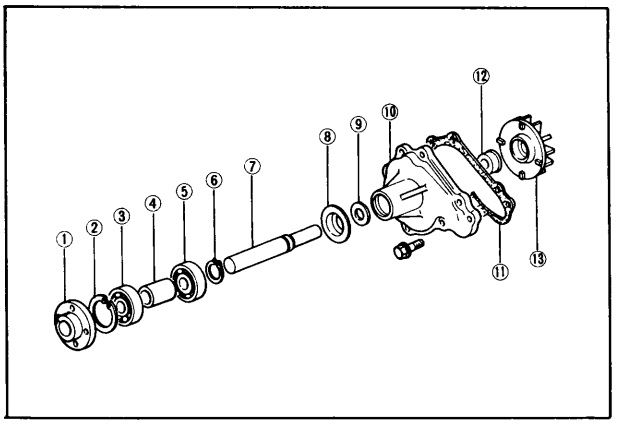

Fig. 3–17 Water pump components

1. Pulley boss
2. Snap ring
3. Bearing
4. Spacer
5. Bearing
6. Stop ring
7. Shaft
8. Dust seal
9. Baffle plate
10. Pump body
11. Gasket
12. Seal assembly
13. Impeller

3–G–5. Installing Water Pump

To install, follow the removal procedures in the reverse order with the following caution.
Tighten the water pump attaching bolts evenly to 2.25 ~ 3.25 m-kg (16.3 ~ 23.5 ft-lb) in the sequence shown in Fig. 3–18.

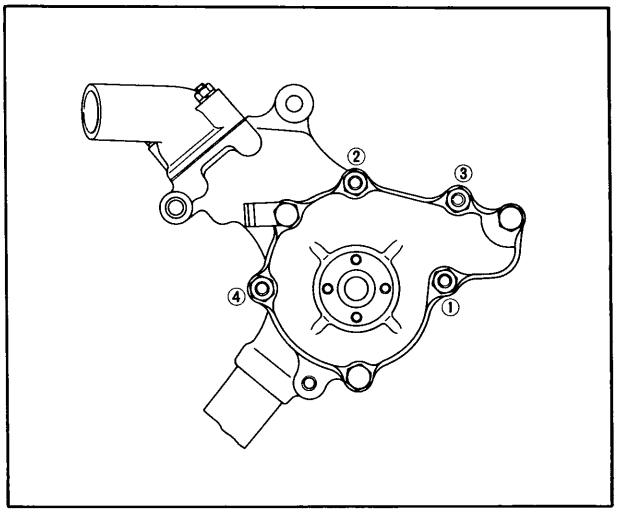

Fig. 3–18 Tightening order of water pump attaching bolts

SPECIAL TOOL

49 0813 145A	Water pump support

FUEL SYSTEM

FUEL SYSTEM ..... 4 : 1
4–A. CARBURETOR ..... 4 : 1
4–A–1. Idle Adjustment ..... 4 : 1
4–A–2. Fast Idle Adjustment ..... 4 : 2
4–A–3. Float Adjustment ..... 4 : 2
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4–A–9. Fuel Inlet Fitting ..... 4 : 6
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4–F. AIR CLEANER ..... 4 : 11
4–F–1. Air Cleaner Element ..... 4 : 11
4–F–2. Intake Air Temperature Control System ..... 4 : 11
4–F–3. Checking Control Valve ..... 4 : 11

FUEL SYSTEM

The fuel system consists of the carburetor, fuel pump, fuel filter, fuel tank, fuel line, accelerator linkage, air cleaner and sub-zero starting assist device. By the suction of the fuel pump, the fuel flows through the fuel line into the fuel filter. The fuel passes through the filter element from the outside to the inside of the element. During this fuel flow, the filter element cleans out all the dirt. The fuel pump is producing a constant controlled pressure, and the fuel volume required for engine operations. The fuel supplied by the fuel pump flows passing through the fuel hose into the carburetor.

The carburetor mixes the air and fuel in varying proportions for different operating conditions. As the air passes through the carburetor before entering the engine, fuel is supplied into the engine through the various circuits of the carburetor

The air cleaner operates primarily to remove dust and dirt from the air which is drawn into the carburetor and then into the engine.

4–A. CARBURETOR

The carburetor is of a two-stage, four-barrel, down-draft type. This carburetor comprises two sets each of primary barrels and secondary barrels.

The primary stage includes an idle system, slow system, accelerator pump system, choke system and main metering system. In addition, an idle switch, and richer solenoid, or power valve solenoid for exhaust emission control system is attached to the carburetor. The fluid of sub-zero starting assist device and the oil from the metering oil pump are admitted from primary stage barrels to combustion chamber. The altitude compensator and evapo compensator valve takes the air from primary stage barrels and controls the air supply to the intake manifold.

The secondary stage includes a secondary operating diaphragm system, step system and main metering system. Choking action is accomplished by means of choke knob, bimetal and diaphragm.

4–A–1. Idle Adjustment

Inspect and adjust, the idle speed and mixture after sufficiently warming up the engine, switching off the accessaries such as an air conditioner, etc. and removing the fuel filler cap to avoid the influence of evaporative gas.

Note: Idle speed changes according to ambient temperature. It is recommended that the idle setting should be carried out indoor by blowing the engine room with the additional cooling fan.

a. Adjusting idle speed

Adjust the idle speed to specifications with the throttle adjust screw.

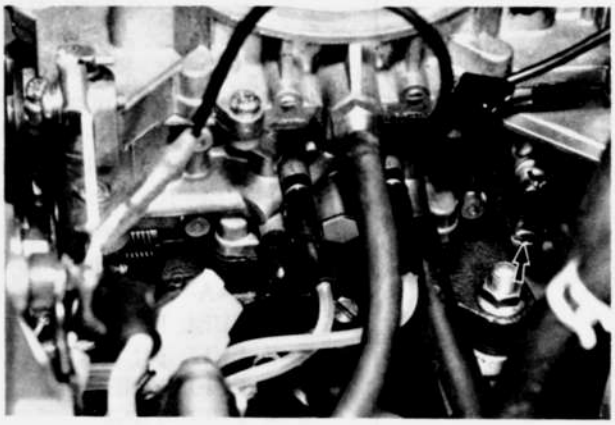

Fig. 4–1 Adjusting idle speed

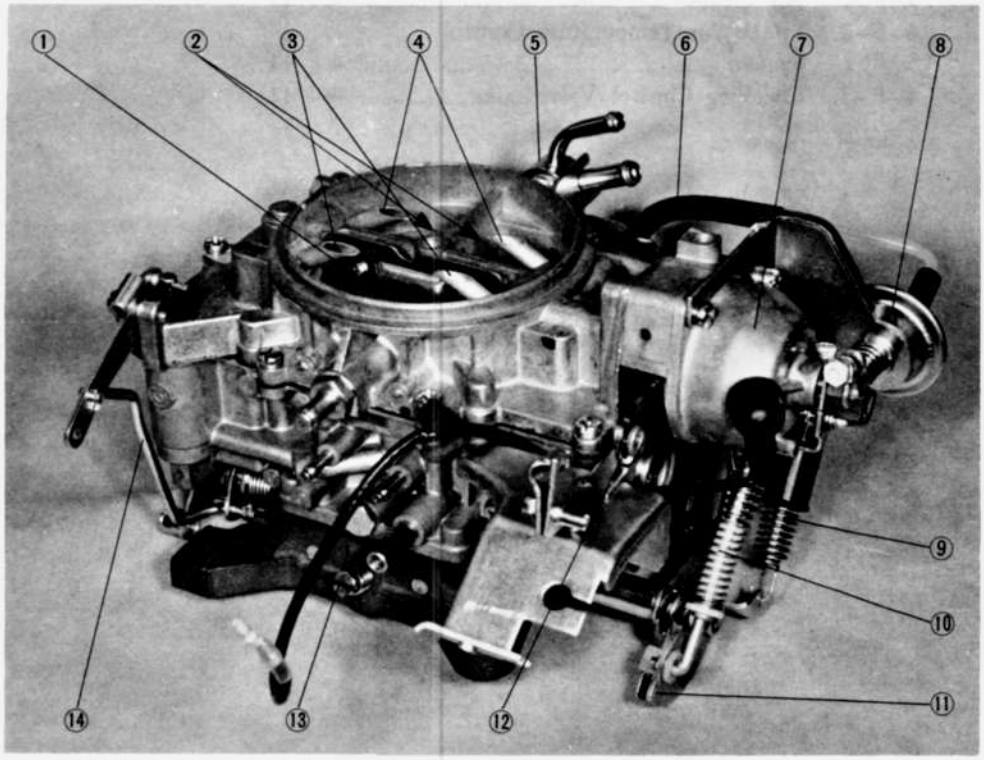

Fig. 4–2 Carburetor
1. Primary stage
2. Secondary stage
3. Primary air vent
4. Secondary air vent
5. Fuel inlet fitting
6. Vacuum sensing tube
7. Bimetal spring housing
8. Vacuum diaphragm
9. Throttle return spring
10. Sub-return spring
11. Throttle lever
12. Choke lever link
13. Mixture adjust screw
14. Accelerating pump connecting rod

Specifications – idle speed

Car with manual transmission	800^{+50}_{-0} rpm
Car with automatic transmission	750^{+50}_{-0} rpm in "D" range

b. Inspecting idle mixture

1. Check the float level as described in Par. 4–A–3.
2. Measure the CO density at the time of the engine idling.
3. Make sure that the CO concentration is below 0.1% and the engine operation is stable. If not, adjust the idle mixture.

c. Adjusting idle mixture

1. Adjust the idle speed.
2. Adjust CO concentration to about 0 % by using MAS (Mixture Adjust Screw).
3. Turn MAS counter-clockwise until CO increases to 0.5 %.
4. Turn MAS clockwise until CO first reaches 0.1 %. (CO shows little change after reaching 0.1 % even if MAS is turned clockwise continuously.)
5. Turn MAS further in the same direction by 1/4 turn from that position.
6. If the idle speed shifts from the specified RPM as the result of the above, repeat the procedures 1 ~ 5.

4–A–2. Fast Idle Adjustment

a. Inspecting fast idle speed

Sufficiently warm up the engine and turn it off. Next, start the engine again with the choke knob fully pulled; the fast idle speed is normal if, after about 10 seconds, the engine speed settled to within 3,000 ~ 3,500 rpm. The fast idle speed is concerned with ignition system, choke system and throttle valve opening angle.

b. Adjusting the throttle valve opening angle at fast idle

Adjust the fast idle speed to the specified RPM by bending the choke connecting rod.

When the carburetor is disassembled, measure the clearance Ⓑ with the choke lever link fully pulled by using a suitable wire gauge or drill. If the clearance Ⓑ is not within the specifications, adjust it by bending the choke connecting rod.

Note:

Be sure to check the ignition timing before inspecting idle adjustment and fast idle adjustment.

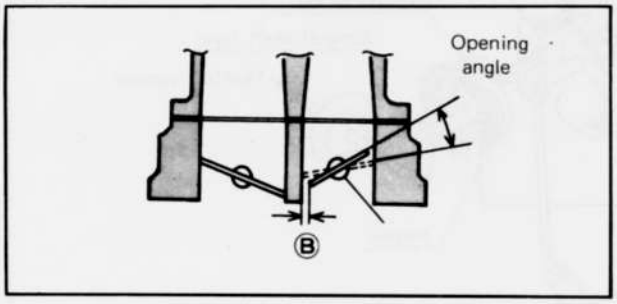

Fig. 4–3 Throttle valve clearance (B)

Specifications – clearance (B)

1.75 ~ 2.15 mm (0.069 ~ 0.085 in)

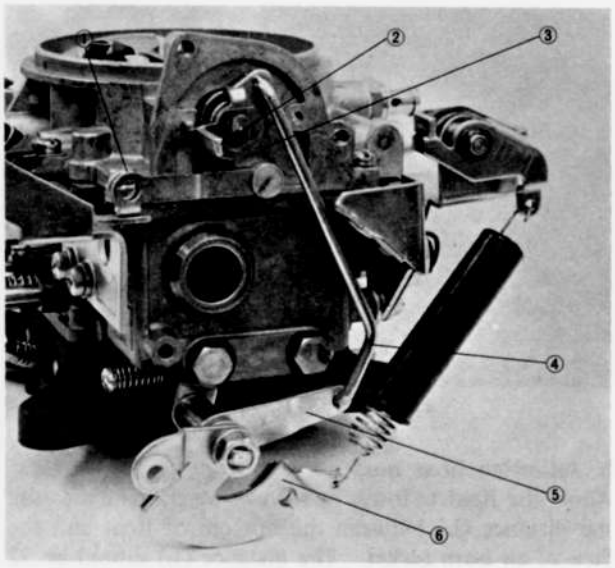

Fig. 4–4 Adjusting fast idle

1. Choke lever link
2. Choke shaft lever
3. Choke lever
4. Choke connecting rod
5. First idle lever
6. Throttle lever

4–A–3. Float Adjustment

a. Adjusting float level

1. With engine operating, check the fuel levels in the float chamber through the fuel sight glasses using a suitable mirror.

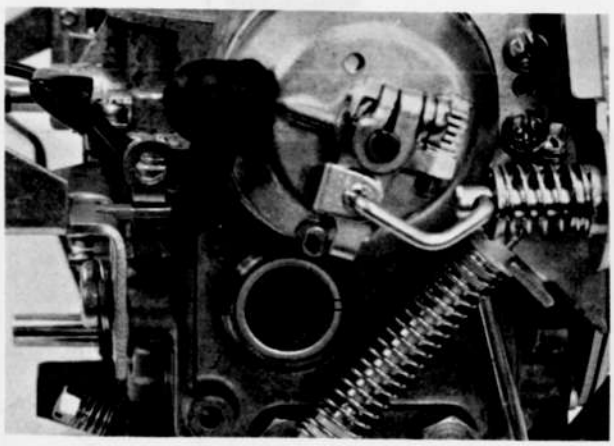

Fig. 4–5 Fuel sight glass

2. If the fuel levels are not within the specified mark on the sight glasses, remove the air horn with the floats.
3. Invert the air horn on a stand, lift the float and let it down quietly until the float seat lip just touches the needle valve.

By keeping this position, take measurement of clearance (H) between the float and the face of air horn gasket.

4. Adjust the clearance (H) to be 10 mm (0.39 in) by bending the float seat lip shown in Fig. 4–8.
5. Install the air horn and recheck the fuel levels through the sight glasses.

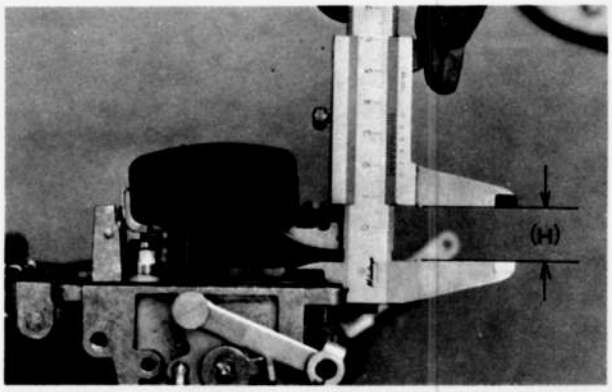

Fig. 4–6 Checking float level

b. Adjusting float drop

Allow the float to lower by its own weight, and measure the distance (L) between the bottom of float and the face of air horn gasket. The distance (L) should be 52 ± 0.5 mm (2.05 ± 0.02 in).

If the distance (L) is not within specifications, adjust it by bending the float stopper shown in Fig. 4–8.

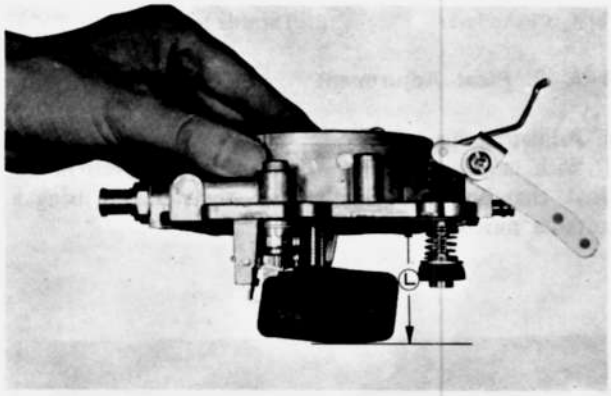

Fig. 4–7 Checking float drop

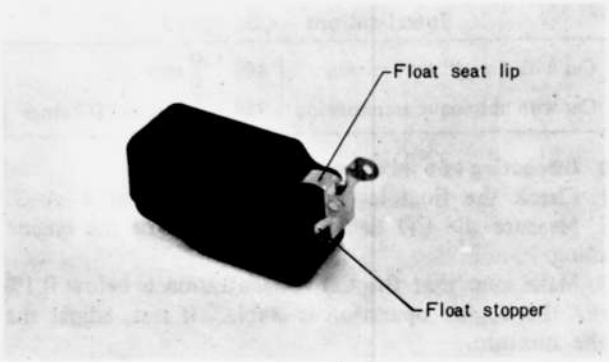

Fig. 4–8 Float

4–A–4. Choke System

a. Adjusting vacuum diaphragm

1. First, confirm that the diaphragm plunger has been pulled out during the engine idling.
2. Push the diaphragm plunger in until seated and check the stroke of it.

This stroke should be in the following specifications.

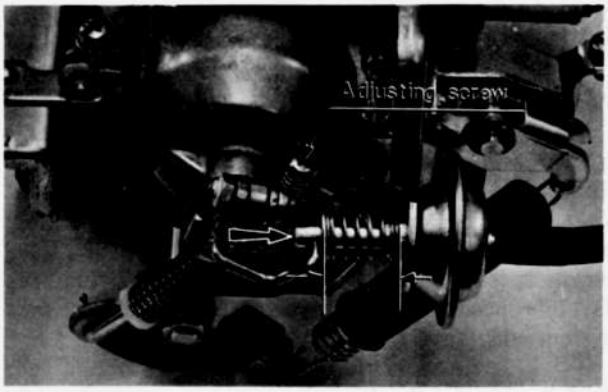

Fig. 4–9 Adjusting diaphragm stroke

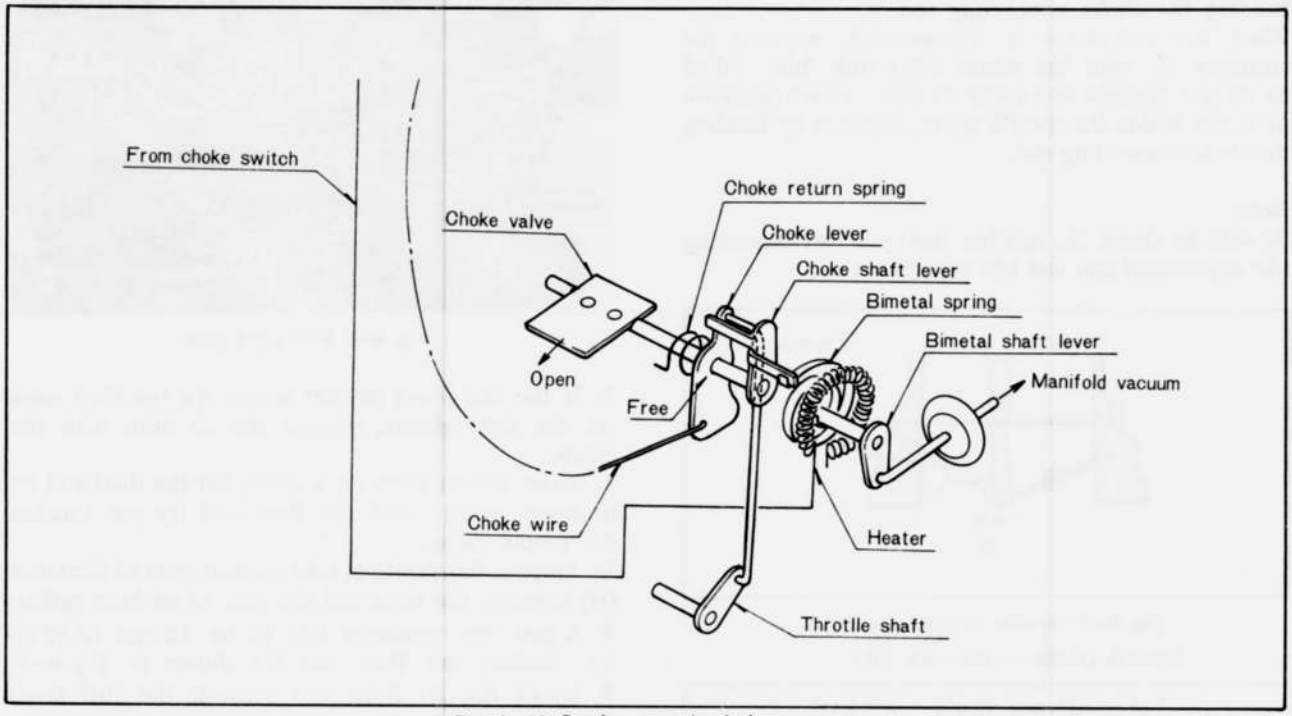

Fig. 4–10 Semi-automatic choke system

Spcifications – diaphragm stroke

Manual T/M	3.3 ± 0.1 mm (0.130 ± 0.004 in)
Automatic T/M	4.5 ± 0.1 mm (0.177 ± 0.004 in)

b. Adjusting bimetal spring

1. Fully pull out the choke lever link and keep its position by wire.
2. Push the diaphragm plunger in fully and keep its position by wire as shown in Fig. 4–11.

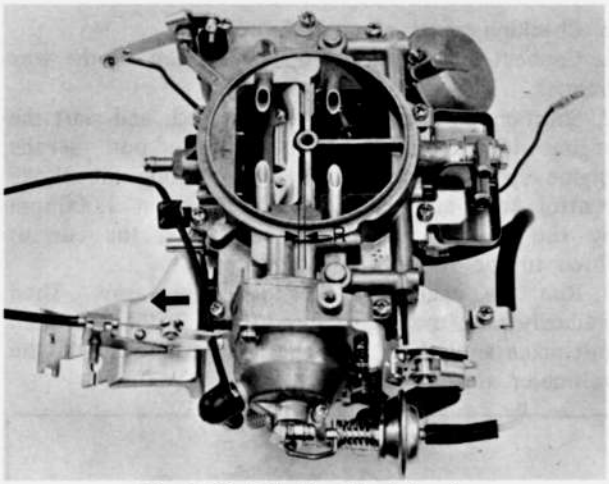

Fig. 4–11 Adjusting bimetal spring

3. Check the choke valve clearance (R) as shown in Fig. 4–11.
4. If the clearance (R) is not within specifications, first loosen Ⓐ then turn Ⓑ to adjust the clearance (R).

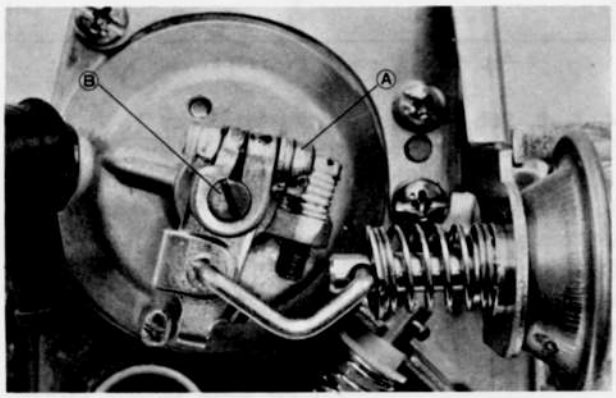

Fig. 4–12 Adjusting choke valve clearance (R)

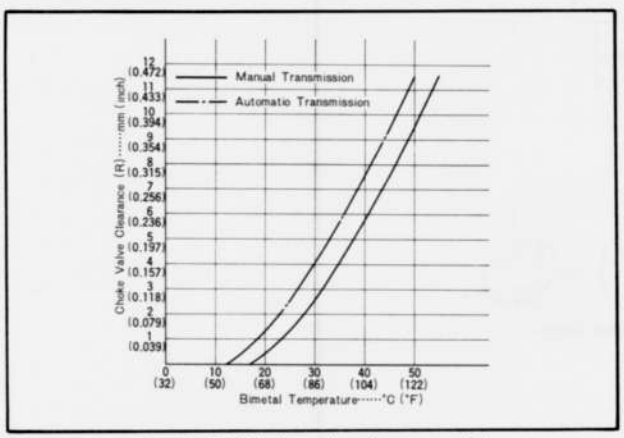

Fig. 4–13 Choke valve clearance (R)

4–A–5. Accelerator Pump

a. Checking accelerator pump

1. Remove the air cleaner.
2. Check the pump for discharge by moving the primary throttle valve.
3. Check the pump for nozzle's clogging.

When the pump nozzle is clogged, remove the nozzle and clean up the nozzle.

b. Checking amount of accelerator pump discharge

Checking of accelerator pump discharge amount is as follows:

1. Make sure that the pump connecting rod is set inside hole of the pump lever.
2. Place the vehicle on a level ground.
3. Set the burette at the fuel inlet of the carburetor and fill it with fuel.
4. Fully operate the throttle valve about five times and confirm the fuel discharged from the accelerating pump jet.
5. Set the fuel level in the burette at 300 mm (11.8 in) above the fuel inlet, as shown in Fig. 4–14.

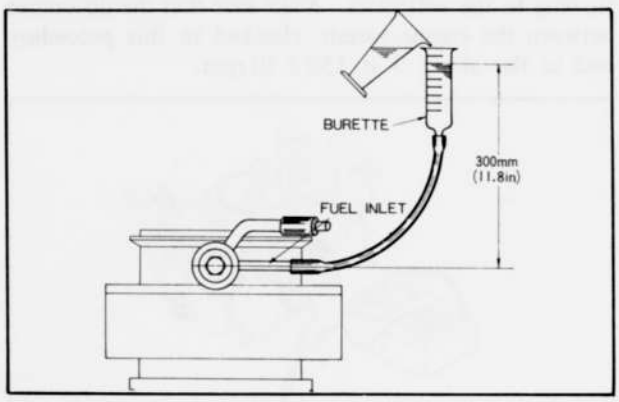

Fig. 4–14 Checking fuel discharge

6. Fully operate the throttle valve ten times according to the cycle as shown in Fig. 4–15 by means of the throttle lever or accelerator pedal and check the amount of discharge by reading the decrease of fuel in the burette.
7. If the discharge amount is not within specifications, check the accelerator pump piston and etc.

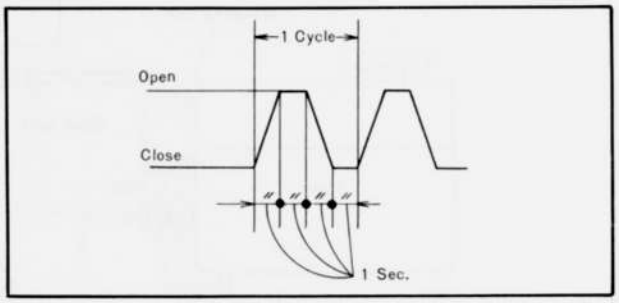

Fig. 4–15 Test pattern

Specifications – amount of fuel discharged out of accelerator pump

6.8 ~ 9.2 cc/10 strokes

4–A–6. Richer Solenoid Inspection (Car with manual transmission only)

a. Checking richer solenoid

1. Warm up the engine and keep it idling.
2. Remove the coupler of the richer solenoid and apply 12V directly on the solenoid; if the engine hunts on this occasion, the operation of the solenoid is normal.
3. If the engine does not hunt then, confirm the operating noise of the richer solenoid and check for clogging of the richer jet.

b. Checking signal of control unit

1. Connect a voltmeter with the coupler of the wire harness.
2. Remove the coupler from the idle switch and then directly apply 12V on the coasting valve of the deceleration control valve.
3. Gradually drop the engine speed from 2,000 rpm. Make sure that the current stops flowing to the voltmeter at 1,150 ± 100 rpm.
4. Gradually raise the engine speed from the idling and check the speed at which the current begins flowing to the voltmeter. Make sure that the difference between the engine speeds checked in this procedure and in the above 3 is 150 ± 70 rpm.

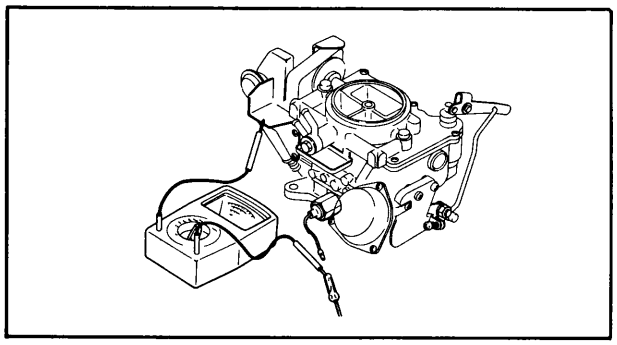

Fig. 4–16 Checking richer solenoid

4–A–7. Power Valve Solenoid Inspection (Car with automatic transmission only)

a. Checking power valve solenoid

1. Apply 12V directly on Ⓐ solenoid of the air control valve.
2. Set the CO meter.
3. Set the engine speed at 2,000 rpm; the operation of the solenoid is normal if the CO density varies when the coupler is opened and shut repeatedly.
4. If the CO density does not vary on that occasion, confirm the operating noise of the solenoid and check the power valve and power jet of the carburetor.

b. Checking signal of control unit

1. Connect a voltmeter with the coupler of the wire harness.
2. Short-circuit the water thermo switch and start the engine with the choke control knob pulled out. Set the engine speed to 2,000 rpm by operating the choke control knob and then keep the speed at 3,000 rpm by the throttle lever. Make sure that the current flows to the voltmeter at that time.
3. Run the engine at the idle speed again. Then gradually raise the engine speed up to 2,500 ± 200 rpm and make sure that the current stops flowing to the voltmeter at that time.

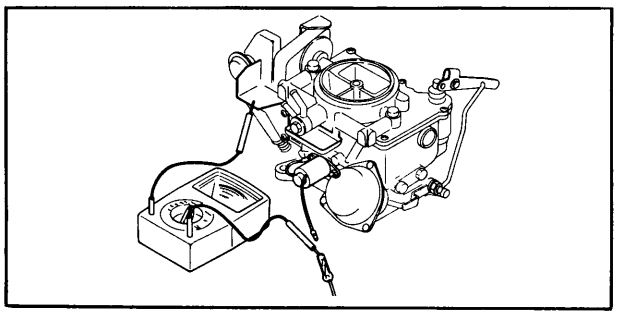

Fig. 4–17 Checking power valve solenoid

4–A–8. Sub-Zero Starting Assist Device

This is the device for increasing the starting ability of the engine in extreme cold. When the ignition key is turned to the position of "START" under the circumstances where the temperature is below −18°C (0°F), a certain amount of starting assist fluid is supplied into the carburetor by a pump installed for supplying the starting assist fluid.

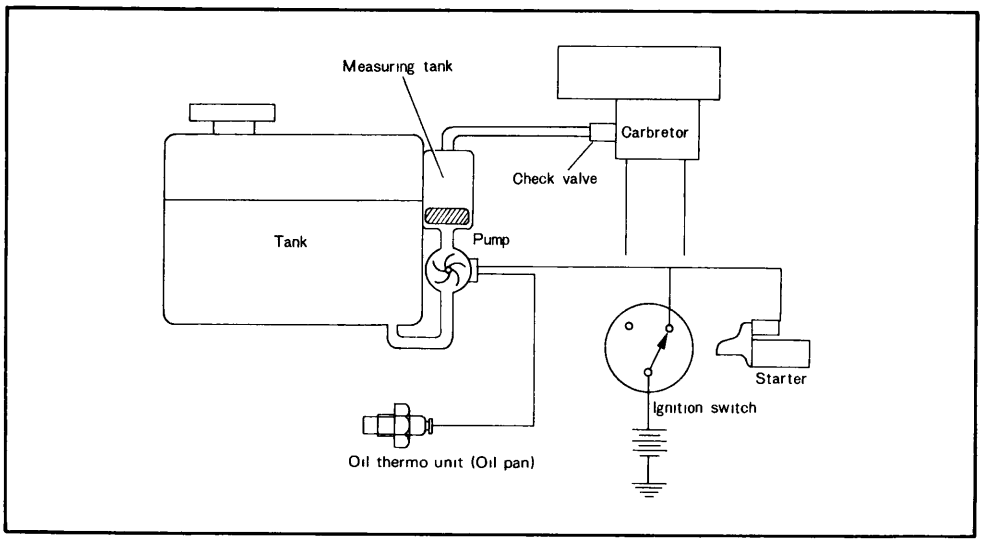

Fig. 4–18 Sub-zero starting assist system

a. Checking sub-zero starting assist device

1. Make sure that there is sufficient starting assist fluid in the tank. Replenish if necessary.
2. Disconnect the coupler of S terminal connected to the starter magnetic switch. This is to prevent the engine from revolving when the ignition key is turned to "START".
3. Remove the air cleaner cover.
4. Turn the ignition key to the position of "START" and make sure that the starting assist fluid does not spouts out from the nozzle of the carburetor. [Ambient temperature should be above -18°C (0°F)]
5. Disconnect the coupler of the oil thermo unit and connect the body with the earth.

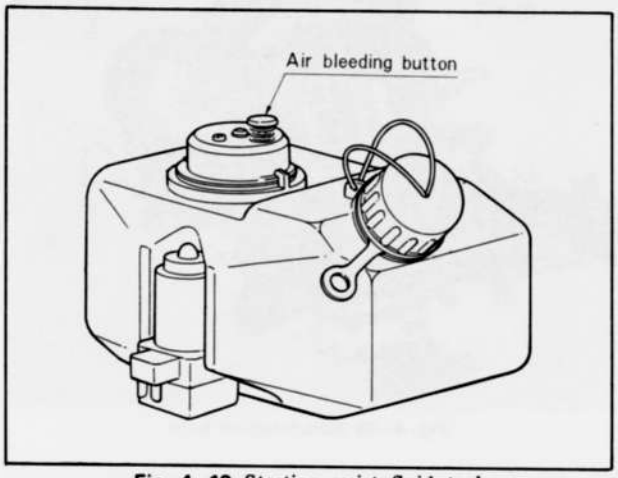

Fig. 4–19 Starting assist fluid tank

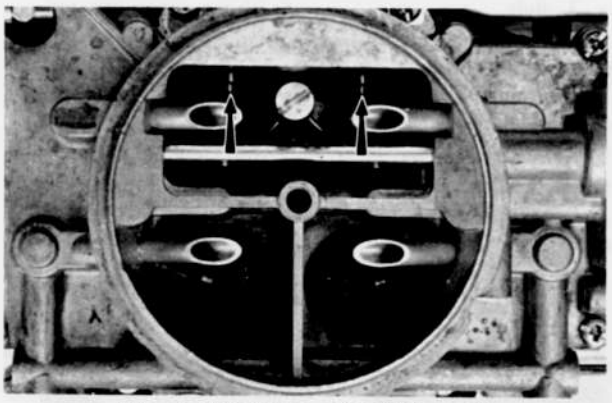

Fig. 4–20 Starting assist fluid nozzle

6. Turn the ignition key to the position of "START" with the air bleeding button of the tank kept pushed and make sure that the starting assist fluid spouts out from the nozzle of the carburetor.

b. Checking oil thermo unit

The oil thermo unit is in normal condition if it is energized below -18°C (0°F) and is not above it.

c. Sub-zero starting assist fluid

The mixture proportion of starting assist fluid should be 90% of high quality ethylene glycole anti-freeze solution plus 10% of water.

4–A–9. Fuel Inlet Fitting

The carburetor inlet fitting is provided with a fuel return device to prevent percolation. Whenever the ignition key is "ON", a small amount of fuel which is led to the carburetor, returns to the fuel tank through the orifice of fuel return pipe.
Check the orifice for clog. When it is clogged, remove the fuel inlet fitting and clean it by compressed air.

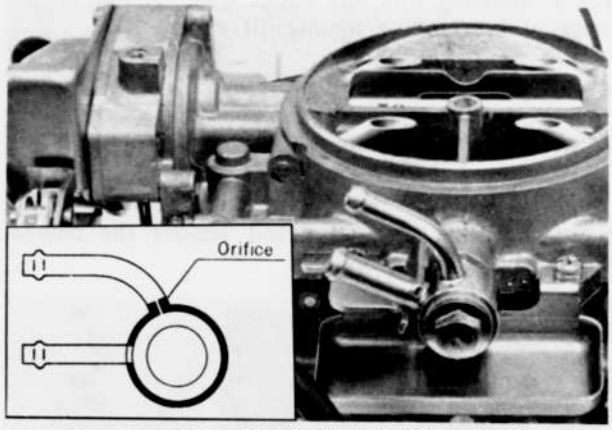

Fig. 4–21 Fuel inlet fitting

4–A–10. Safety Throttle Return System

The safety throttle return system is adopted in order to prevent any possible danger from occurring when the throttle return spring should become broken during operation and at that instant the accelerator should get out of control.
Under normal conditions, only throttle return spring operates as a return spring by pulling throttle lever which is connected to the accelerator wire. Link is fixed by rod (whose upper end is fixed by counter lever) and does not have any connection with the movement of link. In case throttle return spring should become broken, the upper end of rod slips off of counter lever by sub-spring and throttle lever is pushed by the movement of link instantaneously.
Compressed sub-spring works as an accelerator return spring with the same force as when throttle return spring is in operation. Consequently even if throttle return spring should become broken during operation, no adverse effects will occur in the operation of the accelerator control.

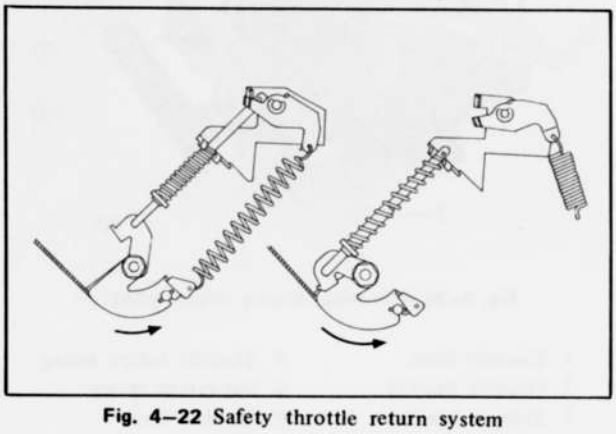

Fig. 4–22 Safety throttle return system

a. Checking throttle return system

Make sure that the sub-return spring and the rod are arranged as shown in Fig. 4–22. The throttle return lever should not be stressed by the rod.

b. Checking carburetor linkage

Check the operation of each of the secondary system linkage, accelerating pump linkage, accelerating wire linkage and choke linkage, and also check whether the accelerating wire and choke wire are not on the verge of breaking or coming off.

4–A–11 Disassembling Carburetor

a. Removing bimetal spring housing assembly

1. Disconnect the vacuum sensing tube.
2. Remove the screws attaching the bimetal spring housing to the carburetor and remove the bimetal spring housing assembly.

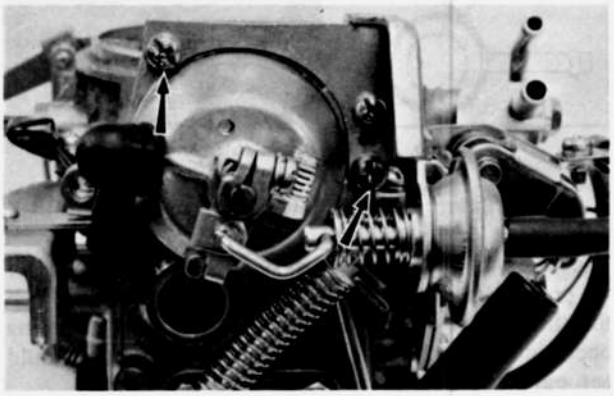

Fig. 4–23 Removing bimetal spring housing assembly

b. Removing throttle return springs

1. Dislocate the sub-return spring by turning the counter lever counter-clockwise and remove the sub-return spring from the spring stopper bracket set.
2. Remove the throttle return spring.
3. Remove the spring stopper bracket set by removing the attaching screws.

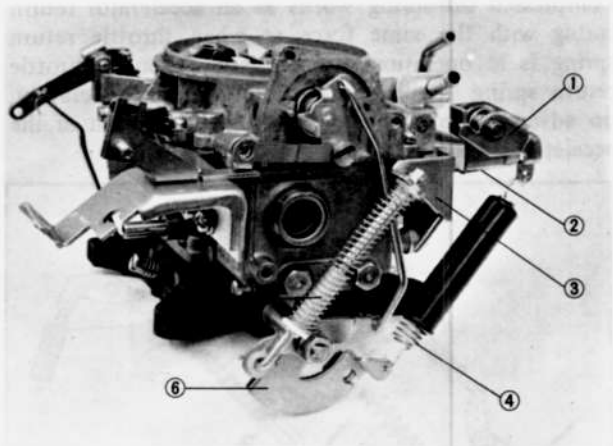

Fig. 4–24 Removing throttle return springs

1. Counter lever
2. Counter bracket
3. Stopper bracket
4. Throttle return spring
5. Sub-return spring
6. Throttle lever

c. Removing air horn

1. Disconnect the choke connecting rod by removing the cotter pin, plain washer and spring.
2. Remove the accelerating pump connecting rod by removing the cotter pin.
3. Remove the bolt attaching the fuel inlet fitting by box wrench or offset wrench (don't use a spanner – open end wrench), and remove the fitting and filter. Remove the connector if necessary.
4. Remove the screws attaching the air horn to the carburetor body and remove the air horn being careful not to break the gasket.

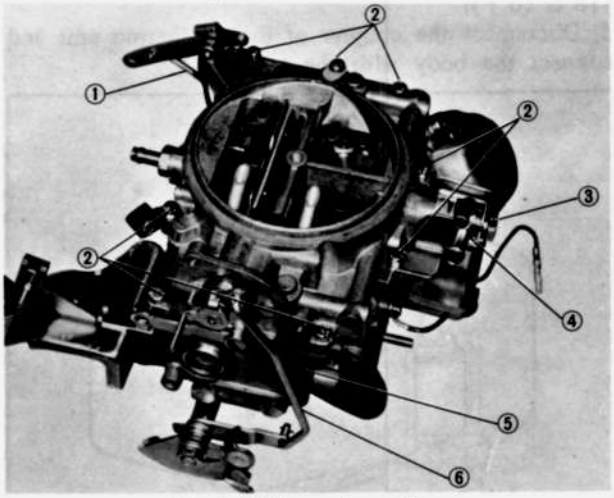

Fig. 4–25 Removing air horn

1. Pump connecting rod
2. Attaching screw
3. Bolt
4. Fuel inlet fitting
5. Carburetor body
6. Choke connecting rod

d. Disassembling air horn

1. Remove the float retaining pin, float and remove the needle valve assembly.
2. Remove the accelerating pump lever by removing the attaching screw and pull out the pump piston.
3. Remove the starting assist fluid inlet fitting if necessary.

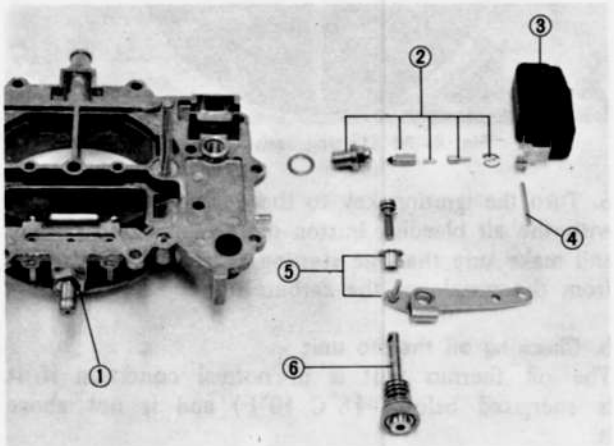

Fig. 4–26 Disassembling air horn

1. Inlet fitting (for starting assist)
2. Needle valve assembly
3. Float
4. Retaining pin
5. Accelerating pump lever
6. Accelerating pump piston

4. Remove the primary slow air bleeds.

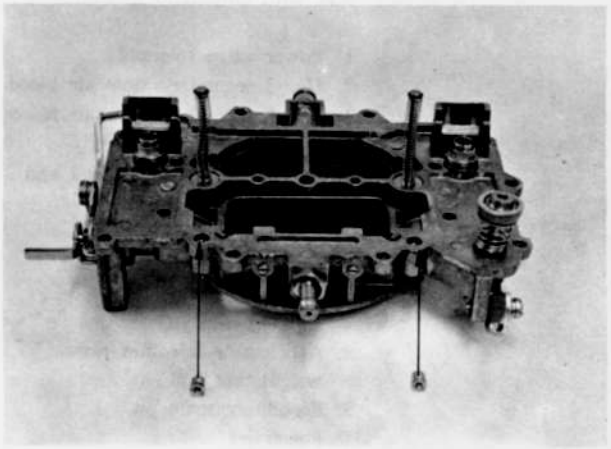

Fig. 4–27 Removing primary slow air bleed

e. Removing carburetor body

1. Remove the spring, retainer plate and check ball from the accelerating pump cylinder of the carburetor body.
2. Remove the idle switch by removing the attaching bolt and spring (Car with manual transmission only).

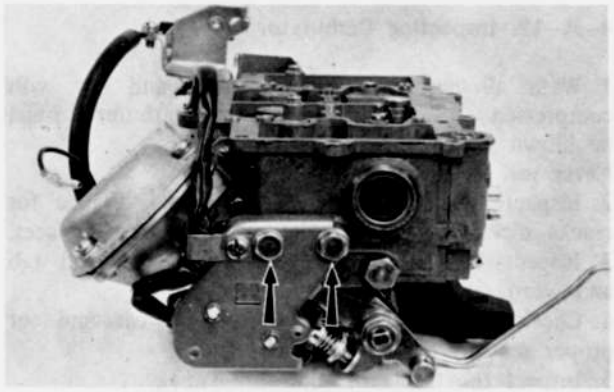

Fig. 4–28 Removing idle switch

3. Disconnect the connecting rod of the diaphragm chamber by removing the cotter pin and remove the diaphragm chamber by removing the screws.

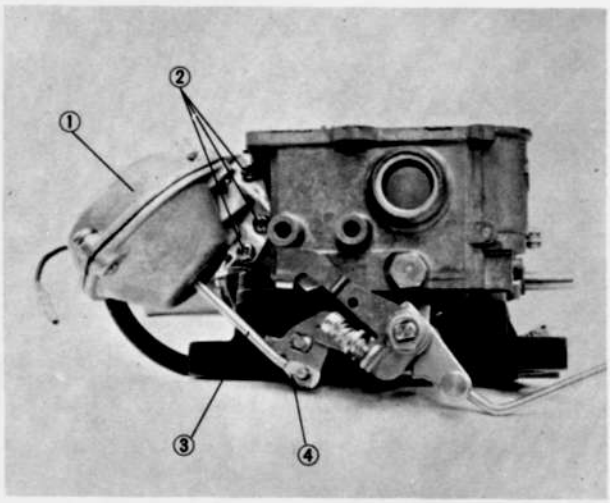

Fig. 4–29 Removing diaphragm chamber

1. Diaphragm chamber
2. Attaching screw
3. Connecting rod
4. Cotter pin

4. Remove the screws attaching the throttle body to the carburetor body and remove the carburetor body.

f. Disassembling carburetor body

1. Remove the accelerator injection nozzle, weight and ball from the carburetor body.
2. Write down the numbers and positions of all jets and air bleeds.
3. Remove the all jets and air bleeds from the surface of the carburetor body.
4. Remove the power valve solenoid by removing the attaching screws (Car with automatic transmission only).

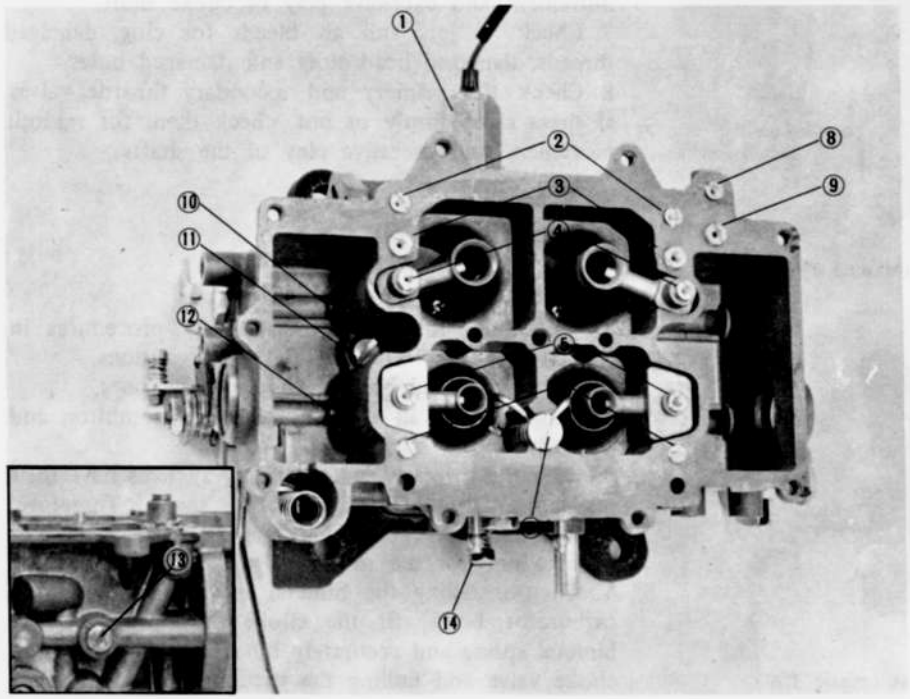

Fig. 4–30 Carburetor body (Car with manual transmission)

1. Richer solenoid
2. No. 2 secondary slow air bleed
3. No. 1 secondary slow air bleed and secondary slow jet
4. Secondary main air bleed and emulsion tube
5. Primary main air bleed and emulsion tube
6. Primary slow jet
7. Accelerator injection nozzle, weight and ball
8. No. 2 richer air bleed
9. No. 1 richer air bleed and richer jet
10. Secondary main jet
11. Plug
12. Primary main jet
13. Vacuum jet
14. Mixture adjust screw

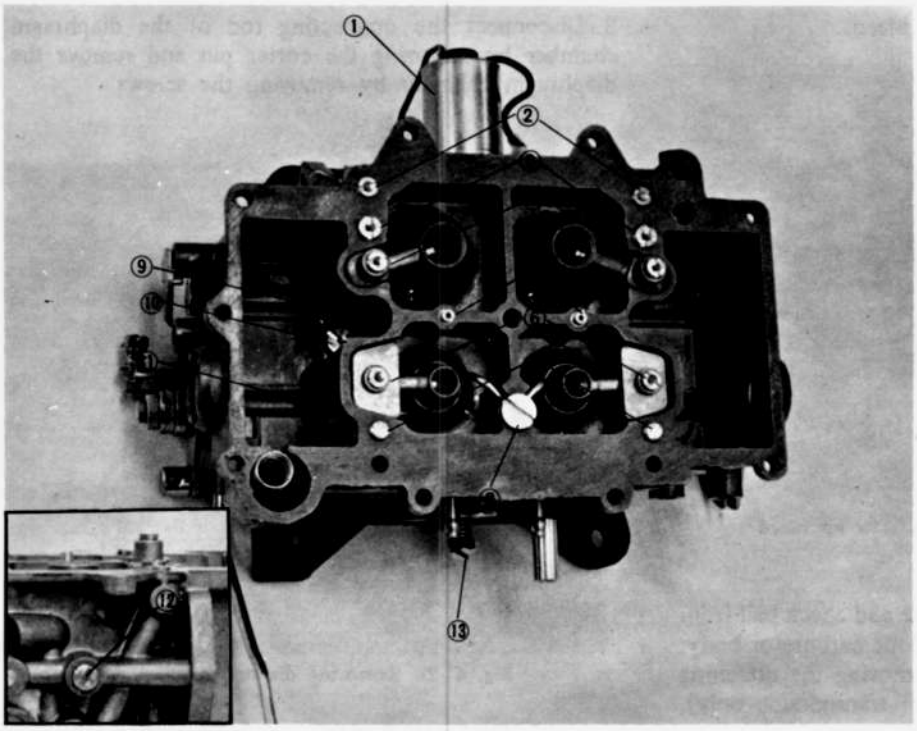

Fig. 4–31 Carburetor body
(Car with automatic transmission)

1. Power valve solenoid
2. No. 2 secondary slow air bleed
3. No. 1 secondary slow air bleed and secondary slow jet
4. Secondary main air bleed and emulsion tube
5. Vacuum passage
6. Primary main air bleed and emulsion tube
7. Primary slow jet
8. Accelerator injection nozzle, weight and ball
9. Secondary main jet
10. Power jet
11. Primary main jet
12. Vacuum jet
13. Mixture adjust screw

g. Disassembling throttle chamber

1. Remove the mixture adjust screw
2. Remove the throttle adjust screw.
3. Remove the richer solenoid (Car with manual transmission only).
4. Remove the front lever set by removing the attaching nut.
5. Remove the rear lever set by removing the attaching nut.

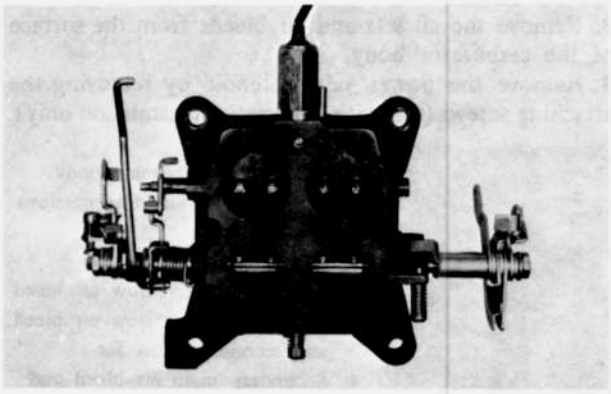

Fig. 4–32 Throttle chamber (Manual T/M)

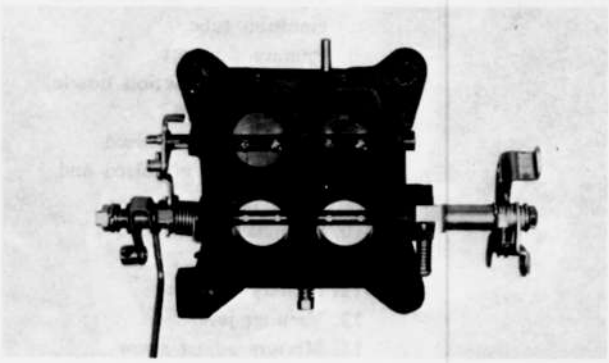

Fig. 4–33 Throttle chamber (Automatic T/M)

4–A–12. Inspecting Carburetor

1. Wash all parts in clean gasoline and dry with compressed air. All passages of the carburetor must be blown very carefully.
Never use a wire for cleaning the jets.
2. Inspect the air horn, body and body flange for cracks, nicks or burrs on their respective gasket surfaces.
3. Inspect the float for deformation, damaged tab and worn retaining pin bore.
4. Check the float needle valve for wear and for proper seating.
5. Inspect the filter for rust and damage.
6. Check the choke valve for proper choking, smooth movement and excessive play of choke shaft.
7. Check all jets and air bleeds for clog, damaged threads, damaged head slots and damaged holes.
8. Check the primary and secondary throttle valves if these close firmly or not, check them for smooth movement and excessive play of the shafts.

4–A–13. Carburetor Assembly

To assemble, follow the disassembly procedures in the reverse order with the following cautions.
1. Discard the old gaskets and use new ones.
2. Confirm that all parts are in good condition and clean.
3. Both the primary and secondary systems have their respective parts which are of a shape. Therefore, when installing, care should be taken so as not to mistake one for the other.
4. When installing the bimetal spring housing to the carburetor body, fit the choke shaft lever to the bimetal spring and accurately by means of closing the choke valve and pulling the vacuum diaphragm shaft.

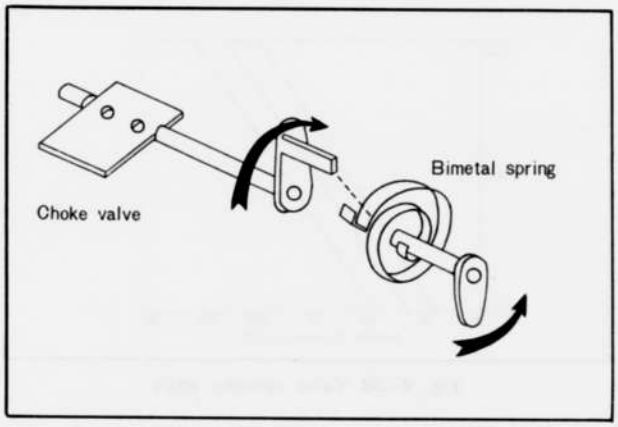

Fig. 4–34 Installing vacuum diaphragm housing

4–B. FUEL PUMP

Turn the ignition key "ON" and check the operational noise of the fuel pump. In case that there is no operational noise from the fuel pump, check the disconnection of the harness.
And if there is no abnormality, replace the fuel pump. The pressure test and volume test shall be conducted according to the following procedures.

a. Pressure test

1. It is required that measurement should be performed while the engine is in cold condition, and make sure that there is no fire around.
2. Remove the air cleaner assembly. Disconnect the fuel inlet hose at the carburetor. Use care to prevent combustion due to fuel spillage.
3. Connect the pressure gauge to the fuel inlet hose.

Note:
It is recommended to place the pressure gauge outside the engine compartment using a hose of adequate length. In this case, place the gauge almost at the height of carburetor.

4. Turn the ignition switch on and note the pressure reading. If the reading is not within the specifications mentioned below, the pump is damaged and should be repaired or replaced. If the pump pressure is within the specifications, perform the test for volume.

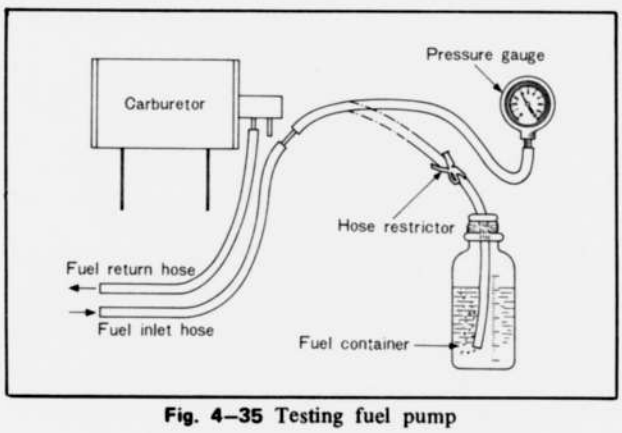

Fig. 4–35 Testing fuel pump

b. Volume test

Turn the ignition switch on, open the hose restrictor and expel the fuel into the container, while observing the expelling amount for one minute. Close the restrictor and read the amount.
If the pump volume is below specifications, repeat the test using an auxiliary fuel supply and a new fuel filter. If the pump volume meets specifications while using the auxiliary fuel supply, check for a restriction in the fuel supply from the tank and for the tank not venting properly.

Specifications — fuel pump

Fuel pressure	0.3 ~ 0.38 kg/cm² (4.26 ~ 5.41 lb/in²)
Feeding capacity	More than 1,150 cc/min (1.2 U.S. quart/min)

4–C. FUEL FILTER

The fuel filter is of a cartridge type. The element of the filter is sealed cartridge and should be replaced following the maintenance schedule.

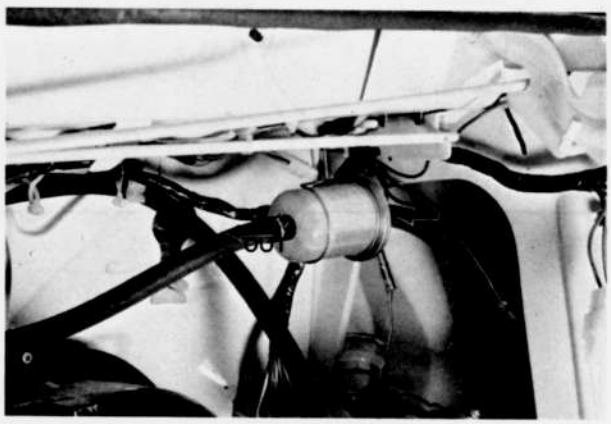

Fig. 4–36 Fuel filter

4–D. FUEL LINES

Inspect the fuel lines for leaks and tighten the fuel line connections to prevent leakage. It is important that the fuel system should be kept clean and free from water. In an excessive amount of dirt or water is found, drain the fuel from the tank and blow out the fuel lines with compressed air.

4–E. FUEL TANK

Inspect the fuel tank for cracks and corrosion. If any defect is present, repair or replace as necessary.

Note:
Before repairing, clean the fuel tank thoroughly with steam and sufficiently to remove all explosive gas.

4–F. AIR CLEANER

4–F–1. Air Cleaner Element

The air cleaner is of a paper filter type. The element should be serviced following the maintenance schedule. To clean, blow the element with compressed air at low pressure.

4–F–2. Intake Air Temperature Control System

Intake air temperature control system consisting of a control valve and a bimetal is located within the air cleaner and senses the engine room temperature for a stabilized intake air temperature.

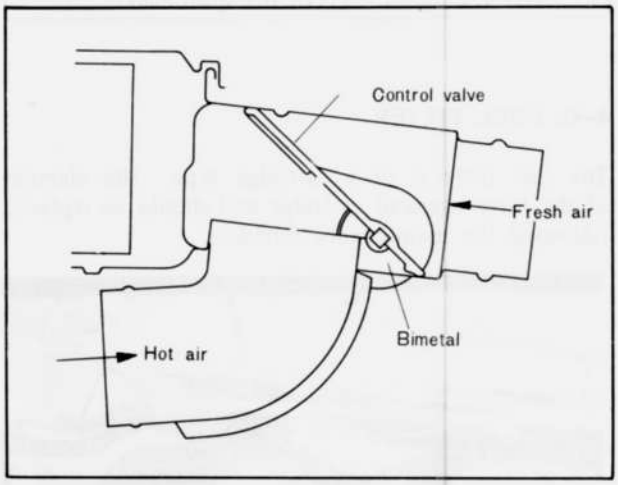

Fig. 4–37 Control valve

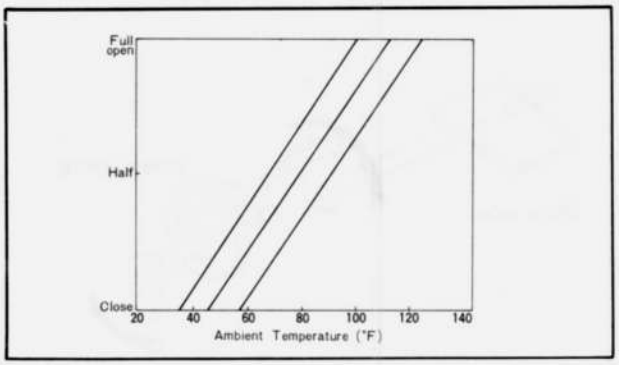

Fig. 4–38 Valve opening angle

4–F–3. Checking Control Valve

Move the control valve up and down inside the air cleaner and if there is no difficulty to move and also the spring force of the bimetal is felt, it is in good order.

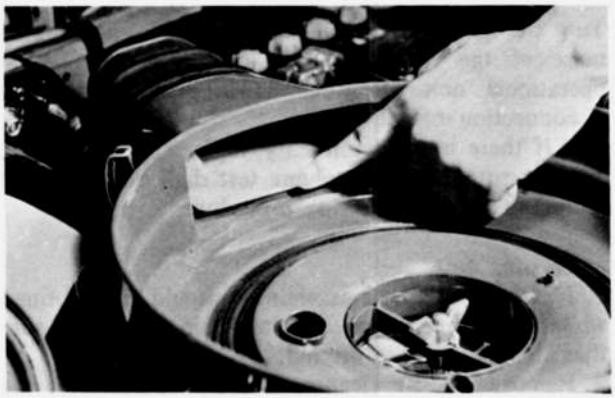

Fig. 4–39 Control valve

ELECTRICAL SYSTEM (ENGINE)

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5–A. BATTERY

5–A–1. Checking Battery

As the battery has an important influence on startability, ignition and lighting, check the following points periodically and always keep the battery in perfect condition.

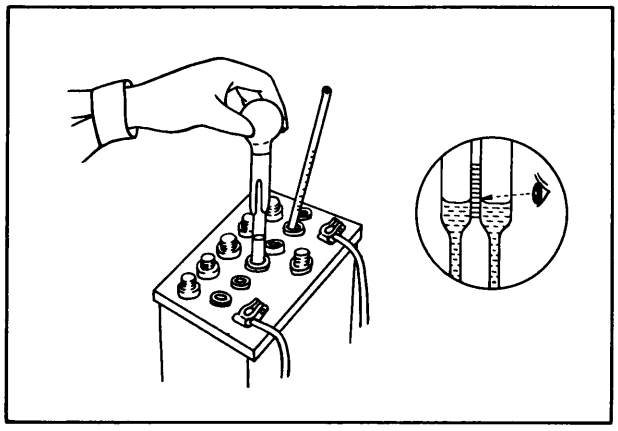

Fig. 5–1 Checking specific gravity

1. Check the electrolyte level in each cell of the battery, and add distilled water to maintain the solution 10 ~ 20 mm (0.4 ~ 0.8 in) above the plates.
Do not overfill.

2. Check the specific gravity of the electrolyte with a hydrometer, as shown in Fig. 5–1. If the reading is 1.28 or more, it indicates that the battery is fully charged. If the reading is below 1.22, the battery requires recharging.
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–A–2. Charging Battery

a. Constant current charge

1. If the exterior of the battery is dirty with sulphuric acid or dust and dirt, wash these off with clean water and dry thoroughly before charging the battery.
2. Check the electrolyte level and add distilled water if necessary.

Note:
If addition of distilled water is neglected, the plates and separators will become exposed to air, causing a sulphation to occur on the plates.
Do not add dilute sulphuric acid unless the electrolyte has overflown or led out.

3. Connect the battery to the charger ensuring that the polarities are correct.

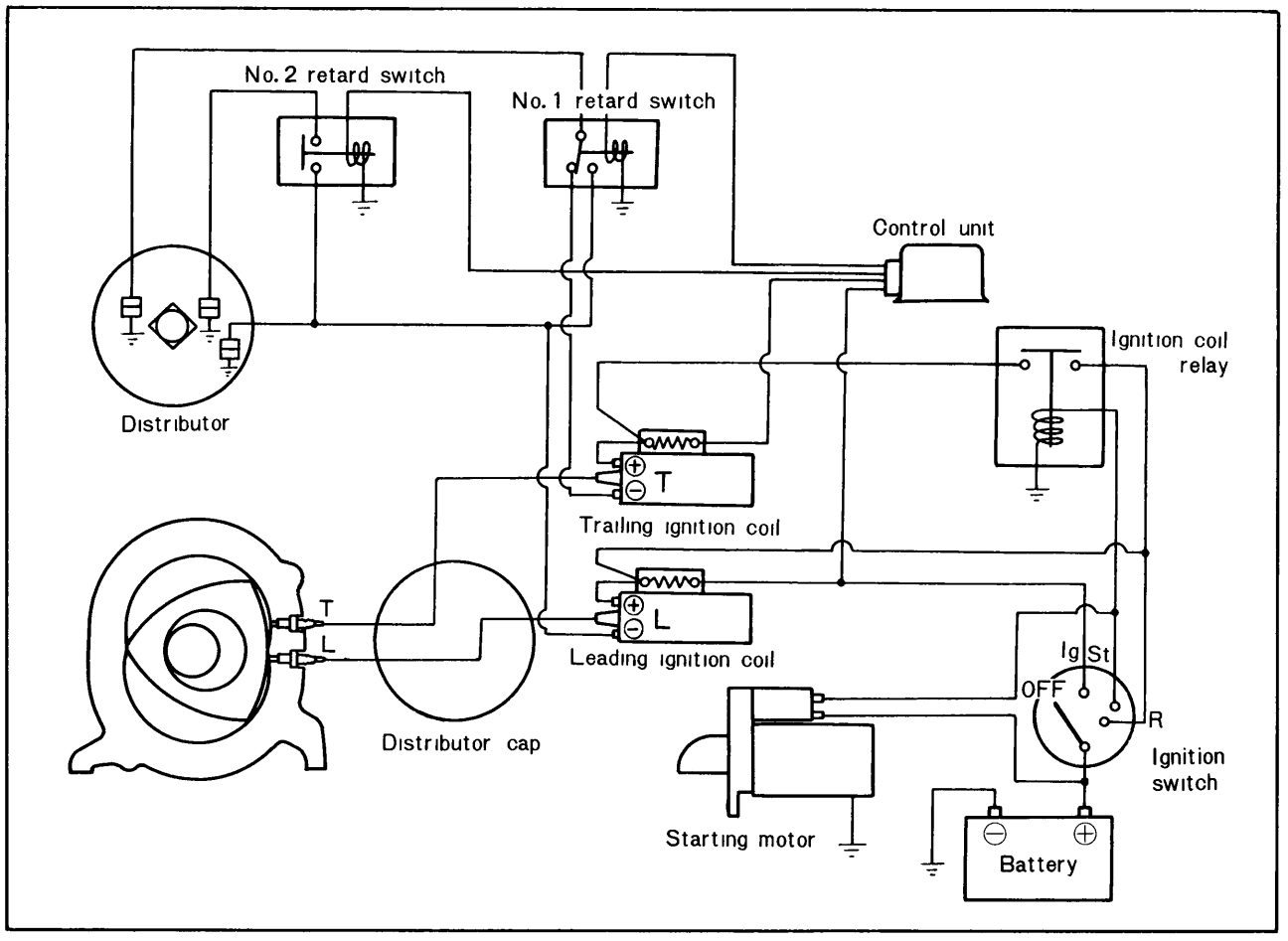

Fig. 5–2 Ignition system

4. To charge, apply an electric current of approximately 6A until the specific gravity of the electrolyte reaches 1.27 ~ 1.29.

b. Fast charge

As a fast charge causes both the temperature and the level of the electrolyte to rise suddenly, it does not have a favorable effect on the battery. Therefore, this should not be performed unless in the case of an emergency.

When a fast charge is being applied with the battery mounted on the vehicle, ensure that the cables are removed from the battery terminals before the charge is applied. If this is neglected, it could cause a damage to the diodes on the alternator.

The battery should be kept by the use of cooling water to prevent the temperature of the electrolyte from exceeding 55°C (131°F), otherwise the charging should be discontinued temporarily when the temperature rises above this point.

5–B. IGNITION SYSTEM

In the rotary engine, two spark plugs are provided in each working chamber, one above the minor axis (called the trailing side) and the other below the minor axis (called leading side) of the trochoid surface, so as to enable the engine to obtain the optimum combustion efficiency under any operating condition.

The primary wires from the individual breaker points for trailing and leading plugs are led to the two separate coils and the secondary wires also are separately led via the distributor to the trailing and leading plugs.

The inside of the distributor is divided into two sections; leading and trailing points are installed in the lower part and leading retard point is installed in the upper part.

These points are used properly by the signal of the control unit given according to the operating conditions of the vehicle.

The coil with external resistor is used.

The ignition coil relay is equipped to short-circuit the external resistor in starting (when the starter is running) so as to increase the secondary voltage and improve the startability.

Short-circuiting of resistor by the ignition coil relay is made on the trailing side only and that on the leading side by the ignition switch. The ignition coil relay has another contact point which serves to energize the ignition circuit for the fuel pump, etc.

5–C. DISTRIBUTOR

The distributor for this model had three breaker points: one is leading normal point, another is trailing point, and the other is leading retarded point.

The distributor consists of distributing mechanism, contact breaker mechanism, and ignition timing advance control of centrifugal.

5–C–1. Checking Breaker Points

Check the conditions of wear, burning, transferred metal and pitting of the breaker points.

In case any abnormality is found in those checking in the above, clean or replace them.

If there is an abnormal damage on the contact face, check the condenser.

5–C–2. Adjusting Breaker Points

1. Check the dwell angle of each point following the instructions of 5–C–5. a.
2. If the dwell angle is within specifications, adjustment of breaker points is not required. If not, adjust the breaker points following the instructions of 5–C–5. b.

Point gap	0.45 ± 0.05 mm (0.018 ± 0.002 in)

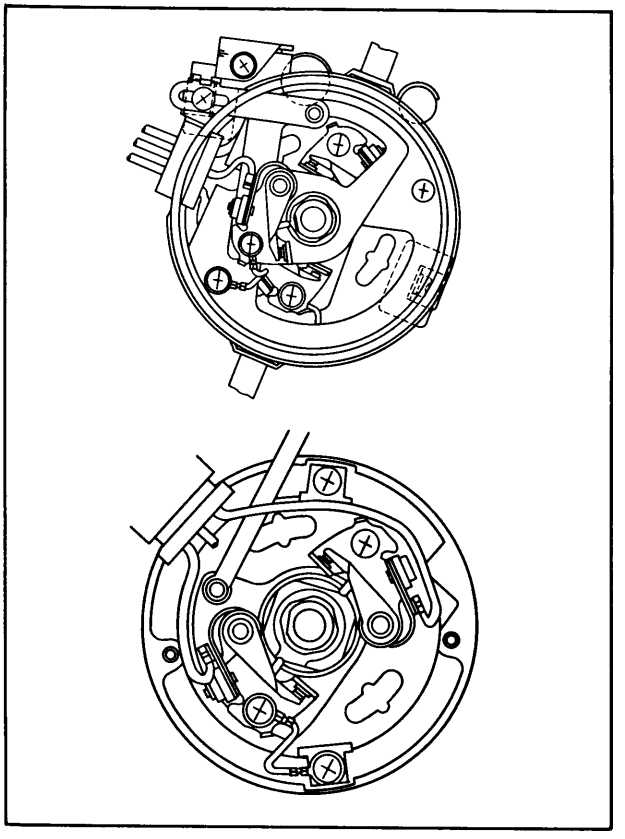

Fig. 5–3 Adjusting breaker points

5–C–3. Adjusting Initial Ignition Timing

To check and adjust the timing with a timing light, proceed as follows:

*** STEP–1 * (Leading)**

1. Connect a tacho-dwell tester to the engine.

Note:

The tacho-dwell tester can be used in the same method as when measuring the dwell angle on a 4 cylinder, 4 cycle reciprocating engine.

2. Connect a timing light to the high tension cord for leading spark plug of the front rotor housing.
3. Start the engine, and run it at specified idle speed.

(See page 4 : 2)

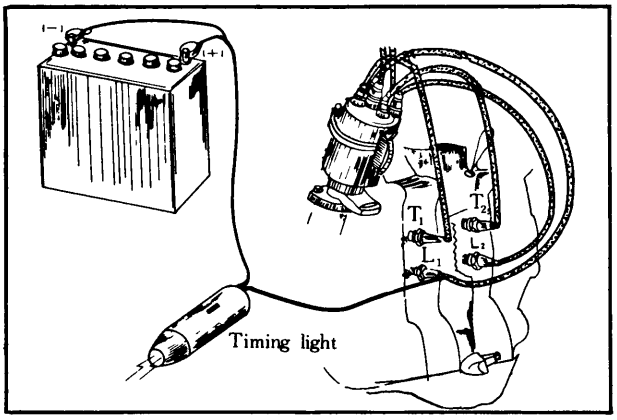

Fig. 5–4 Checking ignition timing

4. Check the ignition timing by aiming the timing light at the timing indicator pin on the front cover and specified timing mark on the pulley.

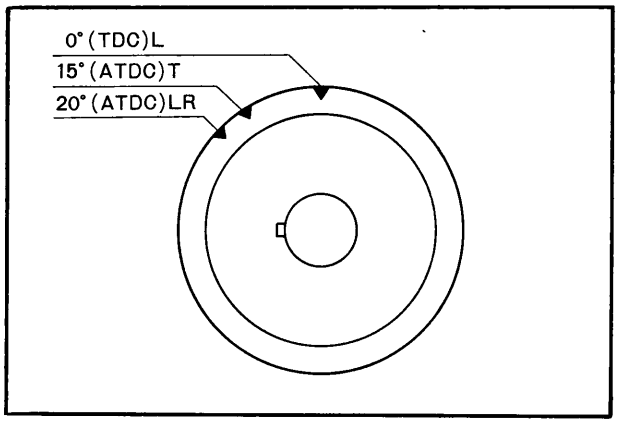

Fig. 5–5 Timing marks

5. If the leading timing is not correctly aligned, stop the engine.
6. Loosen the distributor locking nut slightly and rotate the distributor housing with engine running so that the leading timing may align with the indicator pin on the front cover.
7. Stop the engine and tighten the distributor locking nut. Recheck the timing.

*** STEP–2 * (Leading retard)**

8. Remove the coupler of the distributor and connect proper leading wires to the ends of separated couplers as shown in Fig. 5–6.

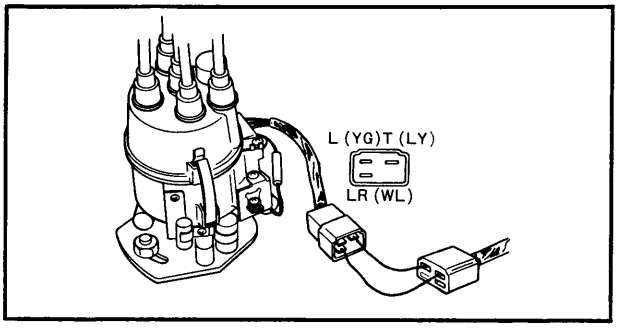

Fig. 5–6 Coupuler connection diagram

9. Start the engine and check the initial timing of the leading retard side in the same manner as in STEP–1.
10. If the timing is outside the specification, loosen the screw of the external adjusting lever for the leading retard side with the engine idling and, after operating the lever to the front and rear and adjusting the timing to the specification, tighten the screw. Reconfirm the timing.

*** STEP–3 * (Trailing)**

11. Change connection of the timing light to the high tension cord for trailing spark plug of the front housing.
12. Start the engine and check the initial timing of the trailing side in the same manner as in STEP–1.
13. If the timing is outside the specification, adjust it to the specification by operating the external adjusting lever for the trailing side in the same manner as in STEP–2.
Reconfirm the timing.

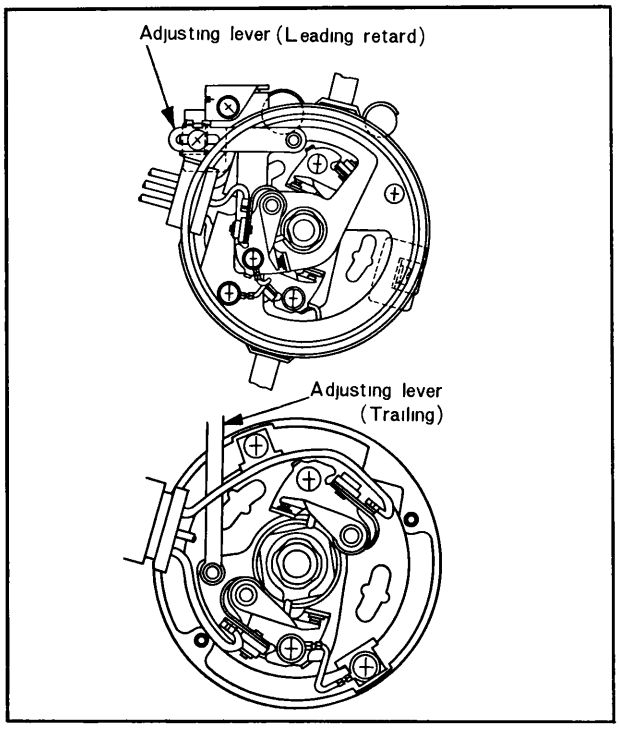

Fig. 5–7 Adjusting timing

14. Recheck the timing. If the timing mark is not correctly aligned, repeat this performing until the correct timing is obtained.

Specifications — Initial timing

Leading	0° ± 1° TDC
Leading retard	20° ± 2° ATDC
Trailing	15° ± 2° ATDC

5–C–4. Removing Distributor

1. Remove the high tension cords.
2. Disconnect the coupler of primary wires from the distributor.
3. Remove the distributor attaching nut.
4. Pull the distributor out of the front cover.



Fig. 5–8 Removing distributor

5–C–5. Testing Distributor

a. Dwell angle test

*** STEP–1 * (Leading & Trailing)**

1. Connect the tester following the instructions of the manufacturer. Then start the engine and let it idle.
2. Turn the cylinder selector to the **4 cylinder, 4 cycle** position.
3. Read the dwell angle on the dwell meter and compare the reading to specification.
4. If the dwell angle is below specification, the breaker point gap is too wide. If the dwell angle is above specification, the breaker point gap is too close.

*** STEP–2 * (Leading retard)**

1. Remove the coupler of the distributor and connect wires as shown in Fig. 5–6
2. Check the dwell angle in the same manner as in STEP–1.

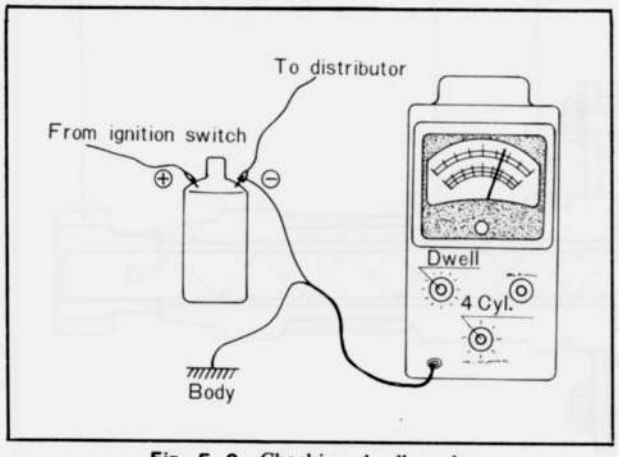

Fig. 5–9 Checking dwell angle

Specifications — Dwell angle

Leading Leading retard Trailing	58° ± 3°

b. Dwell angle adjustment

If the dwell angle is not within specifications, proceed as follows:

1. Remove the high tension cord (ignition coil to distributor) from the ignition coil.
2. Remove the distributor cap and place them out of the way.
3. Connect the **remote starter switch** (49 0242 685A) in the circuit.
4. Loosen the breaker point attaching screws.
5. With the ignition switch on, crank the engine with a remote starter switch and adjust the gap to specification.
6. Release the remote starter switch and tighten the breaker point attaching screws.
7. Since the adjustment may have changed when the attaching screw was tightened, crank the engine again with the remote starter switch and check the dwell angle. When the dwell is properly adjusted, remove the remote starter switch and tester leads.

c. Advance test

Centrifugal advance mechanism is installed in the leading and trailing sides of the distributor, but no advance mechanism is installed in the leading retard side.

The advance is checked to determine if the ignition timing advances in proper relation to engine speed.

1. Check the dwell angle. If the angle is not within the specifications, adjust the breaker points.
2. Check the breaker arm spring tension and replace the points if the spring tension is not within specifications.
3. Check the advance characteristic. The advance characteristic of the distributor should be within the range as shown in Fig. 5–11.

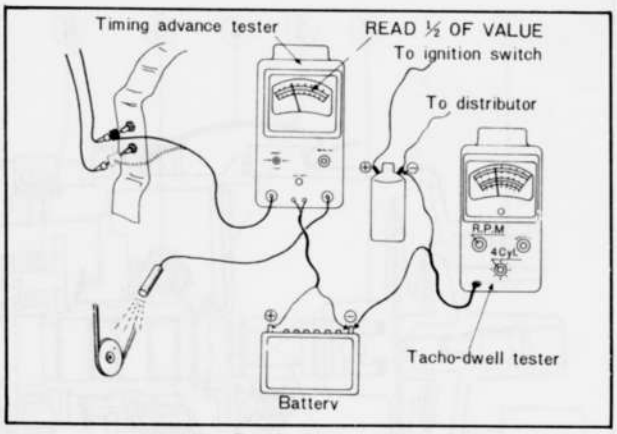

Fig. 5–10 Advance test

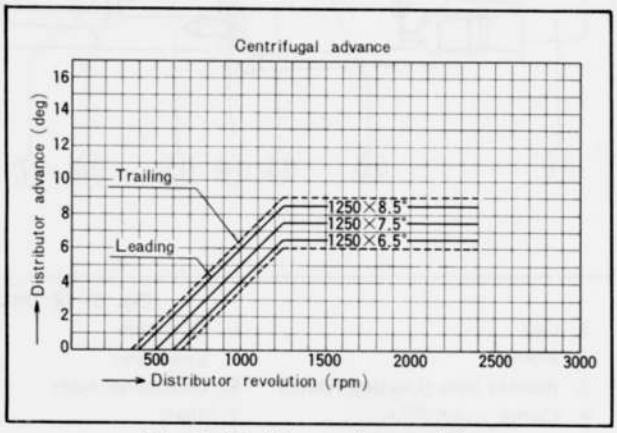

Fig. 5–11 Advance characteristic

Note:
The ignition advance tester can be used in the same method as when measuring the ignition advance on the **4 cylinder, 4 stroke reciprocating engine** but the numerical value indicated on the scale is twice as much as the actual advance degree of rotary engine. So the **indicated value should be divided into two.**

5–C–6. Disassembling Distributor

1. Loosen the cap retaining clips and lift off the cap.
2. Remove the rotor.
3. Remove the clip and installation screw of the exterior adjusting lever for the leading retard side and remove the lever. Next, remove the primary wire and set screw from the leading retard point and remove the point assembly from the breaker base.
4. Remove the installation screws of the breaker base and lift off the breaker base.
5. Remove the primary wire and set screw from the leading point and trailing point. Next, remove the primary wires with rubber block from the distributor housing.
6. Remove the condensers by removing the attaching screws.
7. Remove the clip and installation screw of the exterior adjusting lever for the trailing side. Next, remove the lever bracket installation screws and remove the lever and lever bracket.
8. Remove the set screw from the leading point and trailing point and remove each point assembly from the breaker base.
9. Remove the breaker base installation screws and lock plates and lift off the breaker base.
10. Remove the distrubutor cam by removing the snap ring.
11. Remove the distrubutor driven gear by removing the retaining pin.
12. Remove the distrubutor shaft in upward direction through the top of the distrubutor housing.
13. Remove the governors by removing the springs.

5–C–7. Inspecting Distributor

a. Checking cap

Inspect the distributor cap for crack, carbon runners and evidence of arcing. If any of these conditions exists, the cap should be replaced. Clean any corroded high tension terminals.

b. Checking rotor

Inspect the rotor for cracks or evidence of excessive burning at the end of the metal strip. If any of these conditions exists, the rotor should be replaced.

c. Checking tension of contact arm spring

For inspection, hook a spring scale on the contact arm and pull in a straight line at a right angle to the

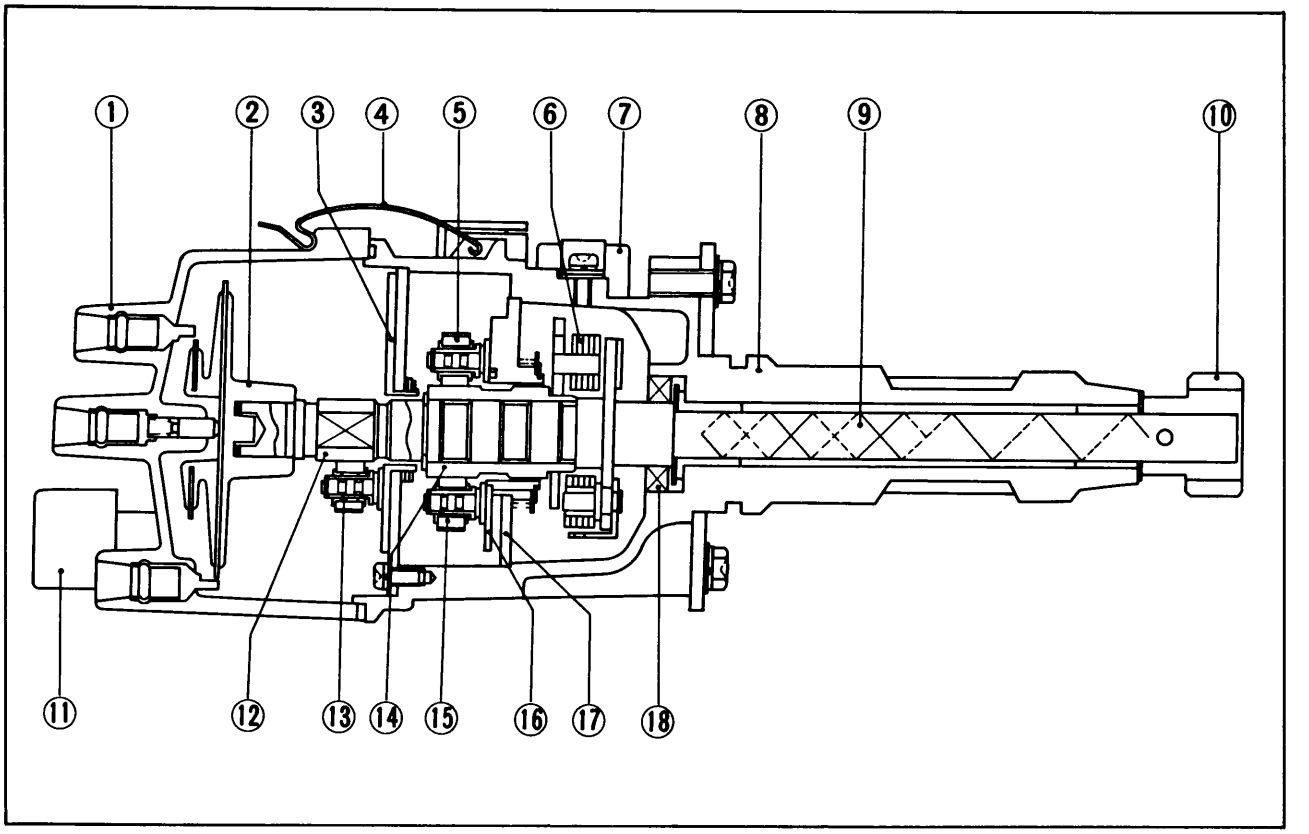

Fig. 5–12 Distributor components

1. Cap
2. Rotor
3. Breaker base (Leading retard)
4. Clamp
5. Leading breaker point
6. Governor
7. Condenser
8. Distributor body
9. Shaft
10. Distributor driven gear
11. Rubber cap
12. Cam
13. Leading retard breaker point
14. Cam
15. Trailing breaker point
16. Breaker base (Leading)
17. Breaker base (Trailing)
18. Oil seal

contact arm. Take a reading when the contact points start to separate. The reading should be between 0.5 ~ 0.65 kg (1.1 ~ 1.4 lb).

d. Checking condenser

If the condenser is leaky, it will cause a weak spark or burned contact points. Check the capacity of the condenser with a condenser tester.
The capacity is 0.24 ~ 0.30μF.

5–C–8. Assembling Distributor

Assemble the distributor in the reverse order of disassembling.

Note:

When installing the breaker base for the leading and trailing sides in the distributor housing, match the arrow mark on the housing with the center of graduation of the breaker base.

5–C–9. Installing Distributor

1. Turn the eccentric shaft until the TDC mark on the drive pulley aligns with the indicator pin on the front cover. (See Fig. 5–5)
2. Align the tally mark on the distributor housing and driven gear as shown in Fig. 5–13.

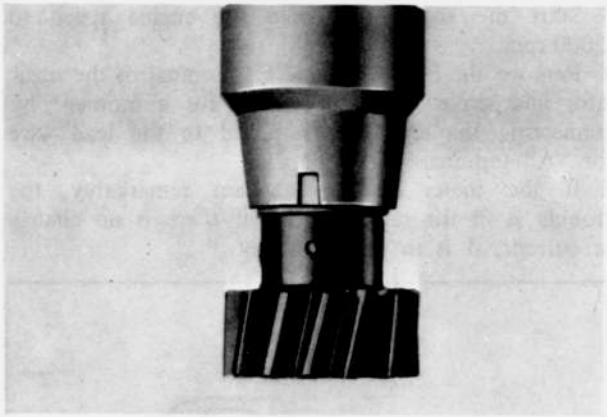

Fig. 5–13 Aligning tally mark

3. Insert the distributor so that the distributor lock bolt is located in the center of the slit, and engage the gears.
4. Rotate the distributor clockwise until the leading contact point starts to separate, and tighten the distributor attaching nut.
5. Install the distributor cap and connect the primary wires coupler.
6. Set the timing with a timing light, then tighten the distributor attaching nut. (Refer to Par. 5–C–3)

5–D. IGNITION COIL

This model is equipped with two ignition coils of which is the oil cooling type. On this type of ignition coil, oil is sealed within the insulator inside the coil and, therefore, if by any chance an oil leakage should occur, this would cause a drop in the efficiency of the coil, resulting in deteriorating the performance of the engine. Therefore check the ignition coil to ensure that the terminals are clean and that there are no cracks or oil leakages. Also, check the external and primary resistance.

Ignition Coil	Type	External Resistance	Primary Resistance
Leading	HP5-13J	1.4 Ω/20°C	1.35 Ω/20°C
Trailing	HP5-13E	1.6 Ω/20°C	1.5 Ω/20°C

5–E. SPARK PLUG

On this engine, 2 spark plugs are provided in each working chamber so as to enable the engine to obtain the optimum combustion efficiency under any operating condition. These spark plugs for this engine are slightly different from for the reciprocating engines in dimensions and heat values.
As you are aware, heat range of the spark plugs should be selected by owing of various conditions, otherwise durability of the spark plug, startability of the engine and running performance of the car will be down. Therefore, it is recommended that heat range of the spark plugs should be selected in each vehicle running conditions.
All spark plugs must be of the same maker and number or heat range. If spark plugs shown burning white or rapid electrode wear, replace with a **cold range type** spark plugs.
Do not use spark plug which is not specified.

5–E–1. Spark Plug Heat Range

Two types of spark plug, standard spark plug and cold type spark plug, are available and they should be selected according to the weather condition and driving condition.

a. Standard

The standard spark plugs are of the standard specification and suitable for the vehicle which is not frequently driven at a continuous speed over 150 km/h (95 miles/h).

b. Cold type

The cold type spark plugs are of a heat range higher than the standard spark plugs. They should be used in case the standard spark plugs are overheated, or for the vehicles which is frequently driven at a continuous speed of over 150 km/h (95 miles/h).

5–E–2. Removing Spark Plug

1. Disconnect the wire from each spark plug by grasping, twisting and then pulling the moulded cap of the wire only. Do not pull on the wire because the wire connection inside the cap may become separated or the boot may be damaged.
2. After loosening each spark plugs one or two turns, clean the area around each spark plug port with compressed air, then remove the spark plugs.

5–E–3. Checking Spark Plug

1. Inspect each plug individually for badly worn electrodes, glazed, broken or blistered porcelain, and replace the plug as necessary.
2. Clean the spark plugs thoroughly using a sand blast cleaner.
3. Inspect each spark plug for make, and heat range.

Note:
Don't adjust the plug gap because the porcelain may be cracked or broken.
If broken pieces of the porcelain should enter working chambers, they may cause serious damage to the engine.

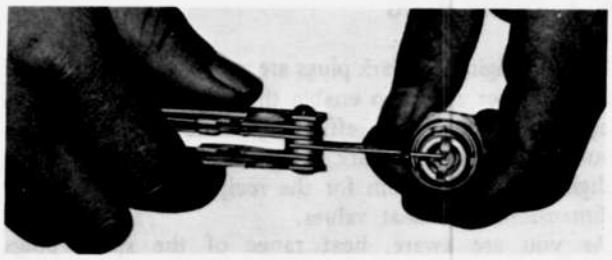

Fig. 5–14 Checking gap

Below is the table of recommended spark plugs.

	Standard	Cold type	Initial gap
NGK	B7EM BR7EM B7EMV BR7EMV	B8EM BR8EM B8EMV BR8EMV	0.65 ± 0.05 mm (0.026 ± 0.002 in)
NIPPON-DENSO	W22EA W22EAR W22EA-G W22EAR-G	W25EA W25EAR W25EA-G W25EAR-G	
CHAMPION	N-80B RN-80B N-180B RN-180B	N-78B RN-78B N-178B RN-178B	

5–E–4. Installing Spark Plug

1. In order to protect the thread portion of the spark plugs, it is recommended to **apply Moly Paste (0259 77 767 or 0259 77 768)** to the threaded portion of the new spark plugs.
2. Thread the spark plugs into the rotor housing finger tight until the gaskets contact the housing. If the plugs cannot be installed with finger pressure, clean the threads with a suitable greased thread chaser.
Torque each plug to 1.3 ~ 1.8 m-kg (9 ~ 13 ft-lb).
3. Connect the spark plug wires.

5–F. ALTERNATOR

5–F–1. Precautiosn on Service

When servicing the charging system, observe the following precaution. If not followed, the result will be in serious damage of the system.
1. **Do not** short across or ground any of the terminals on the alternator or requlator.
2. **Never** operate the alternator on with an open circuit (with the field terminal connected and the armature terminal disconnected).
3. When installing a battery, always make sure that the negative post of the battery is attached securely to the ground strap.
4. **Never** reverse battery cables, not even for an instant, as reverse polarity current flow will damage the diodes in the alternator.
5. When charging the battery with a fast charger, disconnect the positive cable at the battery.
6. Do not remove the A terminal from the alternator or regulator while the engine is running.

5–F–2. Checking Charging System on Car

If the electrical system is not charging properly, check all electrical connections and the fan belt tension prior to performing any test of the charging system, then determine whether the trouble is in the alternator or regulator before removing the alternator.
Check the alternator by using a **alternator tester** (49 0370 290). If the checker is not available, check as follows:
1. Disconnect the wire from "B" terminal of the alternator and connect the negative lead of the ammeter to the wire and the positive lead to the "B" terminal.
2. Remove the regulator couplers and connect them by using the proper lead wire as shown in Fig. 5–15.
3. Start the engine and hold the engine speed to 2,000 rpm.
4. Remove the lead wire for "F" terminal of the regulator and make the short circuit for a moment by connecting the lead wire removed to the lead wire for "A" terminal.
5. If the meter reading increases remarkably, the trouble is in the regulator and if there is no change in current, it is in the alternator.

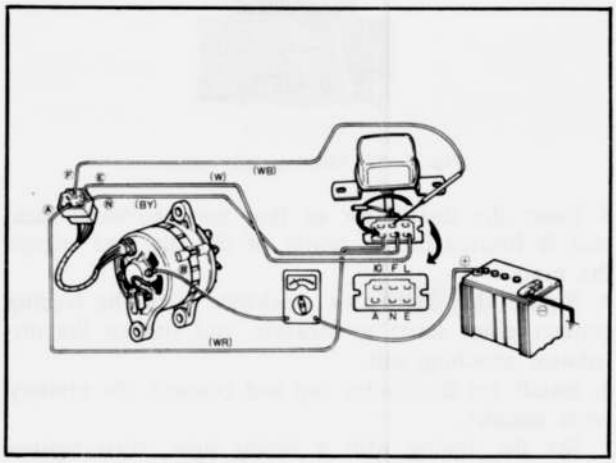

Fig. 5–15 Checking charging system

5–F–3. Disassembling Alternator

1. Remove the radio noise suppression condenser from the rear of the alternator.
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. Hold the front housing and rotor assembly, clamping the rotor.

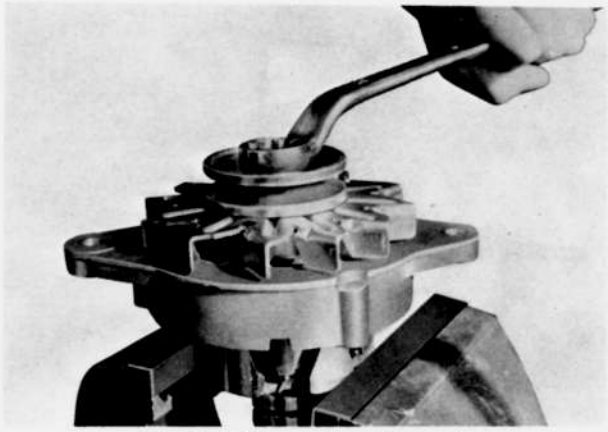

Fig. 5–16 Loosening pulley nut

5. Loosen the pulley retaining nut and remove the nut, washer, pulley, fan, spacer and front slinger.
6. Remove the front housing with bearing and remove the rear slinger.
7. Remove the nut, washers and insulator from the "B" terminal at the rear of the alternator.
8. Remove the screw attaching the rectifier to the rear housing and remove two screws attaching brush holder and rectifier.
9. Carefully remove the stator, rectifier and brush holder assembly from the rear housing. Use care to keep the brush holder assembly intact during removal from the rear housing.
10. Remove the brush holder assembly.
11. Unsolder the stator leads from the rectifier.
12. 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 attaching screws, and press the bearing from the front housing

5–F–4. Inspecting Alternator

a. Checking stator coil

Check the stator coil for both open and grounded circuits with a tester.

To check for open, connect the prods to each of the two leads, as shown in Fig. 5–20. If there is no flow of current, the coil is open circuit and must be repaired or replaced.

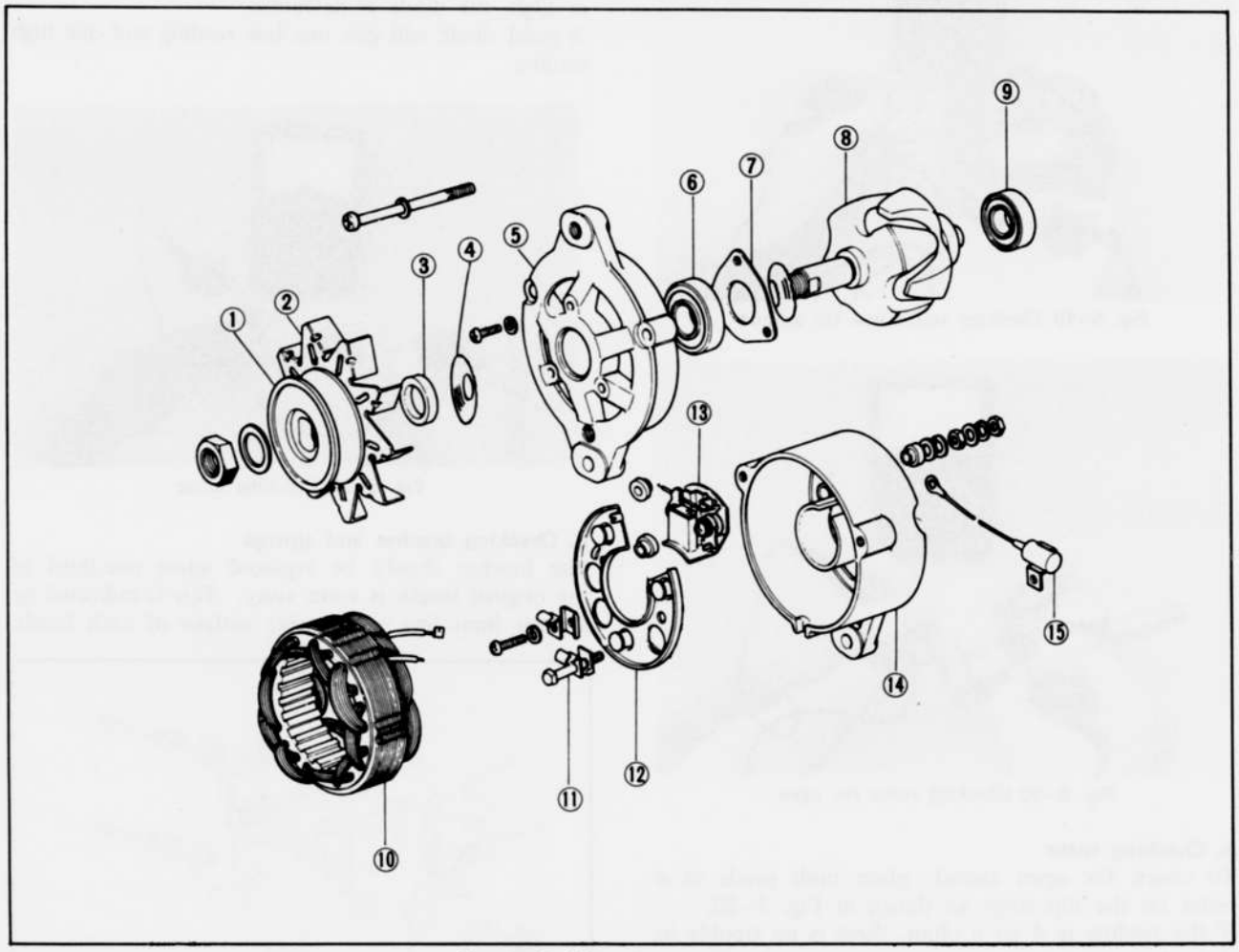

Fig. 5–17 Alternator components

1. Pulley
2. Fan
3. Spacer
4. Slinger
5. Front housing
6. Front bearing
7. Bearing retainer
8. Rotor
9. Rear bearing
10. Stator
11. Terminal bolt
12. Rectifier
13. Brush and holder
14. Rear housing
15. Condenser

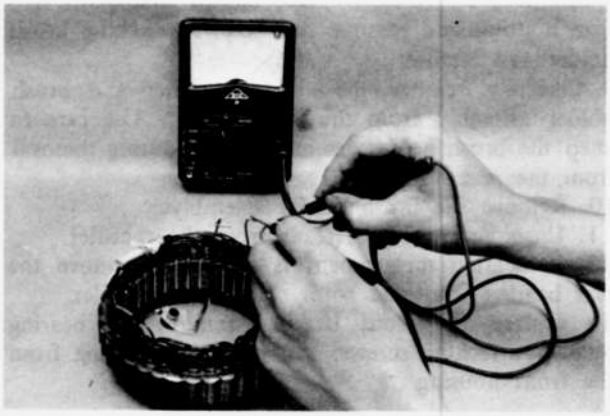

Fig. 5–18 Checking stator coil for open

To check for ground, connect one prod to the core and the other to each lead wire, as shown in Fig. 5–21. If a ground is present the current will flow and the stator coil must be repaired or replaced.

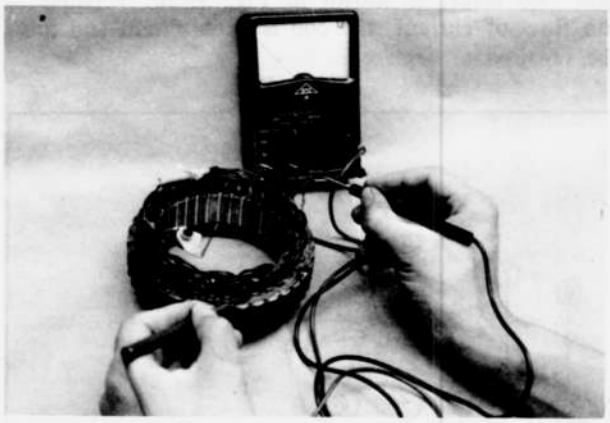

Fig. 5–19 Checking stator coil for ground

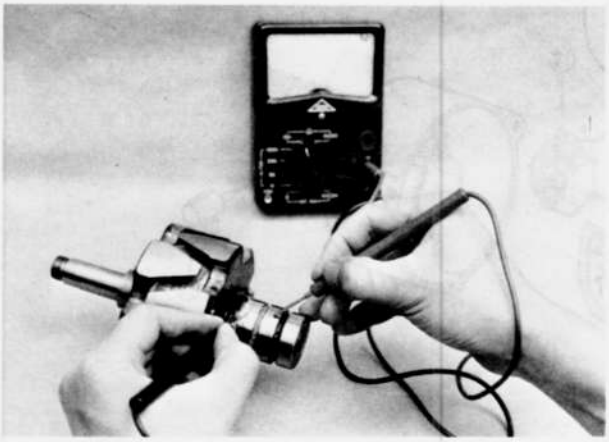

Fig. 5–20 Checking rotor for open

b. Checking rotor

To check for open circuit, place both prods of a tester on the slip rings, as shown in Fig. 5–20.
If the reading is 4 to 6 ohms, there is no trouble in the rotor.
To check for ground, connect one prod to the slip ring and other prod to the core, as shown in Fig. 5–21. If the current flows the rotor must be repaired or replaced.

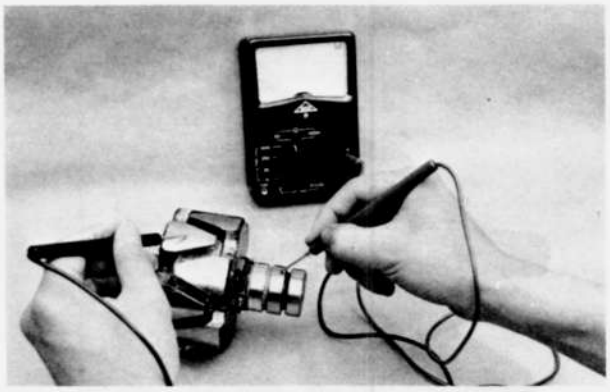

Fig. 5–21 Checking rotor for ground

c. Checking diodes

Diodes for use in the alternator are available in two different types, the positive diode which allows current to flow from the lead wire to the case but not from the case to the lead wire and the negative diode which has the opposite properties.
To check, read the resistance between the lead wire and case with a tester. Then reverse the tester leads and note the reading. If both readings are very low or high, the diode is defective.
A good diode will give one low reading and one high reading.

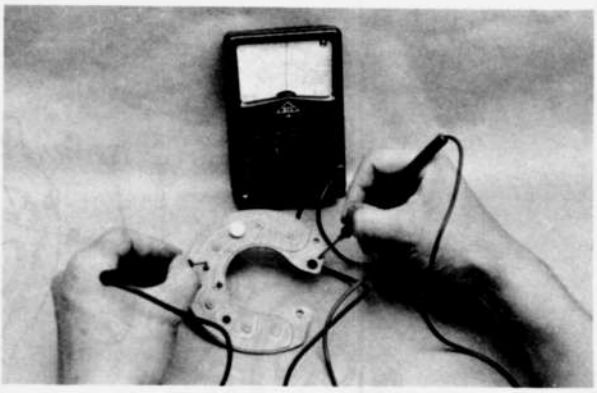

Fig. 5–22 Checking diode

d. Checking 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 surface of each brush.

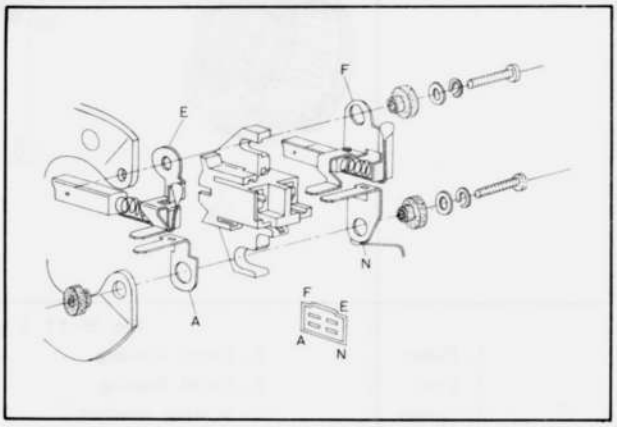

Fig. 5–23 Brush holder assembly

Check the brush spring tension. The tension should be between 330 and 450 gr (12 and 16 oz). Replace the springs if the tension is less than 330 gr (12 oz) or if excessive corrosion exists.

e. Checking bearings

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

5–F–5. Assembling Alternator

Assemble the alternator in the reverse order of disassembling, 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 as shown in Fig. 5–24.

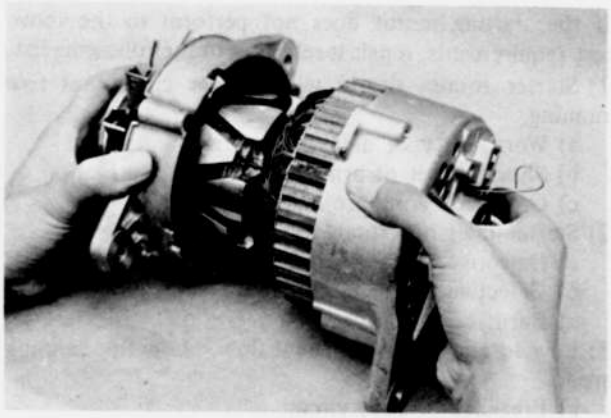

Fig. 5–24 Installing rotor assembly

2. The soldering of the diode leads should be performed in **less than twenty seconds** as the excessive heat may damage the diode.

5–G. REGULATOR

The regulator used for this model is composed of two control units, a constant voltage relay and a pilot lamp relay, mounted as an assembly.

5–G–1. Checking Constant Voltage Relay

To check, use an almost fully charged battery and connect a voltmeter between the (A) and (E) terminals of the regulator, as shown in Fig. 5–25.

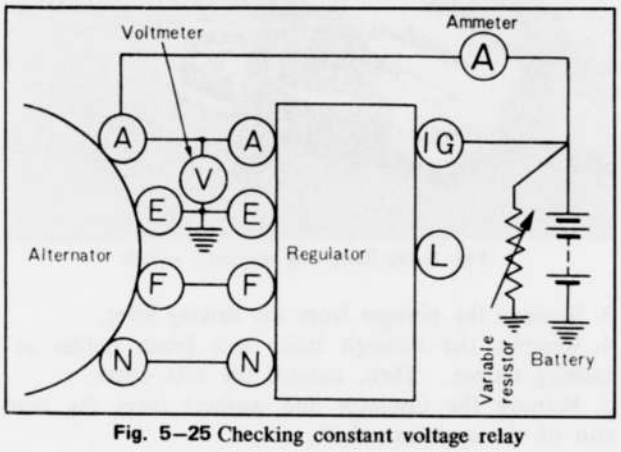

Fig. 5–25 Checking constant voltage relay

Then, hold the alternator revolution to 4,000 rpm (engine revolution 1,800 rpm) and take a reading of the voltmeter. If the reading is from 14 to 15 volts, it is in proper order. If it is not within the specifications, the voltage relay must be adjusted, as instructed in Par. 5–G–3.

5–G–2. Checking Pilot Lamp Relay

Make a circuit, as shown in Fig. 5–26, using a voltmeter and variable resistor, and light up the pilot lamp. Then, slide the knob of the variable resistor so that the voltage gradually increases.

Read the voltage between the (N) and (E) terminal when the lamp goes out. If this voltage is 4.2 to 5.2 volts, it is normal.

Next, slide the knob to gradually reduce the voltage and the lamp will light again. If the reading is 0.5 ~ 3.0 volts at this time, it is proper.

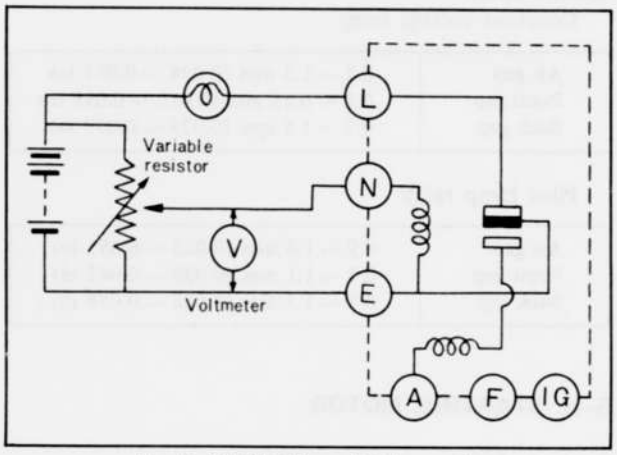

Fig. 5–26 Checking pilot lamp relay

5–G–3. Adjusting Regulator

First, check the air gap, back gap and point gap with a wire gauge. If they are not within the specifications, adjust by bending the stationary contact bracket. After correct gaps are obtained, adjust the voltage setting. Bend the upper plate down to decrease the voltage setting, up to increase the voltage setting.

In case of the pilot lamp relay, if the voltage when the lamp lights up is adjusted to the specification,

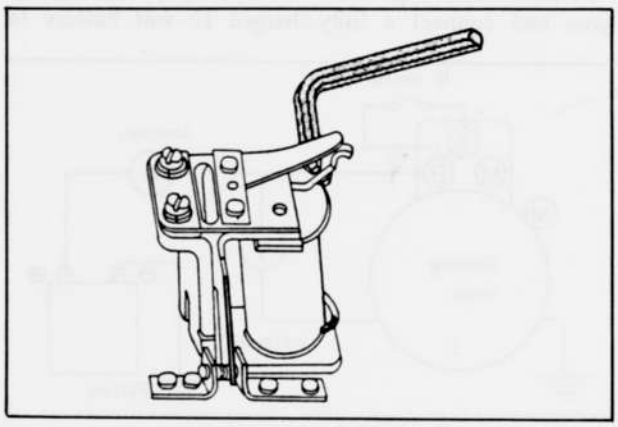

Fig. 5–27 Adjusting regulator

the voltage when the lamp goes out may be within the specification.

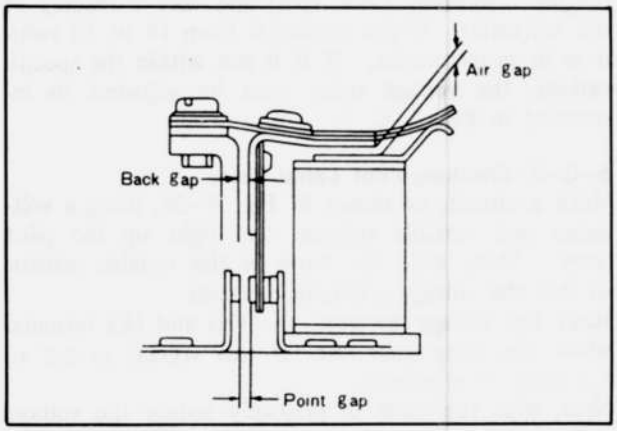

Fig. 5–28 Gaps of regulator

Specifications

Constant voltage relay

Air gap	0.7 ~ 1.3 mm (0.028 ~ 0.051 in)
Point gap	0.3 ~ 0.45 mm (0.012 ~ 0.018 in)
Back gap	0.7 ~ 1.5 mm (0.028 ~ 0.059 in)

Pilot lamp relay

Air gap	0.9 ~ 1.4 mm (0.035 ~ 0.055 in)
Point gap	0.7 ~ 1.1 mm (0.028 ~ 0.043 in)
Back gap	0.7 ~ 1.5 mm (0.028 ~ 0.059 in)

5–H. STARTING MOTOR

5–H–1. Checking Starting Circuit

When the starting motor fails to operate or does not satisfactorily operate, check the following points before removing the starting motor:

1. Weak battery
2. Corroded or loose battery terminal
3. Loose starting motor terminal
4. Broken or loose wires of the starting circuit
5. Faulty ignition switch

5–H–2. Testing Starting Motor

a. Free running test

1. Place the starting motor in a vise equipped with soft jaws and connect a fully-charged 12 volt battery to the starting motor.
2. Connect an ammeter between the (B) terminal of the starting motor and the battery.
3. Operate the starting motor and take a reading. On 1.2 KW starting motor, the current draw should be less than 75 amperes at 4,900 rpm or more. [2.0 KW: less than 100 amperes at 7,800 rpm or more]

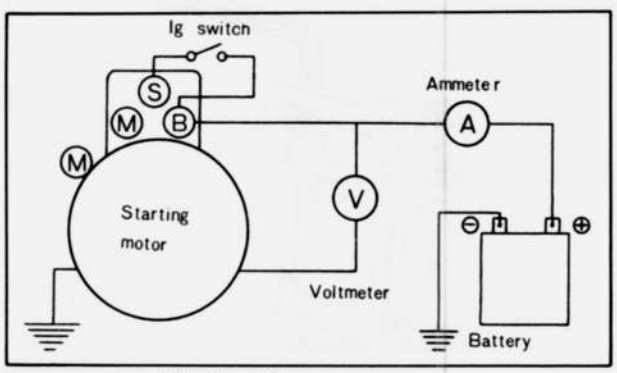

Fig. 5–29 Free running test

b. Lock resistance test

1. Install the starting motor on a test bench.
2. Test the lock resistance of the starting motor, following the instructions of the test equipment manufacturer.
3. With applied battery voltage adjusted to 5.0 volts, the current flow should be 780 amperes [2.0KW: 1,100 amperes] or less and the torque should be 1.1 m-kg (8.0 ft-lb) [2.0KW: 2.4 m-kg (17.4 ft-lb)] or more.

If the starting motor does not perform to the above test requirements, repair it referring to the following list.

1) Starter rotates slowly with a large current at free running.
   a) Worn, dirty or defective bearings
   b) Short circuit of armature
   c) Grounded armature and field coil
2) Starter does not rotate with a large current.
   a) Defective field circuit
   b) Defective armature circuit
   c) Burnt commutator
3) Low torque and low current flow. Low free running speed.
   a) Breakage of field circuit
   b) Excessive internal resistance
4) Low torque. High free running speed.
   a) Short circuit of field coil

5–H–3. Disassembling Starting Motor

1. Disconnect the field strap from the terminal on the magnetic switch.
2. Remove the magnetic switch attaching screws and remove the magnetic switch, spring and washers from the driving housing.

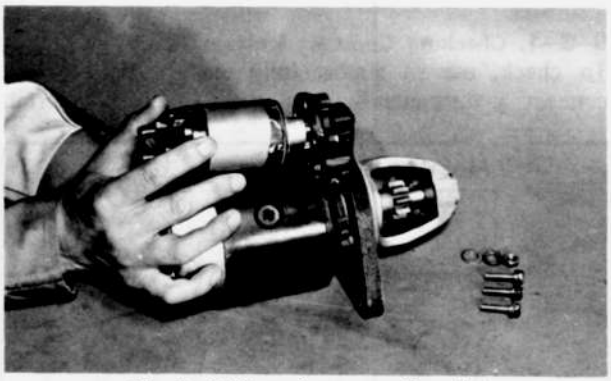

Fig. 5–30 Removing magnetic switch

3. Remove the plunger from the driving lever.
4. Remove the through bolts and brush holder attaching screws. Then, remove the rear cover.
5. Remove the insulator and washers from the rear end of the armature shaft.

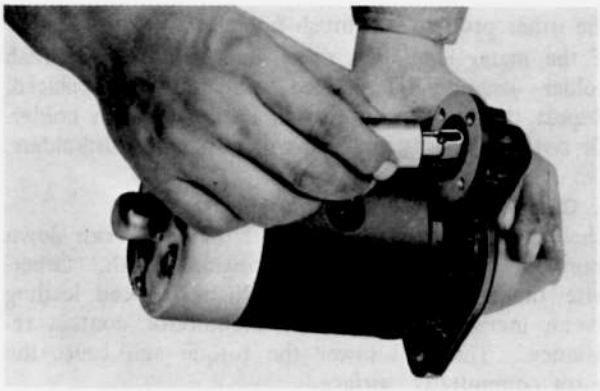

Fig. 5–31 Removing plunger

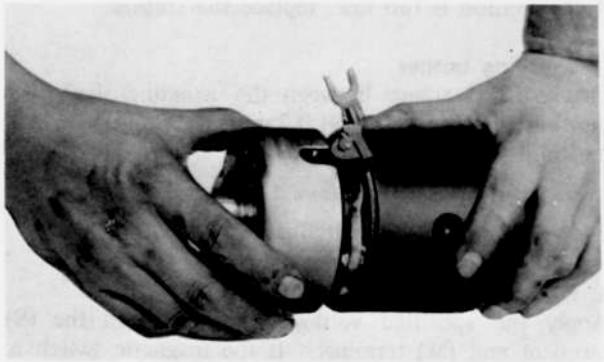

Fig. 5–32 Removing rear cover

6. Remove the brush holder.
7. Separate the yoke from the driving housing.

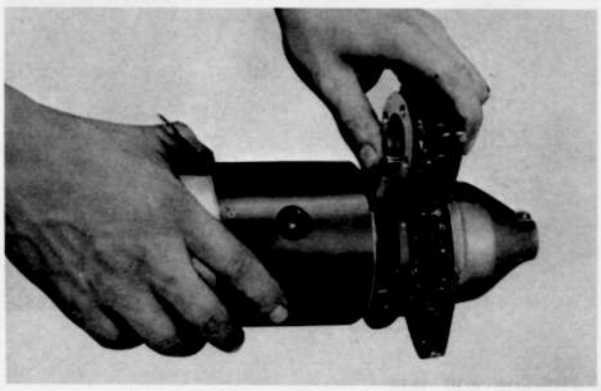

Fig. 5–33 Removing yoke assembly

8. Remove the rubber packing, springs and spring seat.

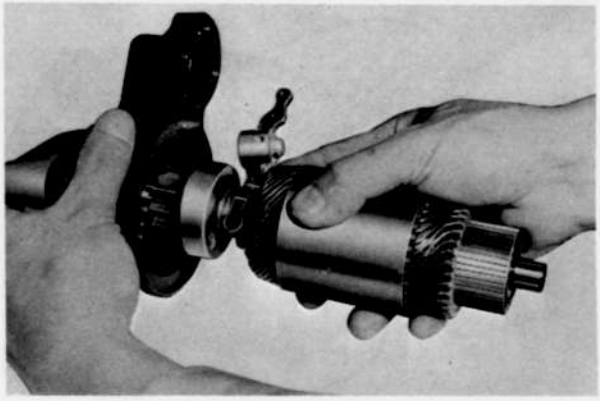

Fig. 5–34 Removing armature assembly

9. Remove the armature and over-running clutch assembly from the driving housing.
10. Remove the driving lever.
11. 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.

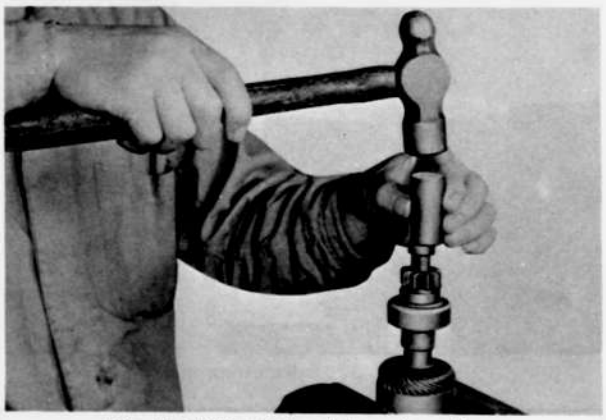

Fig. 5–35 Removing pinion stop collar

12. If the field coil removal is necessary, remove the pole shoe retaining screws. Then, remove the pole shoes and field coil from the yoke.

5–H–4. Inspecting Starting Motor

a. Checking armature

Check the armature for both ground and short circuit. To check for ground, touch one prod of an ohmmeter to each segment and the other prod to the core or shaft.

An infinite reading should be obtained for each segment. If the meter reading is not infinite, the armature windings are shorted to the core or shaft and the armature must be replaced.

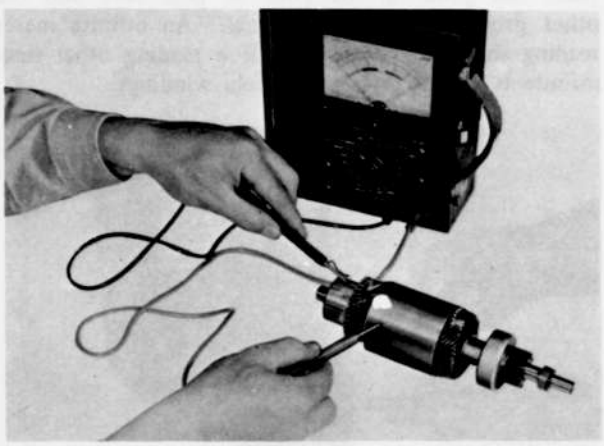

Fig. 5–36 Checking armature

To check for short circuit, use a growler tester. Place the armature against the core of the 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.

b. Checking commutator

If the commutator is dirty, discolored or worn, clean it with emery paper and wash with clean solvent. After cleaning, undercut the mica between the segments to the depth of 0.5 ~ 0.8 mm (0.020 ~ 0.032 in), as shown in Fig. 5–37.

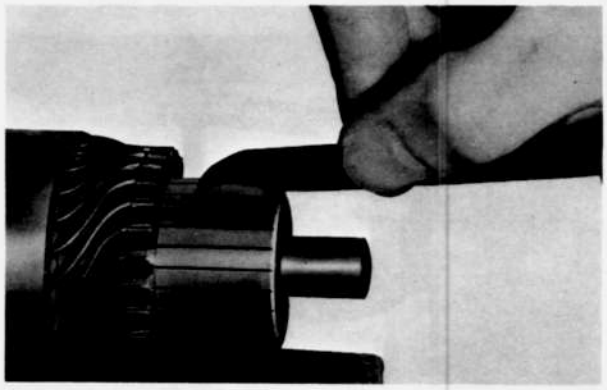

Fig. 5–37 Undercutting mica

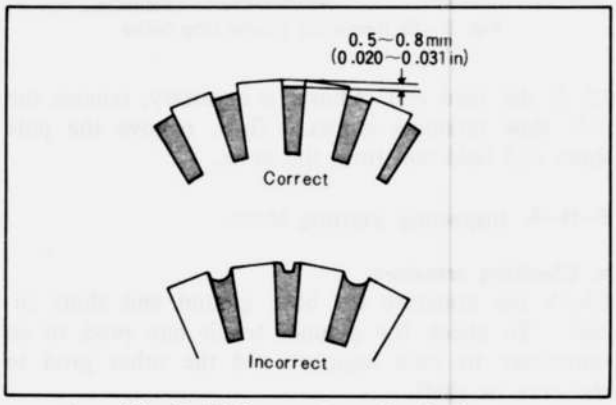

Fig. 5–38 Commutator mica depth

c. Checking field coil

To test the field coil for ground with an ohmmeter, place one prod on the yoke or pole core and the other prod to the field terminal. An infinite meter reading should be obtained. If a reading other than infinite is found, replace the field windings.

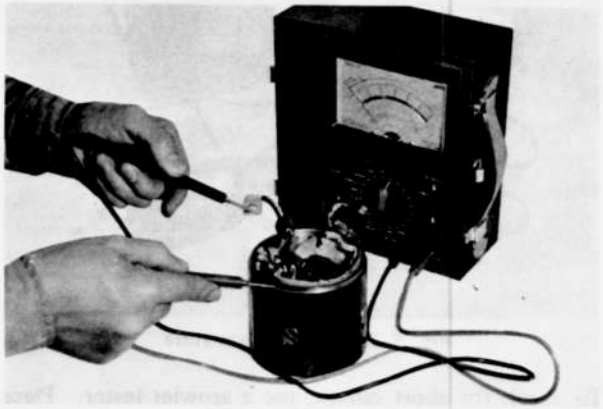

Fig. 5–39 Checking field coil for ground

d. Checking brush holder

Check the brush holder for ground. Touch one prod of an ohmmeter to the insulated brush holder and the other prod to the brush holder frame.

If the meter reading is other than infinite, the brush holder assembly is shorted and must be replaced. Repeat this test for the other insulated brush holder. Do not use this test on the two grounded brush holders.

e. Checking brushes and brush springs

Check the brushes and replace if they are worn down more than one third of their original length. Otherwise, the brush spring tension will be reduced, leading to an increase in the brush-commutator contact resistance. This will lower the torque and cause the burnt commutator surface.

The spring tension is 1.4 ~ 1.8 kg (49 ~ 63 oz). If the tension is too low, replace the springs.

f. Checking bushes

Check the clearance between the armature shaft and the bush. If it exceeds 0.2 mm (0.008 in), replace the bush.

5–H–5. Magnetic Switch Test

a. Pull-in coil test

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

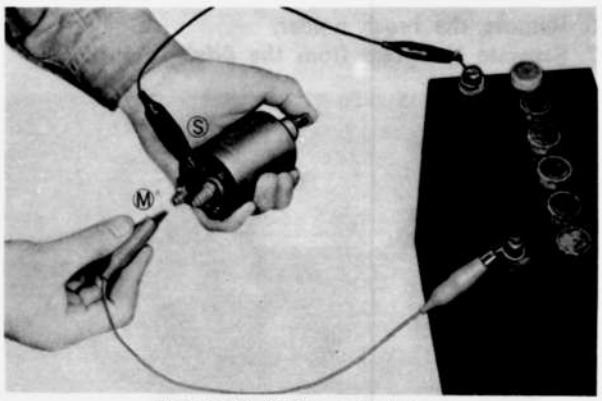

Fig. 5–40 Pull-in coil test

b. Holding coil test

Ground the (M) terminal to the magnetic switch body with a lead and impose the specified voltage (12V)

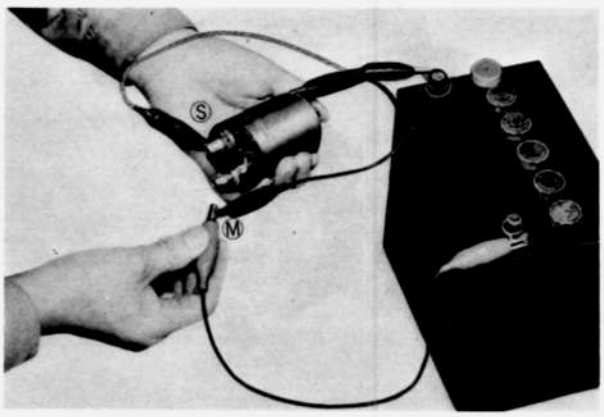

Fig. 5–41 Holding coil test

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.

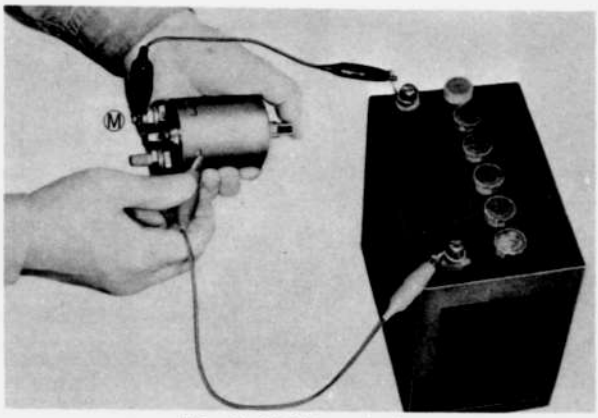

Fig. 5–42 Return test

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.

5–H–6. Assembling Starting Motor

To assemble the starting motor, reverse the procedure of Par. 5–H–3, **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 (0.020 ~ 0.079 in).

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

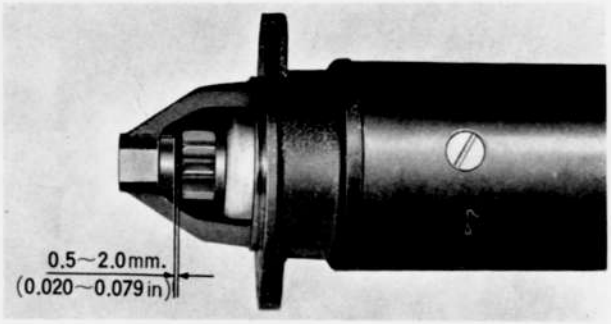

Fig. 5–43 Checking pinion position

SPECIAL TOOLS

49 0242 685A	Remote starter switch
49 0370 290	Alternator tester

CLUTCH

6–A. CLUTCH PEDAL ADJUSTMENT ..... 6 : 1
6–B. CLUTCH REMOVAL ..... 6 : 1
6–C. CLUTCH INSPECTION ..... 6 : 1
6–C–1. Checking Release Bearing and Fork ..... 6 : 1
6–C–2. Checking Pressure Plate and Cover Assembly ..... 6 : 2
6–C–3. Checking Clutch Disc ..... 6 : 2
6–C–4. Flywheel Inspection ..... 6 : 2
6–C–5. Checking Eccentric Shaft Rear Oil Seal ..... 6 : 3
6–C–6. Ring Gear Replacement ..... 6 : 3
6–C–7. Checking Pilot Bearing ..... 6 : 3
6–D. CLUTCH INSTALLATION ..... 6 : 3
6–E. CLUTCH MASTER CYLINDER ..... 6 : 3
6–E–1. Removing Clutch Master Cylinder ..... 6 : 3
6–E–2. Disassembling Clutch Master Cylinder ..... 6 : 4
6–E–3. Checking Clutch Master Cylinder ..... 6 : 4
6–E–4. Assembling Clutch Master Cylinder ..... 6 : 4
6–E–5. Installing Clutch Master Cylinder ..... 6 : 4
6–F. CLUTCH RELEASE CYLINDER ..... 6 : 4
6–F–1. Removing Clutch Release Cylinder ..... 6 : 4
6–F–2. Disassembling Clutch Release Cylinder ..... 6 : 4
6–F–3. Checking Clutch Release Cylinder ..... 6 : 5
6–F–4. Assembling Clutch Release Cylinder ..... 6 : 5
6–F–5. Installing Clutch Release Cylinder ..... 6 : 5
6–G. AIR BLEEDING ..... 6 : 5
SPECIAL TOOLS ..... 6 : 5

DESCRIPTION

The clutch is of the single dry disc type. The clutch assembly consists of the clutch disc assembly, clutch cover and pressure plate assembly, and clutch release mechanism.

The clutch operating mechanism is of the hydraulic type, consisting of a dash mounted master cylinder and a clutch release cylinder mounted on the clutch housing.

6–A. CLUTCH PEDAL ADJUSTMENT

The free travel of the clutch pedal before the push rod contacts with the piston should be **0.5 to 3.0 mm (0.02 to 0.12 in).**

To adjust the free travel, loosen the lock nut and turn the push rod until the proper adjustment is made. Tighten the lock nut after adjustment is completed.

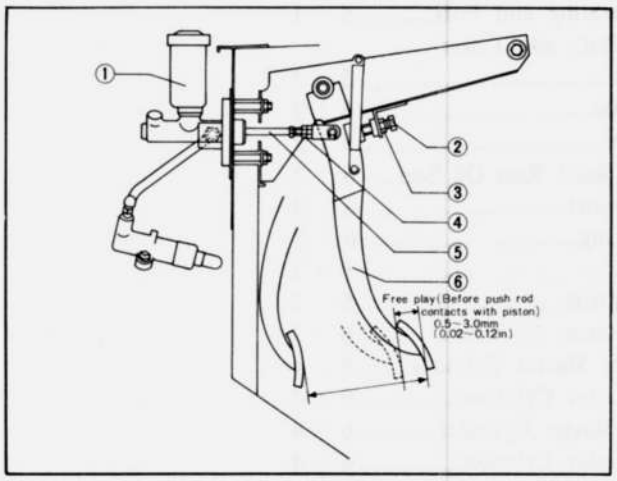

Fig. 6–1 Clutch pedal adjustment

1. Master cylinder
2. Height adjusting bolt
3. Lock nut
4. Lock nut
5. Rod
6. Pedal

6–B. CLUTCH REMOVAL

To remove the clutch from the vehicle, proceed as follows:

1. Remove the transmission.
2. Install the **ring gear brake** (49 1881 060).
3. Remove the 4 standard bolts and 2 reamer bolts holding the clutch cover assembly to the flywheel, and remove the clutch cover assembly and the clutch disc.
4. Straighten the tab of the lockwasher. With the **wrench** (49 0820 035), loosen the nut that attaches the flywheel to the eccentric shaft and remove the nut.
5. Using the **puller** (49 0823 300A), remove the flywheel from the eccentric shaft.

Note:
After removing the flywheel, inspect for oil leaking through the engine rear oil seal.

6. Pull the release fork outward until the spring clip of the fork releases from the ball pivot. Remove the fork release bearing from the clutch housing.

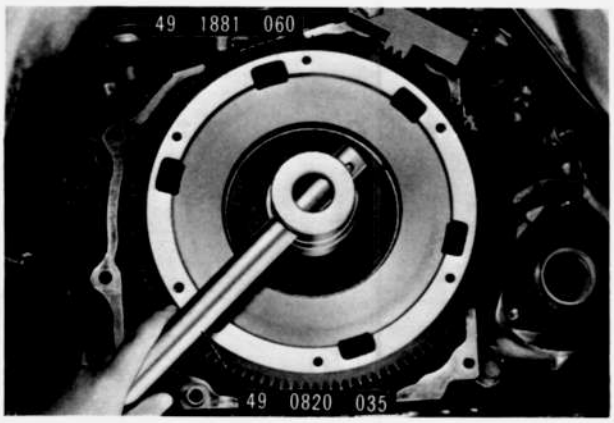

Fig. 6–2 Loosening flywheel nut

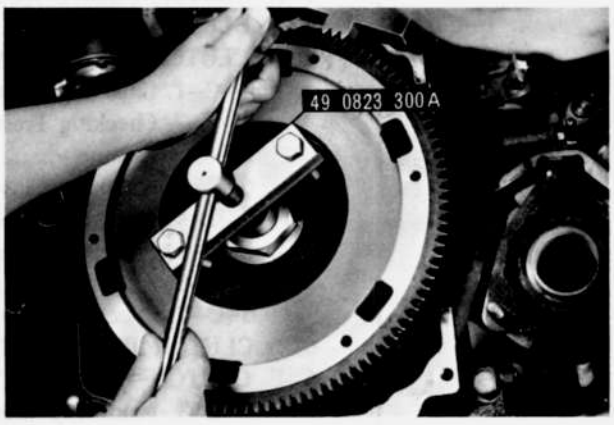

Fig. 6–3 Removing flywheel

6–C. CLUTCH INSPECTION

6–C–1. Checking Release Bearing and Fork

Note: The release bearing is packed with lubricant which is intended to last the whole life time of the bearing. Therefore, the bearing must not be washed in gasoline or any other solvent.

Check the release bearing by pressing and turning the front race slowly by hand. Replace if the bearing feels rough or seems noisy when turning.



Fig. 6–4 Checking release bearing

Examine the clutch housing carefully to be certain there are no burrs on the outer surface of the clutch

housing which pilots the release bearing.
Check the release fork for crack or bend. If necessary, replace the fork.

6–C–2. Checking Pressure Plate and Cover Assembly
Check the contact surfaces of the pressure plate with the clutch facing for wear, damage or warpage.
If it is slight, correct it by lapping with compound or by turning a lathe. But if severe, replace with a new one.
Check the diaphragm spring and cover and if any wear or damage is found, replace the pressure plate and cover assembly.

6–C–3. Checking Clutch Disc
Inspect the clutch disc for warpage with a dial indicator or a feeler gauge, as shown in Fig. 6–5.
If it is **more than 1.0 mm (0.039 in)**, replace with a new one.



Fig. 6–5 Checking clutch disc for warpage

Excessively worn facing will cause slippage or score the pressure plate and flywheel due to the projected heads of rivets.

Check the depth between the facing surface and the rivet using a depth gauge, as shown in Fig. 6–6. If the reading is **less than 0.30 mm (0.012 in)**, replace the clutch disc.

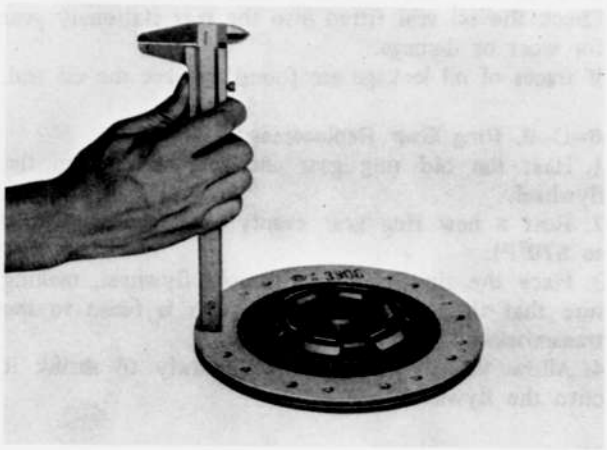

Fig. 6–6 Checking clutch disc for wear

If oil is evident on the facing, clean or replace the facing and eliminate the cause of oil leakage.
Make certain that the clutch disc slides easily on the main drive shaft without any excessive play.

6–C–4. Flywheel Inspection
Inspect the contact surface of the flywheel with the clutch facing for burnt surface, scored surface or rivet grooves.
If it is slight, it can be reconditioned by grinding in

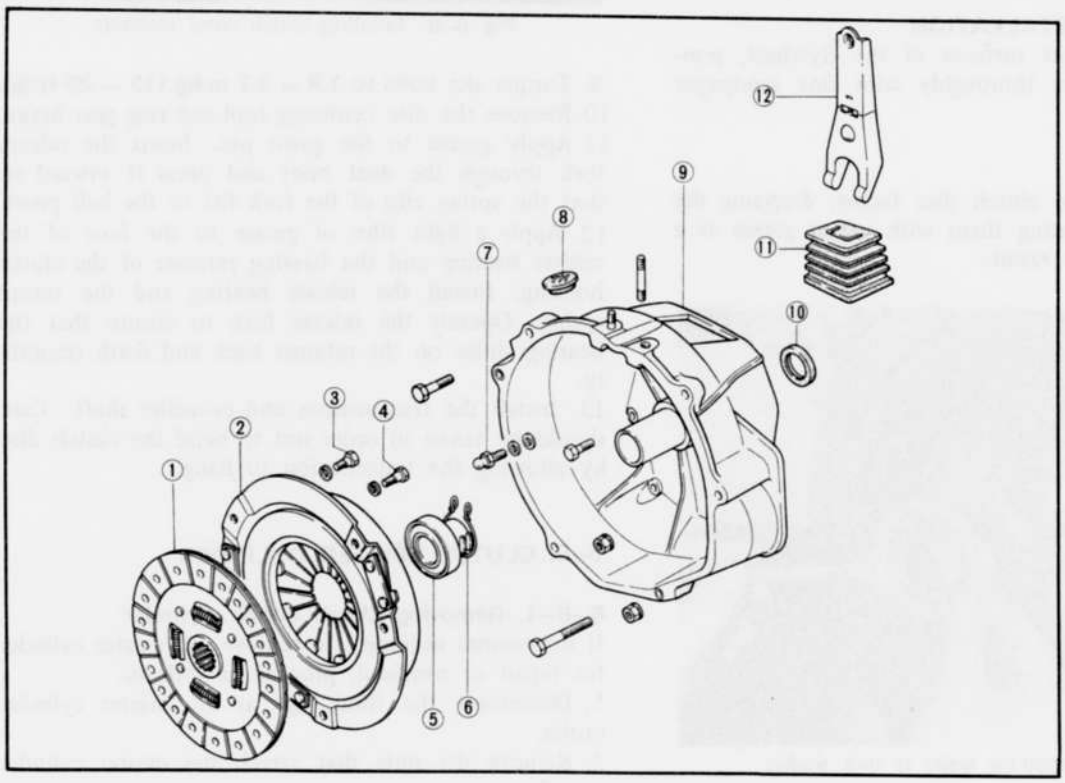

Fig. 6–7
Clutch components
1. Clutch disc
2. Clutch cover
3. Reamer bolt
4. Bolt
5. Release collar
6. Spring
7. Pivot pin
8. Top hole cover
9. Clutch housing
10. Oil seal
11. Dust cover
12. Release fork

a lathe. If the damage is deep, the flywheel should be replaced.
Check the ring gear teeth and replace if the ring gear teeth are broken, cracked or seriously burred.
Check the oil seal contacting surface of the flywheel for roughness. Repair or replace the flywheel if necessary.

6–C–5. Checking Eccentric Shaft Rear Oil Seal
Check the oil seal fitted into the rear stationary gear for wear or damage.
If traces of oil leakage are found, replace the oil seal.

6–C–6. Ring Gear Replacement
1. Heat the old ring gear and remove it from the flywheel.
2. Heat a new ring gear **evenly 250 to 300°C (480 to 570°F).**
3. Place the ring gear on the cold flywheel, making sure that the **chamfer on the teeth is faced to the transmission.**
4. Allow the ring gear to cool slowly to shrink it onto the flywheel.

Note:
On the vehicle equipped with an automatic transmission, the ring gear and drive plate should be replaced as an assembly.

6–C–7. Checking Pilot Bearing
Check the transmission main drive shaft pilot bearing which is pressed into the rear end of the eccentric shaft.
If the bearing is loose or rough, it should be replaced, as described in Par. 1–B–11.

6–D. CLUTCH INSTALLATION

1. Clean the contact surfaces of the flywheel, pressure plate and disc thoroughly with fine sandpaper or crocus cloth.

Note:
Avoid touching the clutch disc facing, dropping the parts or contaminating them with oil or grease as a clutch chatter may result.

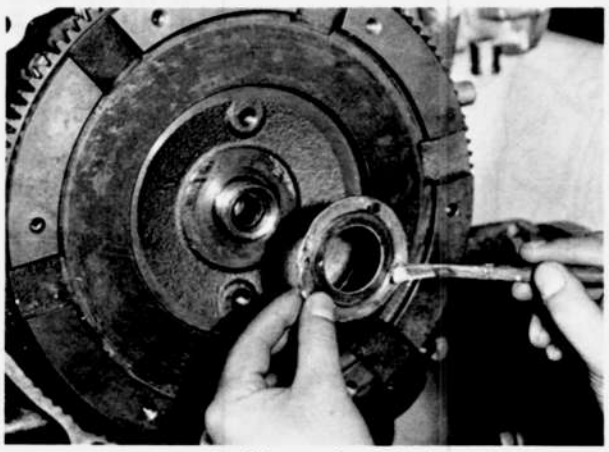

Fig. 6–8 Applying sealer to lock washer

2. Fit the key into the keyway on the eccentric shaft.
3. Install the flywheel onto the rear end of the eccentric shaft, aligning the keyway of the flywheel with the key.
4. Apply sealer on both sides of the lockwasher and place it in position. Install the nut.
5. Install the **ring gear brake** (49 1881 060) and with the **wrench** (49 0820 035) tighten the nut to **40 ~ 50 m-kg (289 ~ 362 ft-lb).**
6. Bend the tab of the lockwasher to prevent loosening.
7. Hold the clutch disc in its mounting position with the **clutch disc centering tool** (49 0813 310).
If the tool is not available, use a spare main drive shaft.
8. Install the clutch cover and pressure plate assembly, **aligning the "O" marks** of the clutch cover and flywheel and install the 4 standard and 2 reamer bolts finger tight. To avoid pressure plate cover distortion, tighten the bolts a few turns at a time until they are all tight.

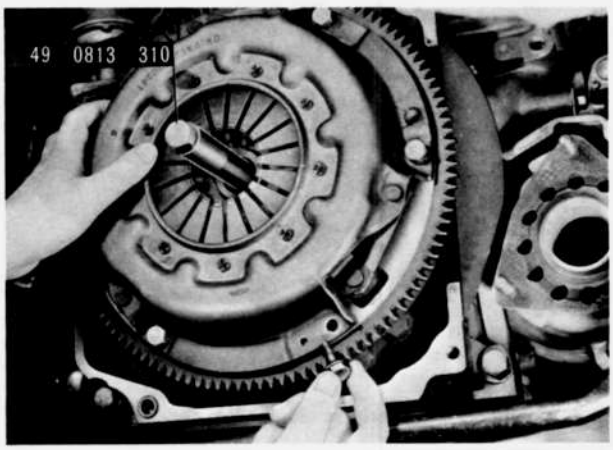

Fig. 6–9 Installing clutch cover assembly

9. Torque the bolts to **1.8 ~ 2.7 m-kg (13 ~ 20 ft-lb).**
10. Remove the disc centering tool and ring gear brake.
11. Apply grease to the pivot pin. Insert the release fork through the dust boot and press it inward so that the spring clip of the fork fits to the ball pivot.
12. Apply a light film of grease to the face of the release bearing and the bearing retainer of the clutch housing. Install the release bearing and the return spring. Operate the release fork to ensure that the bearing slides on the retainer back and forth smoothly.
13. Install the transmission and propeller shaft. Care should be taken in order not to bend the clutch disc by allowing the transmission to hang.

6–E. CLUTCH MASTER CYLINDER

6–E–1. Removing Clutch Master Cylinder
If it becomes necessary to remove the master cylinder for repair or overhaul, proceed as follows:
1. Disconnect the fluid pipe at the master cylinder outlet.
2. Remove the nuts that attach the master cylinder

to the dash panel.
3. Pull the master cylinder straight out and away from the dash panel.

6–E–2. Disassembling Clutch Master Cylinder

The procedures for disassembling the master cylinder after removing the master cylinder are as follows:
1. Clean the outside of the master cylinder thoroughly and drain the brake fluid.
2. Remove the reservoir from the cylinder.
3. Remove the dust boot from the cylinder.
4. Remove the piston stop wire with a screwdriver and remove the stop washer.
5. Remove the piston assembly, primary cup and return spring from the cylinder.

6–E–3. Checking Clutch Master Cylinder

1. Wash the parts in clean alcohol or brake fluid. **Never** use gasoline or kerosene. Blow the parts dry with compressed air.
2. Check the piston cups and replace if they are damaged, worn, softened, or swelled.
3. Examine the cylinder bore and piston for wear, roughness or scoring.
4. Check the clearance between the cylinder bore and the piston. If it is **more than 0.15 mm (0.006 in)**, replace the cylinder or piston.
5. Ensure that the compensating port on the cylinder is open.

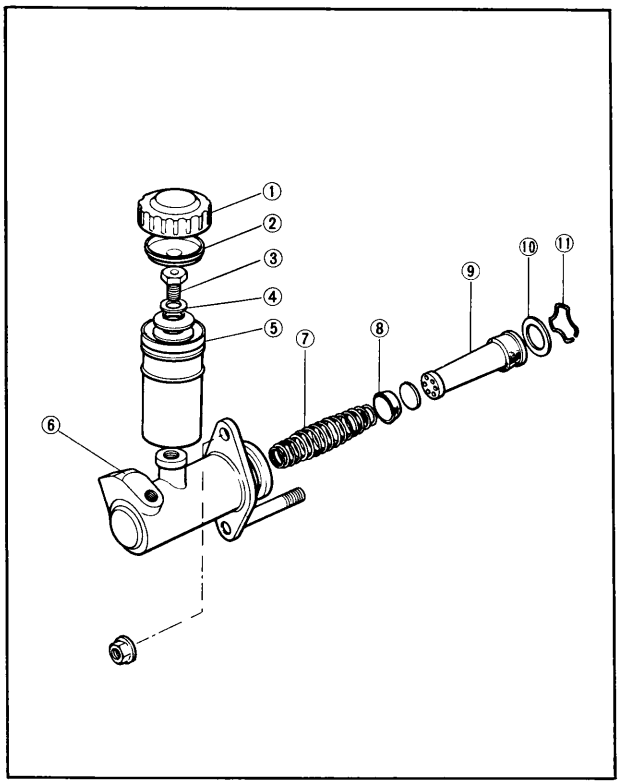

Fig. 6–10 Clutch master cylinder components
1. Cap
2. Fluid baffle
3. Bolt
4. Washer
5. Reservoir
6. Cylinder
7. Spring
8. Primary piston cup
9. Piston and secondary cup assembly
10. Piston stop washer
11. Piston stop wire

6–E–4. Assembling Clutch Master Cylinder

1. Before assembling, dip the piston and cups in clean brake fluid.
2. Install the reservoir to the cylinder.
3. Insert the return spring into the cylinder.
4. Install the primary cup so that the flat side of the cup goes toward the piston.
5. Fit the secondary cup onto the piston and install them into the cylinder.
6. Install the stop washer and stop wire.
7. Fill with brake fluid and operate the piston with a screwdriver until the fluid is ejected at the outlet.
8. Install the dust boot to the cylinder.

6–E–5. Installing Clutch Master Cylinder

1. Install the clutch master cylinder assembly onto the dash panel and tighten the nuts.
2. Connect the fluid pipe to the cylinder.
3. Fill with brake fluid.
4. Bleed the clutch hydraulic system, as described in Par 6–G.

6–F. CLUTCH RELEASE CYLINDER (Play-nonadjustment Type)

6–F–1. Removing Clutch Release Cylinder

1. Disconnect the fluid pipe at the clutch release cylinder.
2. Remove the nuts attaching the cylinder to the clutch housing. Remove the release cylinder.

6–F–2. Disassembling Clutch Release Cylinder

1. Clean the outside of the cylinder thoroughly.
2. Remove the dust boot from the cylinder.
3. Remove the release rod.
4. Remove the piston and cup assembly from the cylinder. If necessary, blow out with compressed air from the fluid passage.
5. Remove the spring.
6. Remove the bleeder screw and valve (steel ball).

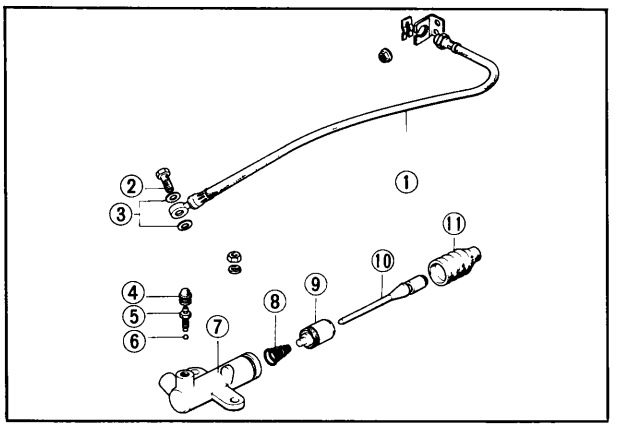

Fig. 6–11 Release cylinder components
1. Flexible hose
2. Connection bolt
3. Gasket
4. Rubber cap
5. Bleeder screw
6. Valve (steel ball)
7. Cylinder
8. Spring
9. Piston assembly
10. Release rod
11. Boot

6–F–3. Checking Clutch Release Cylinder

1. Wash the parts in clean alcohol or brake fluid. **Never use gasoline or kerosene.**
2. Check the piston cups and replace if they are damaged, worn, softened, or swelled.
3. Examine the cylinder bore and piston for wear, roughness or scoring.
4. Check the clearance between the cylinder bore and the piston. If it is **more than 0.15 mm (0.006 in)**, replace the cylinder or piston.
5. Ensure that the compensating port on the cylinder is open.

6–F–4. Assembling Clutch Release Cylinder

1. Install the spring into the cylinder.
2. Fit the piston cup to the piston and install them into the cylinder.
3. Install the release rod into the cylinder.
4. Install the dust boot.
5. Install the valve (steel ball) and bleeder screw into the bleeder hole. Fit the bleeder cap.

6–F–5. Installing Clutch Release Cylinder

1. Install the clutch release cylinder assembly to the clutch housing with two nuts.
2. connect the fluid pipe.
3. Fill the reservoir of the master cylinder with brake fluid and bleed the system, as described in Par. 6–G.

6–G. AIR BLEEDING

1. Remove the rubber cap from the bleeder screw and attach a vinyl tube to the bleeder screw.
2. Insert the free end of the vinyl tube into a suitable container while bleeding the clutch system.
3. Depress the clutch pedal several times quickly, then with the clutch pedal depressed.
Open the bleeder screw to expel the air.
Close the screw, then return the pedal to the full-released position.
4. Repeat this operation until air bubbles cease to appear at the free end of the vinyl tube.

Note:

a. During bleeding operation, the reservoir of the master cylinder must be kept at least 3/4 full of the brake fluid.
b. Never re-use brake fluid which has been drained from the clutch hydraulic system.

SPECIAL TOOLS

49 0820 035	Wrench for flywheel nut
49 0813 310	Clutch disc. centering tool
49 0823 300A	Flywheel puller
49 1881 060	Ring gear brake

TRANSMISSION

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TRANSMISSION

MAZDA RX-3 is equipped with a four speed manual transmission which is of the fully synchronized type with all gears except the reverse gear being in constant mesh.

The gearshift mechanism is a direct control with a floor-shift type.

The transmission gear ratio is as follows:

	Gear ratio
First	3.683
Second	2.263
Third	1.397
Top	1.000
Reverse	3.692

7–A. TRANSMISSION REMOVAL

When removing the transmission from the vehicle, proceed as follows:

1. Remove the gearshift lever knob.
2. Remove the boot for the gearshift lever.
3. Remove the bolts attaching the retainer cover to the gearshift lever retainer.
4. Pull the gearshift lever, shim and bush straight up and away from the gearshift lever retainer.
5. Disconnect the earth wire of the battery.
6. Remove the bolt attaching the power brake vacuum pipe clip to the clutch housing.
7. Remove the earth wire from the transmission case.
8. Remove the nuts attaching the clutch release cylinder and remove the clutch release cylinder.
9. Remove the one upper bolt securing the starting motor, then remove the three upper bolts and nuts securing the transmission to the engine rear end.
10. Raise the vehicle and support with stands.
11. Disconnect the wires of the starting motor and the reverse lamp switch.
12. Disconnect the speedometer cable from the extension housing.
13. Remove the bolts attaching the heat insulator to the exhaust front pipe, and remove the heat insulator.
14. Disconnect the exhaust front pipe from the exhaust pipe brackets by removing the bolts and nuts. Disconnect the exhaust front pipe flange from the exhaust manifold by removing the nuts. Remove the bolts and nuts attaching the front pipe flange to the main silencer, and remove the exhaust front pipe.
15. Remove the propeller shaft, as described in Par. 8–A–1, and insert the **main shaft holder** (49 0259 440) into the extension housing.
16. Remove the lower bolt securing the starting motor to the clutch housing and remove the starting motor.
17. Place a jack under the front side of the engine and support the engine with the jack.
18. Remove the bolts securing the transmission support to the body.
19. Remove the two lower bolts securing the transmission to the engine rear end.
20. Slide the transmission rearward until the main drive shaft clears the clutch disc and carefully withdraw it downward from the vehicle.

7–B. TRANSMISSION DISASSEMBLY

The procedures for disassembling the transmission after removing the transmission from the vehicle are as follows:

1. Place the transmission on a work stand.
2. Remove the drain plug, and drain the lubricant from the transmission. Clean the metal fillings adhered on the magnet of the drain plug if necessary. Refit the drain plug after draining lubricant.
3. Pull the release fork outward until the fork retaining spring release itself from the ball stud. Remove the fork and boot from the clutch housing.
4. Remove the nuts attaching the clutch housing, and remove the clutch housing and gasket.

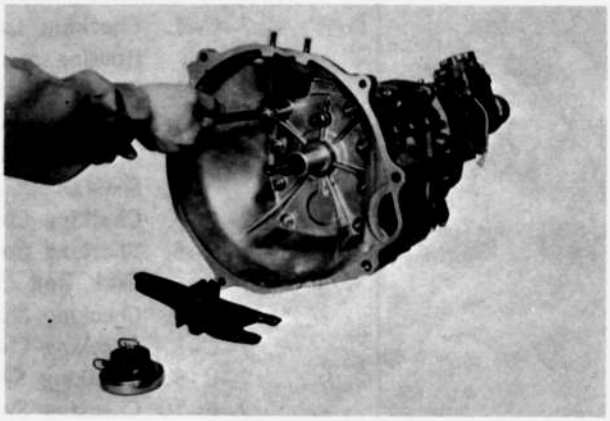

Fig. 7–1 Removing clutch housing

5. Remove the adjusting shim from the bearing bore of the clutch housing.
6. Remove the bolts attaching the gearshift lever retainer to the extension housing and remove the retainer and gasket.
7. Remove the nuts attaching the extension housing to the transmission case. With the control lever end in neutral, press the end to the left as far as it will go, and slide the extension housing off the transmission.
8. Remove the spring cap bolt and remove the spring and friction piece from the extension housing.
9. Remove the neutral switch from the extension housing.
10. Remove the bolt that attach the gearshift control lever end to the gearshift control lever, and remove the control lever end, key and control lever.

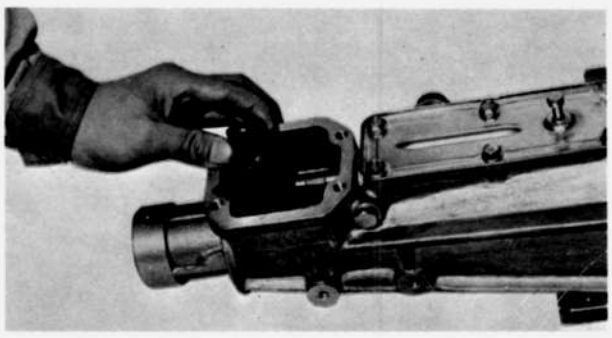

Fig. 7–2 Removing control lever end

11. Remove the speedometer sleeve lock plate, and remove the sleeve and driven gear assembly from the extension housing.
12. Remove the back-up lamp switch from the extension housing.
13. Remove the snap ring that secures the speedometer drive gear to the main shaft. Slide the drive gear off the main shaft, and remove the lock ball.
14. Evenly loosen the bolts securing the case cover to the transmission case and remove the cover and gasket.
15. Remove the three spring cap bolts and remove the detent springs and detent balls (locking balls) from the transmission case.

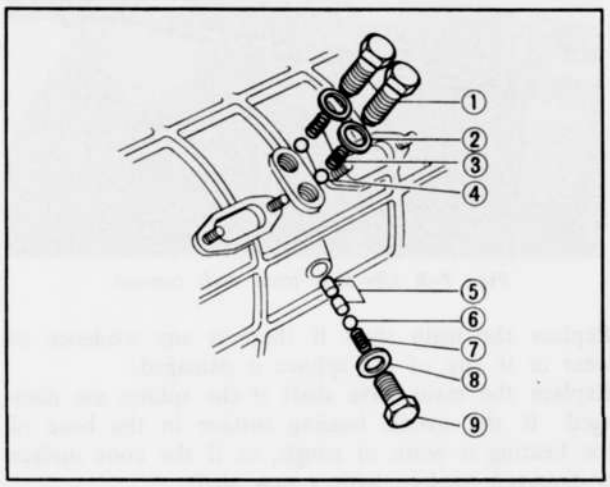

Fig. 7–3 Spring cap bolts

1. Spring cap bolt
2. Washer
3. Detent spring
4. Detent ball
5. Shift inter-lock pin
6. Detent ball
7. Detent spring
8. Washer
9. Spring cap bolt

16. Remove the nuts attaching the two blind covers to the transmission case and remove the blind covers and gaskets.
17. Slide the reverse shift fork rod with the reverse shift fork and reverse idle gear out the rear of the transmission case. Remove the attaching bolt from the reverse shift fork and remove the shift fork.
18. Remove the attaching bolt from the third-and-fourth shift fork. Slide the third-and-fourth shift fork rod out the rear of the transmission case.
19. Remove the attaching bolt from the first-and-second shift fork. Slide the first-and-second shift fork rod out the rear of the transmission case.
20. Straighten the tab of the lock washer, hold the rear end of the main shaft with the **holder** (Part No. 49 0259 440) as shown in Fig. 7–4 and loosen the main shaft lock nut. Slide the reverse gear off the rear of the main shaft, and remove the key.
21. Remove the snap ring from the rear end of the counter shaft and remove the counter reverse gear.
22. Remove the bolts attaching the bearing cover plate to the transmission case and remove the bearing cover plate.
23. Remove the reverse idler gear shaft from the transmission case.
24. Install the **synchronizer ring holder** (Part No. 49 0839 445) between the fourth synchronizer ring and the synchromesh gear on the main drive shaft.

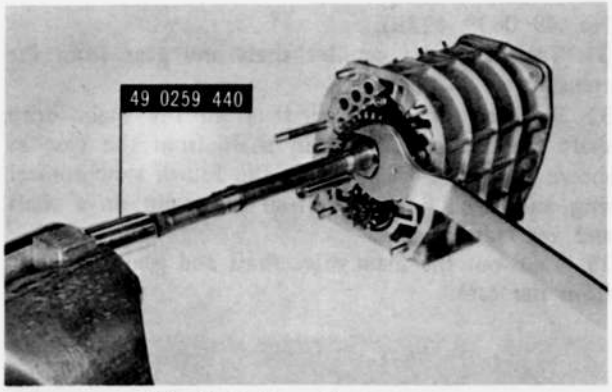

Fig. 7–4 Removing lock nut

25. Remove the snap ring that secures the counter shaft front bearing to the front end of the counter shaft. Using the **bearing puller** (Part No. 49 0839 425B) shown in Fig. 7–5, remove the counter shaft front bearing.

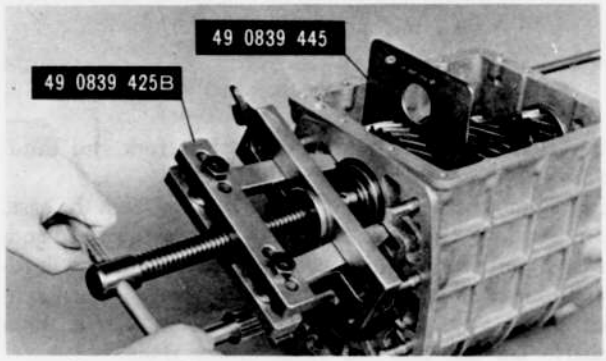

Fig. 7–5 Removing counter shaft front bearing

26. Remove the adjusting shim from the counter shaft front bearing bore of the transmission case.
27. Remove the counter shaft rear bearing from the counter shaft with the **puller** (Part No. 49 0839 425B).
28. Using the **puller** (Part No. 49 0839 425B) shown in Fig. 7–6, remove the main shaft bearing.
29. Remove the adjusting shim from the main shaft bearing bore of the transmission case.
30. Remove the snap ring that secures the main drive shaft bearing to the main drive shaft. Remove the main drive shaft bearing with the **puller** (Part

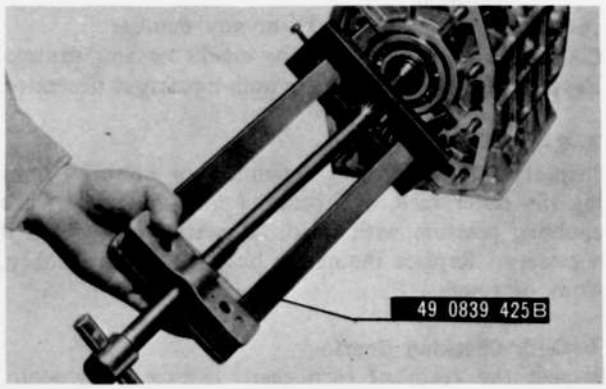

Fig. 7–6 Removing main drive shaft bearing

No. 49 0839 425B).
31. Take out the counter shaft and gear from the transmission case.
32. Separate the main shaft from the main drive shaft and remove the main shaft from the case as shown in Fig. 7–7. Remove the fourth synchronizer ring and needle bearing from the main drive shaft and gears assembly.
33. Take out the main drive shaft and gears assembly from the case.

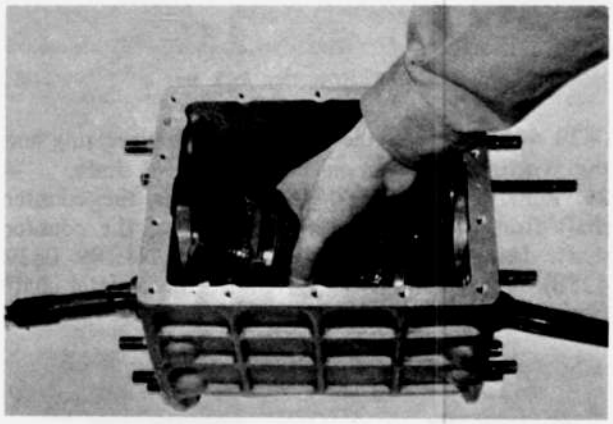

Fig. 7–7 Removing main shaft and gears assembly

34. Remove the first-and-second shift fork and third-and-fourth shift fork from the case.
35. Remove the two shift inter-lock pins from the case.
36. Remove the snap ring that secures the third-and-fourth clutch hub and sleeve assembly. Slide the third-and-fourth clutch hub and sleeve assembly, third synchronizer ring, third gear out the front of the main shaft. **Do not** mix the synchronizer rings.
37. Slide the first gear, first synchronizer ring and first gear sleeve out the rear of the main shaft.
38. Remove the second gear, second synchronizer ring, first-and-second clutch hub and sleeve assembly from the main shaft.

7–C. TRANSMISSION INSPECTION

Thoroughly clean all the parts. Inspect the parts for wear, damage and other defects. The parts found defective must be repaired or replaced.

7–C–1. Checking Transmission Case and Clutch Housing

Inspect the case for cracks or any damage.
Check the clutch housing for cracks or any damage. Replace the oil seal in the clutch housing if necessary.

7–C–2. Checking Bearings

Inspect each bearing for roughness or noise by holding the outer race, and rotating the inner race while applying pressure with hand. Replace the bearings if necessary. Replace the needle bearings that are broken, worn or rough.

7–C–3. Checking Gears

Inspect the teeth of each gear. If excessively worn, broken or chipped, replace with new gear. Excessive wear of the gears causes increase of backlash, which results in producing noises or may cause the gear to work off while running.

7–C–4. Checking Main Shaft and Main Drive Shaft

Check the main shaft run-out with a dial indicator. If the run-out exceeds **0.03 mm (0.0012 in),** correct with a press or replace with a new one.

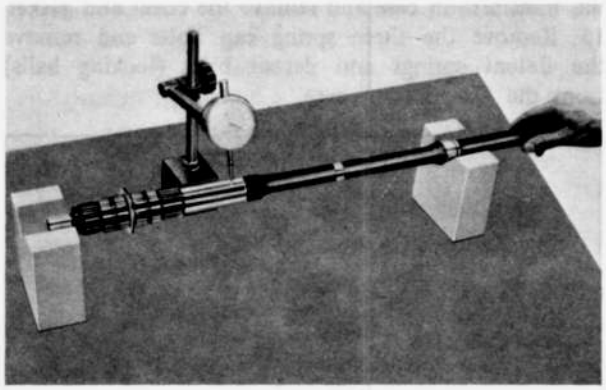

Fig. 7–8 Checking main shaft run-out

Replace the main shaft if there is any evidence of wear or if any of the splines is damaged.
Replace the main drive shaft if the splines are damaged. If the needle bearing surface in the bore of the bearing is worn or rough, or if the cone surface is damaged, replace with a new shaft.

7–C–5. Checking Counter Shaft

Check the teeth of the counter shaft gear for wear or damage. Replace the counter shaft if it is bent, scored or worn.

7–C–6. Checking Control Lever and Shift Fork Rod

Check the contact surface of the shift fork rod with the detent ball for wear or damage.
Check the contact surface of the shift fork rod with the control lever for wear. The clearance between the shift fork rod and the control lever should be **less than 0.8 mm (0.031 in).**

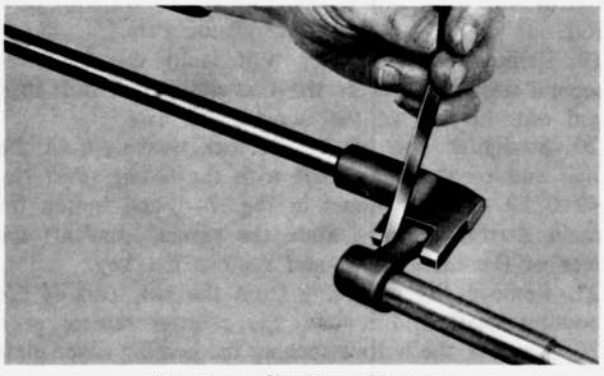

Fig. 7–9 Checking clearance

7–C–7. Checking Shift Fork

Check the contact surface of the shift forks with the clutch sleeve for wear or damage. The clearance

between the shift fork and the clutch sleeve should be **less than 0.5 mm (0.020 in).**

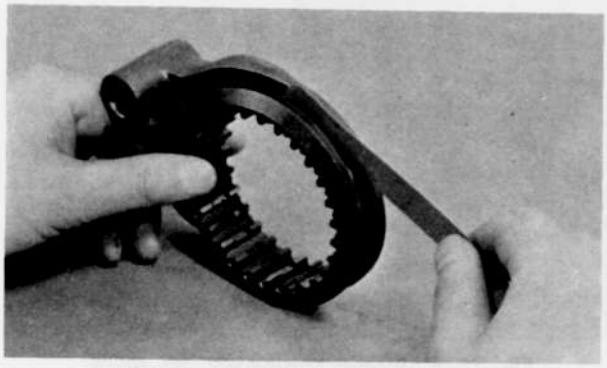

Fig. 7–10 Checking clearance

7–C–8. Checking Clutch Sleeve

Check the clutch sleeves for free movement on their hubs.

Check the splines of the clutch sleeve for wear or damage.

Check the contact surface of the clutch sleeve with the shift fork for wear or damage.

7–C–9. Checking Synchronizer Ring

1. Check the synchromesh gear on the synchronizer ring for wear or damage.
2. Check the tapered portion for uneven wear or

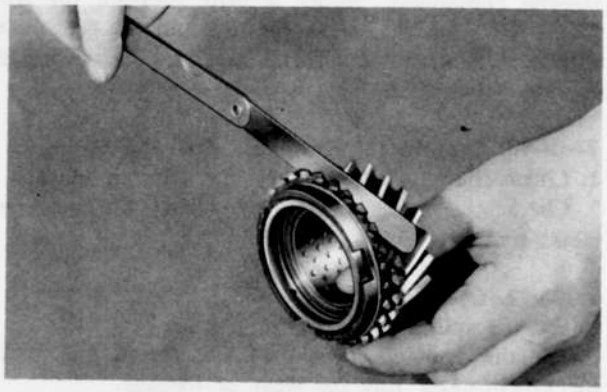

Fig. 7–11 Checking clearance

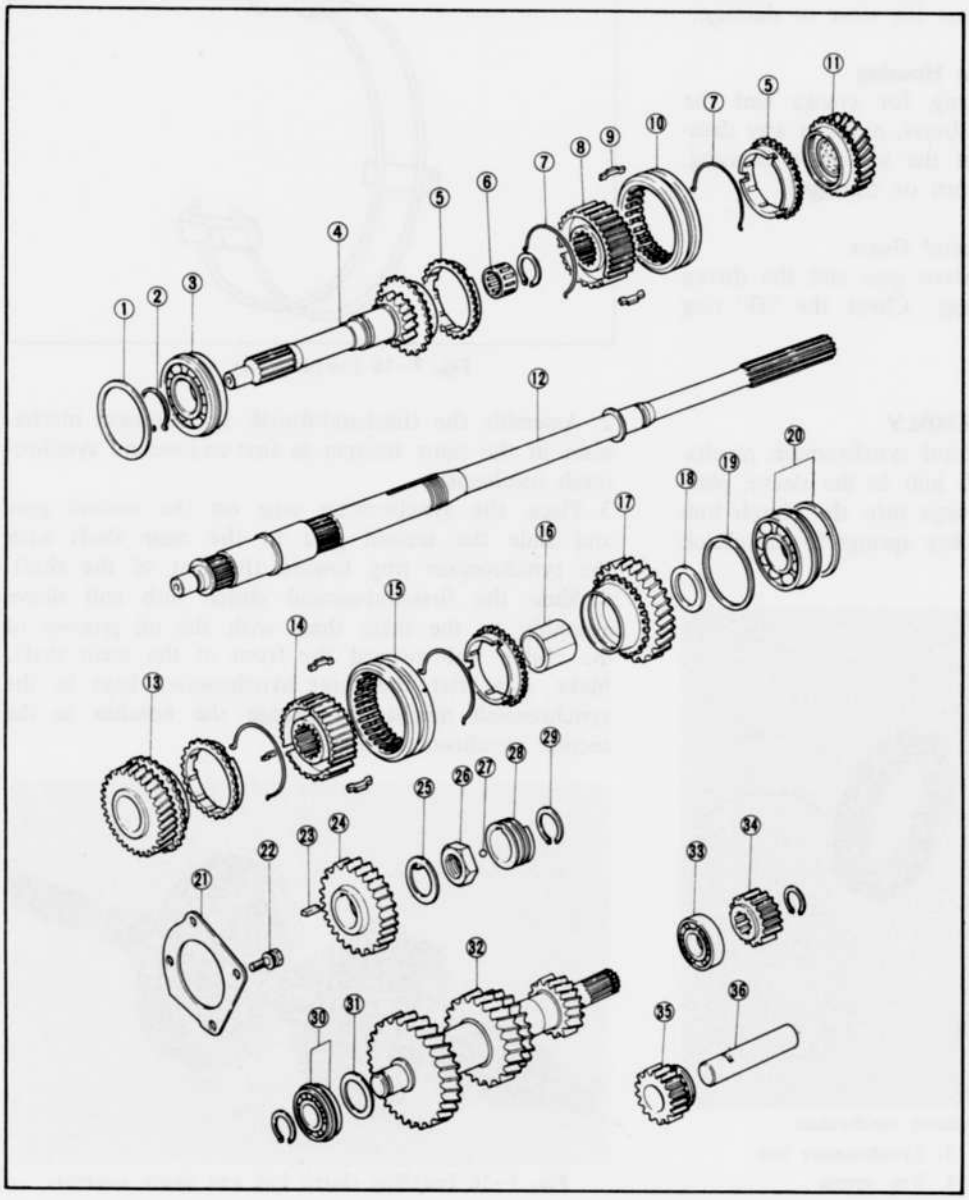

Fig. 7–12
Shafts and gears

1. Adjusting shim
2. Snap ring
3. Main drive shaft bearing
4. Main drive shaft
5. Synchronizer ring
6. Needle bearing
7. Synchronizer key spring
8. Third-and-fourth clutch hub
9. Synchronizer key
10. Clutch hub sleeve
11. Third gear
12. Main shaft
13. Second gear
14. First-and-second clutch hub
15. Clutch hub sleeve
16. Gear sleeve
17. First gear
18. Thrust washer
19. Adjust shim
20. Ball bearing and clip
21. Bearing stopper
22. Bolt
23. Key
24. Reverse gear
25. Lock washer
26. Lock nut
27. Steel ball
28. Speedometer drive gear
29. Snap ring
30. Ball bearing and clip
31. Adjust shim
32. Counter shaft
33. Needle bearing
34. Counter reverse gear
35. Reverse idler gear
36. Reverse idler gear shaft

damage. Also place the ring on the gear cone, and check the clearance between the gear and the ring. If the clearance is **less than 0.8 mm (0.031 in)**, replace the synchronizer ring.

3. If the contact between the ring and the gear cone is incorrect, or if a new synchronizer ring is used, lap the synchronizer ring with the gear cone using a lapping compound. Apply a light pressure for lapping. After lapping, clean the ring and the gear cone with a suitable solvent, then check the clearance and contact between the ring and the gear cone.

7–C–10. Checking Synchronizer Key and Spring

1. Check the synchronizer key for wear or damage.
2. Check the synchronizer key spring for wear or weakness.

7–C–11. Checking Clutch Hub

Check the splines for wear or damage.
Check the contact surface of the clutch hub with the synchronizer ring for wear or damage.
Check the contact surface of the clutch hub with the thrust surface of the gears for wear or damage.

7–C–12. Checking Extension Housing

Inspect the extension housing for cracks and the machined mating surface for burrs, nicks or any damage. Inspect the oil seal in the extension housing. Replace them if they are worn or damaged.

7–C–13. Checking Speedometer Gears

Check the drive gear and driven gear and the driven gear shaft for wear or damage. Check the "O" ring for weakness or damage.

7–D. TRANSMISSION ASSEMBLY

1. Assemble the first-and-second synchromesh mechanism by installing the clutch hub to the sleeve, placing the three synchronizer keys into the clutch hub key slots and installing the key springs to the clutch hub.

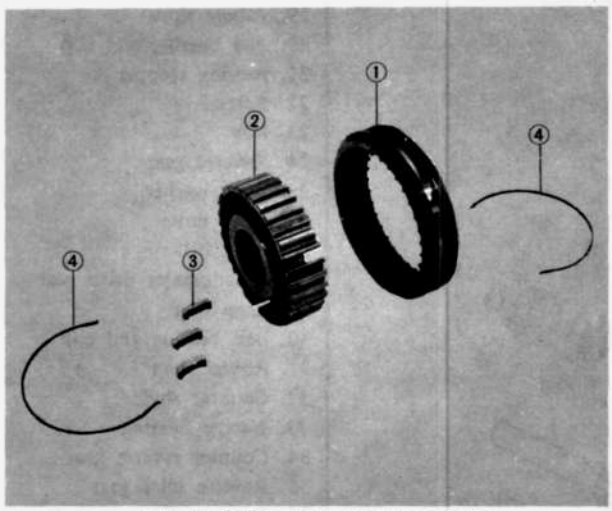

Fig. 7–13 Synchromesh mechanism

1. Clutch sleeve
2. Clutch hub
3. Synchronizer key
4. Key spring



Fig. 7–14 Installing synchronizer key spring

Note :
When installing the key springs, the open ends of the springs should be kept parallel as shown in Fig. 7–15.

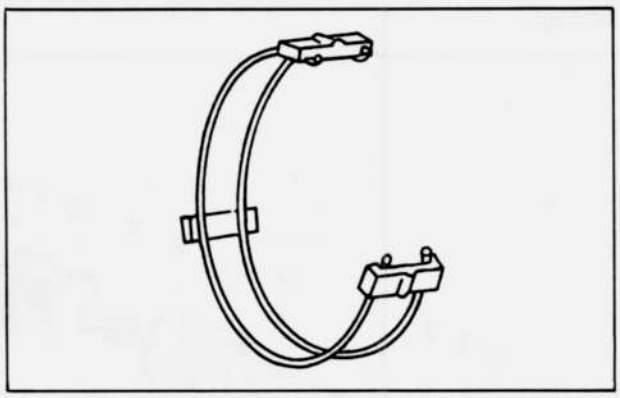

Fig. 7–15 Installing key spring

2. Assemble the third-and-fourth synchromesh mechanism in the same manner as first-and-second synchromesh mechanism.
3. Place the synchronizer ring on the second gear and slide the second gear to the main shaft with the synchronizer ring toward the rear of the shaft.
4. Slide the first-and-second clutch hub and sleeve assembly to the main shaft with the oil grooves of the clutch hub toward the front of the main shaft. Make sure that the three synchronizer keys in the synchromesh mechanism engage the notches in the second synchronizer ring.

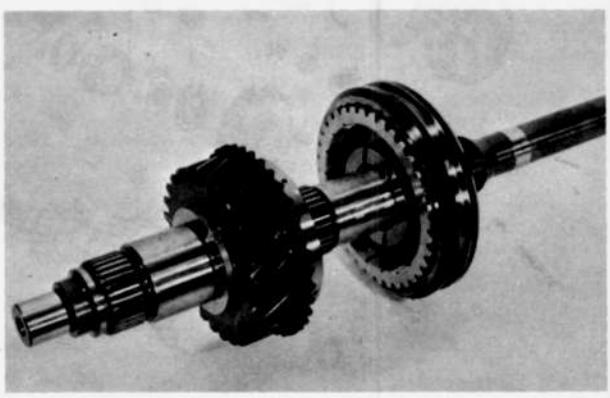

Fig. 7–16 Installing clutch hub and sleeve assembly

5. Slide the first gear sleeve to the main shaft.
6. Place the synchronizer ring on the first gear and slide the first gear to the main shaft with the synchronizer ring toward the front of the shaft. Rotate the first gear as necessary to engage the three notches shaft in the synchronizer ring with the synchronizer keys in the first-and-second.
7. Install the original thrust washer to the main shaft.

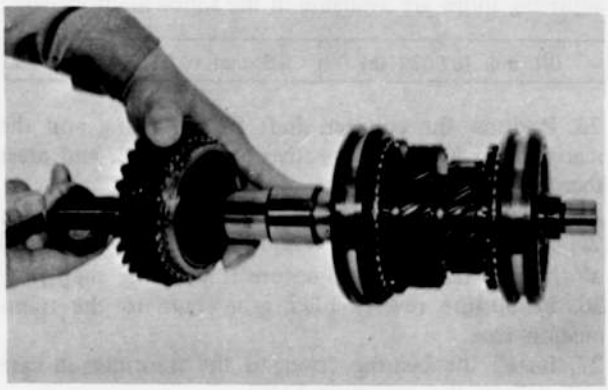

Fig. 7–17 Installing first gear

8. Place the synchronizer ring on the third gear and slide the third gear to the front of the main shaft with the synchronizer ring toward the front.
9. Slide the third-and-fourth clutch hub and sleeve assembly to the front of the main shaft making sure

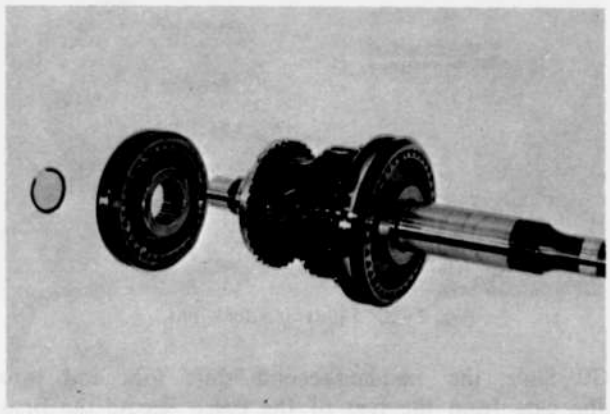

Fig. 7–18 Installing clutch hub and sleeve assembly

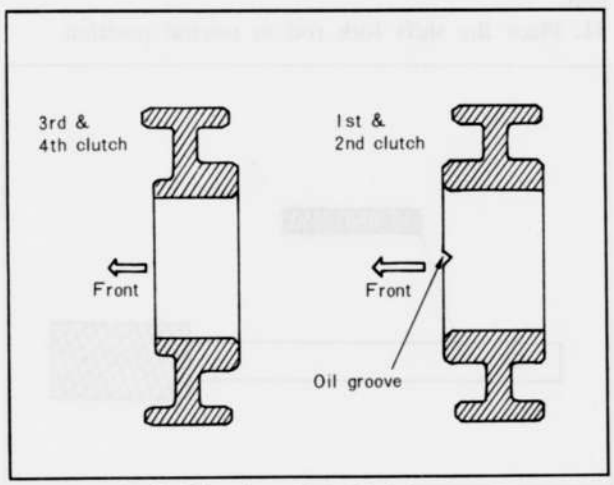

Fig. 7–19 Direction of clutch hub assembly

that the three synchronizer keys in the synchromesh mechanism engage the notches in the synchronizer ring.

Note :
The direction of the third-and-fourth clutch hub and sleeve assembly should be as shown in Fig. 7–19.

10. Install the snap ring to the front of the main shaft.
11. Position the main shaft and gears assembly in the case.

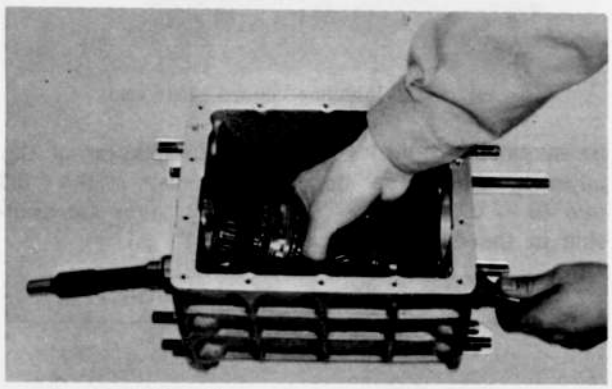

Fig. 7–20 Installing main shaft and gears assembly

12. Place the needle bearing to the front end of the main shaft.
13. Place the synchronizer ring on the third-and-fourth clutch hub making sure that the three synchronizer keys in the third-and-fourth synchromesh mechanism engage the notches in the synchronizer ring.
14. Install the main shaft and gears assembly into the transmission case. Then, engage the main shaft and gears assembly with the main drive shaft.
15. Position the first-and-second shift fork and third-and-fourth shift fork in the groove of the clutch hub and sleeve assembly, as shown in Fig. 7–21.

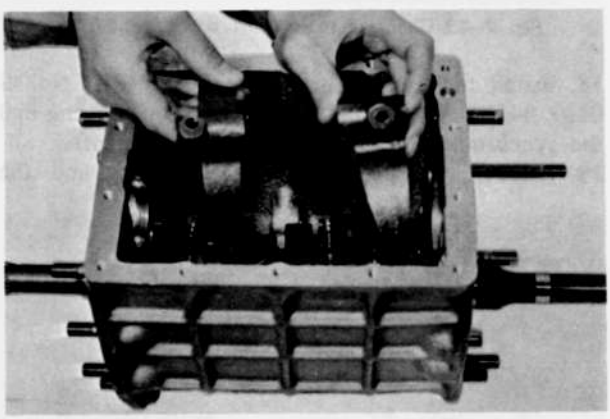

Fig. 7–21 Installing shift forks

16. Install the counter shaft gear in the case, making sure that the counter shaft gear engage each gear of the main shaft assembly, as shown in Fig. 7–22.
17. Check the main shaft bearing end play, proceed as follows : Measure the depth of the main shaft bearing bore in the clutch housing by using a depth gauge. Then, measure the main shaft bearing height shown in Fig. 7–23. The difference between the two

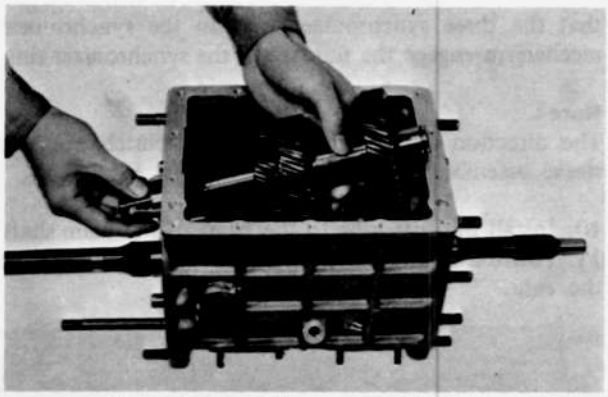

Fig. 7–22 Installing counter shaft gear

measurements indicates the required thickness of the adjusting shim. The standard end play is **0 ~ 0.1 mm (0 ~ 0.0039 in).** The adjusting shims are available in the following thickness :

0.1 mm (0.0039 in)	0.3 mm (0.0118 in)

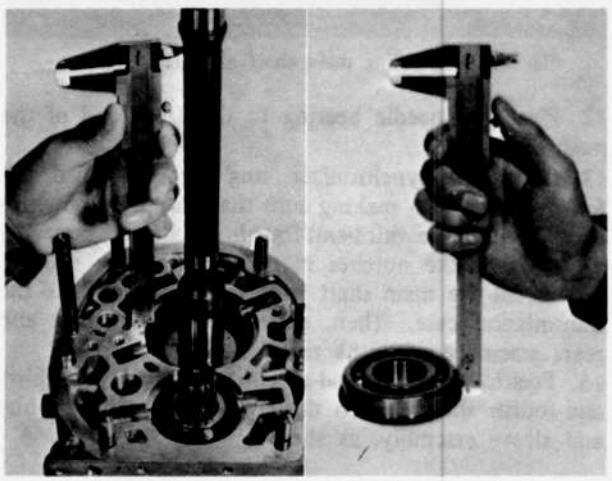

Fig. 7–23 Checking main shaft bearing end play

18. Install the **synchronizer ring holder** (Part No. 49 0839 445) between the fourth synchronizer ring and the synchromesh gear on the main drive shaft.
19. Position the main drive shaft bearing and the main shaft bearing in their respective bearing bore, and press them in by using a press.
20. Install the snap ring to secure the main drive shaft bearing.
21. Remove the synchronizer ring holder.
22. Check the counter shaft bearing end play in the same manner for the main shaft bearing end play. The standard clearance is **0 ~ 0.1 mm (0 ~ 0.0039 in).** The adjusting shims are available in the following thickness :

0.1 mm (0.0039 in)	0.3 mm (0.0118 in)

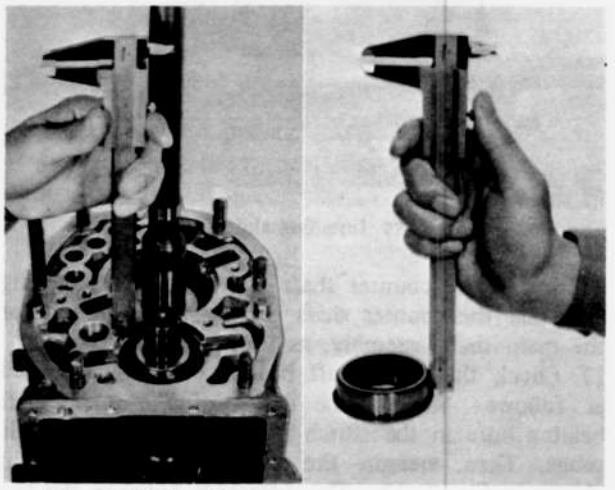

Fig. 7–24 Checking counter shaft bearing end play

23. Position the counter shaft front bearing and the rear bearing in their respective bearing bore, and press them in by using a press.
24. Install the snap ring to secure the front bearing.
25. Install the counter reverse gear to the rear end of the counter shaft and secure it with the snap ring.
26. Install the reverse idler gear shaft to the transmission case.
27. Install the bearing cover to the transmission case and tighten the attaching bolts.
28. Install the reverse gear with the key to the main shaft.
29. Tighten the main shaft lock nut to **20.0 ~ 28.0 m-kg (145 ~ 203 ft-lb),** by using the **holder** (Part No. 49 0259 440).

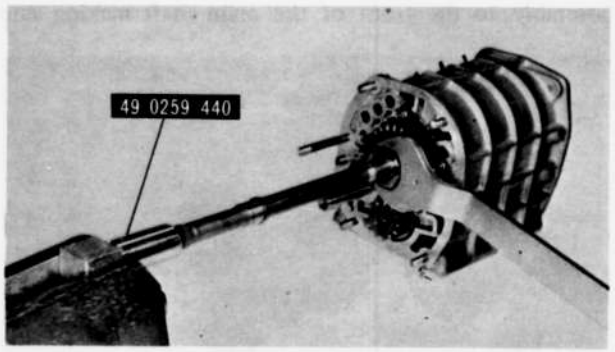

Fig. 7–25 Tightening lock nut

30. Slide the first-and-second shift fork rod into the case from the rear of the case. Secure the first-and-second shift fork to the shift rod with the lock bolt.
31. Place the shift fork rod in neutral position.

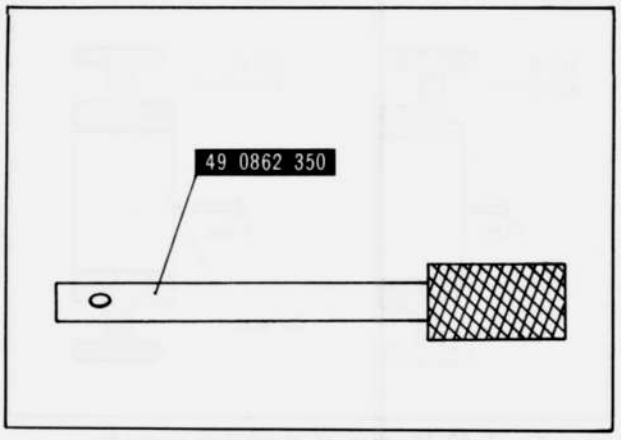

Fig. 7–26 Shift fork rod guide

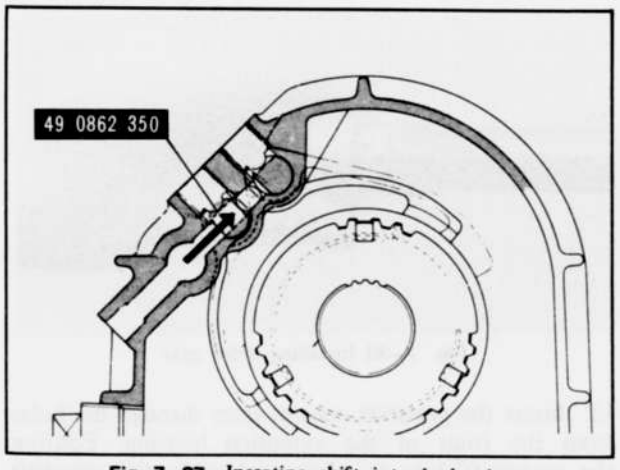

Fig. 7–27 Inserting shift inter-lock pin

Using the **shift fork rod guide** (Part No. 49 0862 350) shown in Fig. 7–26, insert the shift interlock pin into the case, as shown in Fig. 7–27.

32. Slide the third-and-fourth shift fork rod into the case from the rear of the case. Secure the third-and-fourth shift fork to the shift rod with the lock bolt.

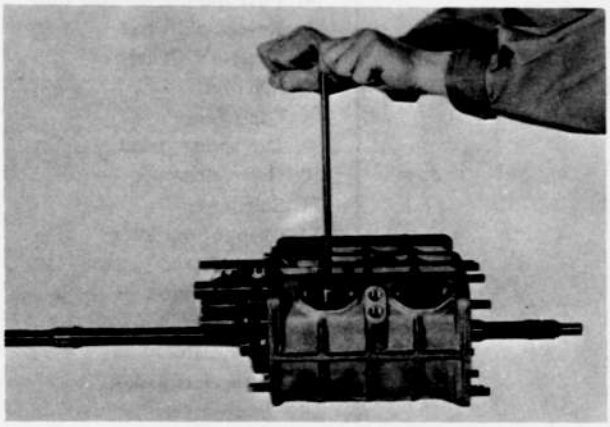

Fig. 7–28 Securing shift fork

33. Insert the shift inter-lock pin into the case by using the **rod guide** (Part No. 49 0862 350).

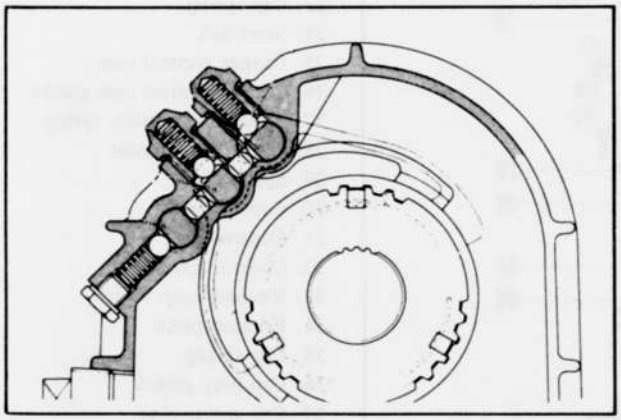

Fig. 7–29 Inserting shift inter-lock pin

34. Install the reverse shift fork to the reverse shift fork rod and secure the shift fork with the lock bolt.

35. Slide the reverse shift fork rod with the reverse shift fork and reverse idler gear into the case from the rear of the case.

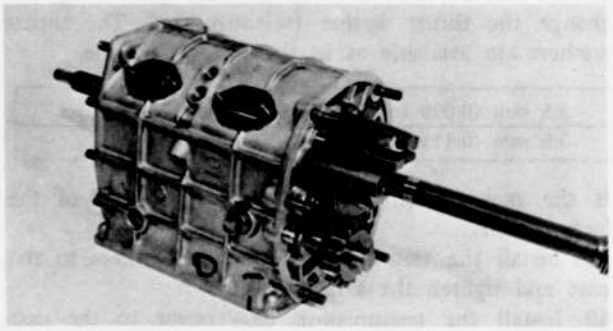

Fig. 7–30 Installing reverse idle gear

36. Position the three detent balls and three springs into the case and install the spring cap bolts.

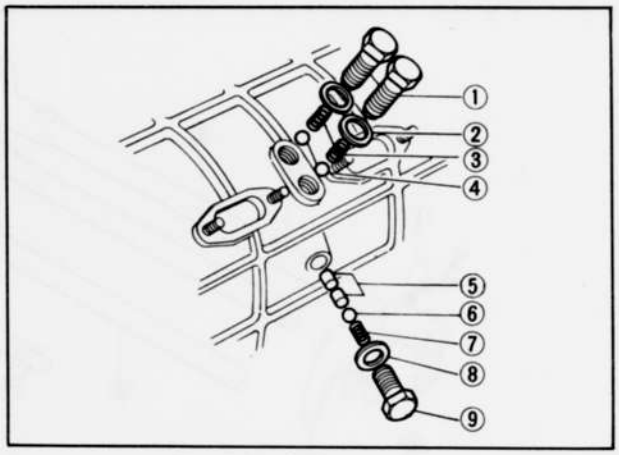

Fig. 7–31 Spring cap bolts

1. Spring cap bolt
2. Washer
3. Detent spring
4. Detent ball
5. Shift inter-lock pin
6. Detent ball
7. Detent spring
8. Washer
9. Spring cap bolt

37. Place the third-and-fourth clutch sleeve in the third gear.

38. Check the clearance between the synchronizer key and the exposed edge of the synchronizer ring with a feeler gauge. This measurement should be

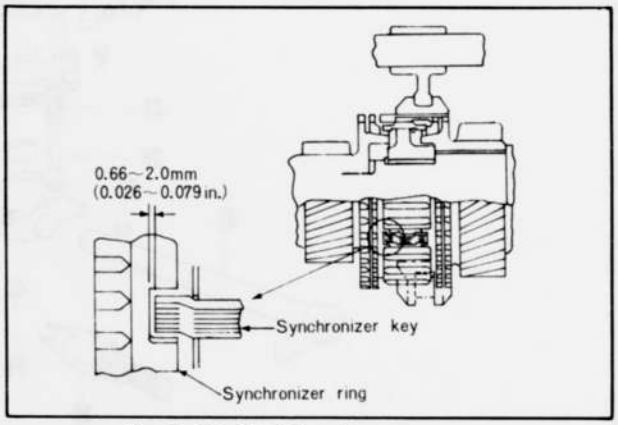

Fig. 7–32 Checking clearance

0.66 ~ 2.0 mm (0.026 ~ 0.079 in). If the measurement is greater than 2.0 mm (0.079 in), the synchronizer key could pop out of position.
If the measurement exceeds 2.0 mm (0.079 in), exchange the thrust washer (selective fit). The thrust washers are available as in the following table.

2.5 mm (0.098 in)	3.5 mm (0.138 in)
3.0 mm (0.118 in)	

If the measurement corrects, bend the tab of the lock washer.
39. Install the two blind covers and gaskets to the case and tighten the attaching nuts.
40. Install the transmission case cover to the case and tighten the attaching bolts.
41. Install the lock ball, speedometer drive gear and snap ring to the main shaft from the rear of the main shaft.

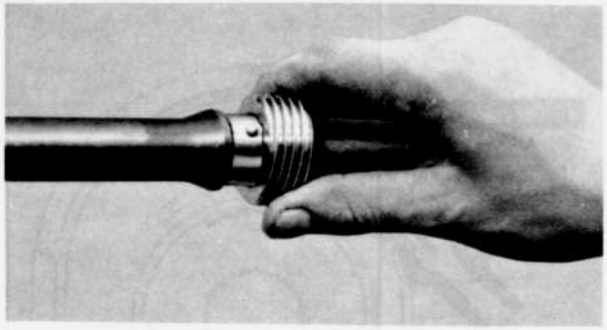

Fig. 7–33 Installing drive gear

42. Insert the gearshift control lever through the holes from the front of the extension housing. Position the woodruff key in place and slide the gearshift control lever end to the gearshift control lever. Secure the lever end to the control lever with the bolt.
43. Install the neutral switch to the extension housing.

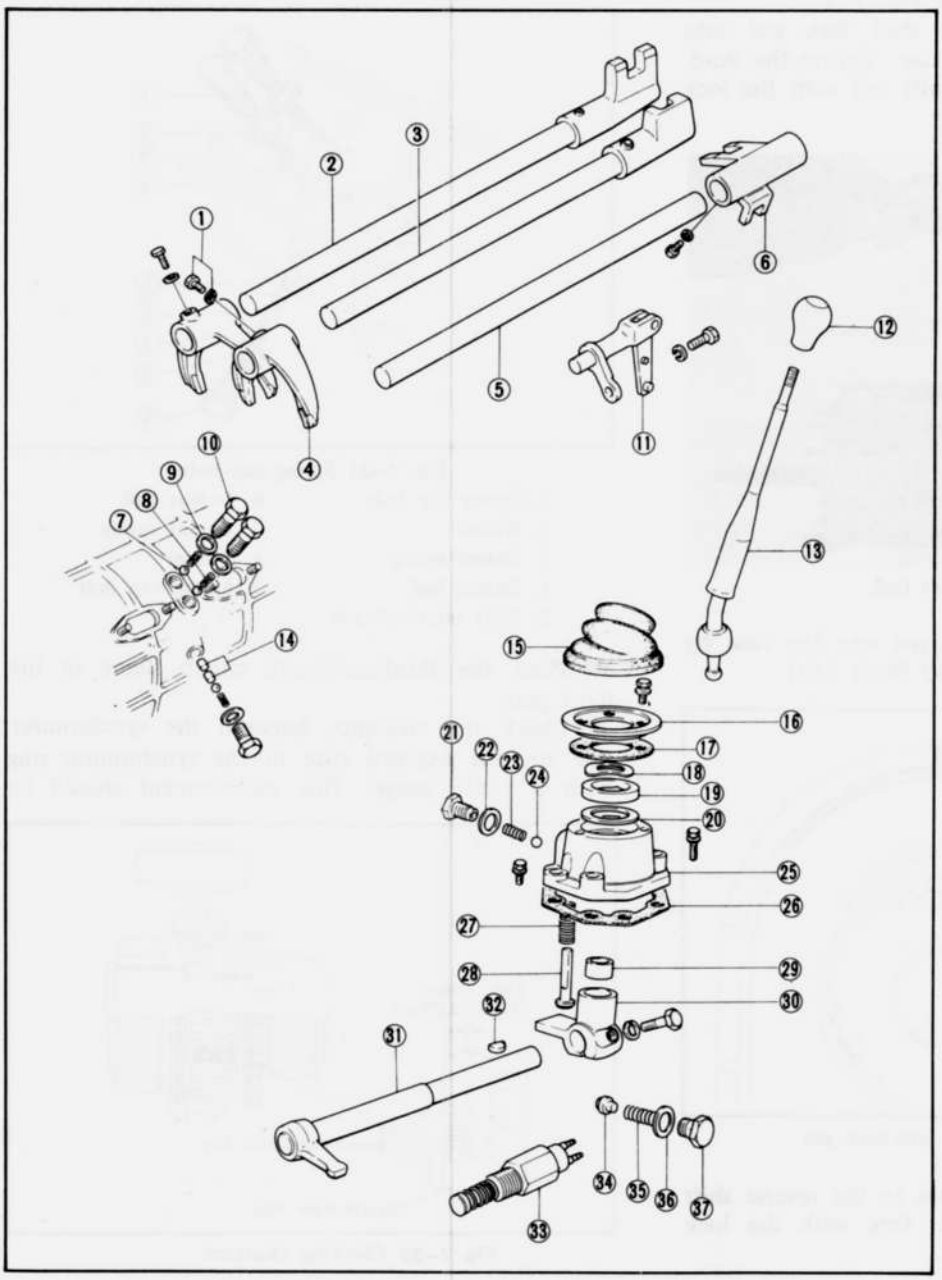

Fig. 7–34 Gear shift mechanism
1. Third-and-fourth shfit fork
2. Third-and-fourth shift rod
3. First-and-second shift rod
4. First-and-second shift fork
5. Reverse shift rod
6. Reverse shift fork
7. Steel ball
8. Cap spring
9. Cap spring gasket
10. Cap spring plug
11. Shift lever
12. Change lever knob
13. Change lever
14. Interlock pin
15. Dust boot
16. Cover plate
17. Cover plate gasket
18. Wave washer
19. Bush
20. Shim
21. Cap spring plug
22. Cap spring gasket
23. Cap spring
24. Steel ball
25. Change control case
26. Change control case gasket
27. Select lock spindle spring
28. Select lock spindle
29. Spring seat
30. Control end
31. Control lever
32. Control lever key
33. Reverse lamp switch
34. Friction piece
35. Cap spring
36. Cap plug gasket
37. Cap spring plug

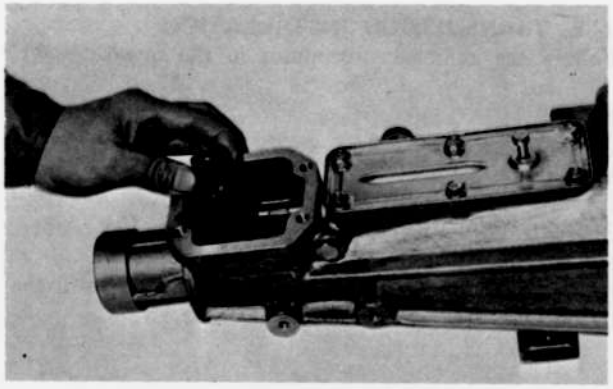

Fig. 7–35 Installing control lever end

and tighten the switch.
44. Position the spring and friction piece in the extension housing and tighten the spring cap bolt to the extension housing.
45. Install the back-up lamp switch to the extension housing and tighten the switch.
46. Insert the speedometer driven gear assembly to the extension housing and secure it with the bolt and lock plate.

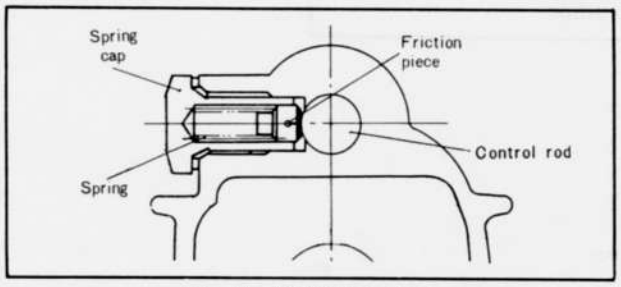

Fig. 7–36 Friction piece

47. Place the gasket on the rear of the transmission case and position the extension housing on the transmission case with the gearshift control lever end laid down to the left as far as it will go. Tighten the attaching nuts.

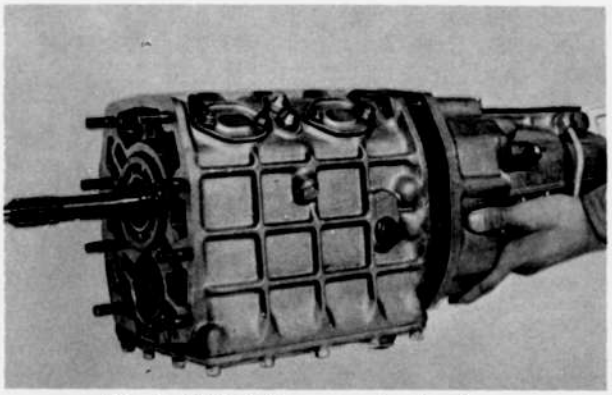

Fig. 7–37 Installing extension housing

48. Check to ensure that the gearshift control lever operates properly.
49. Insert the select lock spindle and spring from the inside of the gearshift lever retainer. Position the lock ball and spring in alignment with the select lock spindle and tighten the spring cap bolt.

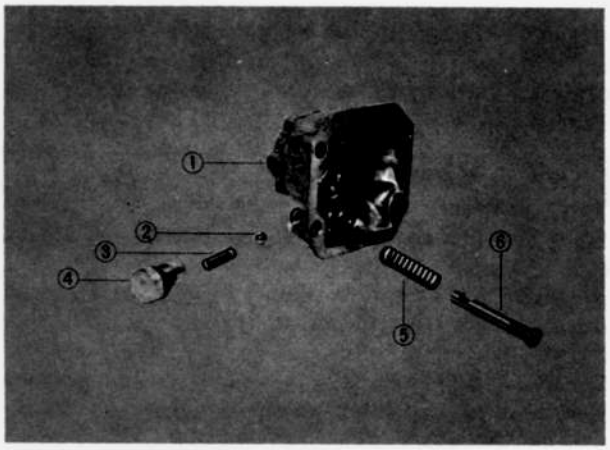

Fig. 7–38 Gearshift lever retainer

1. Retainer
2. Locking ball
3. Spring
4. Spring cap bolt
5. Spring
6. Select lock spindle

50. Position the gasket and gearshift lever retainer to the extension housing, and tighten the attaching bolts.
51. Check the bearing end play as follows:
Measure the depth of the main drive shaft bearing bore in the clutch housing using a depth gauge. Then, measure the bearing height shown in Fig. 7–39. The difference between two measurements indicates the

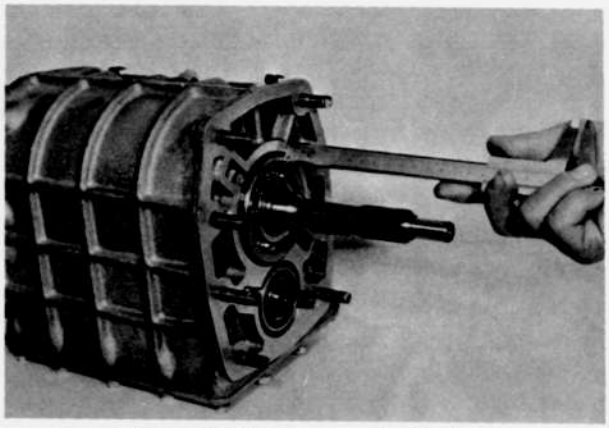

Fig. 7–39 Measuring bearing height

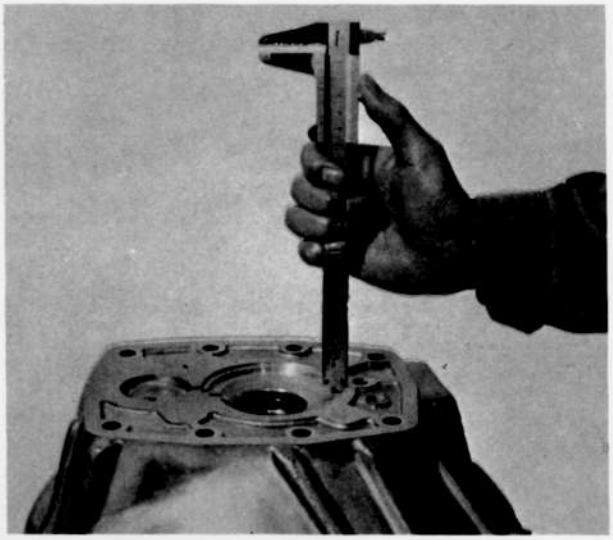

Fig. 7–40 Measuring bearung bore depth

required thickness of the adjusting shim. The standard clearance is **0 ~ 0.1 mm (0 ~ 0.0039 in)**. If necessary, select and use the properly sized shim. The shims are available in the following thickness:

0.1 mm (0.0039 in)	0.3 mm (0.0118 in)

52. Apply lubricant to the lip of the oil seal in the clutch housing.
53. Place the gasket on the front side of the case and install the clutch housing to the case. Tighten the attaching nuts.
54. Install the release bearing, release fork and release fork boot to the clutch housing.

7–E. TRANSMISSION INSTALLATION

Follow the removal procedures in the reverse order.

Note:
(a) Apply a thin coat of grease to the splines of the main drive shaft.
(b) Use the **clutch disc arbor** (Part No. 49 0813 310) to align the splines of the main drive shaft and clutch disc.
(c) Fill the transmission case with lubricant until the lubricant overflows from the level hole.

SPECIAL TOOLS

49 0839 425B	Bearing puller seat
49 0259 440	Main shaft holder
49 0839 445	Synchronizer ring holder
49 0862 350	Shift fork rod guide
49 0813 310	Clutch disc arbor

AUTOMATIC TRANSMISSION

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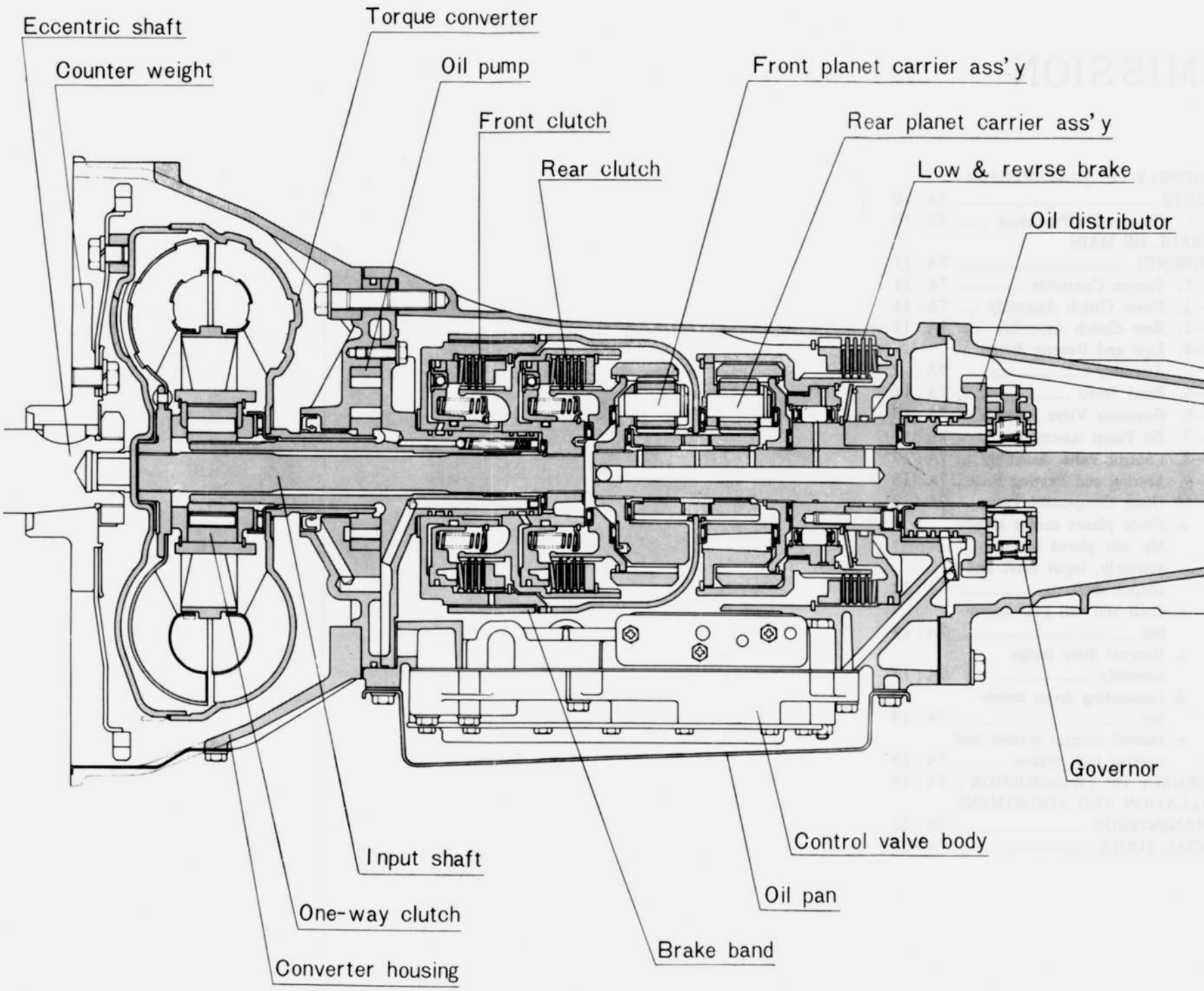

AUTOMATIC TRANSMISSION MODEL R3A (JATCO)

7A–A. TROUBLE DIAGNOSIS AND ADJUSTMENT

In trouble-shooting an automatic transmission it is necessary first of all to correctly define a faulty phenomenon, and then make efficient and orderly check to determine possible causes so that a proper remedy can be effected.

To grasp a faulty phenomenon, check whether the automatic transmission functions normally in all aspects under all conditions including starting, running and stopping. Find out a corresponding trouble from among the troubles in the TROUBLE DIAGNOSIS CHART, and check "Items to Check" in the sequence as indicated.

In diagnosing according to the TROUBLE DIAGNOSIS CHART, make sure to first check and adjust the following items (described in 7A–B):

1. Oil level
2. Idling speed
3. Down-shift solenoid and kickdown switch
4. Manual linkage
5. Inhibitor switch

It is meaningless to proceed to check other items without checking the above items carefully.

In the case of the automatic transmission particularly, there are a great number of troubles which can be solved by inspecting and regulating the above items with the transmission mounted on the vehicle.

So do not remove or disassemble the transmission without checking such items first. Also there are some troubles which require further detailed diagnostic tests including stall test, road test and hydraulic pressure test before removing the transmission from the vehicle. Such tests are described in 7A–C.

If a trouble should prove not correctable by inspection, adjustments and repairs made according to TROUBLE DIAGNOSIS CHART with the transmission installed, that is, if removal and overhauling are indicated by diagnosis, only then, the transmission should be removed and overhauled in the procedure mentioned later.

7A–B. ITEMS TO CHECK AND ADJUST

7A–B–1. Torque Converter Oil

a. Oil level check

Put the vehicle on a level surface and run the engine approximately two minutes at 1,200 rpm. Then move the manual lever through all driving ranges applying brake with the engine idling condition. Place the manual lever in "P". Insert the dipstick fully and take it out quickly before splashing oil adheres to the gauge, and then observe the level on the dipstick. The oil level must be somewhere between L and F marks and never be outside the limits.

Note :

1. The recommended oil is Genuine Automatic Transmission Fluid M2C33F (Type F) or Automatic Transmission Fluid M2C33F (Type F) of any make. Do not mix with other type of automatic transmission fluid than mentioned above.
2. Periodic oil change is not necessary, but the oil level must be checked at least every 6,250 miles (10,000 km).
3. The total amount of oil is 6.2 liters (13.1 U.S. pints, 10.9 Imp. pints, 6.6 U.S. quarts) and the difference between the amounts shown by L and F marks on the dipstick is about 0.45 liter (1.0 U.S. pints, 0.8 Imp. pints, 0.5 U.S. quart).

b. Oil leakage check

When the oil level is lower than specified, add it and at the same time check carefully for possible leaks and repair any if found.

Note :

1. Torque converter oil is of a red-wine color and is distinguishable from engine oil.
2. In checking for possible leak from the transmission breather pipe, jack up one of the rear wheels and run the engine to simulate the running condition. When the oil level is over the "F" limit, the oil never fails to spurt out from the breather pipe. When water is contained in it, the oil sometimes spurts out even when the oil level is within the specified range.

c. Oil condition check

In checking the condition of oil by the oil sticking on the dipstick, note that, if the oil appears like varnish, it might cause control valves to stick, and if it is black, it shows that linings of clutch or brake band have been scorched. In case such oil deterioration is found severe, it sometimes indicates that overhaul should be made without conducting tests listed in TROUBLE DIAGNOSIS CHART. If it is difficult to readily determine whether or not to make such tests, oil should be drained for confirmation.

7A–B–2. Engine Idling Speed

The engine idling speed should be properly adjusted to the specified revolution by using a tachometer for servicing rather than the one installed on the vehicle. If the engine idling speed is too low, the engine cannot revolve smoothly and when it is too high, shifts from "N" or "P" to other ranges will be harsh with increased shock or creep. Adjust the engine idling speed to the specification described in Par. 4–A–1.

7A–B–3. Kick-down Switch and Downshift Solenoid

Position the ignition switch at the first stage after making sure that the accelerator pedal goes through the entire stroke properly. Depress the accelerator pedal as far as it goes. As the throttle nears the wide-open position, the contact point of the kick-down switch is closed with a light click from the solenoid.

The kick-down switch must begin to operate in between 7/8–15/16 of the entire pedal travel or full

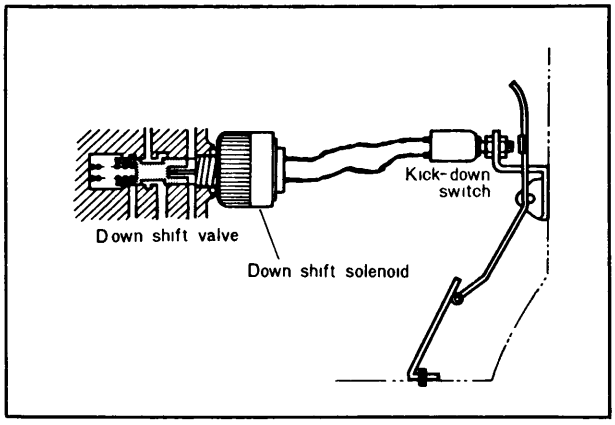

Fig 7A–2 Kick-down switch and down shift solenoid

throttle. If not, adjust the kick-down switch. If the solenoid should not make any clicking sound it indicates some abnormality, so check with a tester must be made.

Note :
When the solenoid is removed for replacing, some one liter of fluid leaks out. So a receptacle should be made ready to catch it.

7A–B–4. Manual Linkage

The adjustment of linkage is equally important as "Inspection of oil level" for the automatic transmission. Therefore, great care should be exercised because defective adjustment will result in the break-down of the transmission.
Pull the manual lever toward you and turn it so far as "P" to "1" range, where clicks will be felt by hand. This is the detent of manual valve in the body, and indicates the correct position of the lever. Inspect whether the pointer of selector dial corresponds to this point, and also whether the lever comes in alignment with the stepping of position plate when it is released.
When the position of the manual lever is found incorrect, disconnect the T joint on the lower rod, and place in "N" the range select lever on the transmission (where the slot of the manual shaft is positioned vertically). Adjust the position of the manual lever by turning the T joint so as to position the manual lever in "N". Finally make sure that the lever travels to "P" and "1" ranges correctly. Check at the same time to see that the linkage has no looseness.

7A–B–5. Select Lever Knob

When the select lever knob is removed, it should be adjusted properly in the following manner.
1) Position the select lever at "N" or "D" range.
2) Loosen the lock nut and screw the select lever knob in until there is no play of the push button.
3) Screw back the select lever knob within one turn to the position where the push button is on the driver's side.
4) Push the push button and confirm that the select lever can be shifted to "P" range.
5) In case the select lever cannot be shifted to "P" range, screw in the select lever knob by one turn.
6) Repeat items (4) and (5) until the select lever can be shifted to "P" range smoothly.
7) Confirm that the select lever cannot, without pushing the push button, be shifted from "N" to "R" or from "D" to "2" range.
8) In case, in item (7), the select lever can be shifted to "R" or "2" range without pushing the push button, it means that the select lever knob is excessively screwed in and so screw back the knob.
9) Make final confirmation on whether the function of the push button is perfect when shifting the select lever to each range.
10) Finally lock the lever by the lock nut under the select lever knob. Tightening torque is 1.5 ~ 2.0 kg-m (10.8 ~ 14.5 ft-lb).

7A–B–6. Inhibitor Switch

The inhibitor switch permits the reverse lamp to light up only when "R" range is selected and the starter motor to revolve only when the lever is in "N" or "P" position, so that when "D", "2" or "1" is selected, the reverse lamp does not light up and the starter motor cannot revolve.
If any abnormality is found in any range, check and adjust the manual linkage; if the manual linkage is found normal, then check the inhibitor switch.

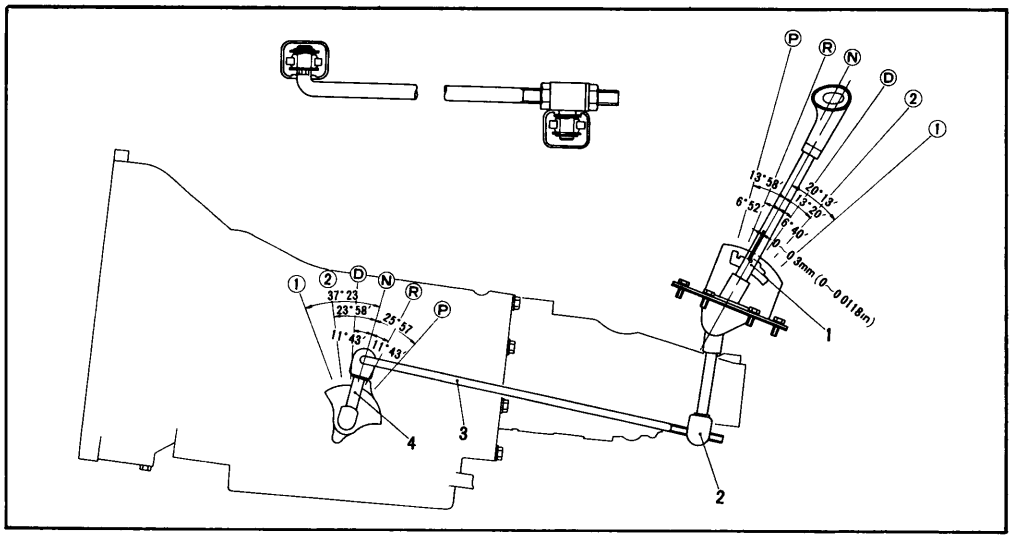

Fig. 7A–3 Manual linkage

1. T joint
2. Manual lever
3. Rod
4. Range select lever

Engage the manual lever in each range and check the connection of the inhibitor switch with a tester, as described in Par. 15–D.
Move the range select lever to both sides from the center position of each range ("R", "P" and "N"), and it is normal if the electricity is on while the lever is within an angle of about 3° on the both sides from each lever set line.
If anything wrong is revealed as a result of the conductivity check of the inhibitor switch, make adjustments in the following procedures.
1. Remove the nut that holds the range select lever and bolts holding the inhibitor switch body, then remove the screw.
2. Correctly position the manual shaft in "N" position by adjusting the range select lever.
The proper "N" position is where the slot of the manual shaft is positioned vertically and detent works to position in the shaft correctly with a click sound.
3. Move the switch slightly aside so that the screw hole will be aligned with the pin hole of the sliding plate when the range select lever is in "N" position by inserting a 2.0 mm (0.079 in) diameter pin into the holes.
4. If the alignment is made correct, tighten the switch body with the bolts, pull out the pin and tighten up the screw again into the hole, and tighten the range select lever as before.
5. Check over again the continuity with the tester. If the malfunction still remains, replace the inhibitor switch.

Note:
When installing the inhibitor switch, in order to prevent a damage on "0" ring, apply some amount of vaseline to a part of "0" ring on manual shaft.

7A–C. DIAGNOSTIC TEST ITEMS

Make sure that all the inspection items described in 7A–B are normal before starting the diagnostic tests– stall test, road test and oil pressure test.

7A–C–1. Stall Test

The purpose of this test is to check the transmission and engine for trouble by measuring the maximum numbers of the engine revolutions while the vehicle is held in a stalled condition and the carburetor is in full throttle operation with the manual lever in ranges "D", "2", "1" and "R" respectively and by comparing the measured results with the standard values.
The specified stall revolution is in the following table.

Stall revolution (rpm)	
In breaking in	After breaking in
2,100 ~ 2,350	2,150 ~ 2,400

a. Stall test procedure
1. Check the levels of engine coolant, engine oil and torque converter oil. Warm up the engine at about 1,200 rpm for several minutes with the manual lever in "P" in order to heat the torque converter oil to a suitable temperature of 60° ~ 100°C (140° ~ 212°F).
2. Mount the engine tachometer at a location that allows good visibility from the driver's seat and put a mark on specified revolutions on the meter.
3. Secure the front and rear wheels completely with chocks and apply the hand brake. Be sure to depress the brake pedal firmly with the left foot before depressing down the accelerator pedal.
4. Place the manual lever in "D" range.
5. Gradually step on the accelerator pedal to the wide-open position. As soon as the engine speed becomes constant, read the engine speed and release the accelerator pedal.
6. Place the manual lever in "N" or "P" and run the engine at about 1,200 rpm for more than one minute to cool down the torque converter oil and coolant.
7. Proceed to do the stall test for "2", "1'. and "R" in the same manner as for "D".

Note :
The stall test operation as specified in the item (5) should be made within five seconds. If it takes too long, the oil deteriorates and the clutches, brake and band are adversely affected. Sufficient cooling time should be given between each test for the four ranges "D", "2", "1" and "R".

b. Judgement
By comparing the measured stall speed and the specified one, troubles can be surmised as follows :
1. Standard stall revolution.
Both transmission control elements and engine performance are normal, and the one-way clutch of the torque converter is not slipping though whether or not there is sticking is unknown.

* In the road test, if the maximum speed cannot be attained and the torque converter oil is found to be at unusually high temperature, the one-way clutch of the torque converter is diagnosed to be sticking.

2. High stall revolution more than standard revolution.
If the engine revolution in stall condition is higher than the standard values, it indicates that one or more clutches in the transmission are slipping and, therefore, no further test is required. For the following abnormalities, the respective causes are presumed.
High rpm in all ranges
Line pressure is low or all clutches, brake and band are slipping.
High rpm in "D", "2" and "1" (normal in "R")
The rear clutch is slipping.
High rpm in "D" (normal in "2", "1" and "R")
The one-way clutch is slipping.
High rpm in "R" (normal in "D", "2" and "1")
The front clutch or the low and reverse brake is slipping.

* In the road test, if there is no engine braking in "1" range, the low and reverse brake is slipping, and if there is engine braking in "1" range, the front clutch is slipping.

High rpm in "2" (normal in "D", "1" and "R")
The band is slipping.

3. Low stall revolution less than standard
The one-way clutch of the torque converter is slipping, or the engine performance is poor.
* In the road test, if poor acceleration is noted at various speeds, indicates poor engine performance or incorrect engine adjustment. In case the starting acceleration is poor while acceleration at high speeds is normal, the one-way clutch of the torque converter is slipping.

7A–C–2. Road Test

An accurate knowledge of the automatic transmission is prerequisite to its exact diagnosis by a road test. The purpose of road test is to make a comprehensive check of the transmission under varying running conditions to detect and analyze troubles and to clear up the cause of troubles.

a. Shift point check

Check to see that the up-shift and down-shift occur within the range specified in the shift point table below, following the checking procedures.

b. Shift point check procedure

1. Make sure that the tire air pressure is in the standard range and preheat the converter oil to appropriate temperature about 60 ~ 100°C (140 ~ 212°F) in engine idling condition.
2. Place the manual lever in "D" range and accelerate in wide open throttle (kick-down switch energized), and read the car speed at the instant of $D_1 \rightarrow D_2$ and $D_2 \rightarrow D_3$ up-shifts with speedometer which is installed on this car.
3. Drive the car with the manual lever in "D". When it is running at a constant speed in D_3, depress the accelerator pedal to the full (the kickdown switch energized) and make sure that $D_3 \rightarrow D_2$ shift occurs. Continue this check at higher speeds until a critical speed from which that down-shift does not occur any more is reached. Proceed to check the critical speed for $D_2 \rightarrow D_1$ kick-down by using the same method. Shift-down can be noted by a shift shock or change in engine sound.
4. When the car is running in D_3 at a speed about 60 km/h (45 mile/h), release the accelerator pedal completely and read the car speed just when $D_3 \rightarrow D_1$ down shift occurs at the fully closes throttle condition.
5. When the car is running in D_3 at a speed more than 60 km/h (45 mile/h), place the manual lever from "D" into "1", and read the car speed just when $1_2 \rightarrow 1_1$ downshift occurs.

Note :
Care must be taken not to shift from "D" to "1" (from "2" to "1") in exceeding the speed in "2" range ("1" range) shown below to avoid the engine overrun.

Engine Max. speed (rpm)	"1" Range	"2" Range
	Mile/h	Mile/h
6,500	40	70

6. Connect a vacuum gauge into the socket in the intake manifold and set it so that it is visible while driving. Place the manual lever in "D" and accelerate with accelerator pressure controlled so that the vacuum gauge will show 200 mm-Hg, and read car speed at the instant of $D_1 \rightarrow D_2$ and $D_2 \rightarrow D_3$ upshifts.

Note :
1. In reading car speeds at shifting, acceleration and deceleration around shift points must be made gently except for (2) above.
2. Checks of (2), (3) and (4) above should indicate general condition of shift point except in very rare instances. Item (6) should be carried out only when the condition in partial throttle must be known.

Car Speed at Gear Shift

Throttle Condition	Gear Shift	Model and Shift Speeds Mile/h
Kick-down (0 ~ 100 mm-Hg) (0 ~ 3.94 in-Hg)	$D_1 \rightarrow D_2$	34 ~ 48
	$D_2 \rightarrow D_3$	62 ~ 80
	$D_3 \rightarrow D_2$	52 ~ 68
	$D_2 \rightarrow D_1$	23 ~ 35
Half throttle (190 ~ 210 mm-Hg) (7.48 ~ 8.27 in-Hg)	$D_1 \rightarrow D_2$	8 ~ 19
	$D_2 \rightarrow D_3$	19 ~ 41
Fully closes throttle	$D_3 \rightarrow D_1$	7 ~ 11
Manual 1	$1_2 \rightarrow 1_1$	27 ~ 35

Note :
The shift speeds in the above table include the permissible allowance of a speedometer on the car. Therefore check the shift speed with the speedometer on the car.

c. Other checks in driving

1. Check each range for faulty performance or shifting. Check to see, for instance, that :
(1) Firm locking is effected when "P" is selected.
(2) Reversing is effected when "R" is selected.
(3) Completely neutral condition is attained by selecting "N".
(4) $D_1 \leftrightarrow D_2 \leftrightarrow D_3$ shifts take place in "D" range.
(5) Kick-down takes place.
(6) When "1" is selected from "D", there occur $D_3 \rightarrow 1_2 \rightarrow 1_1$ or $D_3 \rightarrow 1_1$ shifts with engine braking effected in 1_2 and 1_1.
(7) The transmission does not shift up in "1" range.
(8) In "2" range, the transmission is fixed to 2nd speed.
2. Check to see that shifting is smooth without conspicuous shock and there is no marked creep. (Slight creep in each range is normal.)
3. Check to see that shifts are effected promptly without drag.
4. Check for abnormal gear noise, clutch, band squeal, poor acceleration or oil leak.

7A–C–3. Oil Pressure Test

When there is slippage in the gear train or when shifts do not feel proper, line pressure and governor pressure must be checked.
The following chart shows standard line pressures (before cut back).

Manual Range	Line Pressure kg/cm² (lb/in²)	
	Engine Idling	Stall
"R"	4.0 ~ 7.0 (57 ~ 100)	15.5 ~ 19.0 (220 ~ 270)
"D"	3.0 ~ 4.0 (43 ~ 57)	9.5 ~ 11.0 (135 ~ 156)
"2"	8.0 ~ 12.0 (114 ~ 170)	10.0 ~ 12.0 (142 ~ 170)
"1"	3.0 ~ 4.0 (43 ~ 57)	9.5 ~ 11.0 (135 ~ 156)

a. Line pressure test

Place the transmission in "D", "2", "1" and "R", and check respective line pressure at engine idling and stall conditions. Compare the results with specified pressures to trace the cause of trouble.

b. Line pressure test procedures

1. Warm up the engine to bring the converter oil to operating temperature 60°~ 100°C (140 ~ 212°F).
2. Line pressure for "R" range is taken out at an inspection hole at the right front of the transmission case, and for "D", "2" and "1" ranges the inspection hole is at the right rear. Connect a pressure gauge to the inspection hole and put it where it is visible from the driver's seat.
3. Firmly check the front and rear wheels and apply the hand brake as in the stall test.
4. With the manual lever put in the range to be checked, run the engine at engine idling condition and read the pressure gauge.
5. With the brake pedal depressed fully, press the accelerator pedal gradually to the wide open position. While checking whether the pressure rises smoothly, read the pressure gauge at the stall condition. The test time from starting accelerator depression to its release must not exceed 5 seconds.
6. Measure line pressure for each of other ranges in the same manner. Be sure to interpose more than one minute cooling time at 1,200 rpm with the manual lever placed in "P" or "N".
7. After aboves, check whether the cut-back function to release the shock at gear shifting is operative properly. The cut-back function can be judged normal if the line pressure drops suddenly when the car is accelerated gradually and reaches to the certain running speed.

c. Diagnosis from measurements

1. When line pressure at idling is low in all of "R", "D", "2" and "1", possible causes include a fault in the pressure supply system, e.g. increased side clearance in the oil pump, reduced pump output because of bolts left untightened, oil leak from pump, valve body or transmission case, and sticking of regulator valve or vacuum throttle valve.
2. In case line pressure at idling is low in one range only, there probably are pressure leaks in some devices or oil passages for the relevant range.
3. In case line pressure at idling is high in all ranges, possible cause is throttle pressure rise due to leak from vacuum tube or vacuum diaphragm, or regulator valve sticking.
4. When pressure does not rise at stall condition, the vacuum rod possibly may not be installed.
5. When pressure rise is not smooth or pressure at stall condition does not come within the specified range, possible cause is sticking of vacuum throttle valve, pressure regulator valve or pressure regulator plug.

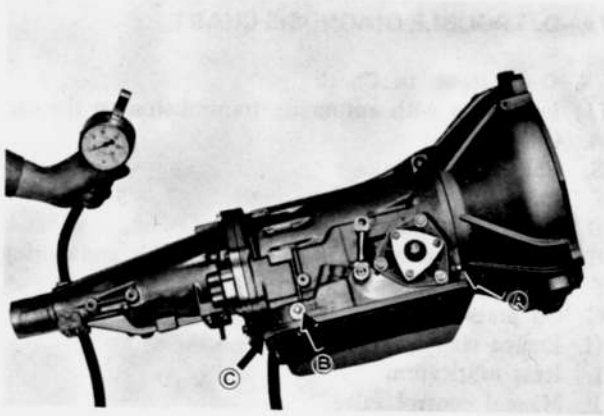

Fig. 7A–4 Oil pressure test
A. For line pressure in "R" range
B. For line pressure in forward ranges
C. For governor pressure

d. Governor pressure test

Governor pressure has only to be measured when shift point is different from the specified.
Connect a pressure gauge in the inspection hole on the left rear of transmission case, and put it where it is visible during driving. Read governor pressure when the car is going at required speeds for each model. If the result is out of the specified range shown in the following table, disassemble and check the governor valve.

Governor Pressure (1)

Driving speed	Output shaft speed rpm	Standard governor pressure kg/cm²	lb/in²
20 mile/h	1,057 ~ 1,160	0.8 ~ 1.3	11 ~ 18
35 mile/h	1,860 ~ 1,990	1.5 ~ 2.2	21 ~ 31
55 mile/h	2,900 ~ 3,100	3.0 ~ 4.0	43 ~ 57

Governor Pressure (2)

Break point	at 1,000 rpm	at 2,000 rpm	at 3,000 rpm
400~600 rpm	0.9~1.3 kg/cm² (13 ~ 18 lb/in²)	1.6~2.2 kg/cm² (23 ~ 28 lb/in²)	3.0~3.8 kg/cm² (43 ~ 54 lb/in²)

7A–D. TROUBLE DIAGNOSIS CHART

7A–D–1. Items to Check

(1) Inspection with automatic transmission on the car.

A. Oil level
B. Range select linkage
C. Inhibitor switch and wiring
D. Vacuum diaphragm and piping
E. Downshift solenoid, kick-down switch and wiring
F. Engine idling speed
G. Oil pressure
H. Engine stall speed
I. Rear lubrication
J. Manual control valve
K. Governor valve
L. Band servo
M. Transmission air check
N. Oil drain check
O. Ignition switch and starter motor
P. Engine adjustment and brake inspection

(2) Inspection after inspecting automatic transmission on the car.

a. Rear clutch
b. Front clutch
c. Band brake
d. Low & reverse brake
e. Oil pump
f. Leak from hydraulic passages
g. One-way clutch in torque converter
h. One-way clutch in power train
i. Front clutch check ball
j. Parking linkage
k. Planetary gear

7A–D–2. Trouble Diagnosis Chart

The numerals show the sequence of inspection for detecting trouble.

Trouble	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	a	b	c	d	e	f	g	h	i	j	k
Engine won't start in "N" and "P" ranges		2	3												1												
Engine starts in other ranges than "N" and "P" ranges		1	2																								
Excessive shock on "N" → "D" range shift				2		1	3			4							⑤										
Car won't move in "D" range (but moves in "2", "1" and "R" ranges)		1					2			3														④			
No drive, excessive slip or very poor acceleration in "D", "2" or "1" range (Driver in "R" range)	1	2					4			5			6	3		7	⑧	⑩				⑨					
No drive, excessive slip or very poor acceleration in "R" range (but Drives in "D", "2" and "1" ranges)	1	2					3			5			6	4			⑨	⑧		⑦		⑩			⑪		
Car won't move in any range	1	2					3			5			6	4							⑦	⑧				⑨	
Tendency to slip when starting	1	2		6			3			5			7	4							⑧	⑨					
Car moves in "N" range		1								3				2			④										
Maximum speed too low and poor acceleration	1	2					4	5		7		6		3		8	⑪	⑫	⑨	⑩	⑬						
Car braked when "R" range is selected												3	2	1			④		⑤							⑥	
Excessive creep						1																					
No creep at all	1	2				3				5				4			⑧	⑨			⑥	⑦					
No $D_1 \rightarrow D_2$ change		1		2	3					5	6	8	7	4					⑨			⑩					
No $D_2 \rightarrow D_3$ change		1		2	3					5	6	8	7	4				⑨				⑩			⑪		
$D_1 \rightarrow D_2$ and $D_2 \rightarrow D_3$ shift-points too high				1	2		3			5	6			4								⑦					
$D_1 \rightarrow D_3$ change without through D_2										2	4		3	1				⑤				⑥					
Excessive shock on $D_1 \rightarrow D_2$ change				1				2		4		5		3					⑥								

Trouble	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	a	b	c	d	e	f	g	h	i	j	k
Excessive shock on $D_2 \rightarrow D_3$ change				1			2			3		5	4					⑥									
Practically no shift shock or excessive slip on $D_1 \rightarrow D_2$ change	1	2		3			4			6		8	7	5					⑨			⑩					
Practically no shock; or excessive slip; or engine runaway on $D_2 \rightarrow D_3$ change	1	2		3			4			6		8	7	5				⑨				⑩			⑪		
Car braked on $D_1 \rightarrow D_2$ change										2				1				④		③				⑤			
Car braked on $D_2 \rightarrow D_3$ change										3		2		1					④								
No $D_3 \rightarrow D_2$ change				1						3	4	6	5	2				⑦	⑧			⑨					
No $D_2 \rightarrow D_1$ or $D_3 \rightarrow D_1$ change				1						3	4	6	5	2					⑦					⑧			
Shift shock felt when accelerator is released and deceleration occurs		1		2	3		4			5	6											⑦					
$D_3 \rightarrow D_2$ and $D_2 \rightarrow D_1$ shift-points too high		1		2	3		4			5	6											⑦					
No kick-down on accelerator depression in D_3 (within kick-down speed limits)				2	1					4	5			3					⑥			⑦					
Abnormal rise of engine speed on accelerator depression in D_3 (above kick-down upper limit)		1		2			3			5	6		7	4				⑧				⑨					
Engine runaway or slip on $D_3 \rightarrow D_2$ change				1			2			4		6	5	3				⑦	⑧			⑨			⑩		
No $D_3 \rightarrow 2$ change on "D" → "2" range shift		1					2			4		5		3					⑥			⑦					
$2 \rightarrow 1$, $2 \rightarrow D$, or $2 \rightarrow D_3$ change in "2" range		1					2			3																	
No shift shock or engine run-away on "1" → "2" range shift	1	2		3		4		1		6			7	5					⑨		⑩						
No $D_3 \rightarrow 1_1$ change on "D" → "1" range shift		1					2			4	5	7	6	3				⑧	⑨			⑩					
No engine braking in "1" range		1					2			4			5	3						⑥		⑦					
$1 \rightarrow 2$ or D_2 change, or 2 or $D_2 \rightarrow D_3$ change in "1" range		1								2												③					
No $1_2 \rightarrow 1_1$ change on "D" → "1" range shift	1	2								4	5	6	7	3						⑧		⑨					
Excessive shift shock on $1_2 \rightarrow 1_1$ change in "1" range				1				2		4				3						⑤							
Car moves in "P" range, and parking gear not removed when "P" range is disengaged.		1																								②	
Transmission overheats	1						3	4	2	6		8	7	5				⑨	⑩	⑪	⑫	⑬	⑭				⑮
Oil spurting up or white exhaust during running	1			3			5	6	2	7			8	4				⑨	⑩	⑪	⑫	⑬	⑭				⑮
Offensive smell from oil charging pipe	1													2			③	④	⑤	⑥	⑦	⑧	⑨				⑩
Transmission noisy in "P" and "N" ranges	1						2														③						
Transmission noisy in "D", "2", "1" and "R" ranges	1						2										③				④			⑤			⑥

7A–E. REMOVAL OF TRANSMISSION

When dismounting the automatic transmission from a vehicle, pay attention to the following point.
Before dismounting the transmission, rigidly inspect it by aid of the "Trouble Diagnosis Chart", and dismount it only when considered to be necessary. The transmission should be removed in the following sequence :
1. Remove the battery earth.
2. Remove the power brake vacuum pipe clip from the converter housing.
3. Remove the service hole cover. To lock the drive plate, apply the wrench to the drive pulley lock bolt. Loosen and remove four bolts that attach the torque converter to the drive plate by using the **special wrench** (49 0877 435). At the same time, make aligning mark across torque converter and drive plate.
4. Jack up the vehicle and support it with safety stands.
5. Remove the screws attaching the heat insulator to the exhaust pipe and remove the heat insulator.
6. Remove the bolt and nut attaching the exhaust front pipe to the exhaust pipe bracket. Disconnect the exhaust front pipe flange from the exhaust manifold by removing nuts. Remove the bolts and nuts attaching the exhaust front pipe flange to the main silencer, and remove the exhaust front pipe.
7. Remove the bolts attaching the heat insulator to the underbody and remove the heat insulator.
8. Remove the four propeller shaft attaching bolts. Then pull it out from the extension housing. Apply a plug to prevent oil leak.

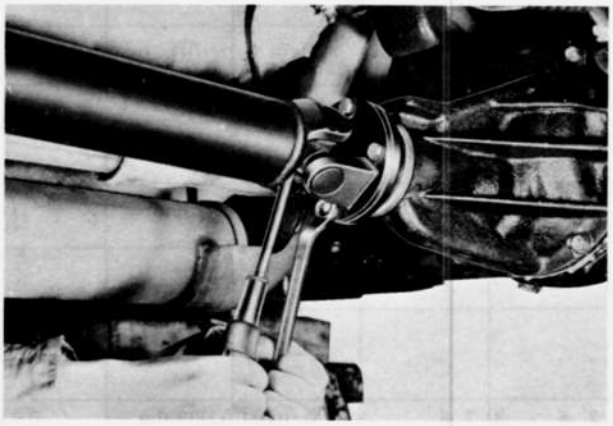

Fig. 7A–5 Removing propellar shaft

9. **Disconnect the speedometer cable from the extension housing.**
10. Disconnect the control rod by removing snap ring.
11. Disconnect the wirings from the starting motor. Loosen the upper and lower bolt attaching the starting motor to the converter housing and remove the starting motor.
12. Remove the undercover (or service cover) on the converter housing.
13. With the transmission supported with the transmission holder, remove the tightening nuts of the

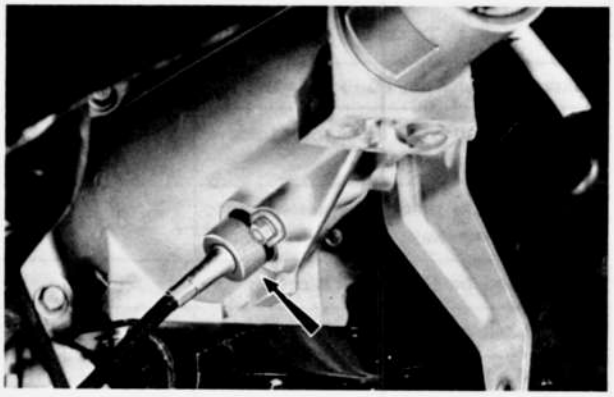

Fig. 7A–6 Removing speedometer cable

transmission member and take out the member. Then lower the transmission holder, widen the clearance between the transmission and the floor.
14. Remove the vacuum union bolt from the inlet manifold. Remove the vacuum pipe clips from the converter housing, transmission case and extension housing. Disconnect the vacuum hose from the vacuum diaphragm and remove the vacuum pipe.
15. Disconnect the wire connections of down-shift solenoid and remove the wires from the clip.
16. Disconnect the feed pipe and return pipe for cooling on the left side of the transmission. Remove the feed pipe and return pipe clips from the converter housing and transmission case.

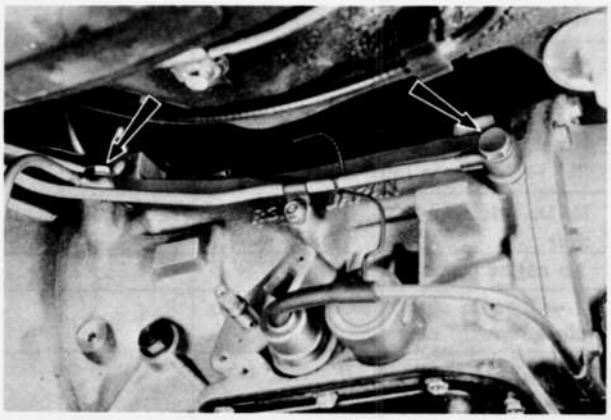

Fig. 7A–7 Removing pipes

17. Loosen and remove the bolts that connect the engine and the torque converter housing to disconnect the transmission and engine.



Fig. 7A–8 Bolts on engine & converter housing

18. Return the transmission to the level position. While slowly plying a screw driver or something between the converter and the drive plate, pull out the transmission rearward with the converter attached to it. Then lower the holder and dismount the transmission.

7A–F. DISASSEMBLY OF TRANSMISSION COMPLETE

Attention must be paid to the following matter in disassembling the transmission :
(1) Clean the outside of the transmission thoroughly before overhauling. In case of that, see that the steam does not enter the transmission and the gasoline is not used in using rubber parts.
(2) Disassembly should be made in a clean workshop, preferably in a dust-proof workshop.

7A–F–1. Disassembly Procedure

1. Remove the torque converter from the housing taking care not to have the converter oil spill.
Then tilt the transmission housing and drain the oil in the oil pan through the end of the extension housing into a vessel.
2. Loosen the bolt for the oil gauge tube and remove it together with the "O" ring.
3. Remove the connecting rod attached to the range select lever.
4. Loosen and remove the bolts that attach the converter housing and the transmission case, and remove the converter housing.

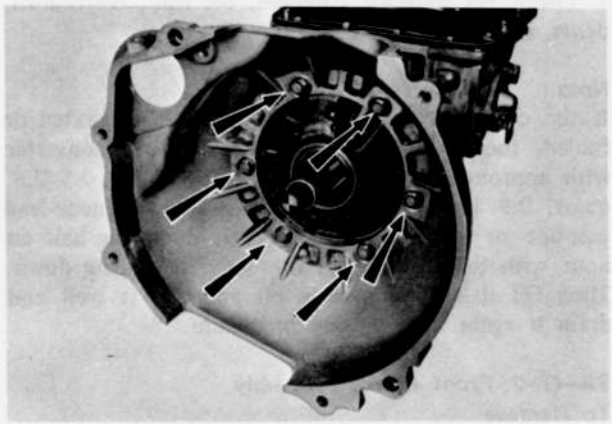

Fig. 7A–9 Bolts on converter housing

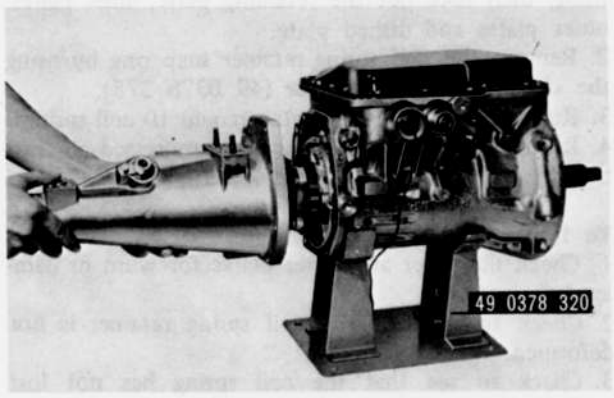

Fig. 7A–10 Removing extension housing

5. Loosen and remove the bolts that attach the extension housing and the transmission case, and pull out the extension housing rearward taking care so that the washer does not fall down. Then remove the parking pawl, spring and washer. Remove the gasket from the transmission case.
6. Loosen and remove out the oil pan bolts and take out the oil pan and the gasket.
7. Turn the downshift solenoid and the vacuum diaphragm unit by hand and remove them together with "O" rings. Take care not to forget taking out the vacuum diaphragm rod.

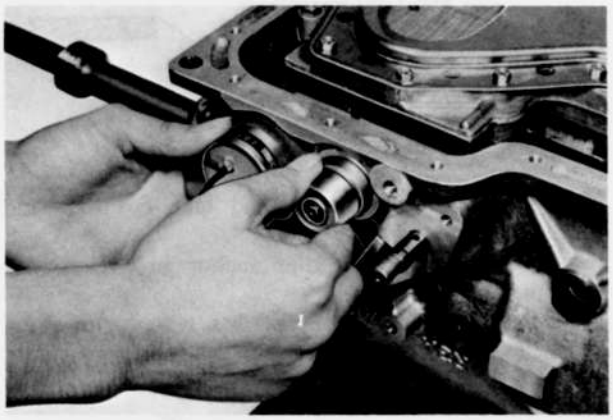

Fig. 7A–11 Removing downshift solenoid

8. Remove the control valve assembly by loosening out nine attaching bolts.

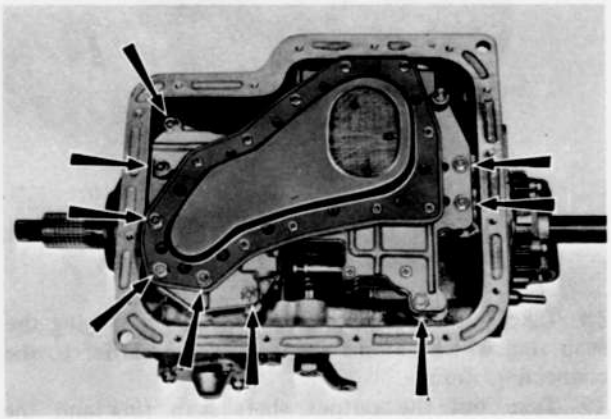

Fig. 7A–12 Control valve body assembly setting bolts

9. Remove the nut attaching the range select lever to the manual shaft and remove the select lever.
10. Disconnect the parking rod from the parking lever by removing snap ring.
Loosen the nut attaching the manual plate to the manual shaft and remove the manual shaft from the transmission case tapping the manual shaft with the plastic hammer. Then, take out the manual plate, washer, nut and parking rod.
11. Pull out the input shaft.
12. Remove the bolts that attach the band servo cover to the servo retainer and remove the servo cover.
13. Loosen lock nut on piston stem. Then tighten piston stem in order to prevent to fall front clutch drum down when oil pump is withdrawn.

14. Pull out the oil pump with the **oil pump remover** (49 0378 390) and remove the gasket.

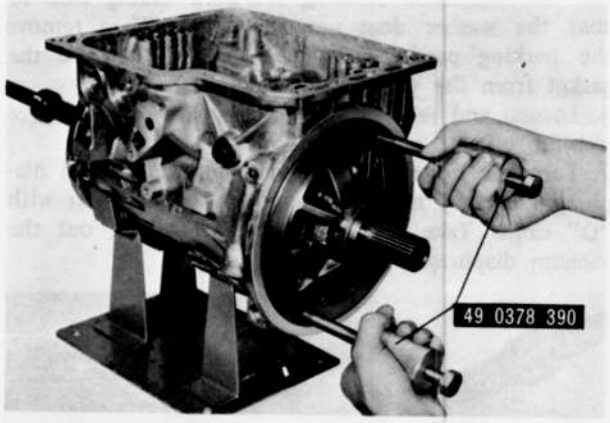

Fig. 7A–13 Removing oil pump

15. Loosen the piston stem and take out the band strut.
16. Loosen and remove the anchor bolt from the transmission case.
17. Remove the following as one set : band, front clutch assembly, rear clutch assembly, front planet carrier assembly with sun gear.

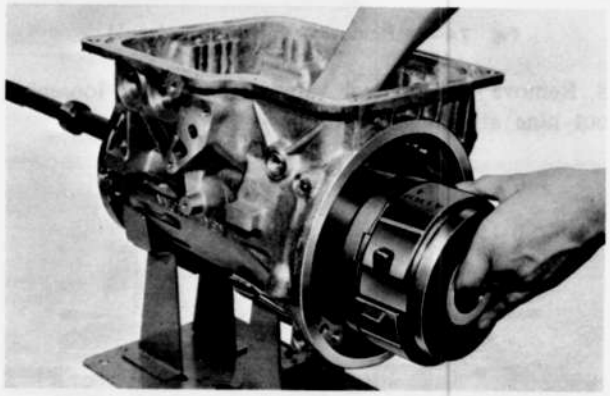

Fig. 7A–14 Removing clutch assembly

18. Take out the rear planet carrier by removing the snap ring which fastens the rear planet carrier to the connecting drum.
19. Take out the output shaft snap ring and the internal drive flange.

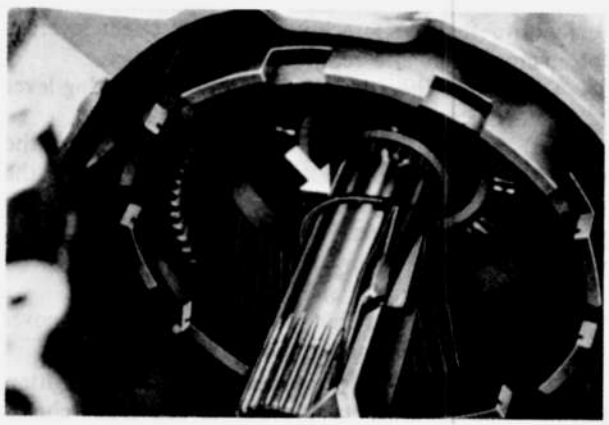

Fig. 7A–15 Removing snap ring

20. Turn left the connecting drum as far as it goes and make sure it is firmly locked. Then turn it right and remove together with the one-way clutch.
21. Remove the snap ring that secures the speedometer drive gear to the output shaft. Slide the drive gear off the output shaft, and remove the lock ball.
22. Pull out the output shaft rearward. Then remove the oil distributor together with governor and take out the needle bearing remaining on the transmission case side.

The above operations complete the disassembly of the principal transmission parts excepting the low-reverse brake which still remain on the transmission case. The low-reverse brake can of course be removed from the transmission case but the disassembling operations of it are described in the next section dealing with overhaul of principal components.

7A–G. OVERHAUL OF MAIN COMPONENTS

The principal components each include a large number of similar parts finished to high precision. So all related parts of each component should be placed apart from others to avoid confusion. Overhaul should be made in the following sequence. (Bearings and bearing races must be checked with respect to parts to which they are mounted.)

7A–G–1. Torque Converter

1. The torque converter is welded all along the circumference and so cannot be disassembled.

To Inspect

1. Check for external damages, oil leak, distortions, dents, etc., and replace if necessary.

Note :

If the converter oil is found markedly degenerated or fouled, thoroughly rinse the inside of the converter with approximately 0.5 liter (1.0 U.S. pints, 0.5 U.S. quart, 0.9 Imp. pint) of cleaning solvent (none-lead gasoline or kerosene) and make it drain for half an hour with the rear side of the converter facing down. Then fill it with converter oil and stir it well and drain it again in the same procedure.

7A–G–2. Front Clutch Assembly

To Remove

1. Remove the snap ring with a screw driver or something, then take out the retaining plate, inner plates, outer plates and dished plate.
2. Remove the coil spring retainer snap ring by using the **clutch spring compressor** (49 0378 375).
3. Remove the coil spring retainer and 10 coil springs.
4. Remove the piston by blowing compressed air into the oil hole as shown in Fig. 7A–18.

To Inspect

1. Check the inner and outer plates for worn or damaged facings.
2. Check to see that the coil spring retainer is not deformed.
3. Check to see that the coil spring has not lost tension.

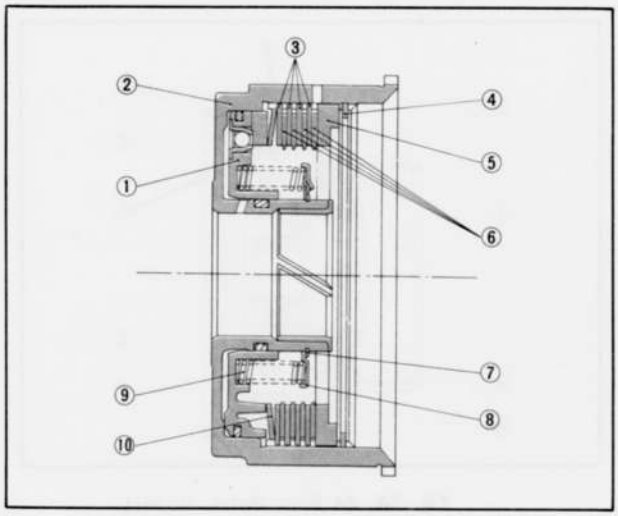

Fig. 7A–16 Front clutch assembly

1. Piston
2. Front clutch drum
3. Outer plate
4. Snap ring
5. Retaining plate
6. Inner plate
7. Snap ring
8. Spring retainer
9. Coil spring
10. Dished plate

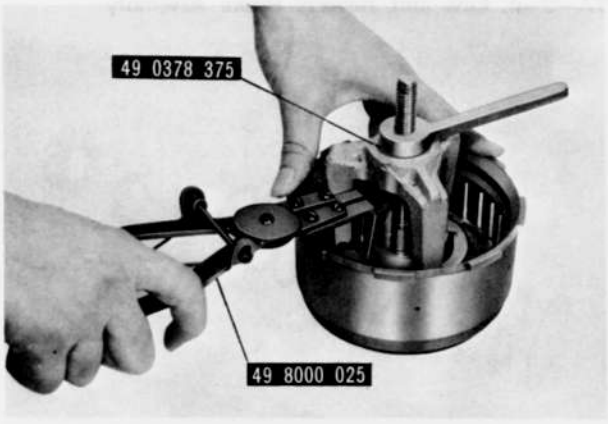

Fig. 7A–17 Removing snap ring

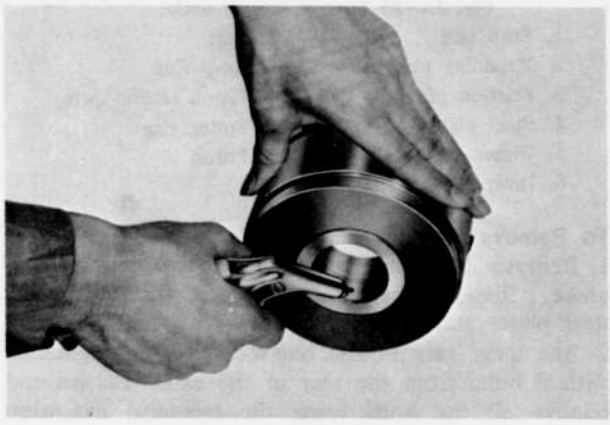

Fig. 7A–18 Blowing out piston

4. Check to see that the seal around the piston and the "O" ring inside the clutch drum are not damaged.
5. If defective parts are found, replace them with new ones.

To Reassemble

1. All parts are smeared with converter oil and re-assembled in the reverse sequence of the disassembly.
2. Measure the clearance between the snap ring and retaining plate with a thickness gauge after reassembly and selectively use a retaining plate to provide the standard clearance **1.0 ~ 1.5 mm (0.039 ~ 0.059 in)**.



Fig. 7A–19 Measuring clearance

Note :

To adjust above clearance, the retaining plate comes in the following six thicknesses.

7.2 mm (0.283 in), 7.4 mm (0.291 in)
7.6 mm (0.299 in), 7.8 mm (0.307 in)
8.0 mm (0.315 in), 8.2 mm (0.323 in)

3. Install the front clutch assembly to the oil pump. Blow compressed air into the oil hole as shown in Fig. 7A–20 and check the clutch operation.

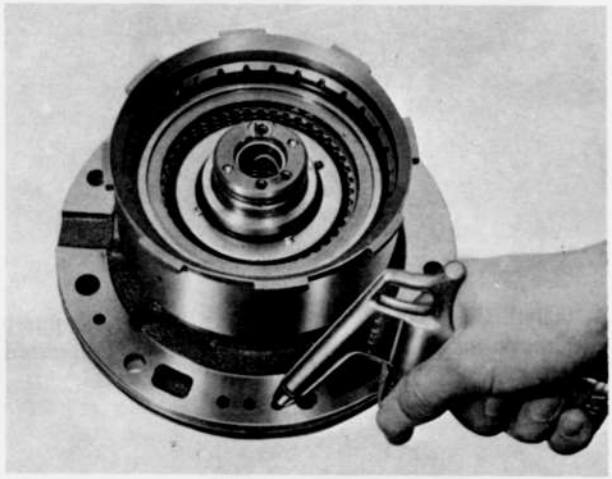

Fig. 7A–20 Testing front clutch

7A–G–3. Rear Clutch Assembly

To Remove

1. Remove the snap ring, retaining plate, outer plates, inner plates and dished plate in the same procedure as for the front clutch assembly.
2. Remove the coil spring retainer snap ring by the use of the **clutch spring compressor** (49 0378 375). Then remove the coil spring retainer and 10 coil springs.
3. Remove the piston by blowing compressed air into the oil hole.

To Inspect

1. Make the same inspection as for the front clutch

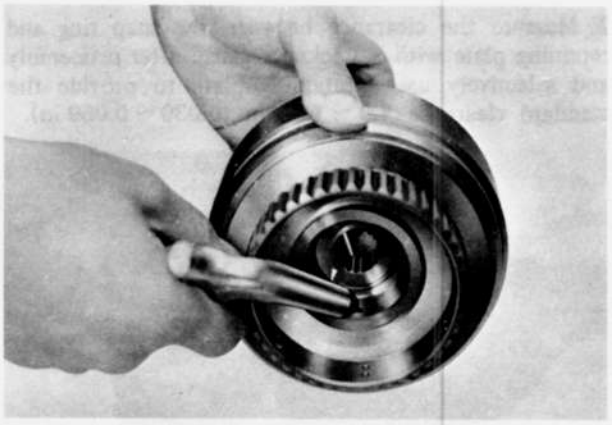

Fig. 7A–21 Blowing out piston

assembly and replace any defective parts with new ones.

To Reassemble

1. All parts are reassembled with converter oil smeared in the reverse sequence of the disassembly, as in the case of the front clutch.
2. After reassembly, check to see that the clearance between the snap ring and retaining plate is within the standard range of **1.0 ~ 1.5 mm (0.039 ~ 0.059 in).**

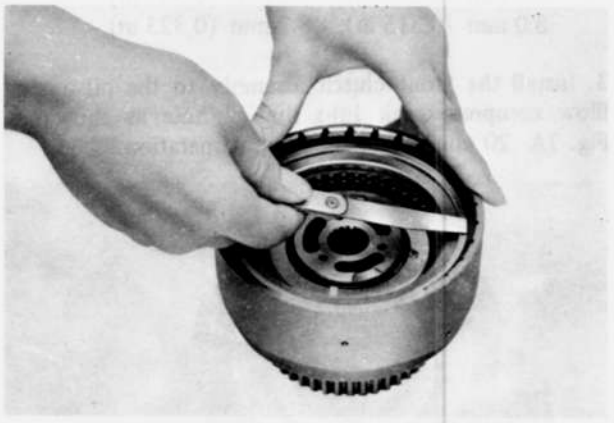

Fig. 7A–22 Measuring clearance

3. Install the rear clutch assembly to the oil pump and check the clutch operation by blowing compressed air into the oil hole as shown in Fig. 7A–23.

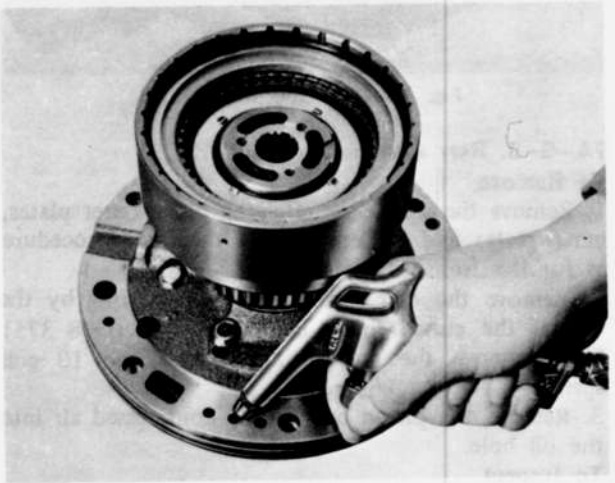

Fig. 7A–23 Testing rear clutch

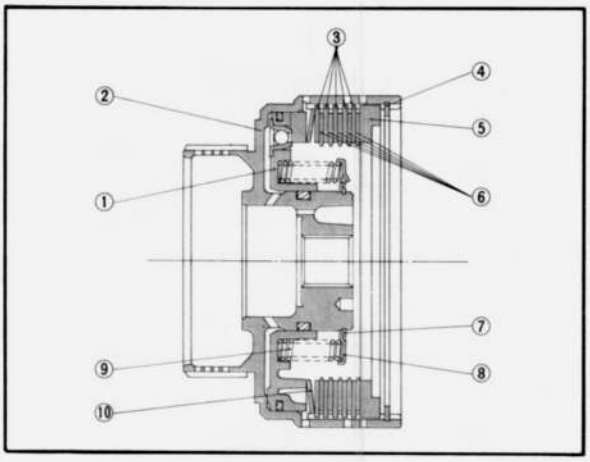

Fig. 7A–24 Rear clutch assembly

1. Piston
2. Rear clutch drum
3. Outer plate
4. Snap ring
5. Retaining plate
6. Inner plate
7. Snap ring
8. Spring retainer
9. Coil spring
10. Dished plate

7A–G–4. Low and Reverse Brake Assembly

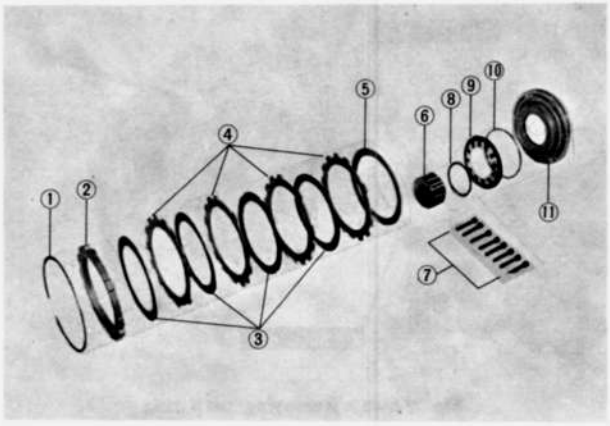

Fig. 7A–25 Low & reverse brake

1. Snap ring
2. Retaining plate
3. Friction plate
4. Steel plate
5. Dished plate
6. Inner race
7. Bolt
8. Snap ring
9. Piston return spring
10. Spring ring
11. Piston

To Remove

1. Remove the snap ring of the low and reverse brake. Remove the retaining plate, friction plates, steel plates and dished plate.
2. The inner race of the one-way clutch is tightened with 8 bolts from the rear of the case. Loosen and remove all the bolts using the **hex-head extension** (49 0378 346), then remove the inner race, snap ring, piston return spring and ring.
3. Remove the piston by blowing compressed air into the low and reverse brake oil hole located at the rear of the transmission case.

To Inspect

1. Check the friction and steel plates for worn or damaged facing.

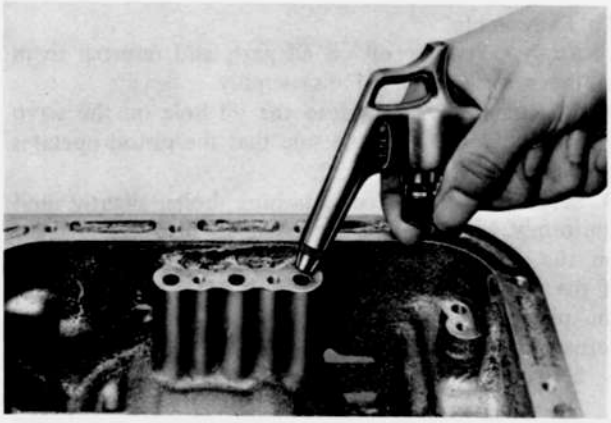

Fig. 7A–26 Blowing out piston

2. Check to see that the piston return spring has not lost tension.
3. Check to see that there is no deformation on the snap ring (stopper) for piston return spring, attached on the one-way clutch inner race.
4. Check to see that the seal rubber on the inside and outside of the piston are not damaged.
5. If any defective part is found, replace with new one.

To Reassemble

1. Lubricate the piston with converter oil and install it into the transmission case.
2. Install the return spring support ring, return spring, snap ring and one-way clutch inner race on the piston in this order. Then tighten the inner race, from rear of the case, with eight bolts by using the **hex-head extension** (49 8000 040) to a specified torque of **1.3 ~ 1.8 m-kg (9 ~ 13 ft-lb).**

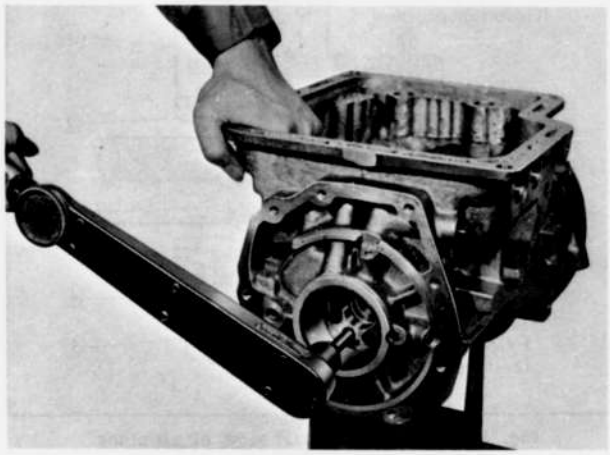

Fig. 7A–27 Tightening inner race

3. Reassemble the dished plate, steel plates, friction plates and retaining plate in the reverse order, smearing each with converter oil. Then fit the snap ring.
4. After reassembly, measure the clearance between the snap ring and retaining plate and select the retaining plate to provide a standard clearance of **0.8 ~ 1.05 mm (0.031 ~ 0.041 in).**

Note :
To adjust above clearance the retaining plate is available in the following six thicknesses.

11.8 mm (0.466 in), 12.0 mm (0.472 in),
12.2 mm (0.480 in), 12.4 mm (0.488 in),
12.6 mm (0.496 in), 12.8 mm (0.504 in)

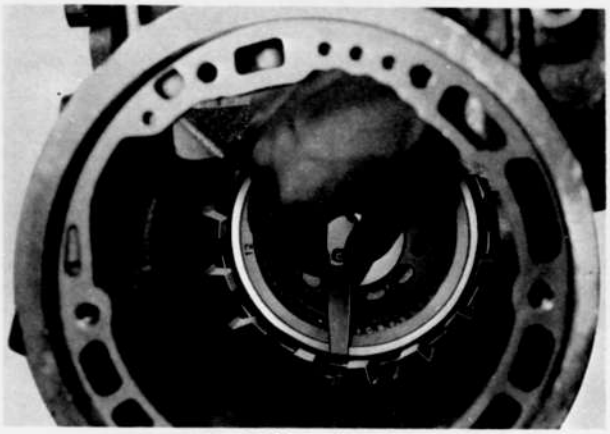

Fig. 7A–28 Measuring clearance

5. Check the operation of the low and reverse brake by blowing air into the oil hole as shown in Fig. 7A–26.

7A–G–5. Band Servo

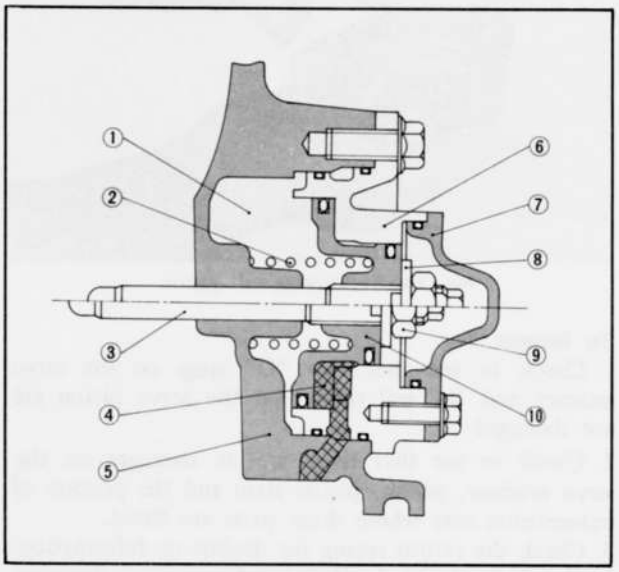

Fig. 7A–29 Cross-sectional of servo

1. Release pressure
2. Return spring
3. Piston stem
4. Apply pressure
5. Transmission case
6. Retainer
7. Cover
8. Washer
9. Adjust nut
10. Piston

To Remove

1. Loosen and remove three bolts that attach the band servo retainer to the transmission case, and remove the band servo retainer together with the servo piston. Take out the return spring. If the servo retainer is difficult to disconnect from the case, it can be readily removed by blowing air into the oil hole on the piston release side.
2. Blow compressed air into the oil hole on the apply side of the servo piston to remove the piston from the retainer.

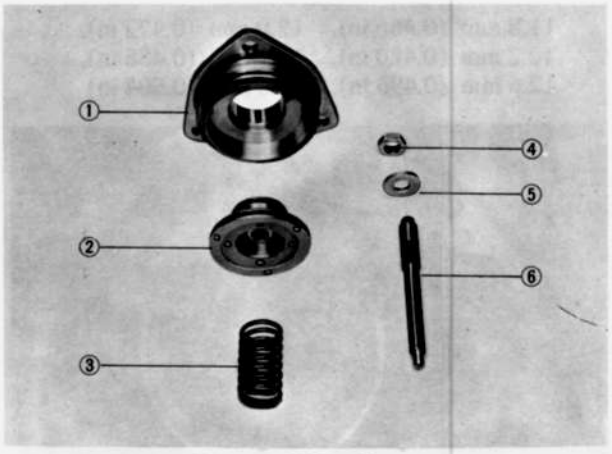

Fig. 7A–30 Band servo

1. Retainer
2. Piston
3. Return spring
4. Adjust nut
5. Washer
6. Piston stem



Fig. 7A–31 Blowing out piston

To Inspect

1. Check to see that two "O" rings on the servo retainer and the seal rubber on the servo piston are not damaged.
2. Check to see that there are no damages on the servo retainer, piston, piston stem and the portion of transmission case where those parts are fitted.
3. Check the return spring for decline or deformation.
4. Check the brake band lining for wear or damages.

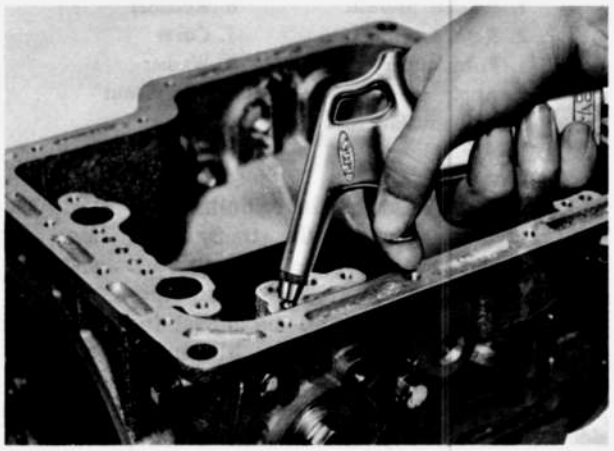

Fig. 7A–32 Checking band servo (1)

To Reassemble

1. Apply converter oil on all parts and reinstall them in the reverse order of disassembly.
2. Blow compressed air into the oil hole on the servo piston apply side to make sure that the piston operates properly, as in Fig. 7A–32.
3. Back off the three attaching bolts slightly and uniformly, and apply compressed air into the oil hole on the servo piston release side, as in Fig. 7A–33. If the retainer rises by the extent of bolt backing off, the piston operation on release is normal. Tightening torque of the servo retainer is **0.5 ~ 0.7 m-kg (3.6 ~ 5.1 ft-lb).**

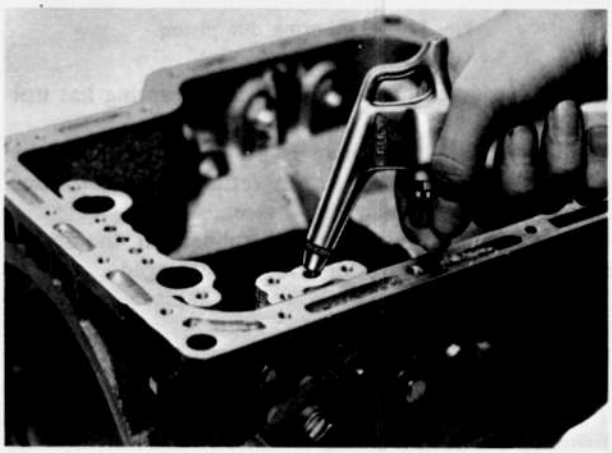

Fig. 7A–33 Checking band servo (2)

7A–G–6. Governor Valve Assembly

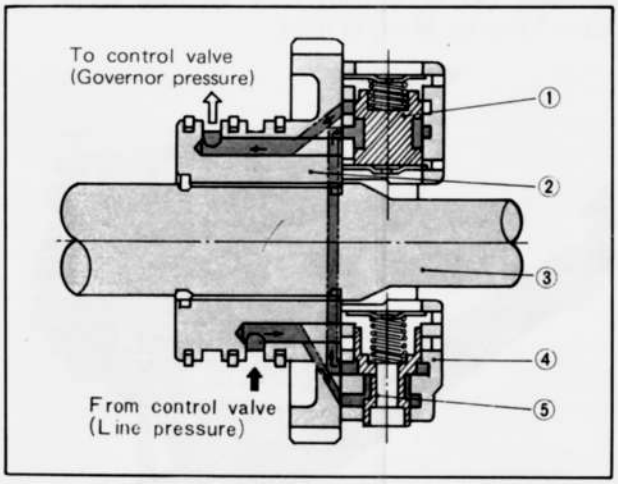

Fig. 7A–34 Cross-sectional view of governor

1. Primary valve
2. Oil distributor
3. Output shaft
4. Governor valve body
5. Secondary valve

To Remove

1. Loosen and remove four bolts that attach the governor. Remove the governor from the oil distributor.
2. Remove the secondary governor retainer plate. Then remove the spring and secondary governor valve from the body.
3. Remove the primary governor valve in the same procedure as for the secondary, if primary governor is to be disassembled for any purpose.

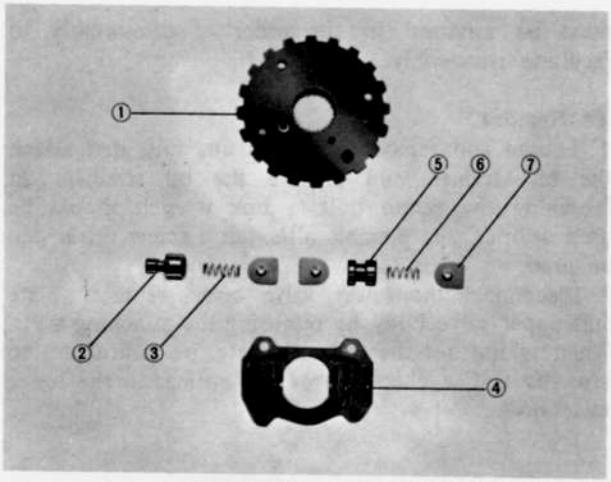

Fig. 7A–35 Governor valve

1. Oil distributor
2. Secondary valve
3. Spring
4. Valve body
5. Primary valve
6. Spring
7. Retainer plate

To Inspect

1. Check the valve and the body to see that there is nothing that may cause valve sticking or catching.
2. Check to see that the spring has not lost tension and the retainer plates are not deformed.
3. Check the side clearance between the sealing and gloove as shown in Fig. 7A–36. The standard clearance is **0.04 ~ 0.16 mm (0.002 ~ 0.006 in)**. When disassembling the seal ring, squeeze it up so that its joint will rise above the groove, and disconnect the joint.

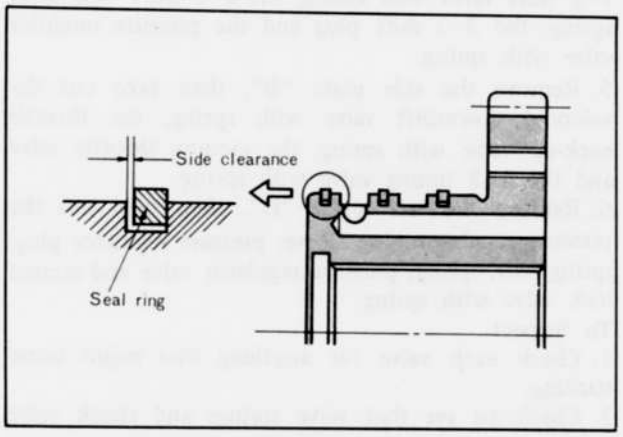

Fig. 7A–36 Clearance of oil seal ring

To Reassemble

1. Lubricate all parts with converter oil and reinstall them in the reverse order of disassembly so as not to confuse primary with secondary. After reassembly, make sure that the governor spring is straight and there is no catch in the governor valve movement.
2. Tighten the governor to the oil distributor with four bolts to a standard torque of **0.50 ~ 0.70 m-kg (3.6 ~ 5.1 ft-lb)**.
3. To determine if secondary governor is in good condition, blow air under light pressure into line pressure hole in Fig. 7A–34 to listen for noise like a model plane.

7A–G–7. Oil Pump Assembly

To Remove

1. Disconnect the pump cover from the pump housing by loosening five bolts that attach them.
2. Take out the inner gear and the outer gear from the pump housing. At the same time, put a sign indicating the installing side with quick-dry ink or something and not with a punch, to avoid erroneous assembly.

To Inspect

1. Check to see that tooth faces of the inner and outer gears are not damaged or worn.
2. Check the side play of the inner (or outer) gear by using a straight edge and thickness gauge as in Fig. 7A–37. The standard value is **0.02 ~ 0.04 mm (0.001 ~ 0.002 in)**. If the clearance exceeds **0.08 mm (0.003 in)**, replace the gears with those selected from the three kinds. Make sure that the inner and outer gears are replaced as a set.



Fig. 7A–37 Measuring clearance (1)

3. Check the clearance between the outer gear teeth and crescent. The standard value is **0.14 ~ 0.21 mm (0.006 ~ 0.008 in)**. If the clearance exceeds **0.25 mm (0.010 in)**, replace the gears.

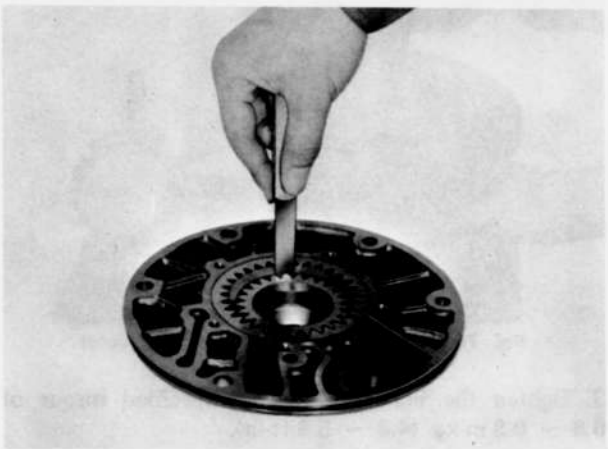

Fig. 7A–38 Measuring clearance (2)

4. Check the clearance between the outer gear and the housing. The standard value is **0.05 ~ 0.20 mm (0.002 ~ 0.008 in)**. If the clearance exceeds **0.25 mm (0.010 in)**, replace the gears as a set.



Fig. 7A–39 Measuring clearance (3)

5. Check to see that the seal rubber attached on the pump housing periphery is not damaged.
6. Check to see that the oil seal lip is not damaged and the spring has not lost tension.
7. Check to see that the seal rings of oil feed grooves for the front and rear clutches are not damaged or lost tension. Measure the side clearance of the seal ring. The standard value is **0.04 ~ 0.16 mm (0.002 ~ 0.006 in)**. When replacing seal ring refer to par. 7A–G–6.
8. Check to see that the pump housing and the cover are not damaged.
9. If any defective part is found, replace with new one.

To Reassemble

1. Fix the pump housing to the **oil pump assembling gauge** (49 2113 025A) and fit the inner gear and outer gear in the pump housing as were installed in original. Then fit the pump cover and tighten it temporarily with five bolts.
2. Set the runout of pump cover within 0.07 mm (0.0028 in) total indicator reading by tapping the cover with a plastic hammer.

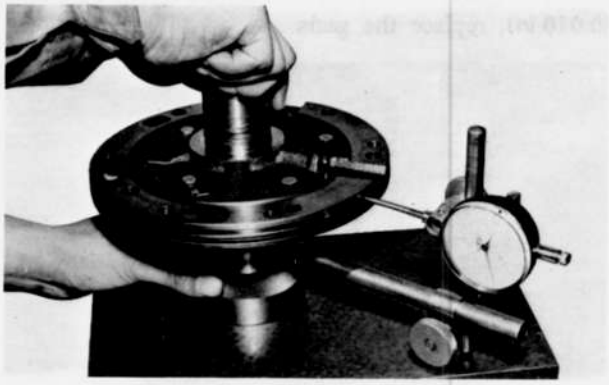

Fig. 7A–40 Checking runout of pump cover

3. Tighten the bolts finally with specified torque of **0.6 ~ 0.8 m-kg (4.3 ~ 5.8 ft-lb).**

7A–G–8. Control Valve Assembly

The control valves are composed of the most accurate of the automatic transmission parts and so particular care must be paid in disassembly and reassembly. Also, since a number of similar parts are used, they must be arranged in the order of disassembly to facilitate reassembly.

To Remove

1. Loosen and remove the bolts and nut, that attach the oil strainer, and remove the oil strainer. In loosening the 8 mm bolt, a box wrench should be used as much as possible although a screw driver can be used.
2. Disconnect the lower valve body, separate plate and upper valve body by removing the attaching bolts. When taking out the separate plate, be careful not to lose the orifice check valves and springs in the lower valve body.

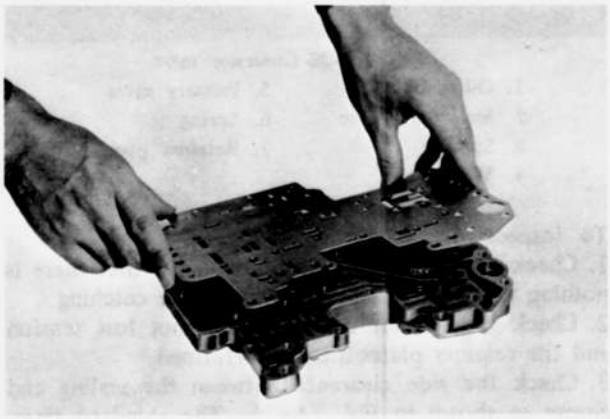

Fig. 7A–41 Removing separate plate

3. Take out the manual valve.
4. Remove the side plate "A", then take out the 1–2 shift valve with spring, the 2–3 shift valve with spring, the 2–3 shift plug and the pressure modifier valve with spring.
5. Remove the side plate "B", then take out the solenoid downshift valve with spring, the throttle back-up valve with spring, the vacuum throttle valve and the 2–3 timing valve with spring.
6. Remove the side plate "D", then take out the pressure regulator plug sleeve, pressure regulator plug, spring seat, spring, pressure regulator valve and second lock valve with spring.

To Inspect

1. Check each valve for anything that might cause sticking.
2. Check to see that valve springs and check valve springs have not lost tension.
3. Check to see that the oil strainer is not damaged.
4. Check for possible abnormal oil passage developing on the separate plate.
5. Check for possible damages or other abnormalities in the oil passages of valve body.
6. If any defective part is found, replace with new one.

To Reassemble

1. Reassemble in the reverse order to disassembly paying special attention to the following points :

a. Install small valves and springs by referring to the components parts of control valve Fig. 7A–42.
b. Lubricate all valves and springs with converter oil before installing.

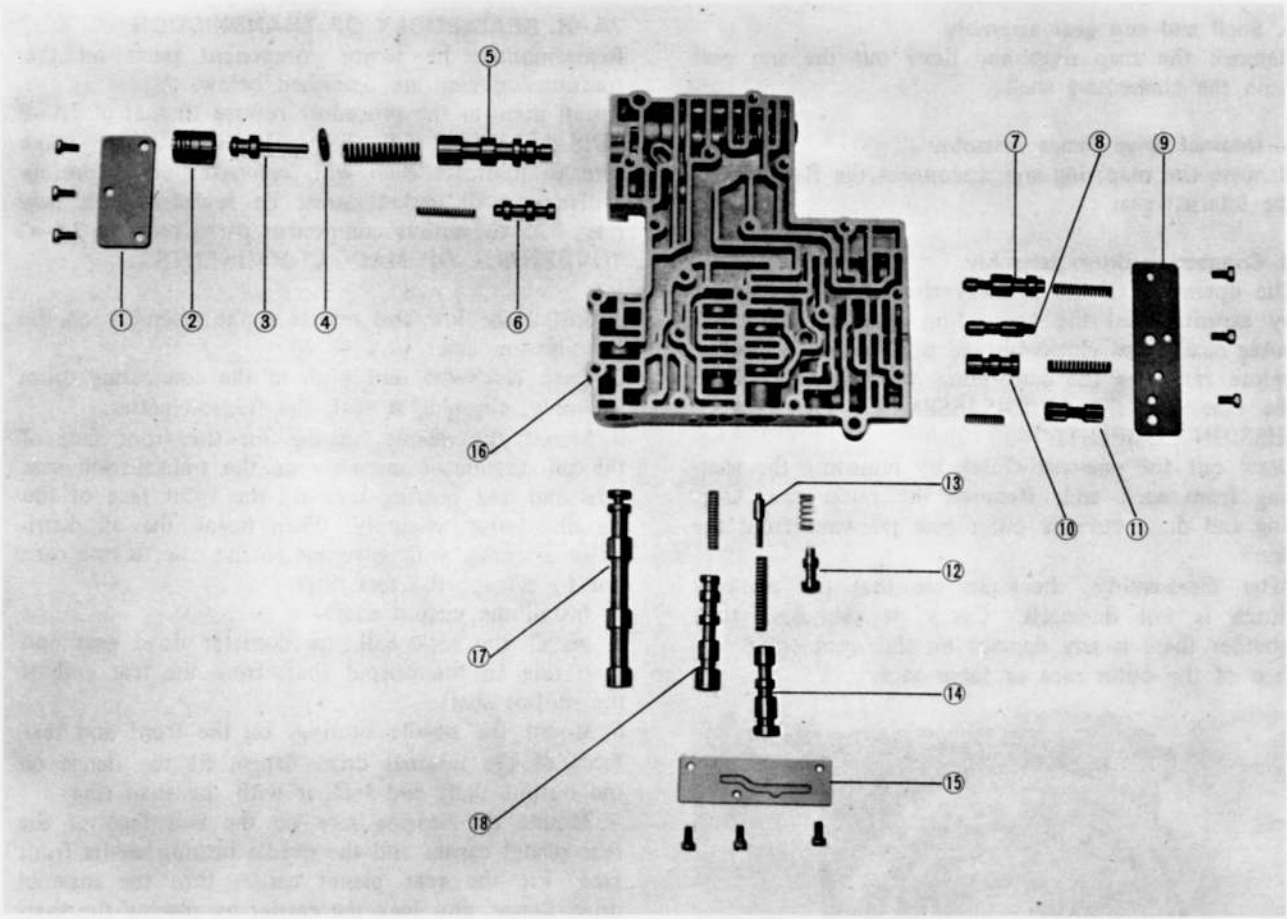

Fig. 7A–42 Component parts of control valve

1. Side plate "D"
2. Plug sleeve
3. Regulator pressure plug
4. Spring seat
5. Regulator pressure valve
6. Second lock valve
7. 2–3 timing valve
8. Vacuum throttle valve
9. Side plate "B"
10. Throttle back-up valve
11. Down-shift valve
12. Modifier valve
13. 2–3 shift plug
14. 2–3 shift valve
15. Side plate "A"
16. Upper valve body
17. Manual valve
18. 1–2 shift valve

c. If there is any valve that is difficult to insert, do not force it in but give it a light, straight push.
d. Make sure that the followings are strictly tightened to **0.25 ~ 0.35 m-kg (1.8 ~ 2.5 ft-lb)**.
Side plate to valve body
Lower valve body to upper valve body
Oil strainer to lower valve body

7A–G–9. Bearing and Bearing Race

Check each bearing and bearing race after cleaning carefully. Also check to see that the mating parts of each bearing and bearing race are not damaged. If any defective part is found, replace it.

7A–G–10. Other Component Parts

Check to see by sight that the following parts are not damaged. Disassembly, if indicated, should be made in the procedure below.

a. Front planet carrier assembly, rear planet carrier assembly, input shaft and output shaft

The planetary carrier cannot be divided into its individual components.
If any part or component is defective, replace the carrier as a unit.
Check the clearance between pinion washer and planetary carrier with a feeler.
The standard clearance is **0.20 ~ 0.70 mm (0.008 ~ 0.027 in)**.

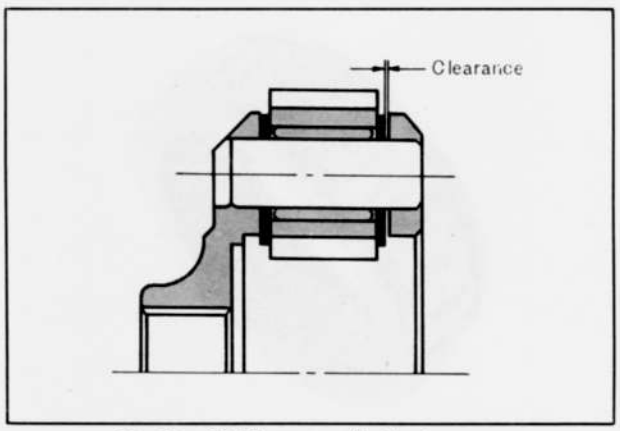

Fig. 7A–43 Clearance of planetary gear

If the clearance exceeds **0.80 mm (0.031 in)**, replace with new one.

b. Shell and sun gear assembly
Remove the snap rings and draw out the sun gear from the connecting shell.

c. Internal drive flange assembly
Remove the snap ring and disconnect the flange from the internal gear.

d. Connecting drum assembly
The operation of the one-way clutch can be checked by assuring that the connecting drum assembly (or outer race) turns clockwise and not counter-clockwise, before removing the connecting drum assembly from the case. See 7A–F "DISASSEMBLY OF TRANSMISSION COMPLETE"–20.
Draw out the one-way clutch by removing the snap ring from each end. Remove the outer race snap ring and draw out the outer race rearward from the drum.
After disassembly, check to see that the one-way clutch is not damaged. Check at the same time whether there is any damage on the contacting surface of the outer race or inner race.

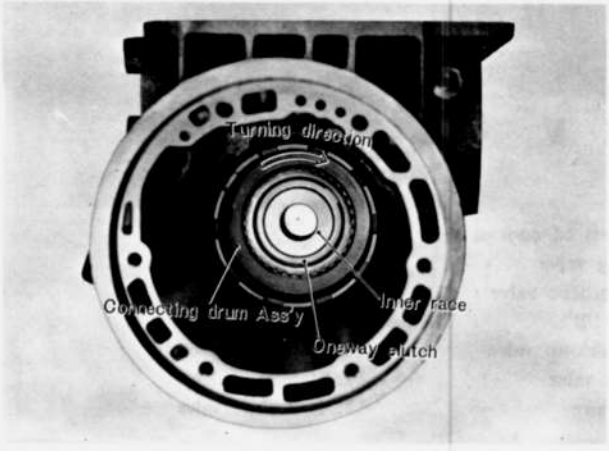

Fig. 7A–44 One-way clutch

When installing the one-way clutch, make sure that it is fitted with the arrow mark "→" on the front of vehicle.



Fig. 7A–45 Mark on the one-way clutch

e. Manual control system and parking lock system
Removal and disassembly of these parts are omitted.

7A–H. REASSEMBLY OF TRANSMISSION

Reassembling the major component parts on the transmission case are described below.
Install them in the procedure reverse to that of 7A–F "DISASSEMBLY OF TRANSMISSION" and make sure to lubricate each with converter oil before installation. All gaskets must be replaced with new ones. As to various component parts, refer to 7A–G "OVERHAUL OF MAIN COMPONENTS".

1. Install the low and reverse brake assembly on the transmission case. (7A–G–4)
2. Turn clockwise and push in the connecting drum assembly, engaging it with the friction plates.
3. Mount the needle bearing for the front face of the oil distributor assembly on the transmission case side and the bearing race on the front face of the oil distributor assembly. Then install the oil distributor assembly with governor to the case, taking care not to damage the seal rings.
4. Install the output shaft.
5. Install the lock ball, speedometer drive gear and snap ring to the output shaft from the rear end of the output shaft.
6. Mount the needle bearings on the front and rear faces of the internal drive flange, fit the flange on the output shaft and lock it with the snap ring.
7. Mount the bearing race on the rear face of the rear planet carrier and the needle bearing on its front face. Fit the rear planet carrier into the internal drive flange, and lock the carrier by placing the snap ring on the connecting drum.
8. Install the band servo on the case. (7A–G–5)
9. Mount the needle bearing on the rear face of the rear clutch hub and the bearing race on the front face of the front planet carrier. Assemble the rear clutch hub and the planet carrier, and install its assembly on the sun gear and connecting shell.
10. Put the above assembly with the rear clutch hub side facing upward. Mount the needle bearing on the front face of the rear clutch hub and the bearing race on the rear face of the rear clutch assembly, and install the rear clutch assembly downward on the rear clutch hub. In doing so, turn it a little so that the teeth of the clutch plates may come into engagement with the clutch hub spline.
11. Install the front clutch assembly into the rear one as in the case of the rear clutch assembly.
12. Install the assembly including the connecting shell, front clutch, rear clutch and front planet carrier into the transmission case.
13. Install the brake band on the front clutch drum.
14. Install the anchor blot to the transmission case and tighten it to **5.6 ~ 8.2 m-kg (41 ~ 59 ft-lb)**.
15. Install the band strut between the piston stem and the brake band.
16. Set the front clutch thrust washer, which adjusts the end play of the front clutch drum, on the rear face of the oil pump cover assembly, and also set the bearing race, which adjusts the total end play, on the rear end of the oil pump cover. Apply some amount of vaseline to prevent bearing race falling.
Install the oil pump assembly with gasket to the

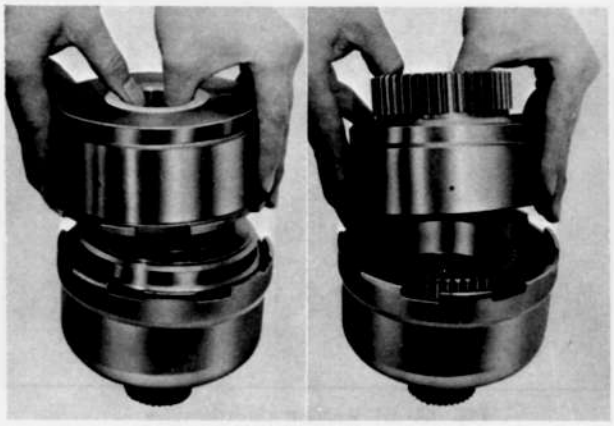

Fig. 7A–46 Assembling clutches

transmission case. Then install and tighten the converter housing onto the transmission case with six bolts to **4.5 ~ 5.5 m-kg (33 ~ 39 ft-lb)**. Insert the input shaft.

Note :
Above two end plays should be checked after the oil pump is properly installed and adjusted following 17 and 18.

17. Push the front clutch drum back and forth and insert a thickness gauge in the clearance between the front clutch drum and connecting shell in order to measure the end play between the rear face of the oil pump cover and the front face of the front clutch drum. Select a thrust washer from the following seven washers to adjust the clearance to specified **0.5 ~ 0.8 mm (0.020 ~ 0.031 in)**.

1.50 mm (0.059 in),	1.70 mm (0.067 in),
1.90 mm (0.075 in),	2.10 mm (0.083 in),
2.30 mm (0.091 in),	2.50 mm (0.098 in),
2.70 mm (0.106 in)	

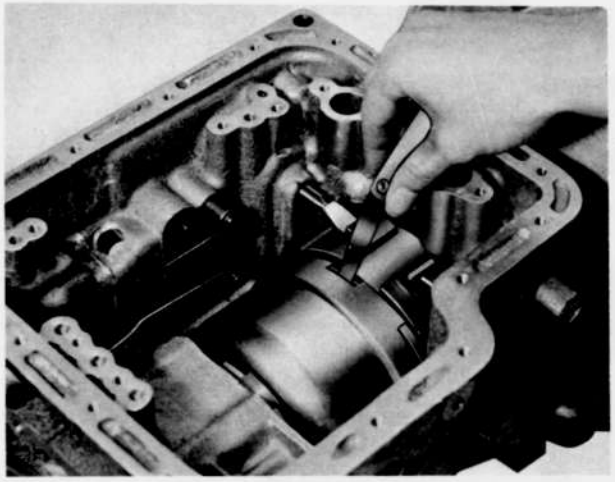

Fig. 7A–47 Checking end play

18. In measuring the total end play, apply the dial gauge on the tip of the input shaft and move the connecting shell fore and aft, and read the needle vibration. The standard clearance is **0.25 ~ 0.50 mm (0.010 ~ 0.020 in)**. Adjust end play by selecting a proper race in the followings.

1.20 mm (0.047 in),	1.40 mm (0.055 in),
1.60 mm (0.063 in),	1.80 mm (0.071 in),
2.00 mm (0.079 in),	2.20 mm (0.087 in)

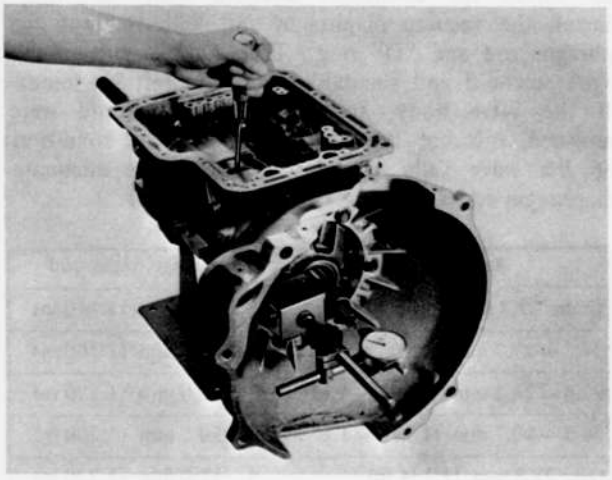

Fig. 7A–48 Checking end play

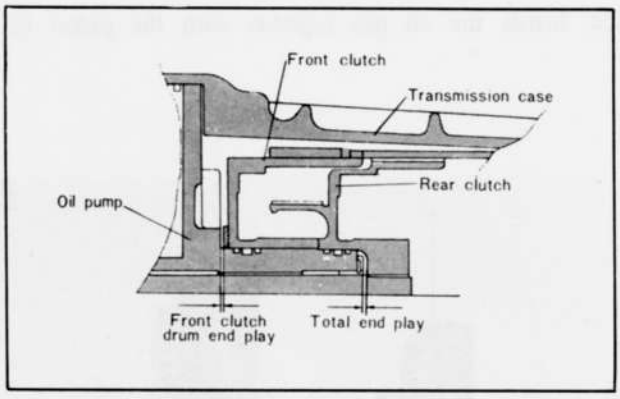

Fig. 7A–49 End plays

19. Tighten the stem of the servo piston to a torque of **1.2 ~ 1.5 m-kg (9 ~ 11 ft-lb)**. Then loosen it by two turns and lock with the lock nut to a tightening torque of **3.0 ~ 4.0 m-kg (22 ~ 29 ft-lb)**.
Install and tighten the band servo cover to the retainer.

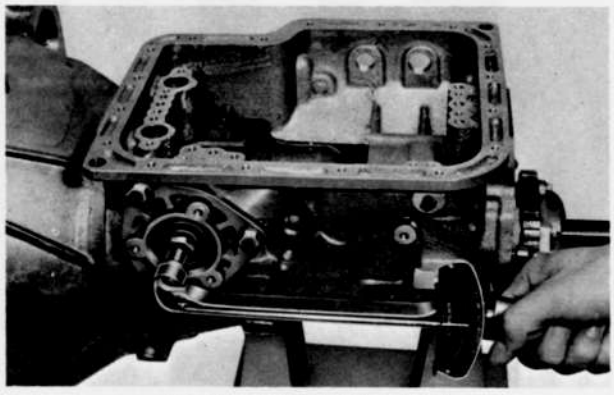

Fig. 7A–50 Tightening stem

20. Push in the manual shaft into the case with manual plate, washer and nut and tighten the nut. Then mount the parking lever and parking rod.
21. Install the range select lever to the manual shaft with the washer and nut then tighten the nut.

22. Install the control valve assembly onto the transmission case with nine bolts to a specified tightening torque of **0.55 ~ 0.75 m-kg (4.0 ~ 5.4 ft-lb)**.
23. Install the downshift solenoid with "O" ring. Install the vacuum diaphragm unit with vacuum diaphragm rod and "O" ring. Then tighten the downshift solenoid and vacuum diaphragm unit by hand. If the valve body, transmission case or rod were replaced, measure the distance "L" in the condition of the valve fully compressed and select adequate diaphragm rod according to the table below.

Measurement "L"	Diaphragm rod
Under 27.2 mm (1.071 in)	29.0 mm (1.140 in)
27.3 ~ 27.7 mm (1.075 ~ 1.091 in)	29.5 mm (1.160 in)
27.8 ~ 28.2 mm (1.095 ~ 1.110 in)	30.0 mm (1.180 in)
28.3 ~ 28.7 mm (1.114 ~ 1.130 in)	30.5 mm (1.200 in)
Over 28.8 mm (1.134 in)	31.0 mm (1.220 in)

24. Install the oil pan together with the gasket to a tightening torque of **0.50 ~ 0.70 m-kg (3.6 ~ 5.0 ft-lb)**.

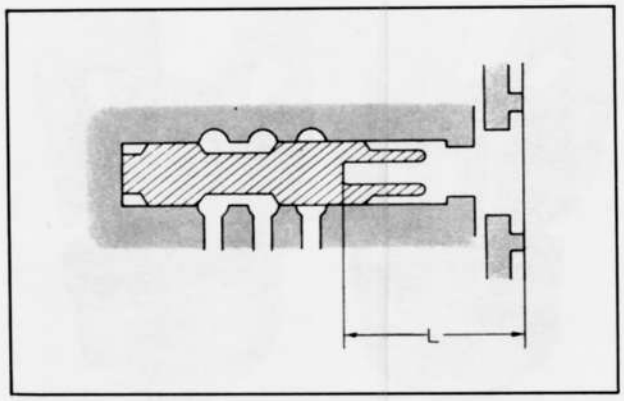

Fig. 7A–51 Vacuum throttle valve

25. Install the spacer, return spring and parking pawl on the shaft. Fit the rear end of the parking rod between the two steel balls in the supporter, then install the extension housing onto the case. Tighten the bolts to a specified torque of **2.0 ~ 2.5 m-kg (15 ~ 18 ft-lb)**.

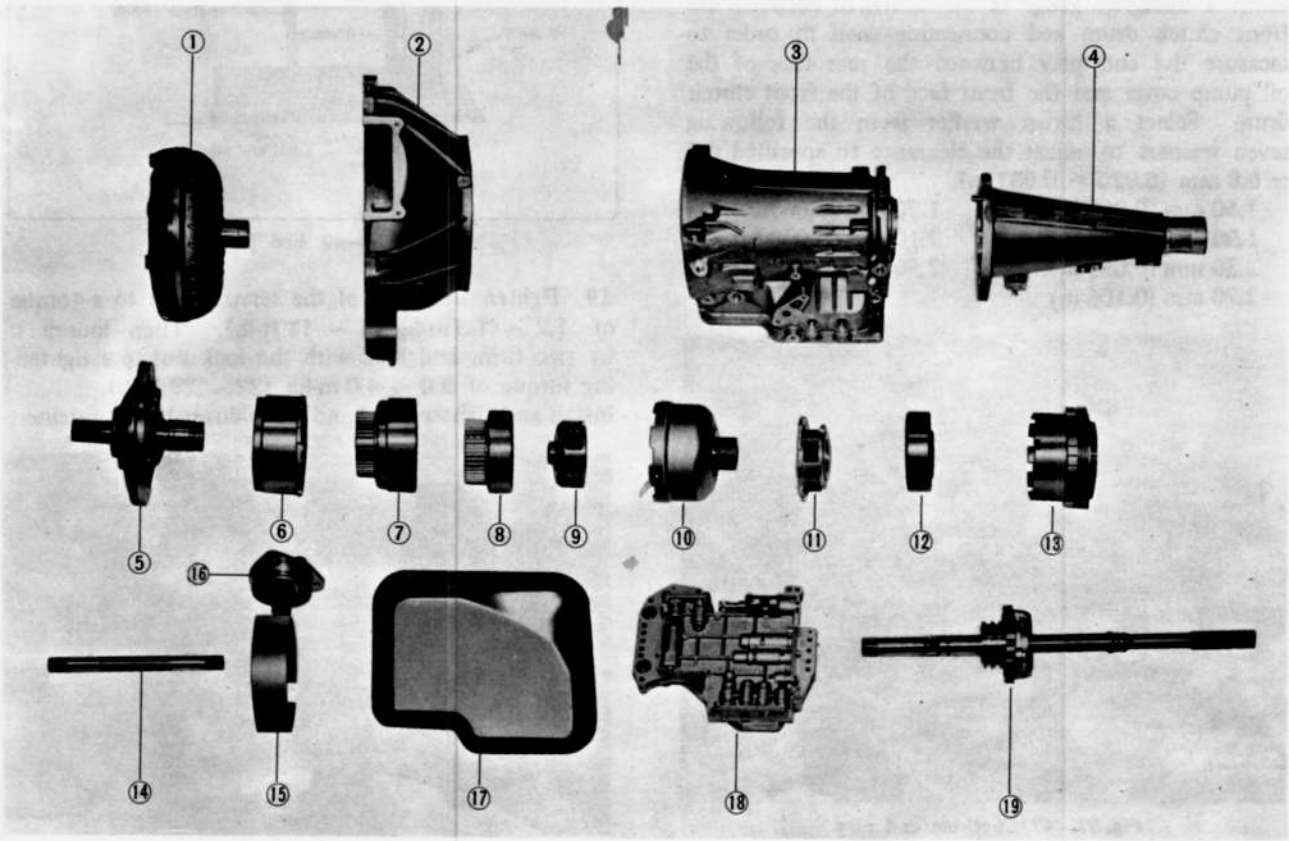

Fig. 7A–52 Main components of transmission

1. Troque converter
2. Converter housing
3. Case
4. Extension housing
5. Oil pump assembly
6. Front clutch assembly
7. Rear clutch assembly
8. Rear clutch hub assembly
9. Front planet carrier assembly
10. Shell & sun gear assembly
11. Rear planet carrier assembly
12. Drive flange assembly
13. Low & reverse brake assembly
14. Input shaft
15. Brake band
16. Servo piston assembly
17. Oil pan
18. Control valve assembly
19. Governor valve assembly and output shaft

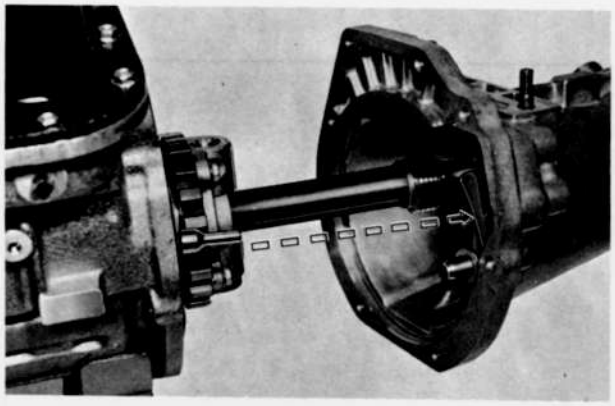

Fig. 7A–53 Installing extension housing

7A–I. INSTALLATION AND ADJUSTMENT OF TRANSMISSION

1. Before installing the transmission, measure the runout of the torque converter drive plate with a dial gauge. The runout must be within **0.3 mm (0.012 in)**. In case the runout exceeds **0.5 mm (0.020 in)**, replace the drive plate.
2. When combining the converter with oil pump, check whether they are rightly combined with each other by measuring the distance shown in Fig. 7A–54. The distance is approximately **19.5 mm (0.78 in)**. If there is great difference in the measurement, the converter should be rightly combined again.

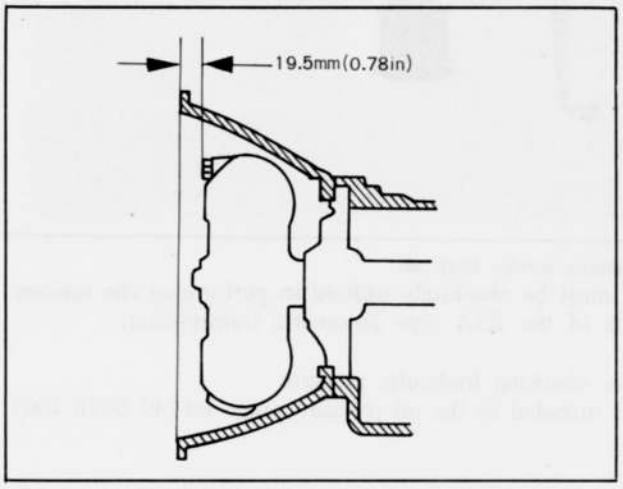

Fig. 7A–54 Checking torque converter fit

3. Installation procedure for the transmission is reverse to the removing procedure, referring to "REMOVAL OF TRANSMISSION" in 7A–E. In tightening the torque converter and the drive plate, temporarily tighten four bolts first, then lock the drive plate by applying the wrench to the drive pulley lock bolt. And tighten the four bolts to a specified torque of **3.7 ~ 5.5 m-kg (27 ~ 40 ft-lb)**. In case of confirming the tightening torque accurately, it is recommendable to proceed as follows:

Install a torque wrench to the hole in the center of the **special wrench** (49 0877 435), and tighten the bolt until the reading on the torque wrench comes to the value to be obtained by the undermentioned formula.

"L" indicates the effective length of the torque wrench. In the case of the torque wrench expressed in the m-kg unit, measure the "L" in terms of cm, and substitute the value (for example, 30 in case of 30 cm) into formula (1). In the case of the ft-lb torque wrench, on the other hand, measure the "L" in the inch unit, and substitute the value into formula (2). The prescribed tightening torque will thus be obtained.

$$\frac{5L}{10+L} \text{ . m-kg} \quad \text{.....(1)}$$

$$\frac{35L}{4+L} \text{ . ft-lb} \quad \text{..... (2)}$$

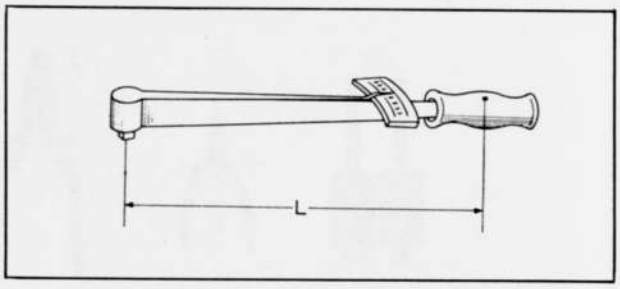

Fig. 7A–55 "L" length of torque wrench



Fig. 7A–56 Tightening torque converter

4. When the installation is finished, rotate the torque converter and check to see that there is no interference in the transmission. Then make the following check:
(1) Fill converter oil. The converter, when empty, can hold **6.2 liters (13.1 U.S. pints, 10.9 Imp. pints, 6.6 U.S. quarts)**. (7A–B–1)
(2) Check and regulate the manual linkage. (7A–B–4)
(3) Check and regulate the inhibitor switch. (7A–B–6)
(4) Check and regulate the engine idling. (7A–B–2) Apply the hand brake. With the engine idling, place the manual lever in "N", "D", "2", "1" and "R", and check to see that there is a slight shock of the transmission.
(5) Confirm the operation of the kick-down switch and downshaft solenoid. (7A–B–3)
(6) Check the oil level again.

5. When checking and regulating are over, conduct stall test, road test and hydraulic test referring to diagnostic test items (7A–C) in order to make sure that the transmission works normally.

SERVICE SPECIAL TOOLS

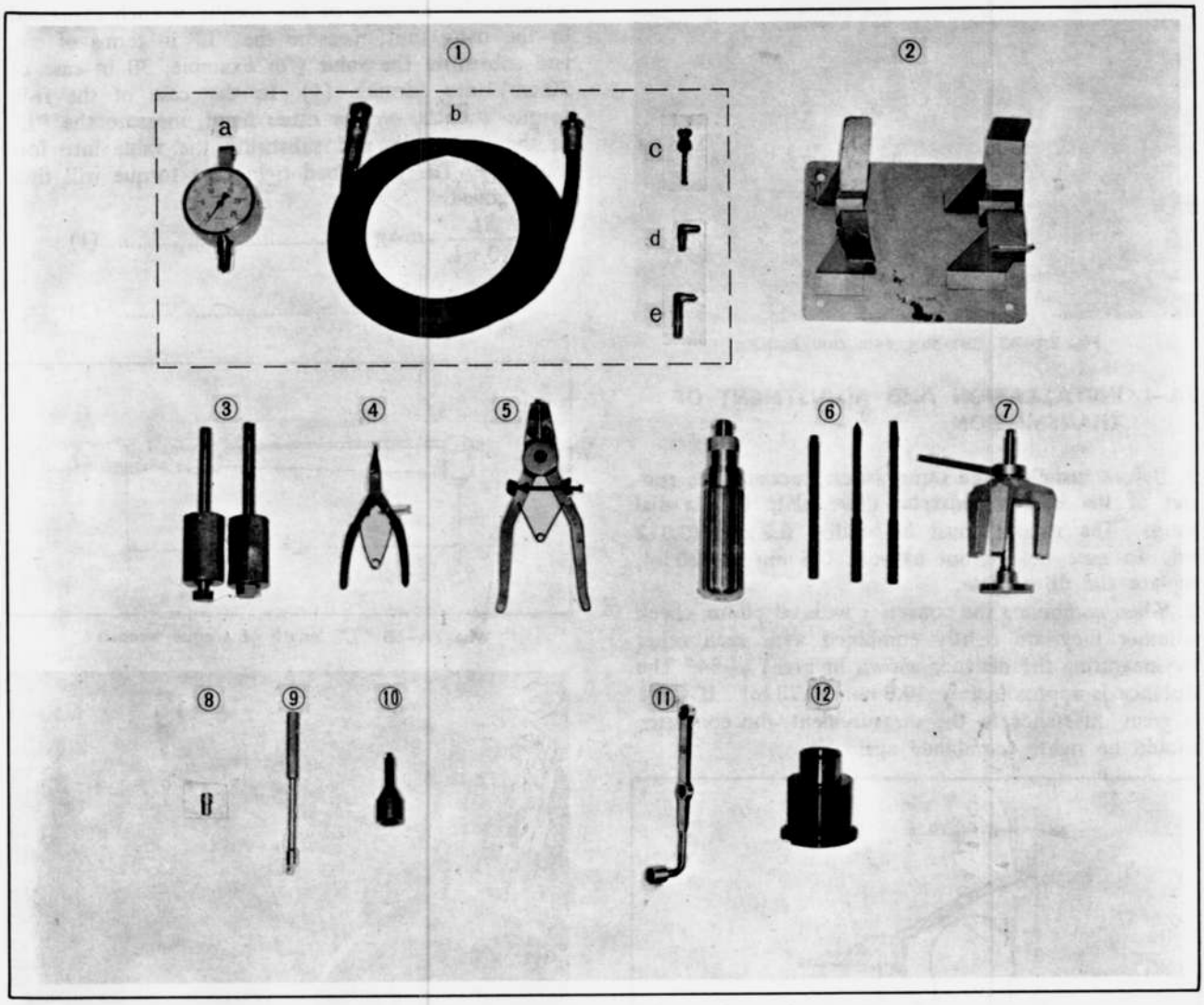

Fig. 7A–57 Automatic transmission service tools set

It is essential that the service special tools in this manual must be absolutely utilized in performing the various operations of trouble shooting, disassembling and assembling of the R3A type automatic transmission.

1. Oil pressure gauge set	49 0378 400	Use for checking hydraulic pressure
a. Oil pressure gauge	49 8000 001	This is included in the oil pressure gauge set (49 0378 400)
b. Rubber hose	49 0378 401	– do –
c. Joint pipe	49 0378 402	– do –
d. Hose adaptor	49 0378 403	– do –
e. Hose adaptor	49 0378 404	– do –
2. Transmission case stand	49 0378 320	Use for setting transmission
3. Oil pump puller	49 0378 390	Use for removing oil pump
4. Snap ring remover	49 8000 015	Use for removing or installing snap ring
5. Snap ring remover	49 8000 025	Use for removing or installing snap ring
6. Torque driver	49 8000 021	Use for tightening in accurate torque Max. torque 1.1 m-kg (95 lb-in)
7. Clutch spring compressor	49 0378 375	Use for assembling or disassembling front and rear clutch
8. Hexagon wrench	49 8000 031	Use for disassembling and assembling control valve
9. Spinner handle	49 8000 035	Use for disassembling and assembling control valve
10. Hex-head extension	49 0378 346	Use for removing and installing one-way clutch inner race with torque wrench. Drive angle 1/2" square and 5 mm (across flat width)
11. Special wrench	49 0877 435	A tool used for removing the bolt that attaches the drive-plate to the torque converter
12. Oil pump assembling gauge	49 2113 025A	Use for centering oil pump

PROPELLER SHAFT

DESCRIPTION ..... 8 : 1
8–A. PROPELLER SHAFT ..... 8 : 1
8–A–1. Propeller Shaft Removal ..... 8 : 1
8–A–2. Checking Propeller Shaft ..... 8 : 1
8–A–3. Installing Propeller Shaft ..... 8 : 2
8–B. UNIVERSAL JOINT ..... 8 : 2
8–B–1. Universal Joint Removal ..... 8 : 2
8–B–2. Checking Universal Joint ..... 8 : 2
8–B–3. Universal Joint Installation ..... 8 : 3
SPECIAL TOOLS ..... 8 : 3

DESCRIPTION

The propeller shaft assembly consists of the tubular piece of steel, universal joints and yokes. The rear end of the propeller shaft is attached to the companion flange of the rear axle through the universal joints and the front end is attached to the main shaft of the transmission by means of the splined slip yoke, which permits fore and aft movement of the propeller shaft whenever the rear axle moves up and down. The universal joints are lubricated for life, so do not require lubricating.

8–A. PROPELLER SHAFT

8–A–1. Propeller Shaft Removal

1. Raise the rear end of the vehicle and support with stands.
2. Mark the companion flange of the rear axle and the propeller shaft so they can be reinstalled in their original position.
3. Remove the bolts that attach the propeller shaft to the companion flange of the rear axle.

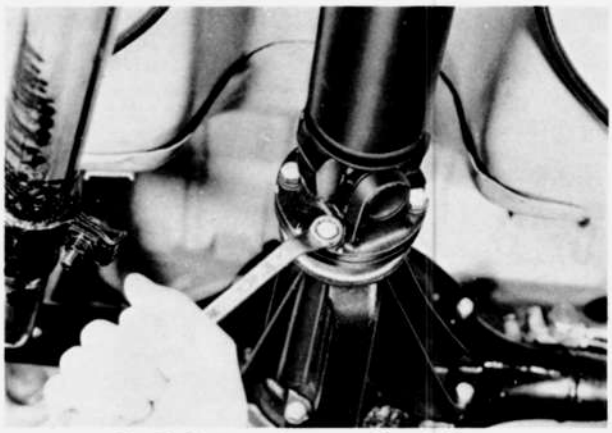

Fig. 8–1 Removing propeller shaft

4. Lower the rear of the shaft and slide rearward.
5. Install the **main shaft holder** (Part No. 49 0259 440) into the extension housing to prevent lubricant from running out of the housing.

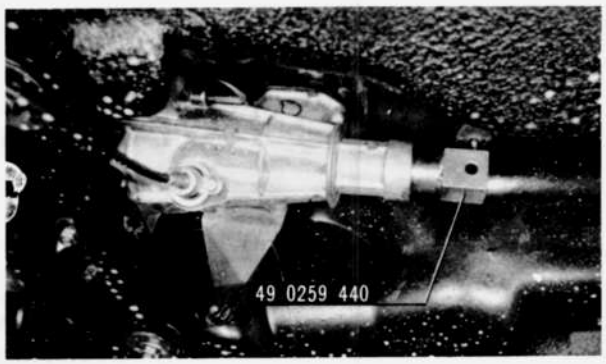

Fig. 8–2 Installing main shaft holder

8–A–2. Checking Propeller Shaft

1. Using a dial indicator, check the run-out at each end and in middle of the shaft. The shaft run-out should not exceed **0.4 mm (0.016 in)** at any one point.
2. Check the shaft for dynamic unbalance. If it is more than **15 cm-g (0.21 in-oz) at 4,000 rpm,** correct or replace it. Excessive unbalance of the shaft causes vibration and noise.

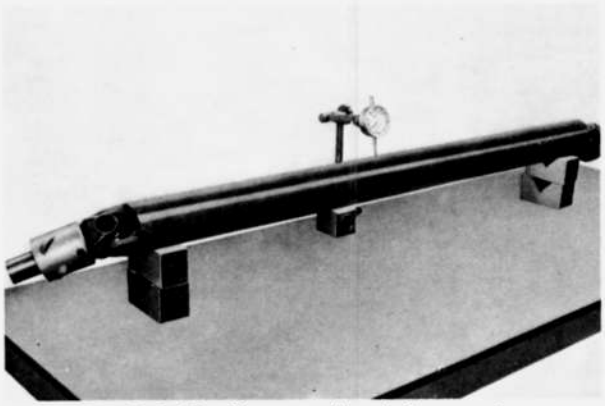

Fig. 8–3 Checking propeller shaft run-out

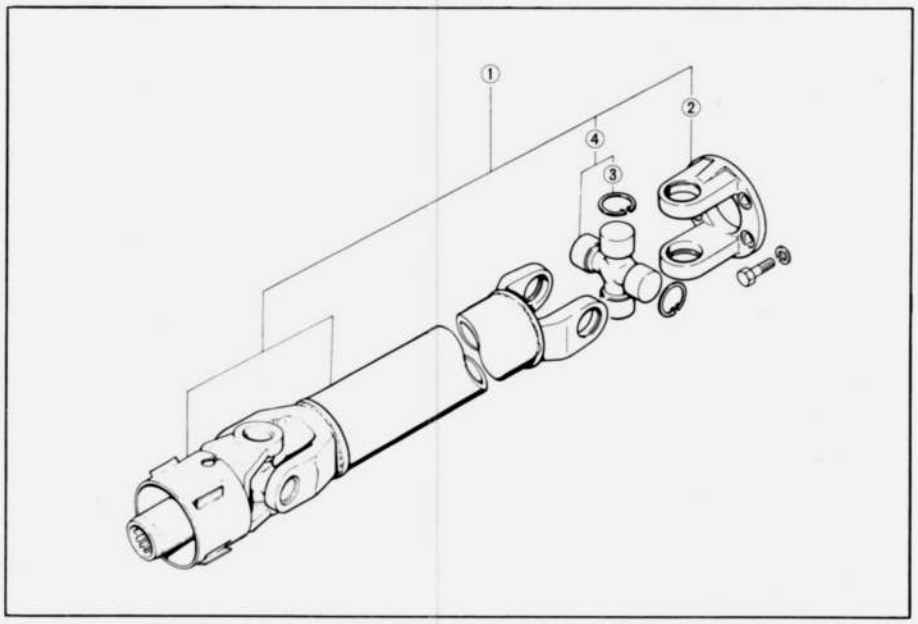

Fig. 8–4 Propeller shaft components

1. Propeller shaft
2. Yoke
3. Snap ring
4. Universal joint set

Note:
As the looseness on the **front universal joint** may cause the increase of the unbalance, resulting the seizure of the extension housing bush, the front universal joint and propeller shaft should be replaced as an assembly.

8–A–3. Installing Propeller Shaft
Follow the removal procedures in the reverse order.

8–B. UNIVERSAL JOINT

8–B–1. Universal Joint Removal
1. Remove the propeller shaft from the vehicle as described in **Par. 8–A–1** on page 8–1.
2. Mark both yoke and shaft so that the units may be reassembled in their original position in order to maintain the original balance.
3. Remove the snap rings that secure the bearings in the yoke.
4. Position the **universal joint replacer** (Part No. 49 0259 460A) as shown in Fig. 8–5 and screw in the center bolt until the bearing cup protrudes approximately 8 mm (0.32 in) out of the yoke.

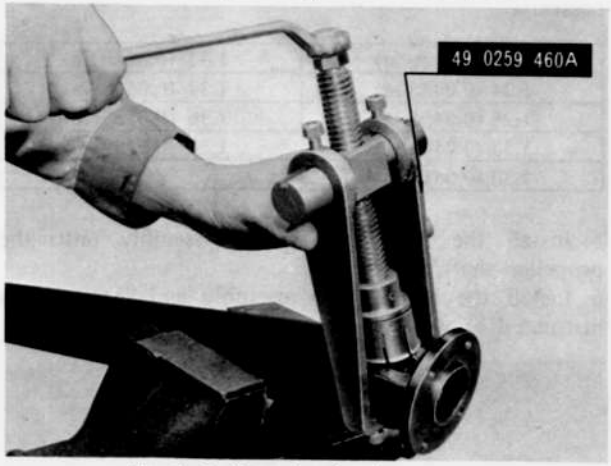

Fig. 8–5 Removing bearing cup

5. Loosen the center bolt and install the spacer between the yoke and the spider as shown in Fig. 8–6.



Fig. 8–6 Installing spacer

6. Screw in the center bolt until the bearing cup comes out of the yoke.
7. Remove the replacer and remove the bearing cup.
8. Remove the yoke and spider assembly as shown in Fig. 8–7.

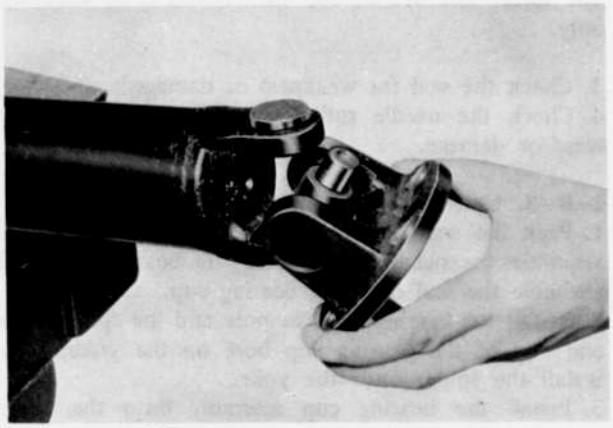

Fig. 8–7 Removing yoke and spider assembly

9. Position the replacer on the yoke as shown in Fig. 8–8 and remove the bearing cup in the same manner.

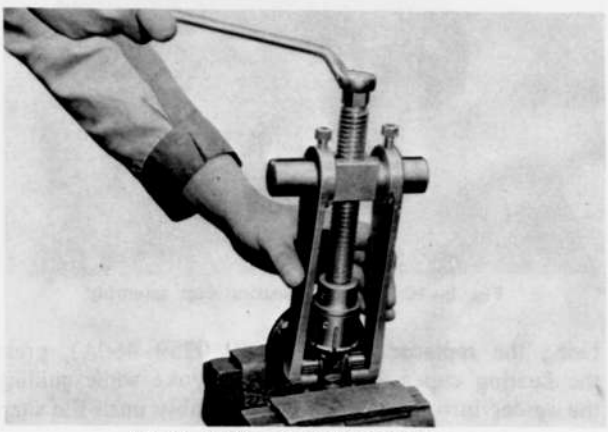

Fig. 8–8 Removing bearing cup

10. Remove the spider from the yoke.

8–B–2. Checking Universal joint
1. Check the spider journals for rust and wear.
2. Measure the diameter of the spider. If the wear

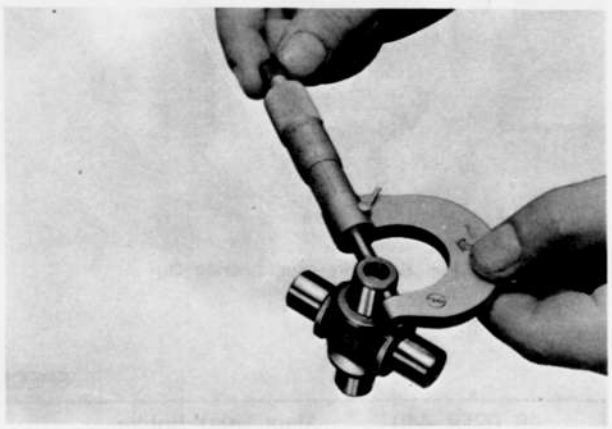

Fig. 8–9 Measuring spider diameter

of the spider exceeds **0.2 mm (0.0079 in)**, replace with a new one. The standard diameter is **14.72 mm (0.5795 in)**.

Note:
The spider and bearing cup are serviced as an assembly only.

3. Check the seal for weakness or damage.
4. Check the needle rollers and the bearing cup for wear or damage.

8–B–3. Universal Joint Installation
1. Pack the wall of the bearing cup with grease, then assemble the needle rollers into the bearing cup and assemble the seal onto the bearing cup.
2. Install the bearing cup assembly and the spider onto one end of the bearing cup bore on the yoke, then install the spider onto the yoke.
3. Install the bearing cup assembly onto the other end of the bearing cup bore on the yoke.

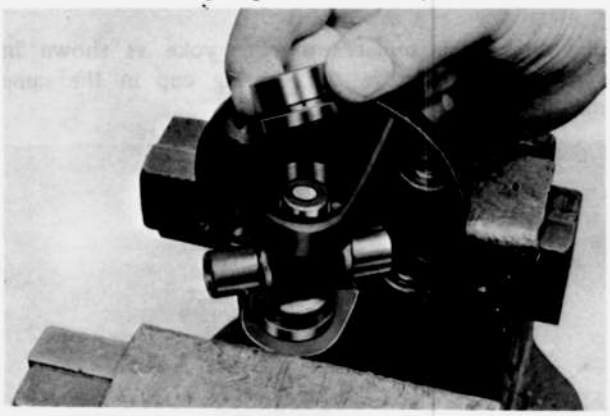

Fig. 8–10 Installing bearing cup assembly

Using the **replacer** (Part No. 49 0259 460A), press the bearing cup assembly into the yoke while guiding the spider into the bearing cup assembly until the snap ring can be installed.

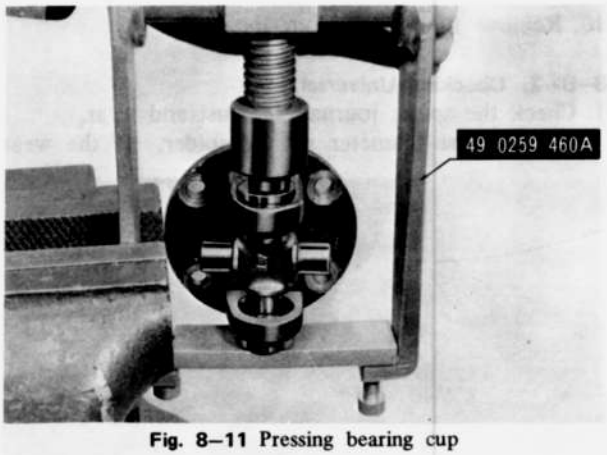

Fig. 8–11 Pressing bearing cup

4. Select the snap ring to obtain minimum play and install the same-thickness snap rings to secure the bearing cups in the yoke.

Note:
Use the same-thickness snap rings for both sides.

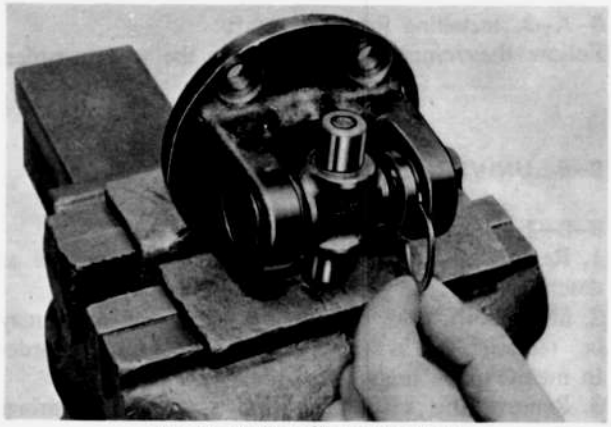

Fig. 8–12 Installing snap ring

Check the spider by moving it. If the spider is too tight, disassemble and detect the fault.
The snap rings are available in the following thicknesses:

1.22 (0.0480 in)	1.32 (0.0520 in)
1.24 (0.0488 in)	1.34 (0.0528 in)
1.26 (0.0496 in)	1.36 (0.0535 in)
1.28 (0.0504 in)	1.38 (0.0543 in)
1.30 (0.0512 in)	

5. Install the yoke and spider assembly onto the propeller shaft.
6. Install the bearing cup assembly and snap ring as instructed above.



Fig. 8–13 Installing bearing cup

7. Install the propeller shaft, as described in **Par. 8–A–3** on Page 8–2.

SPECIAL TOOLS

49 0259 440	Main shaft holder	49 0259 460A	Universal joint replacer

REAR AXLE

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9–A–3. Rear Axle Shaft Installation ..... 9 : 2
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DESCRIPTION

The rear axle is a semi-floating, integral-housing, hypoid gear drive type. The centerline of the drive pinion is mounted below the centerline of the ring gear. The rear axle shafts are retained in the housing by ball bearings and a bearing retainer at the axle housing outer ends. The left and right axle shafts are not interchangeable, the left shaft being shorter than the right shaft.

9–A. REAR AXLE SHAFT

9–A–1. Rear Axle Shaft Removal

1. Raise the rear end of the vehicle, then support the rear axle housing with stands.
2. Remove the wheel.
3. Remove the brake drum and brake shoes, as described in **Par. 11–G–1.**
4. Remove the nuts attaching the brake backing plate and bearing retainer to the axle housing.

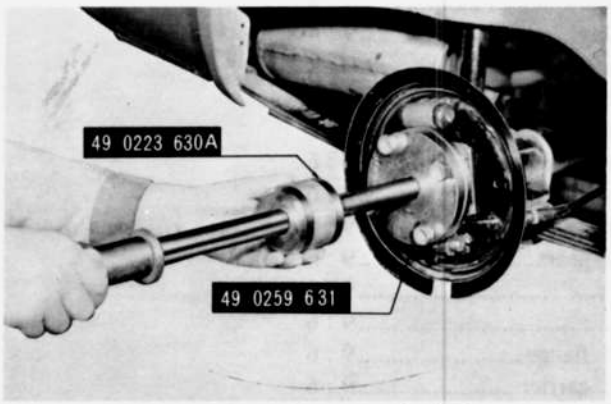

Fig. 9–1 Removing rear axle shaft

5. Remove the rear axle shaft from the rear axle housing, using the **rear axle shaft remover** (Part Nos. 49 0223 630A and 49 0259 631), as shown in Fig. 9–1.
6. Remove the oil seal from the rear axle housing, if necessary.

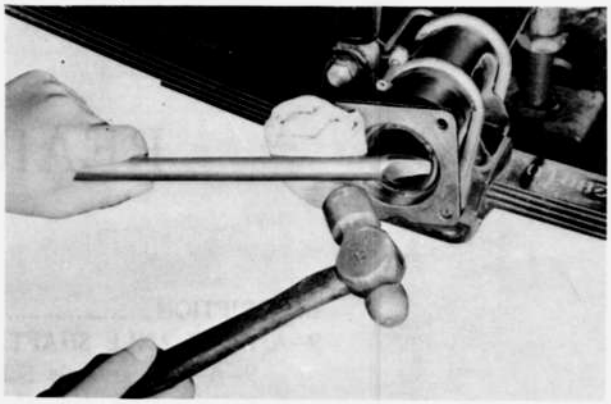

Fig. 9–2 Removing oil seal

9–A–2. Rear Axle Shaft Bearing Replacement

1. Remove the rear axle shaft bearing with the bearing

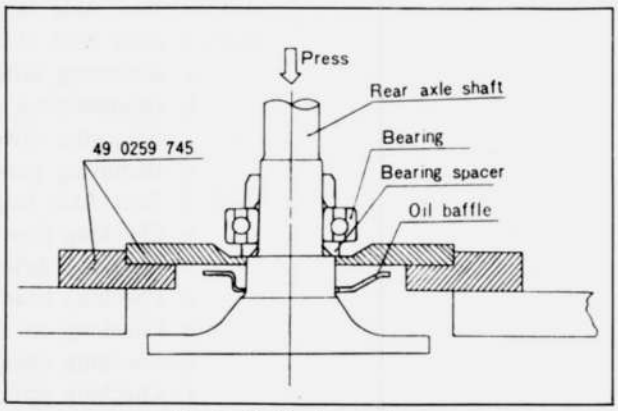

Fig. 9–3 Bearing replacer

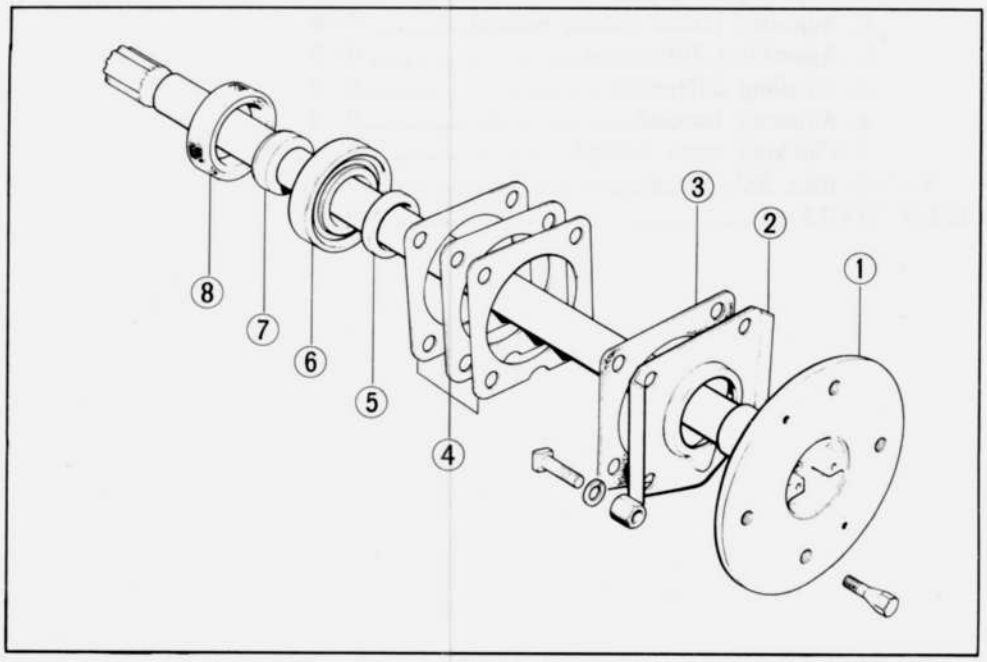

Fig. 9–4
Rear axle shaft components
1. Shaft
2. Bearing retainer
3. Gasket
4. Adjusting shim
5. Spacer
6. Bearing
7. Bearing collar
8. Oil seal

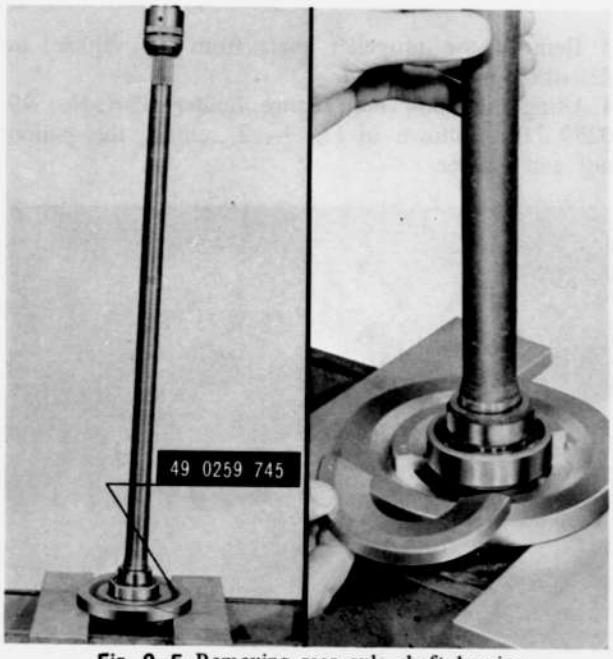

Fig. 9–5 Removing rear axle shaft bearing

retaining collar using a press and **bearing replacer** (Part No. 49 0259 745).

Note:
In case the pressure necessary to press out the bearing exceeds **10 tons (22,000 lb)** or if the bearing replacer is not available, grind the bearing retaining collar with a grinder and cut it with a chisel, taking care not to damage the shaft.

2. Remove the bearing retainer from the axle shaft.
3. Clean all parts and check the conditions of the bearing retaining collar, spacer and axle shaft.
4. Install the bearing retainer and spacer onto the axle shaft.
5. Position the bearing on the axle shaft **with the sealed side toward the axle shaft flange,** and press it on until the spacer comes in contact with the shoulder of the shaft.
6. Using the **bearing replacer** (Part No. 49 0259 745), press the bearing retaining collar on the shaft until the collar seats firmly against the bearing.

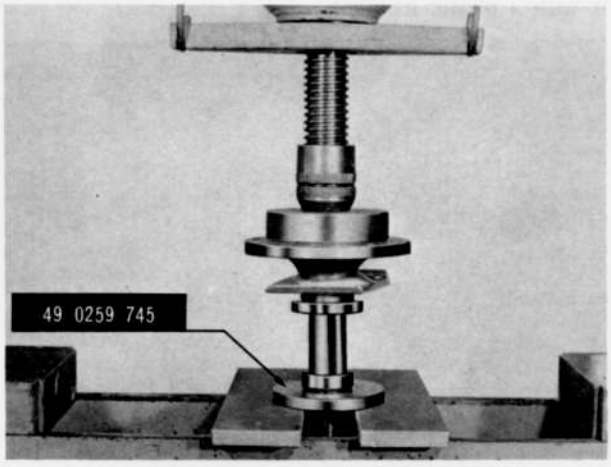

Fig. 9–6 Pressing bearing retaining collar

Note:
(a) **Do not** attempt to press on both the bearing and bearing retaining collar at the same time.
(b) If the bearing retaining collar is press-fitted with less than **3 tons (6,600 lb),** replace it with a new one.

9–A–3. Rear Axle Shaft Installation

1. Apply grease to the lip of the oil seal and install the oil seal into the axle housing.

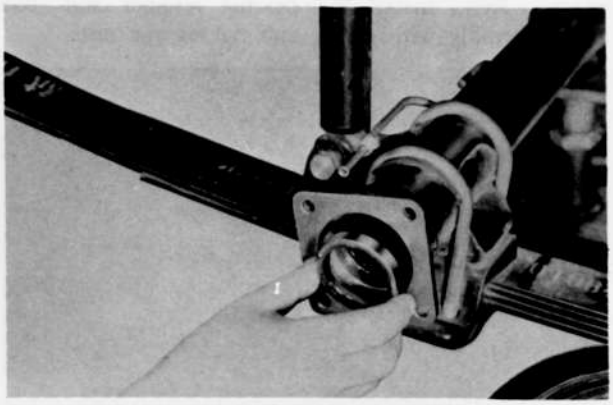

Fig. 9–7 Installing oil seal

2. Check the rear axle shaft end play as follows: Install the brake backing plate and measure the depth of the bearing seat in the axle housing, using a depth gauge as shown in Fig. 9–8. Then, measure the width of the bearing.

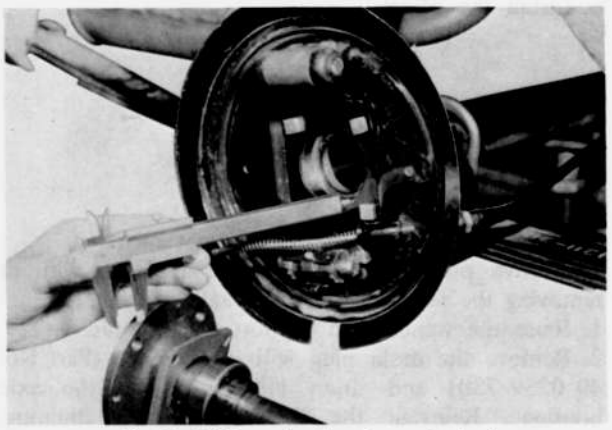

Fig. 9–8 Measuring bearing seat depth

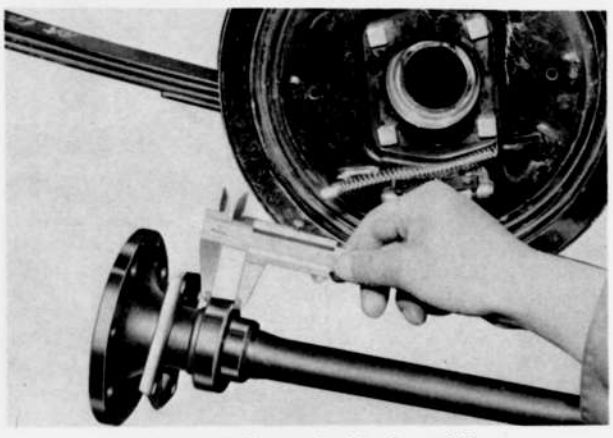

Fig. 9–9 Measuring bearing width

The difference between the two measurements indicates the required thickness of the adjusting shims. The maximum permissible end play is **0.1 mm (0.004 in)**. The shims are available in thicknesses of 0.1 mm and 0.4 mm (0.004 in and 0.06 in).
3. Remove the brake backing plate and apply a thin coat of sealing agent onto the backing plate contacting surface of the rear axle housing.
4. Apply a thin coat of sealing agent to the shims, and position the shims and brake backing plate in place. Then, install the bearing retainer and axle shaft assembly with gasket and tighten the nuts.

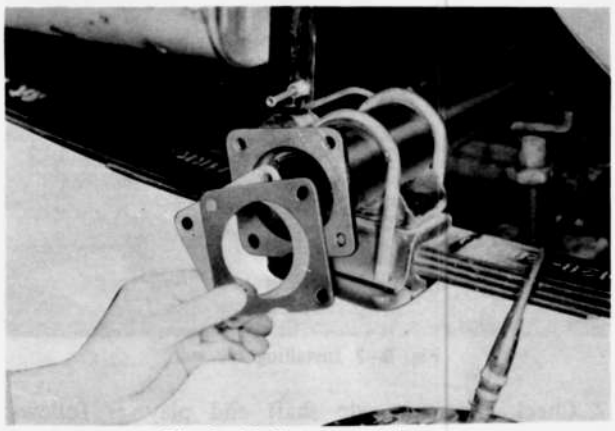

Fig. 9–10 Position of shims

5. Install the brake shoes and drum and adjust the brake shoe clearance.
6. Install the wheel.

9–B. DRIVE PINION OIL SEAL

9–B–1. Drive Pinion Oil Seal Replacement

The drive pinion oil seal can be replaced without removing the rear axle from the axle housing.
1. Raise the vehicle and support with stands.
2. Remove the drain plug with the **wrench** (Part No. 49 0259 730) and drain lubricant from the axle housing. Reinstall the drain plug after draining.



Fig. 9–11 Removing drain plug

3. Remove the propeller shaft from the vehicle, as described in **Par. 8–A–1.**
4. Using the **companion flange holder** (Part No. 49 0259 710A) shown in Fig. 9–12, remove the pinion nut and washer.

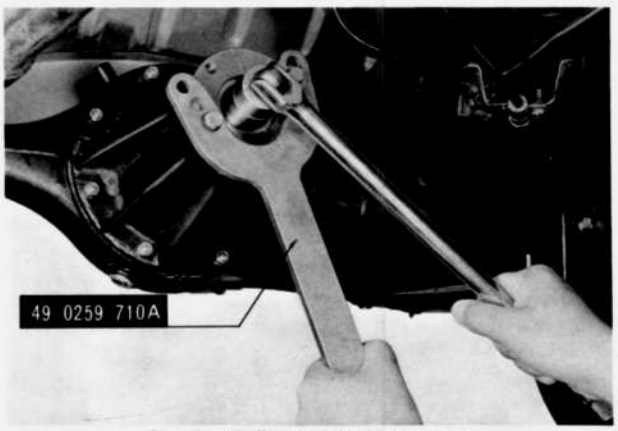

Fig. 9–12 Removing pinion nut

5. While tapping the holder with a hammer, remove the companion flange.

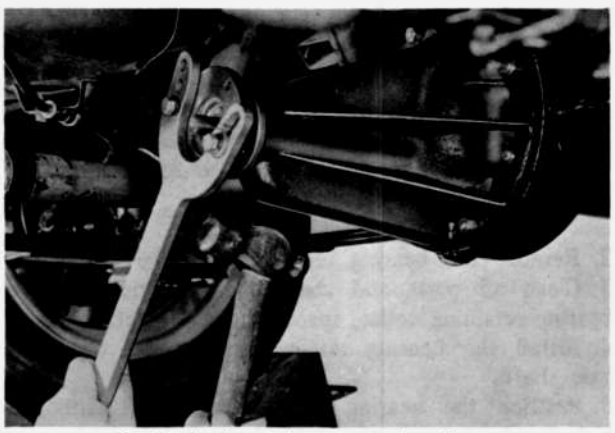

Fig. 9–13 Removing companion flange

6. Remove the drive pinion oil seal from the rear axle.
7. Apply a small amount of lubricant to the oil seal lip.
8. Install a new oil seal to the rear axle while tapping it with a plastic hammer.

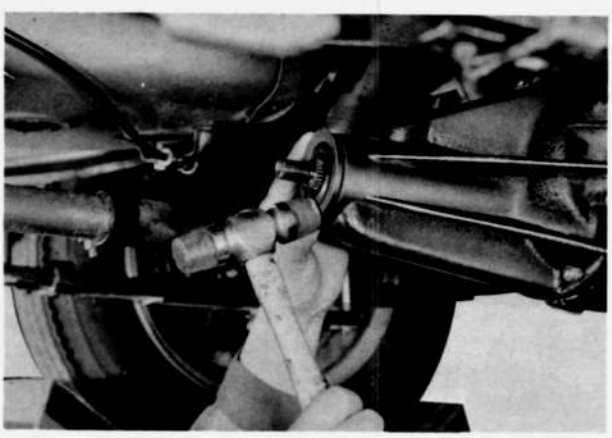

Fig. 9–14 Installing oil seal

9. Install the companion flange together with the holder (Part No. 49 0259 710A).
10. Tighten the pinion nut **to 13 m-kg (94 ft-lb) or 12 m-kg (86.8 ft-lb)** rotating the pinion occasionally to insure proper bearing seating.

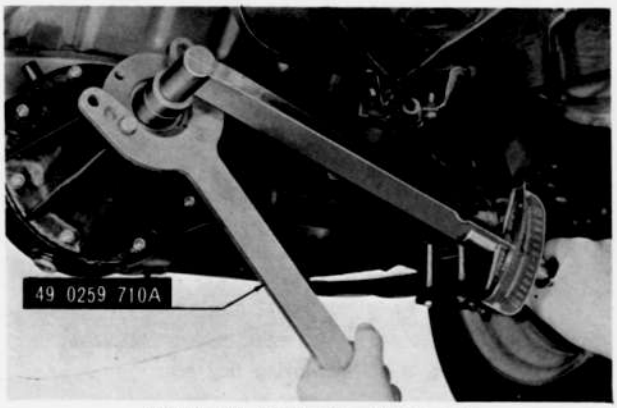

Fig. 9–15 Tightening pinion nut

11. Install the propeller shaft.

9–C. REAR AXLE

9–C–1. Rear Axle Removal

1. Raise the vehicle and support with stands.
2. Remove the drain plug with the **wrench** (Part No. 49 0259 730) and drain the lubricant from the axle housing. Reinstall the drain plug after draining.
3. Remove the propeller shaft from the vehicle, as described in **Par. 8–A–1.**
4. Remove the right and left rear axle shafts, as described in **Par. 9–A–1.**
5. Remove the nuts attaching the rear axle to the axle housing and remove the rear axle from the housing.



Fig. 9–16 Removing rear axle assembly

9–C–2. Rear Axle Disassembly

a. Removing differential

1. Mount the rear axle on the **work stand** (Part Nos. 49 0164 550D and 49 0223 561A).
2. Apply identification punch marks on the carrier, differential bearing cap, and adjuster for reassembly purpose.

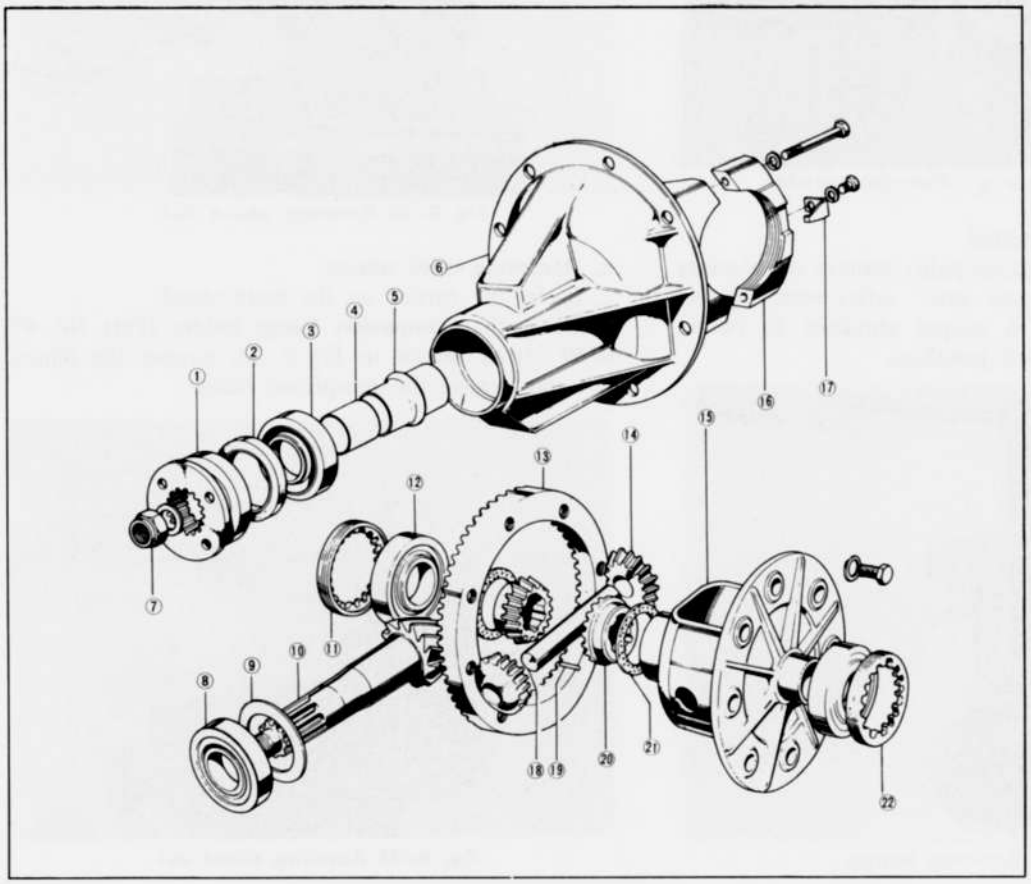

Fig. 9–17
Rear axle components
1. Companion flange
2. Pinion oil seal
3. Pinion front bearing
4. Pinion bearing collar
5. Collapsible pinion bearing spacer
6. Carrier
7. Pinion nut
8. Pinion rear bearing
9. Adjusting washer (Adjusting spacer)
10. Drive pinion
11. Pinion side adjusting nut
12. Side bearing
13. Ring gear
14. Pinion gear
15. Differential gear case
16. Bearing cap
17. Adjusting nut lock
18. Pinion shaft
19. Pinion shaft lock pin
20. Side gear
21. Thrust washer
22. Ring gear side adjusting nut

3. Remove the bolts securing the adjusting nut locks, and remove the nut locks.
4. Loosen the bearing cap attaching bolts and back off the adjusting nut slightly with the **spanner** (Part No. 49 0259 720) to relieve bearing preload. Remove the bearing caps and adjusting nuts.

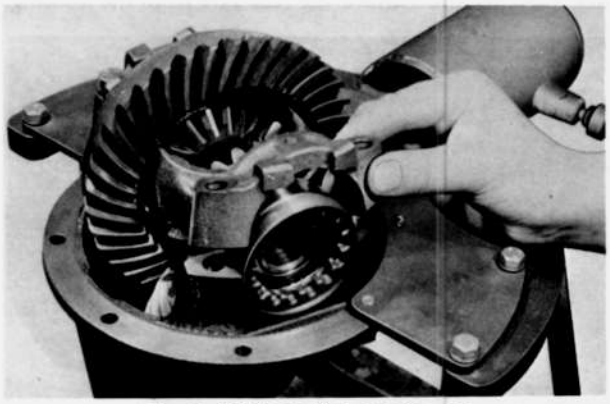

Fig. 9–18 Removing bearing cap

5. Remove the differential assembly together with the bearings.

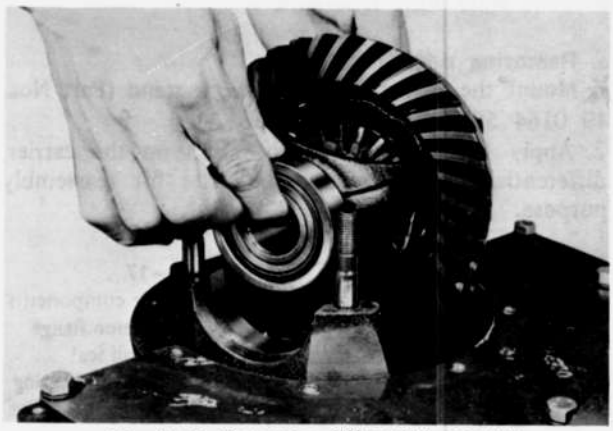

Fig. 9–19 Removing differential assembly

b. Disassembling differential

1. Using the suitable bearing puller, remove the bearings from the differential gear case. After removing the bearings, place them in proper sequence to obtain the original right and left positions.

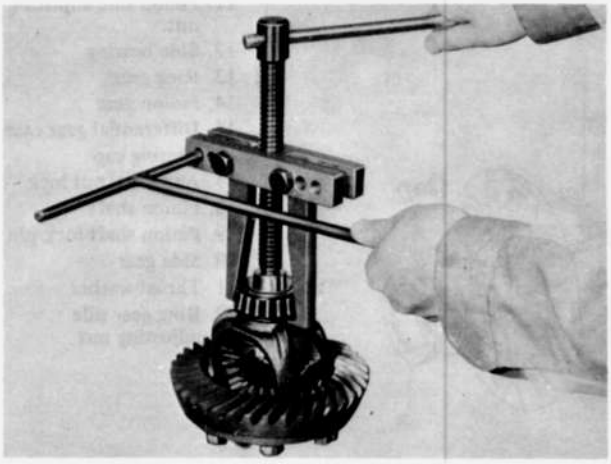

Fig. 9–20 Removing bearing

2. Remove the bolts, and the ring gear from the case.

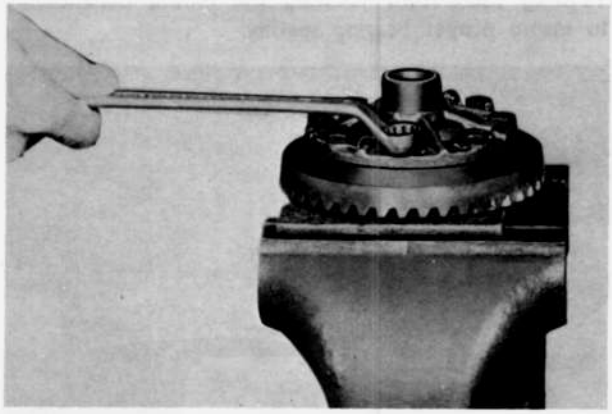

Fig. 9–21 Removing ring gear

3. Pry and straighten the punched portion of the case, and remove the pinion shaft lock pin with a suitable brass rod.
4. Remove the pinion shaft, pinion gears, side gears and side gear thrust washers from the case.

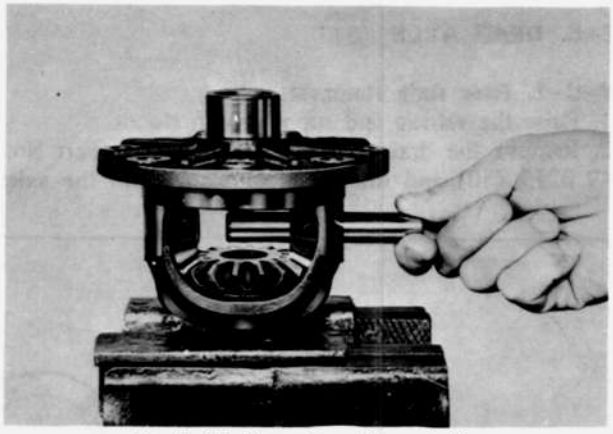

Fig. 9–22 Removing pinion shaft

c. Removing drive pinion

1. Invert the carrier on the work stand.
2. Using the **companion flange holder** (Part No. 49 0259 710A) shown in Fig. 9–23, remove the pinion nut and remove the companion flange.

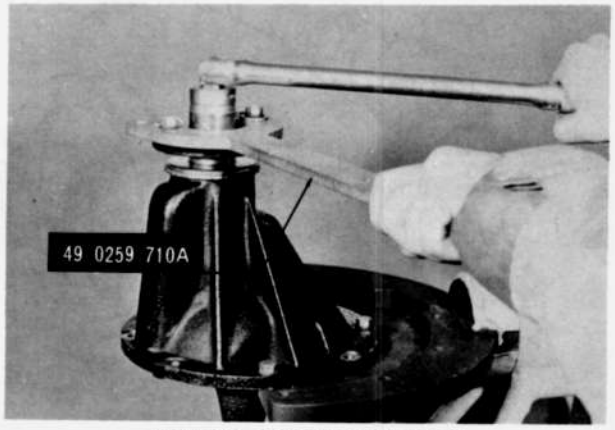

Fig. 9–23 Removing pinion nut

3. Remove the drive pinion from the carrier. If the drive pinion is hard to remove, hold the drive pinion end and press the drive pinion out with a press.
4. Slide the pinion bearing collar (if equipped) and collapsible pinion bearing spacer off the drive pinion. Press out the pinion rear bearing with a press and remove the pinion adjusting spacer from the drive pinion.
5. Remove the oil seal and pinion front bearing from the carrier.

d. Removing pinion bearing outer race
If it becomes necessary to remove the pinion bearing outer race(s), proceed as follows:
Remove the old outer race from the carrier by using a drift in slots provided for this purpose.

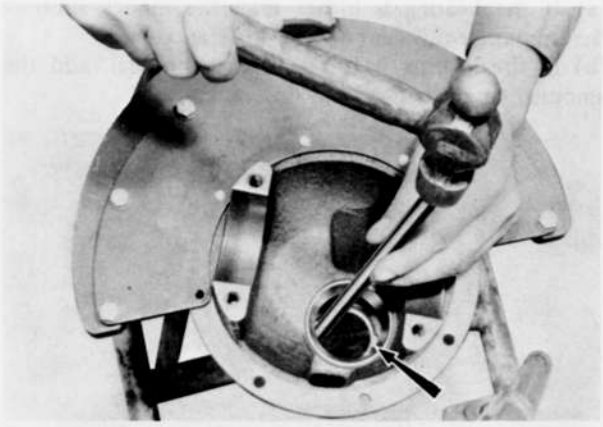

Fig. 9–24 Removing pinion bearing outer race

9–C–3. Rear Axle Inspection

a. Checking drive pinion and ring gear
Check the drive pinion for damaged or excessively worn teeth, damaged bearing journals and splines. Inspect the ring gear for worn or chipped teeth. If any of above conditions is found, replace the ring gear and drive pinion as a set.

b. Checking differential gears
Inspect the differential side gears and pinion gears for cracks, chipped teeth or any damage. Repalce the side gears, pinion gears or side gear thrust washers if necessary. Check the clearance between the pinion gear and pinion shaft. If excessive clearance is found due to wear, replace with new parts. Check the spline fit of the side gear and rear axle shaft. If excessive clearance is found, replace the side gear or axle shaft.

c. Checking bearings
Inspect the differential bearings and pinion bearings for wear, flaking or any damage. If necessary, replace them.

Note:
The bearing cone and outer race should be replaced as a set if damage to either is encountered.

d. Checking oil seal
Check the oil seal for wear or damage. If there is any possibility of oil leakage, replace the oil seal.

e. Checking companion flange
Check the companion flange for wear at splines, and on the contact surface with oil seal.

f. Checking differential carrier
Check the differential carrier for damage or crack.

9–C–4. Rear Axle Assembly

a. Adjusting drive pinion
The drive pinion should be correctly positioned in relation to the ring gear by the use of the pinion adjusting washer which is placed between the front face of the drive pinion gear and pinion rear bearing.

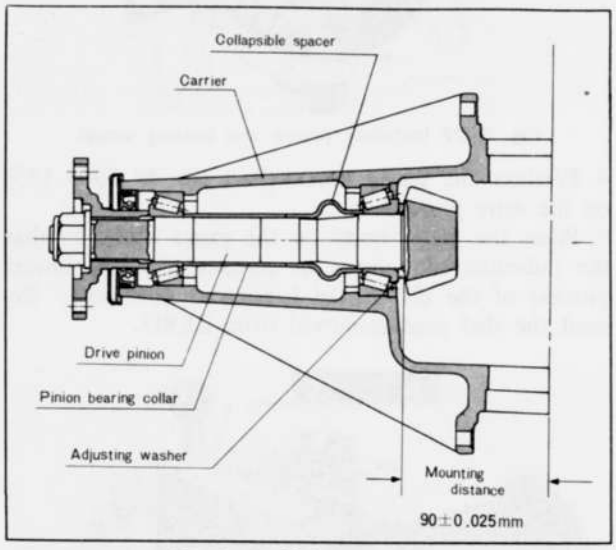

Fig. 9–25 Pinion position

The standard distance between the front face of the drive pinion gear and the center of the ring gear (mounting distance) is 90 ± 0.025 mm. To adjust the drive pinion position, use the **special tools** (Part Nos. 49 0727 570 and 49 0305 555) and proceed as follows:
1. Position a dial indicator on the **gauge body** (Part No. 49 0727 570) and place the gauge body on a surface plate. Push the dial indicator downward until the pointer rotates approximately 3/4 turn clockwise



Fig. 9–26 Setting gauge

and tighten the dial indicator at this position. Then, set the dial indicator to ZERO.
2. Make certain that the differential bearing support bores are free of dirt and burrs.
3. Install the original spacer and **bearing model** (Part No. 49 0221 572) onto the drive pinion and insert the drive pinion into the carrier.

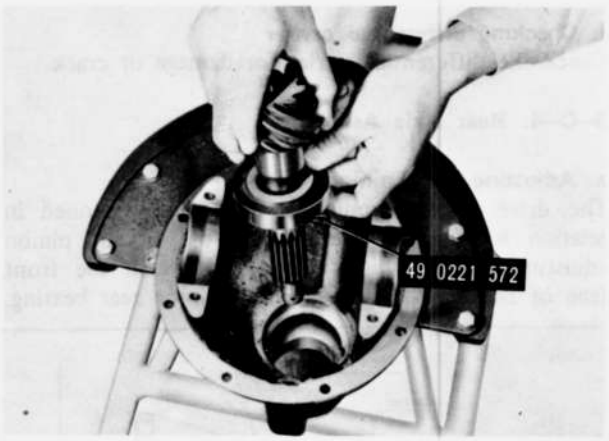

Fig. 9–27 Installing pinion and bearing model

4. Position the **gauge block** (Part No. 49 0305 555) on the drive pinion.
5. Place the gauge body on the gauge block so that the indicator rod comes in contact with the lowest portion of the differential bearing support bore. Record the dial reading moved from ZERO.

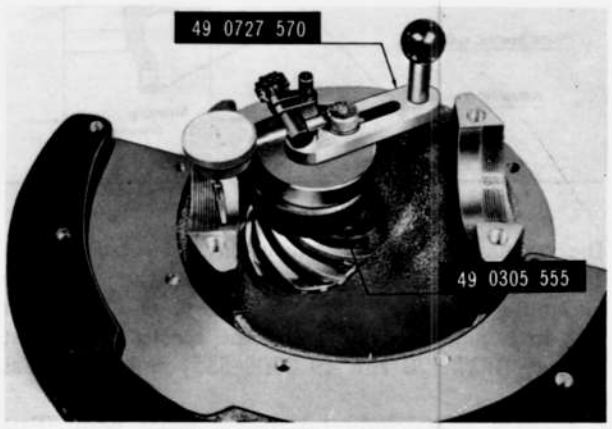

Fig. 9–28 Placing gauge

(a) If the dial indicator shows "+" (plus), add the amount equivalent to the reading.
(b) If the dial indicator shows "–" (minus), subtract the amount equivalent to the reading.
6. Remove the gauge body and dial indicator from the carrier and check zero setting on the surface plate to make sure this setting was not disturbed by handling.
7. In order to compensate for all of the machining variables, the pinion has a plus or minus reading recorded in hundredth millimeters on the rear face of the pinion.

Example:

M + 2 = +0.02 mm (+ 0.0008 in)
M - 1 = -0.01 mm (+ 0.0004 in)

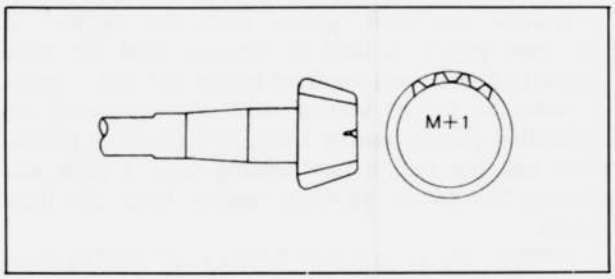

Fig. 9–29 Pinion mark

(a) If the pinion is marked "+" (plus), subtract the amount specified on the pinion.
(b) If the pinion is marked "–" (minus), add the amount specified on the pinion.
8. Place the bearing model and the rear pinion bearing on the surface plate and compare their heights as shown in Fig. 9–30.
(a) If the bearing is higher than the model, subtract the amount equivalent to the difference.
(b) If the bearing is lower than the model, add the amount equivalent to the difference.

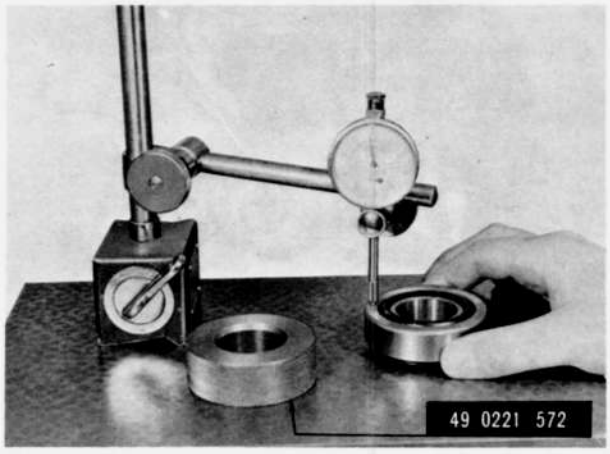

Fig. 9–30 Measuring bearing height

9. Finally select the correct pinion spacer to be used during pinion assembly by adding or subtracting the amount determined in Step 5, 7 and 8 from the thickness of the spacer used in Step 3.
The spacers are available in the following thickness:

Identification mark	Thickness
08	3.08 mm (0.1213 in)
11	3.11 mm (0.1224 in)
14	3.14 mm (0.1236 in)
17	3.17 mm (0.1248 in)
20	3.20 mm (0.1260 in)
23	3.23 mm (0.1271 in)
26	3.26 mm (0.1283 in)
29	3.29 mm (0.1295 in)
32	3.32 mm (0.1307 in)
35	3.35 mm (0.1319 in)
38	3.38 mm (0.1331 in)
41	3.41 mm (0.1343 in)
44	3.44 mm (0.1354 in)
47	3.47 mm (0.1366 in)

10. Position the correct spacer on the pinion and install the rear pinion bearing.

b. Adjusting pinion bearing preload

1. Install the pinion bearing outer race into the carrier. Make sure the outer race are seated into the carrier.
2. Install the collapsible pinion bearing spacer and pinion bearing collar onto the pinion shaft, and position the pinion assembly in the carrier.

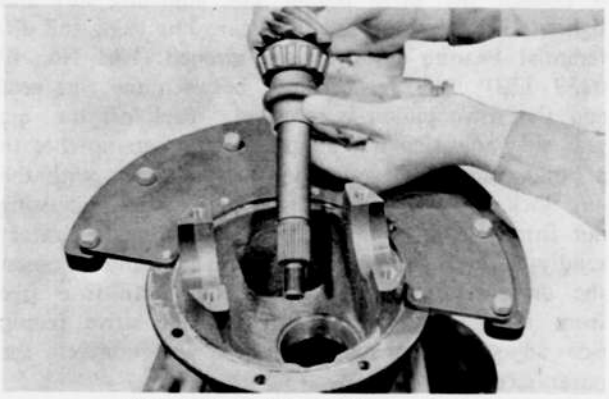

Fig. 9–31 Position pinion assembly

3. Place the pinion front bearing in position on the pinion. Hold the pinion of fully forward and drive the pinion front bearing over the pinion until seated.
4. Apply gear lubricant to the lip of the pinion oil seal and install the oil seal into the carrier.
5. Install the companion flange onto the pinion by tapping with a soft hammer.
6. Install the pinion washer and nut. Before tightening the nut (when the pinion preload is ZERO), check the drag by the oil seal by using a torque wrench.
7. Using the **companion flange holder** (Part No. 49 0259 710A), tighten the pinion nut to the specified torque **13 m-kg (94.0 ft-lb). Do not** exceed the specified torque at this time.

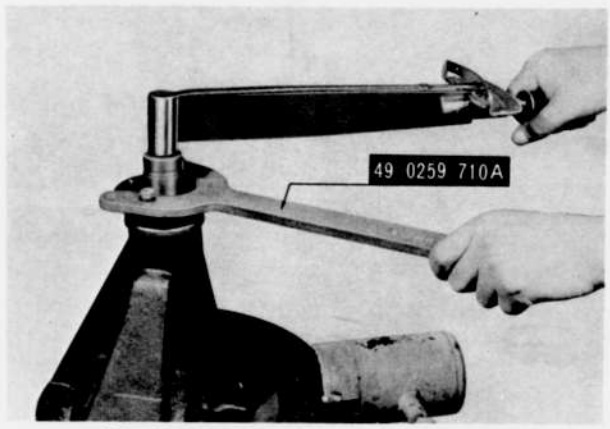

Fig. 9–32 Tightening companion flange

8. Check the pinion bearing preload with a torque wrench. Correct preload will be obtained when the torque required to rotate the pinion is as specified in **9 ~ 14 cm-kg (7.8 ~ 12.2 in-lb)** without oil seal drag.

Note:
If the preload is measured by using a spring scale at the bolt hole of the companion flange, the reading should be **2.5 ~ 3.9 kg (5.51 ~ 8.60 lb)** without oil seal drag.

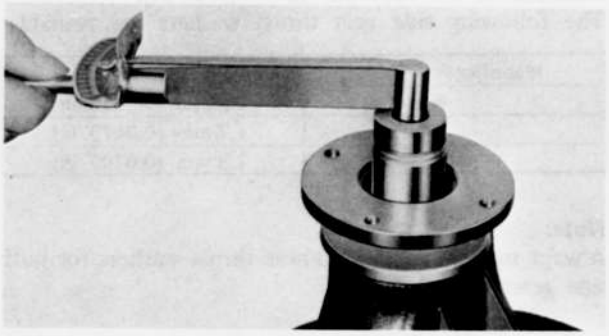

Fig. 9–33 Checking pinion bearing preload

If the torque required to rotate the pinion is less than specified, tighten the pinion nut **a little at a time** until the proper preload is established. **Do not** overtighten the pinion nut. The maximum tightening torque of the pinion nut is **18 m-kg (115.8 ft-lb).** If excessive preload is obtained as a result of overtightening, replace the collapsible bearing spacer. **Do not** back off the pinion nut to establish pinion bearing preload. If the torque on the pinion nut is **less than 13 m-kg (94 ft-lb)** after bearing preload is established, a new collapsible bearing spacer must be used.
9. Tighten the pinion nut until the preload determined in step 8 is established.

c. Assembling differential

1. Install the thrust washer on each differential side gear and install these in the gear case.
2. Through the opening of the gear case, insert each of two pinion gears exactly 180 degrees opposite each other.
3. Rotate the gears 90 degrees so that the pinion gear shaft holes of the case come into alignment with the holes in the pinion gears.
4. Insert the pinion gear shaft through the case and pinion gears so that the pinion gear shaft lock pin holes in the pinion gear shaft will align with the hole in the case.
5. Check the backlash between the side gear and the pinion gear using a dial indicator. To check the backlash, hold the pinion gear and measure the side gear movement with a dial indicator.

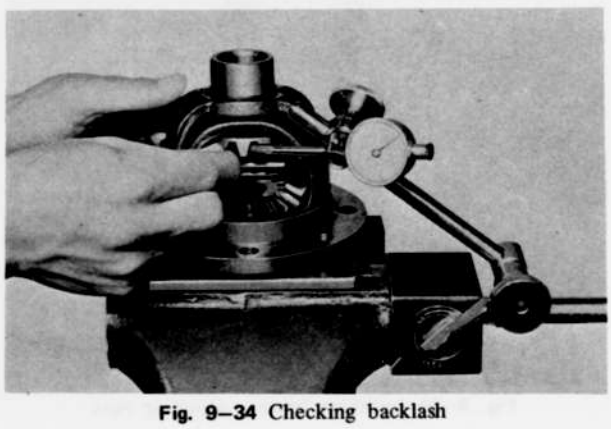

Fig. 9–34 Checking backlash

If the backlash is incorrect, select and install the correct side gear thrust washers to obtain the specified backlash of **0 ~ 0.1 mm (0 ~ 0.004 in).**
The following side gear thrust washers are available:

Identification mark	Thickness
6	1.6 mm (0.0630 in)
7	1.7 mm (0.0670 in)
8	1.8 mm (0.0709 in)

Note:
Always use the same thickness thrust washers for both side gears.

6. Drive in the lock pin into the gear case to lock the pinion gear shaft. Next, punch the lock pin hole edge of the case with a suitable punch and hammer to prevent dropping of the lock pin.
7. Install the ring gear into the case and tighten the bolts to a torque of **6.5 ~ 7.5 m-kg (47 ~ 54 ft-lb).**

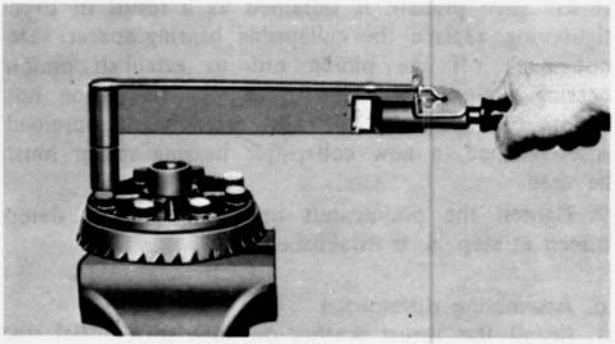

Fig. 9–35 Installing ring gear

8. Install each differential bearing to the hubs of the gear case.
9. Install the differential bearing outer races on the differential bearing cones originally installed.

d. Installing differential
1. Place the differential gear assembly in the carrier making ensure that the marks for backlash adjustment on the face of the pinion and ring gear teeth are aligned with each other.
2. Install the differential bearing adjusting nuts on each side of the differential bearings.

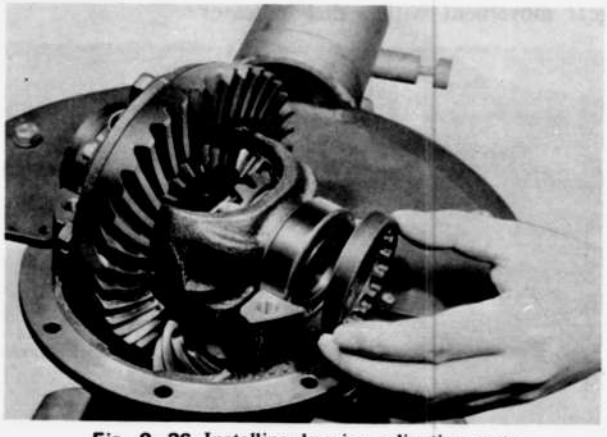

Fig. 9–36 Installing bearing adjusting nuts

3. Install the differential bearing caps onto the carrier, ensuring that the identification marks are matched. Install the cap attaching bolts, and screw them in two or three turns. Carefully set the cap in place so that the threads of the adjusting nut and the cap fit snugly, and then tighten the attaching bolts again temporarily.
4. Loosen the drive pinion side adjusting nut and tighten the ring gear side adjusting nut using the **differential bearing adjusting nut wrench** (Part No. 49 0259 720) until the backlash between the ring gear and the drive pinion is removed. Back off the ring gear side adjusting nut approximately four notches to a point where the notch in the nut aligns with the nut lock. Tighten the drive pinion side adjusting nut firmly to force the differential bearing to contact solidly with the ring gear side adjusting nut. Loosen the drive pinion side adjusting nut until it is free from the bearing, then retighten the drive pinion side adjusting nut snugly until it just contacts the outer race.

e. Adjusting backlash
1. Contact the dial indicator rod with the ring gear tooth at right angle.
2. Check the backlash between the ring gear and the drive pinion. If the backlash is more than specified, loosen the drive pinion side nut one notch, and tighten the ring gear side nut one notch. If the backlash is less than specified, loosen the ring gear side nut one notch, and tighten the drive pinion side nut one notch.
Repeat the above procedures until the backlash becomes **0.17 ~ 0.19 mm (0.0067 ~ .0075 in).**

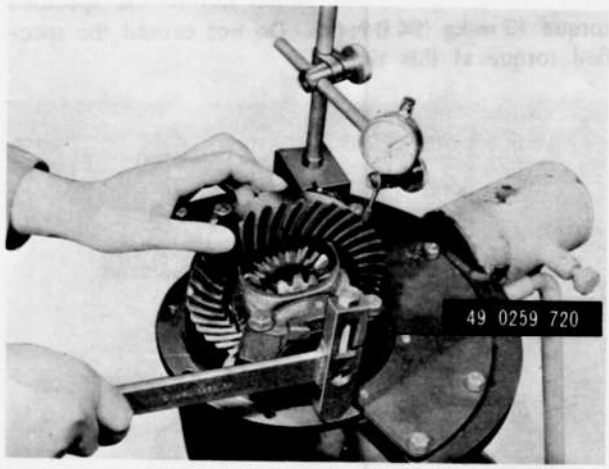

Fig. 9–37 Checking backlash

3. The preload on the differential bearings is obtained by tightening the bearing adjusting nut. Tighten the bearing adjusting nut until the distance between both pilot sections on the bearing caps becomes 185.5 mm (7.306 in), as shown in Fig. 9–38.

Note:
When adjusting preload, care must be taken not to affect the backlash of the ring gear and drive pinion.

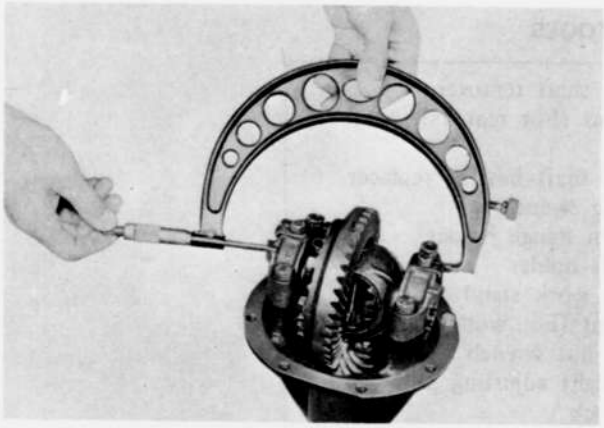

Fig. 9–38 Adjusting preload

4. Tighten the bearing cap attaching bolts to a torque of **4.0 m-kg (30 ft-lb)**.
5. Install the bearing adjusting nut locks onto the bearing caps and tighten the attaching bolts.
6. Again recheck the backlash and differential bearing preload.

f. Checking tooth contact

Check the ring gear and drive pinion tooth contact. To check, apply a thin coat of red lead evenly onto the ring gear teeth, and rotate the ring gear a few times to and fro.

Check the contact pattern made on the teeth.

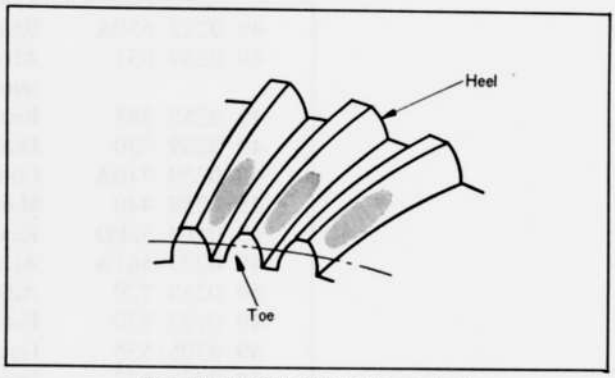

Fig. 9–39 Correct tooth contact

If the tooth contact pattern is not correct, change the drive pinion adjusting spacer or backlash to obtain the correct tooth contact.

9–C–5. Rear Axle Installation

Follow the removal procedures in the reverse order.

Note:

(a) Bleed the brake system and adjust the brake shoe clearance.

(b) Refill the axle assembly with proper grade, and amount of hypoid gear lubricant up-to the filler hole.

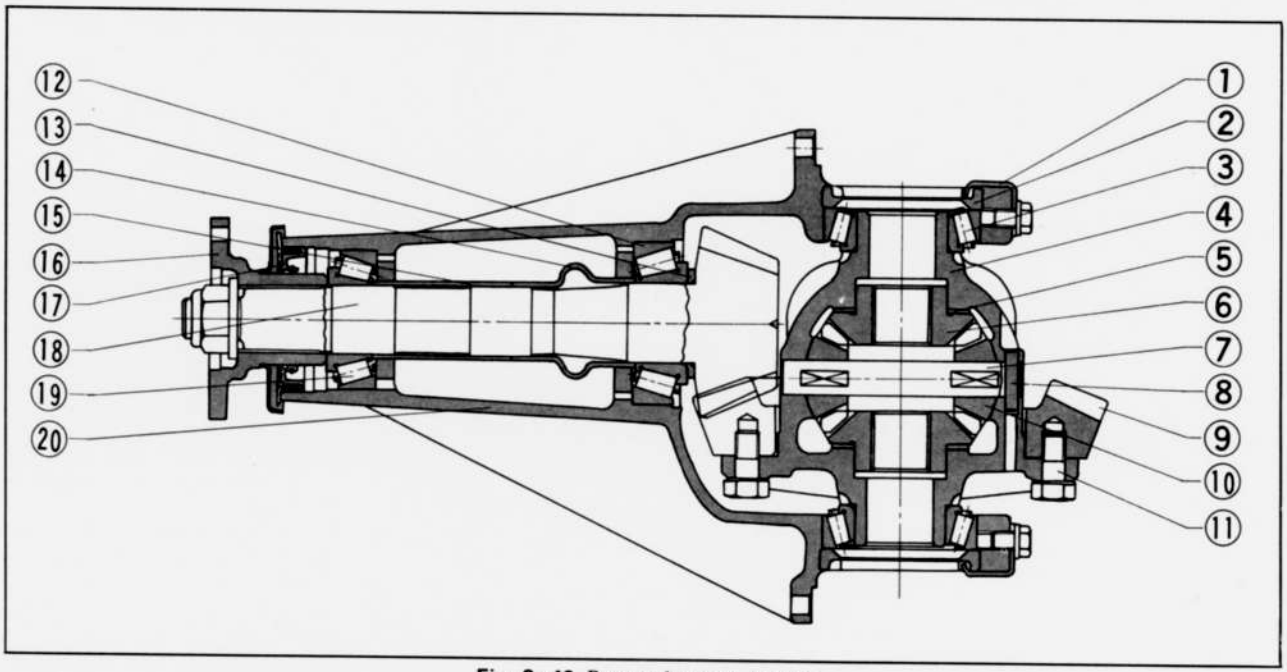

Fig. 9–40 Rear axle cross section

1. Adjusting nut lock
2. Adjusting nut
3. Differential bearing
4. Gear case
5. Side gear thrust washer
6. Side gear
7. Pinion shaft
8. Pinion shaft lock pin
9. Ring gear
10. Pinion gear
11. Bolt
12. Pinion rear bearing
13. Adjusting spacer (pinion position)
14. Collapsible pinion bearing spacer
15. Pinion bearing collar
16. Companion flange
17. Oil seal
18. Drive pinion
19. Pinion front bearing
20. Differential carrier

SPECIAL TOOLS

49 0223 630A	Rear axle shaft remover
49 0259 631	Attachment (For rear axle shaft remover)
49 0259 745	Rear axle shaft bearing replacer
49 0259 730	Drain plug wrench
49 0259 710A	Companion flange holder
49 0259 440	Main shaft holder
49 0164 550D	Rear axle work stand
49 0223 561A	Attachment (For work stand)
49 0259 720	Adjusting nut wrench
49 0727 570	Pinion height adjusting gauge
49 0305 555	Gauge block
49 0221 572	Bearing model

STEERING

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10

DESCRIPTION

The steering system consists of the steering gear, steering column, steering lock assembly, steering wheel and steering linkage. The steering gear is of a recirculating ball nut type and the steering gear ratio varies from 17.0 : 1 to 19.0 : 1, according to the turning angle of the sector shaft. Therefore, this steering gear provides easy steering. The steering linkage consists of the pitman arm, center link (pitman arm to idler arm), idler arm and bracket assembly, and tie-rods. The steering linkage ball joints and idler arm are filled with molybdenum disulfide grease and are sealed completely which require no lubrication service. The toe-in can be adjusted, but the camber, caster, and king pin inclination are set during production, and **cannot be altered.**

10–A. STEERING WHEEL

10–A–1. Checking Steering Wheel Play

The steering wheel play should be **5 ~20 mm (0.2 ~ 0.8 in)**. With the front wheels on the ground and in the straight ahead position, move the steering wheel in both directions without moving the front wheels.

If excessive play is found, the following points should be carefully checked.

1. Fit of the ball joints of the steering linkage
2. Looseness of the wheel bearings
3. Backlash between the sector gear and ball nut

10–B. STEERING GEAR

10–B–1. Steering Gear Removal

1. Remove the horn cap attaching screws and remove the horn ring.
2. Punch mating marks on the steering wheel hub and the worm shaft.
3. Remove the steering wheel attaching nut and then remove the steering wheel assembly.
4. Remove the column cover of the right side.
5. Remove the combination switch assembly retaining ring and lift the switch assembly over the worm shaft.

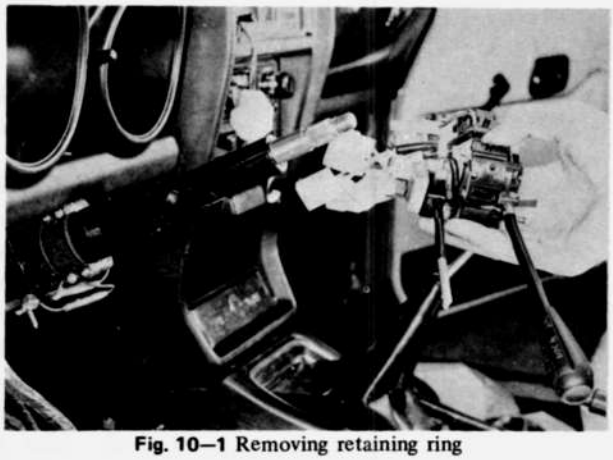

Fig. 10–1 Removing retaining ring

6. Pull out the light switch knob and remove the column cover of the left side.
7. Remove the steering lock and ignition switch assembly, as described in **Par. 10–E–1** and attach a

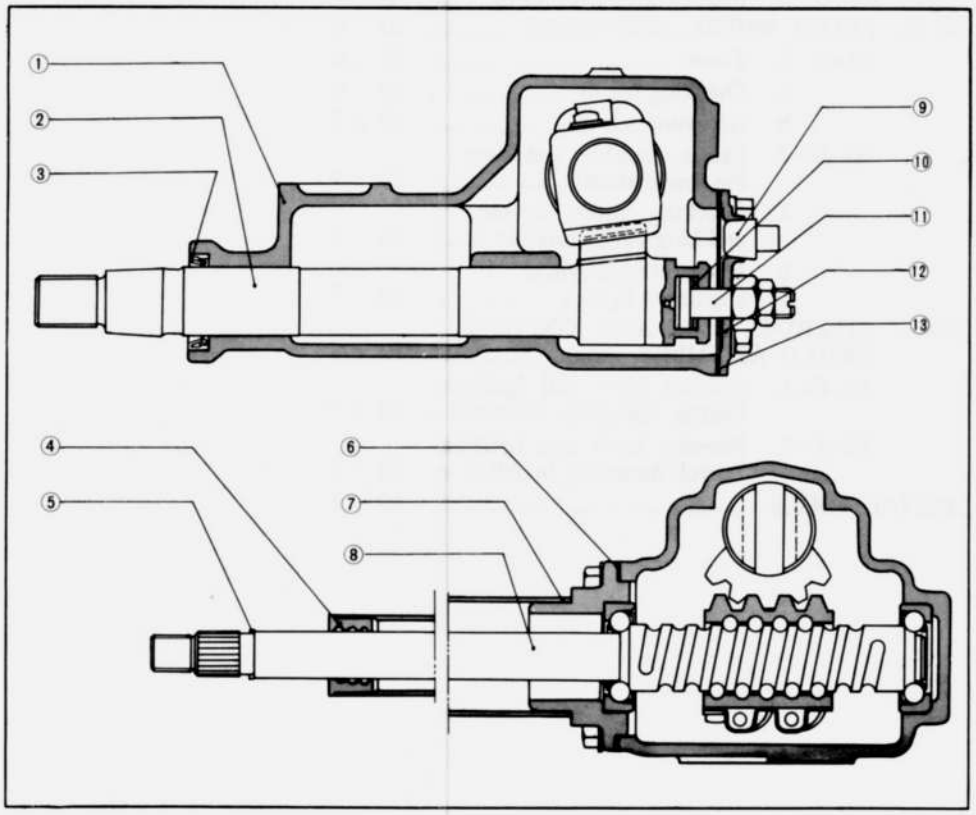

Fig. 10–2 Steering gear box

1. Steering gear housing
2. Sector shaft
3. Oil seal
4. Bush
5. Retaining ring
6. Adjusting shim
7. Column jacket
8. Worm shaft and ball nut assembly (Steering shaft)
9. Plug
10. Thrust washer
11. Sector shaft adjusting screw
12. Side cover
13. Gasket

suitable tape to the steering lock assembly attaching hole on the steering column.
8. Remove the steering column support bracket.
9. Open the hood and remove the steering column dust cover.
10. Raise the vehicle and remove the front wheel.
11. Disconnect the pitman arm from the steering center link by using the **ball joint puller** (Part No. 49 0118 850C).

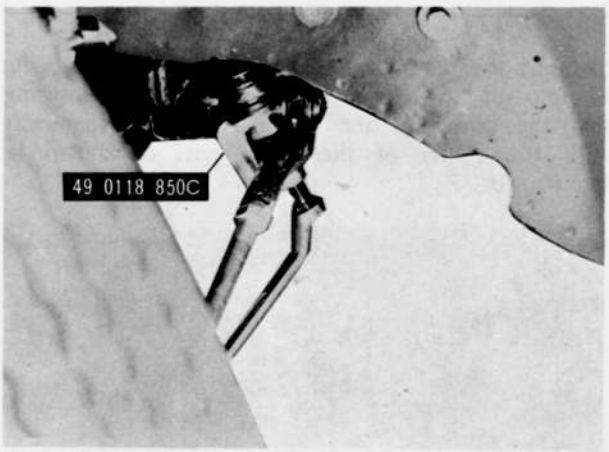

Fig. 10–3 Disconnecting pitman arm

12. Remove the bolts and nuts that attach the steering gear housing to the body.

Note:
Confirm the position of the shim for convenience when readjusting the column shaft alignment.

13. Remove the steering gear housing assembly from the vehicle.

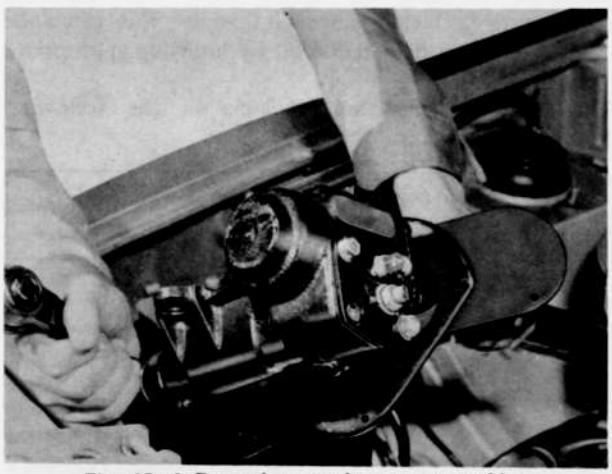

Fig. 10–4 Removing steering gear assembly

10–B–2. Steering Gear Disassembly

1. Drain lubricant from the gear housing by removing the plug.
2. Remove the nut attaching the pitman arm and remove the pitman arm with the **pitman arm puller** (Part No. 49 0223 695D), as shown in Fig. 10–5.
3. Remove the bolts that attach the side cover to the gear housing and loosen the sector shaft adjusting

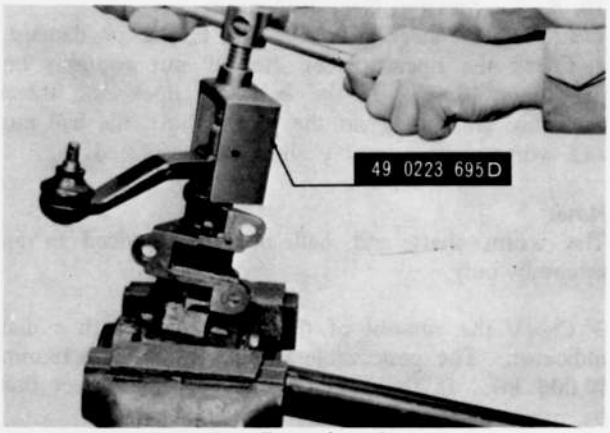

Fig. 10–5 Removing pitman arm

screw lock nut, then remove the sector shaft side cover screwing in the sector shaft adjusting screw.
4. Remove the sector shaft adjusting screw and shim from the slot at the end of the sector shaft.
5. Remove the sector shaft from the gear housing.

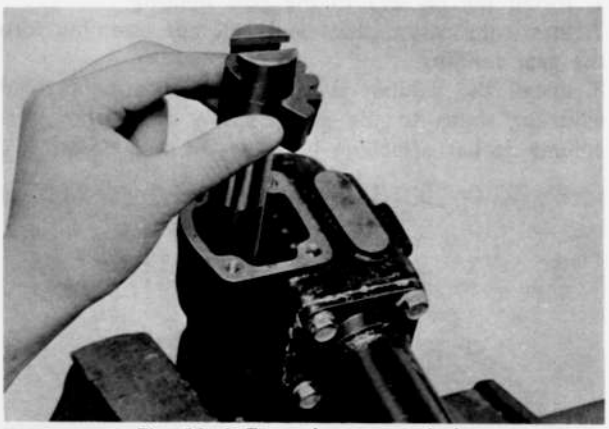

Fig. 10–6 Removing sector shaft

6. Remove the bolts that attach the column jacket to the gear housing and remove the column jacket and shims.

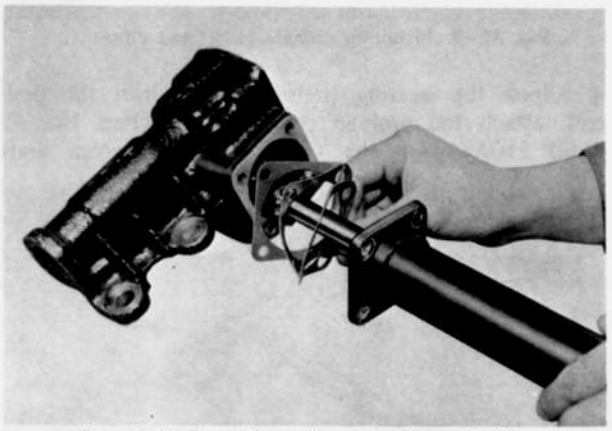

Fig. 10–7 Removing column jacket and shims

7. Remove the worm shaft and ball nut assembly from the gear housing.
8. Remove the oil seal from the gear housing, if necessary.

10–B–3. Steering Gear Inspection

1. Check the steering wheel for cracks or damage.
2. Check the operation of the ball nut assembly on the worm shaft. If the ball nut does not travel smoothly and freely on the worm shaft, the ball nut and worm shaft assembly should be replaced.

Note:
The worm shaft and ball nut are serviced as an assembly only.

3. Check the run-out of the worm shaft with a dial indicator. The permissible run-out is under **0.15 mm (0.006 in)**. If the run-out is excessive, correct this by using a press or replace with new one.
4. Check the sector shaft for wear or damage at the gear surface.
5. Check the oil seal for wear, flaw, or any damage. If there is any possibility of oil leakage, replace the oil seal.

10–B–4. Steering Gear Assembly

1. Install the oil seal to the gear housing.
2. Insert the worm shaft and ball nut assembly into the gear housing.
3. Install the column jacket and the bearing preload adjusting shims to the gear housing and tighten the column jacket attaching bolts to 0.8 m-kg (5.8 ft-lb).

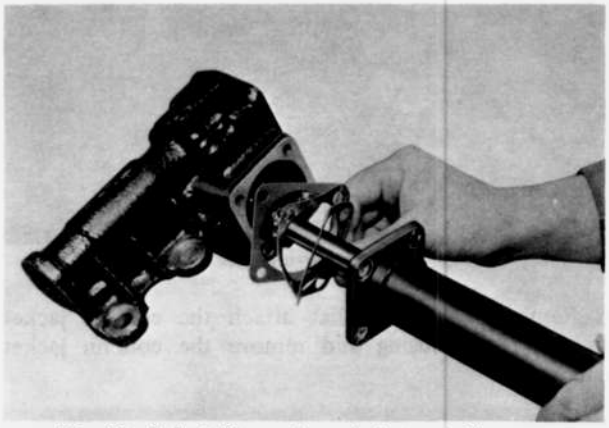

Fig. 10–8 Installing column jacket and shims

4. Adjust the bearing preload. To adjsut the preload, attach the **preload checking tool** (Part No. 49 0180 510A) onto the top end of the worm shaft and connect a pull scale to the preload checking tool. Pull the scale at constant speed, and read the scale keeping the worm shaft rotating. If the reading is less than **0.1 kg (0.22 lb)**, reduce the shim, and add the shim if the preload is more than **0.4 kg (0.88 lb)**. The following shims are available.

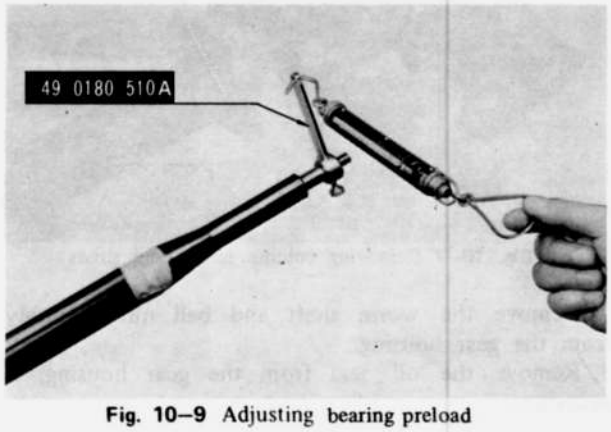

Fig. 10–9 Adjusting bearing preload

0.050 mm (0.002 in)	0.100 mm (0.004 in)
0.075 mm (0.003 in)	0.200 mm (0.008 in)

5. Insert the sector shaft into the gear housing, being careful not to damage the oil seal, and ensuring that the center of the sector gear is in alignment with the center of the worm gear as shown in Fig. 10–10.

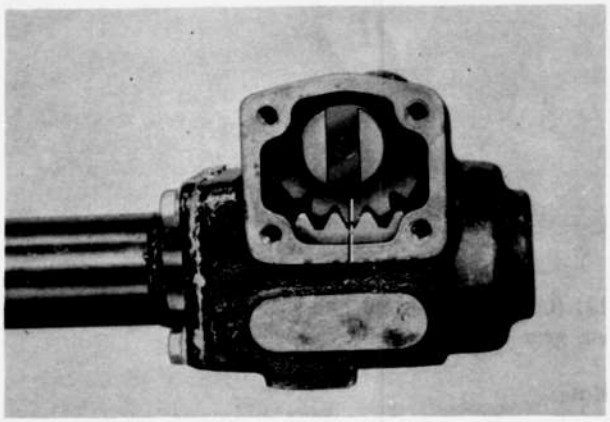

Fig. 10–10 Position sector gear and worm gear

6. Install the sector shaft adjusting screw into the slot at the end of the sector shaft. Check the end clearance between the sector shaft and adjusting screw with a feeler gauge and adjust this clearance to **0 ~ 0.1 mm (0 ~ 0.004 in)** by inserting appropriate thrust washer.
The thrust washers are available in the following four thicknesses:

1.95 mm (0.077 in)	2.05 mm (0.081 in)
2.00 mm (0.079 in)	2.10 mm (0.083 in)

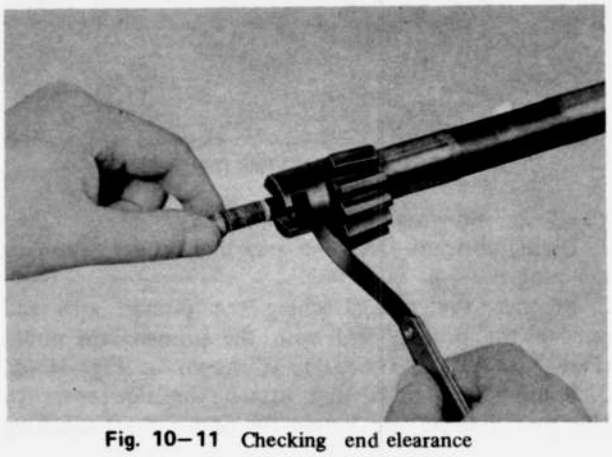

Fig. 10–11 Checking end elearance

7. Place the side cover and the gasket onto the sector shaft adjusting screw and turn the adjusting screw until the side cover is screwed into proper position. Install the side cover attaching bolts and tighten the bolts.



Fig. 10–12 Placing side cover

8. Install the pitman arm onto the sector shaft, aligning the identification marks of the pitman arm and sector shaft. Install the pitman arm attaching nut and tighten the nut to 15.0 m-kg (108 ft-lb).



Fig. 10–13 Installing pitman arm

9. Adjust the backlash between the worm gear and sector shaft gear. To adjust the backlash, position the sector shaft at the center of the worm gear,

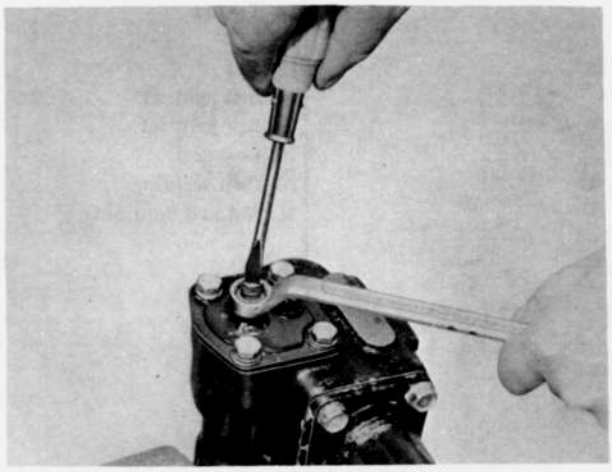

Fig. 10–14 Adjusting backlash

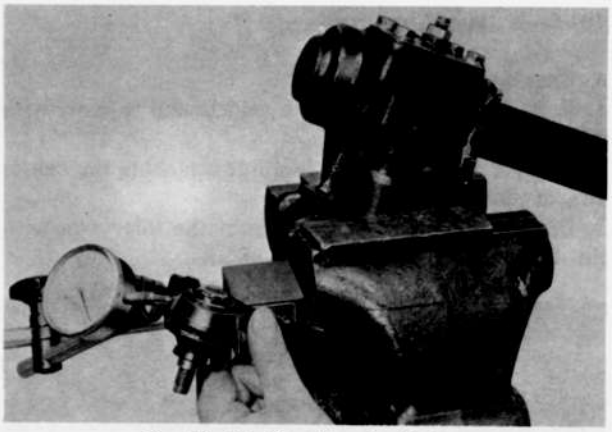

Fig. 10–15 Checking backlash

then obtain the specified backlash of **0 ~ 0.1 mm (0 ~ 0.04 in) at the pitman arm end** by turning the sector shaft adjusting screw as shown in Fig. 10–14. Tighten the adjusting screw lock nut, taking care not to disturb the backlash. Rotate the worm shaft and check to ensure that the sector shaft **turns 40°** smoothly to the right and left.

10. Check the worm shaft rotating torque. To check, attach the **checking tool** (Part No. 49 0180 510) onto the top end of the worm shaft and connect a pull scale to the checking tool. Pull the scale and check the worm shaft rotating torque.

If the reading is less than **0.9 kg (1.98 lb)** or more than **1.5 kg (3.30 lb)**, readjust the bearing preload.

10–B–5. Steering Gear Installation

Follow the removal procedures in the reverse order.

Note:

(a) Before installing the gear housing to the body, install the column jacket to the instrument panel temporarily to obtain proper position of the gear housing.

(b) Place the shim in original position to obtain proper shaft alignment.

(c) Align the mating marks on the worm shaft and the steering wheel hub.

(d) Fill the gear housing with lubricant.

10–C. STEERING LINKAGE

10–C–1. Checking Ball joint

1. Check the dust seal for wear, flaw or any damage. If the dust seal is defective, this will allow entry of water and dust, resulting in ball joint wear. Replace the dust seal if necessary.

2. The end play of the ball stud is preadjusted at the factory to be from 0~0.25 mm (0~0.010in). If it exceeds 1.0 mm (0.039 in), replace the ball joint in its assembled form.

10–C–2. Idler Arm

a. Checking idler arm

1. Raise the front end of the vehicle and support with stand.
2. Remove the cotter pin and nut attaching the center link at the idler arm.
3. Disconnect the center link from the idler arm with the **ball joint puller** (49 0118 850C).

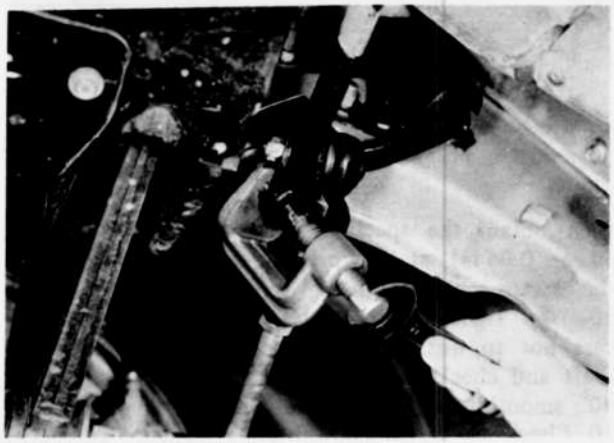

Fig. 10–16 Disconnecting center link

4. Check the revolving torque of the idler arm. To check, install the nut to the idler arm. Then, hook a spring scale at the idler pin and pull the scale until the idler arm starts to turn.
The reading should be 0.1 ~ 3 kg (0.2 ~ 6.6 lb). If it is less than 0.1 kg (0.2 lb), replace the idler arm in its assembled form.
5. Check the end play of the idler pin. If necessary replace the idler arm assembly.

b. Removing idler arm

1. Raise the front end of the vehicle and support with stands.
2. Remove the cotter pin and nut attaching the center link at the idler arm.
3. Disconnect the center link from the idler arm with the **ball joint puller** (49 0118 850C).
4. Remove the bolts attaching the idler arm and remove the idler arm.

c. Installing idler arm

Follow the removal procedure in the reverse order.

Note:

(a) Check the clearance between the idler arm edge and the idler housing end as shown in Fig. 10–18. The clearance should be 4.0 ~ 5.5 mm (0.16 ~ 0.21 in).
(b) Tighten the idler arm attaching bolts to 4.4 ~ 5.5 m-kg (32.0 ~ 40.0 ft-lb).

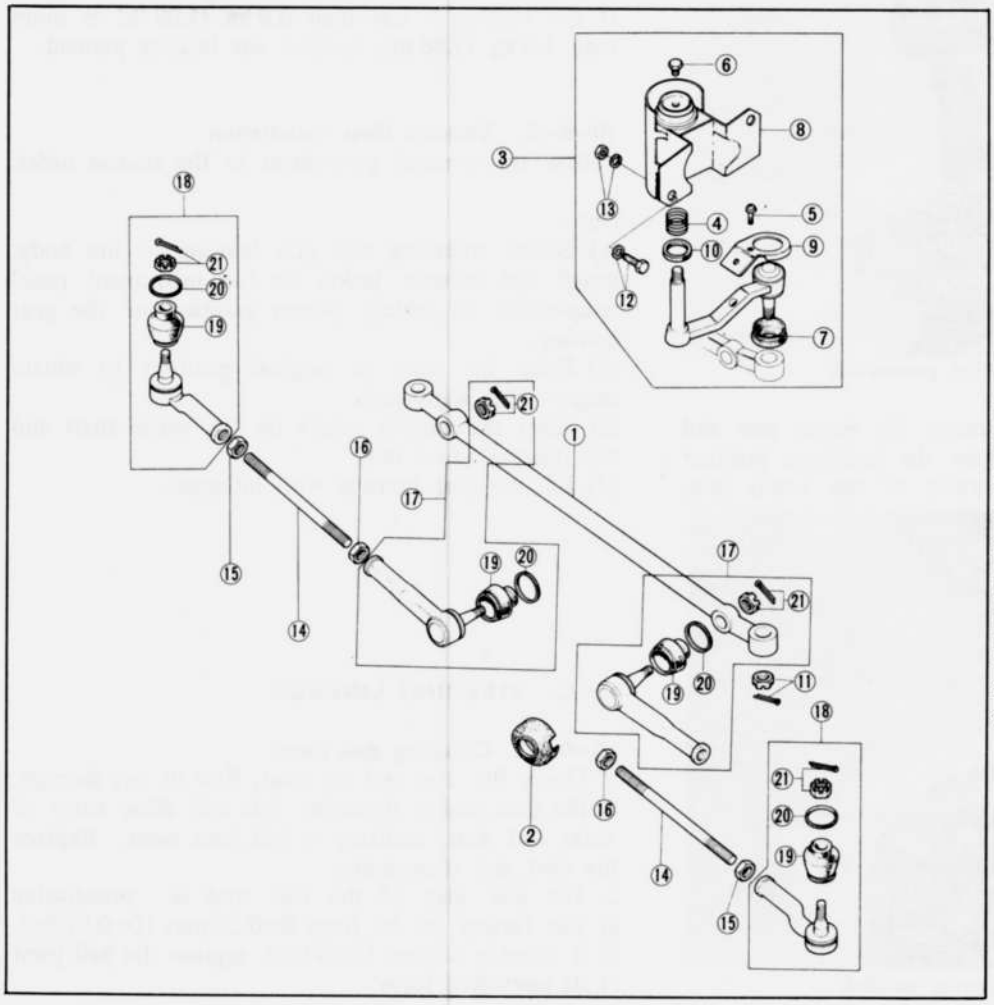

Fig. 10–17 Steering linkage components

1. Center link
2. Protector
3. Idler arm sssembly
4. Spring
5. Screw
6. Plug
7. Dust seal
8. Bracket
9. Insulator
10. Oil seal
11. Nut and Split pin
12. Bolt and Plain washer
13. Nut and Spring washer
14. Tie-rod
15. Nut
16. Nut
17. Ball joint set
18. Ball joint set
19. Dust seal
20. Dust seal ring
21. Nut and Split pin

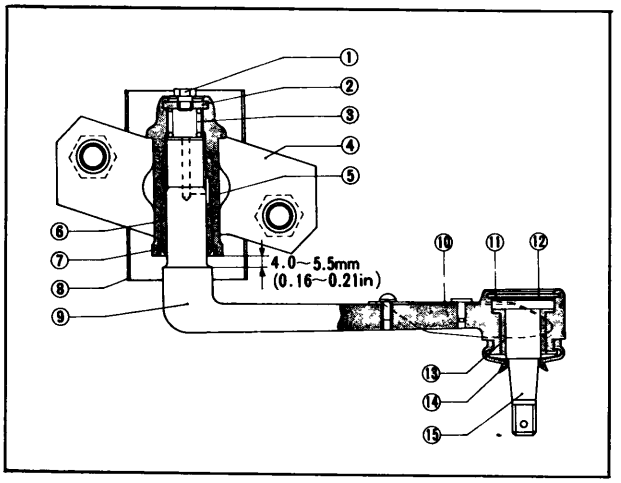

Fig. 10–18 Idler arm cross section

1. Grease plug	6. Bush	11. End plate
2. Plug	7. Oil seal	12. Shim
3. Spring	8. Insulator	13. Bush
4. Idler housing	9. Idler arm	14. Dust seal
5. Bracket	10. Insulator	15. Idler pin

10–C–3. Replacing Pitman Arm

1. Raise the front end of the vehicle and support with stands.
2. Remove the cotter pin and castellated nut that attach the steering center link to the pitman arm.
3. Disconnect the steering center link from the pitman arm with the **ball joint puller** (Part No. 49 0118 850C).
4. Remove the pitman arm attaching nut.
5. Remove the pitman arm from the sector shaft using the **pitman arm puller** (Part No. 49 0223 695D).
6. Install the pitman arm onto the sector shaft, aligning the identification marks of the pitman arm and sector shaft.
7. Install the pitman arm attaching nut and tighten the nut to 14.0 ~ 17.0 m-kg (101 ~ 123 ft-lb).
8. Secure the steering center link to the pitman arm with the castellated nut. Tighten the nut and install the cotter pin.

Note:
Always tighten the nut to the next castellation if necessary to install the cotter pin.

10–C–4. Replacing Tie-rod

The tie-rod should be replaced, if it becomes worn or damaged. **Do not** attempt to straighten the tie-rod if damaged.

1. Raise the front end of the vehicle and support with stands.
2. Remove the cotter pins and castellated nuts that attach both tie-rod ends to the center link and steering knuckle.
3. Disconnect the tie-rod ends from the center link and steering knuckle with the **ball joint puller** (Part No. 49 0118 850C).
4. Remove the tie-rod.
5. Secure the tie-rod to the center link and steering knuckle with castellated nut. Tighten the nut and install the cotter pin.
6. Check and, if necessary, adjust toe-in.

Note:
Whenever the tie-rod or ball joint is replaced, the toe-in is reset.

10–C–5. Replacing Center Link

The center link connecting the pitman arm and the idler arm is non-adjustable. The link should be replaced when damaged or when worn at the ball stud.

1. Raise the front end of the vehicle and support with stands.
2. Remove the cotter pins and castellated nuts that attach both tie-rod ends to the center link.
3. Disconnect the tie-rod ends from the center link using the **ball joint puller** (Part No. 49 0118 850C).
4. Remove the cotter pin and castellated nut attaching the idler arm to the center link.
5. Remove the cotter pin and castellated nut attaching the pitman arm to the center link.
6. Disconnect the pitman arm from the center link using the **ball joint puller** and remove the center link.
7. Position the center link to the pitman arm and idler arm and install the castellated nuts loosely. Tighten the nut and install the cotter pin.
8. Position the tie-rod ends to the center link and install the castellated nuts. Tighten the nut and install the cotter pin.
9. Check and, if necessary, adjust toe-in.

10–D. FRONT WHEEL ALIGNMENT

Front wheel alignment is most important if correct steering, and reasonable tire wear are to be obtained. Before attempting to check the wheel alignment, the following points should be investigated, and if necessary, corrected.

1. Tires for correct inflation
2. Unbalanced tires
3. Wobbling wheels
4. Front wheel bearing adjustment
5. Ball joints, and tie-rod end for looseness
6. Front coil springs for correct seating

When the above points are all in order, the vehicle should be stood on a perfectly level surface in the wheel alignment bay or stall.

10–D–1. Toe-in

a. Checking toe-in

1. Raise the front end of the vehicle until the wheels clear the ground.
2. Turning the wheel by hand, mark a line in the center of the wheel with a scribing block.
3. Lower the vehicle and place the front wheels in the straight-ahead position.
4. Measure the distances between the marked lines at the front and rear of the wheels with a suitable toe-in gauge. The difference between these two distances is the toe-in. The standard toe-in is **0 ~ 6 mm (0 ~ 0.24 in)**.

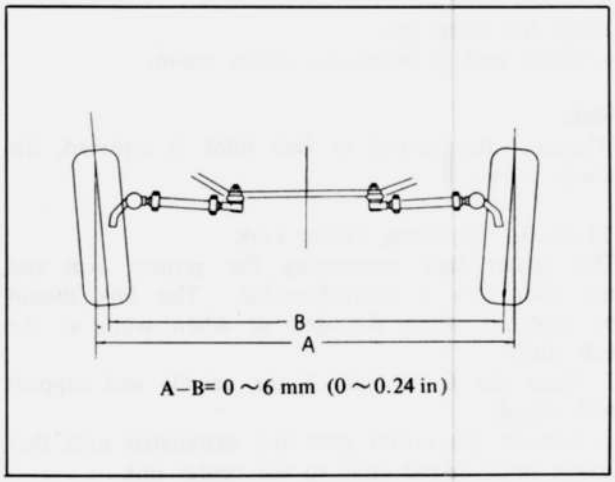

Fig. 10–19 Toe-in

b. Adjusting toe-in

1. Loosen the tie-rod locking nuts at each end of the tie-rod.

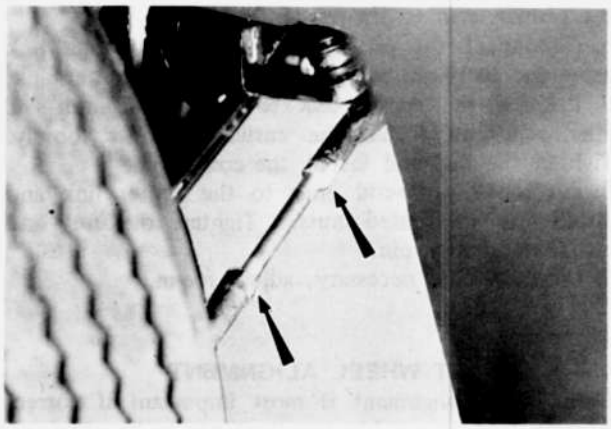

Fig. 10–20 Loosening tie-rod locking nut

2. Check that the tie-rod ends are in the same position on each rod, thus ensuring that the tie-rods are the same length.
3. Turn the both tie-rods an equal amount until the correct toe-in is obtained.

Note:
The tie-rod is threaded with right and left hand threads.

4. Tighten the tie-rod locking nuts and recheck the toe-in.

10–D–2. Caster, Camber and King Pin Inclination

a. Checking caster, camber and king pin inclination

There are several alignment machines available, and the instruction furnished by each manufacturer for the operation of the machine must be followed. Regardless of type of equipment used, it is essential that the vehicle is placed on absolutely level surface at all time, and before checking them, the front and rear of the vehicle is moved up and down several times to set the suspension to normal condition.

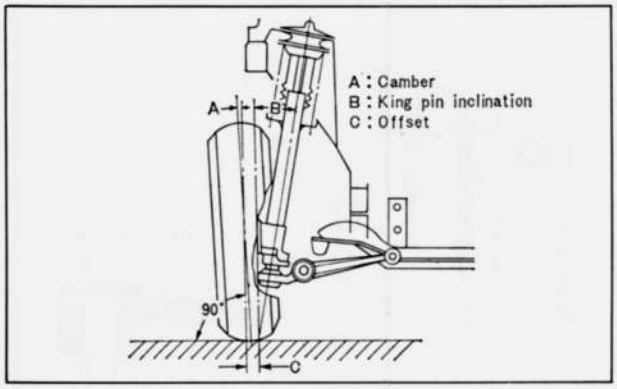

Fig. 10–21 Camber and king pin inclination

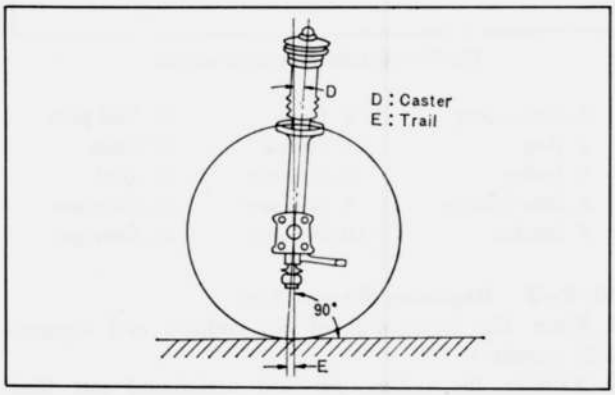

Fig. 10–22 Caster

Specified angles are shown in the following table.

Caster	1° 55′ ± 45′
Camber	0° 55′ ± 1°
King pin inclination	8° 35′

b. Interpretation wheel alignment figures

The caster, camber, and king pin inclination angles are not adjustable. Whenever the caster, camber or king pin inclination is altered out of specified angle, check all parts of the front suspension and body alignment, and replace or repair necessary parts.

10–E. STEERING LOCK AND IGNITION SWITCH ASSEMBLY

10–E–1. Steering Lock and Ignition Switch Assembly Removal

1. Pull out the light switch knob.
2. Remove the column covers by removing the attaching screws.
3. Disconnect the wire connector from the lock and switch assembly.
4. Make the groove (-) on the head of the lock and switch assembly attaching bolt with a suitable tool.
5. Remove the attaching bolts with a screwdriver.
6. Remove the lock and switch assembly.

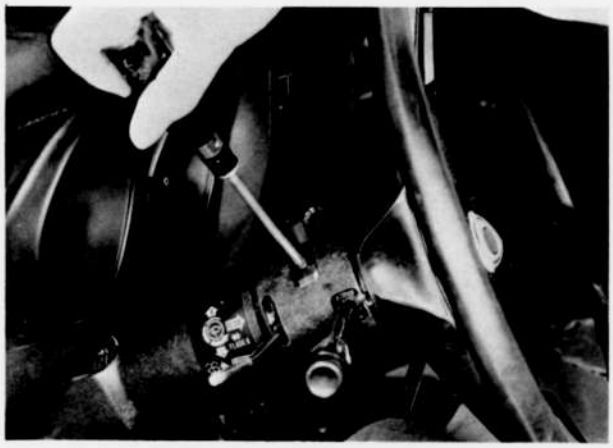

Fig. 10–23 Removing column cover

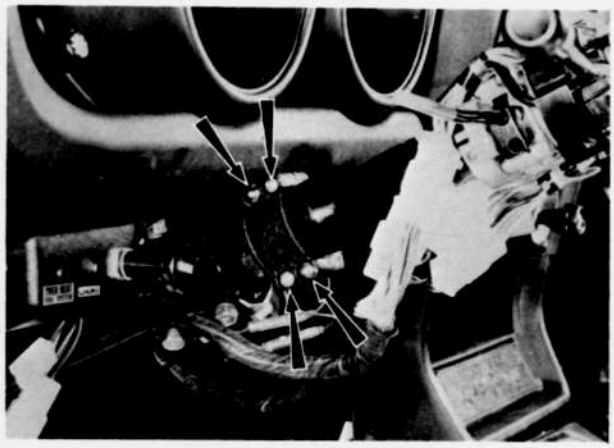

Fig. 10–24 Removing attaching bolts

10–E–2. Steering Lock and Ignition Switch Assembly Installation

Follow the removal procedures in the reverse order.

Note:
After tightening the bolts, break the head section of the bolts to lock the steering lock assembly.

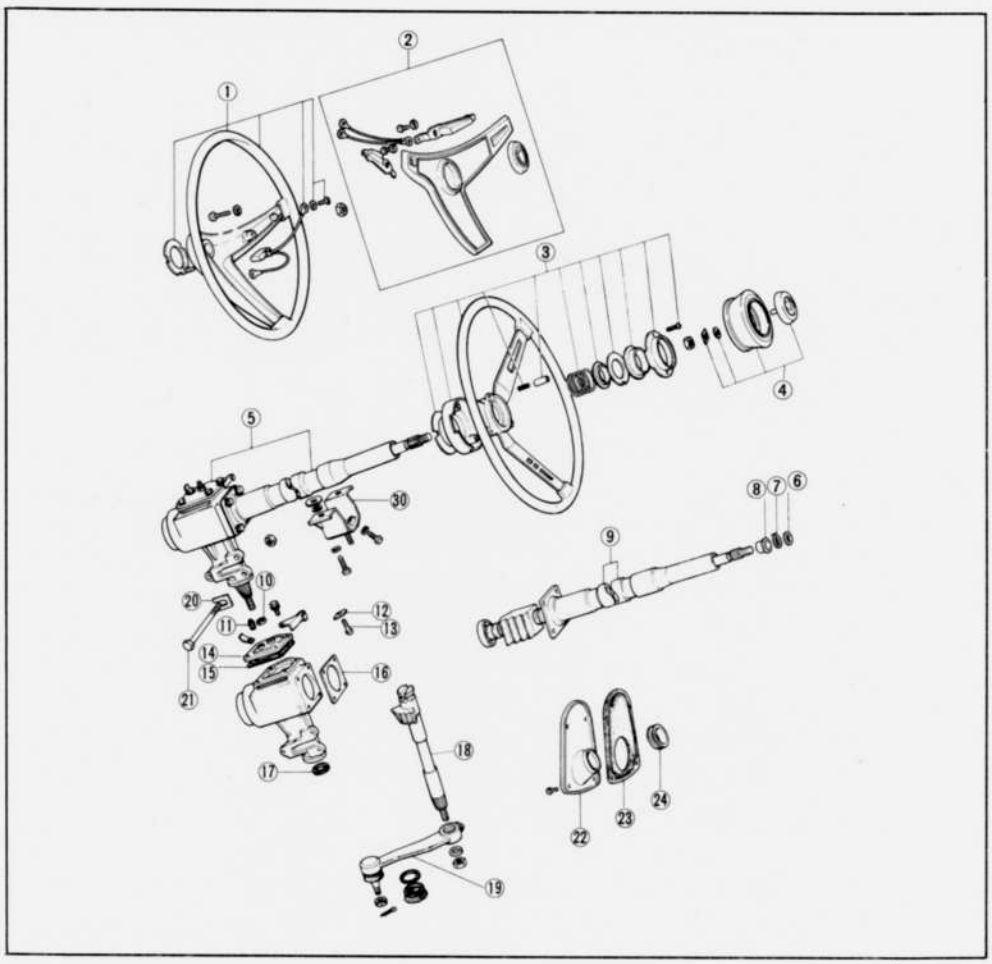

Fig. 10–25 Steering wheel and gear components

1. Steering wheel boss (Rotary Wagon)
2. Hor cap (Rotary Wagon)
3. Steering wheel boss (Coupe)
4. Horn cap (Coupe)
5. Steering gear
6. Washer
7. Stopp ring
8. Bush
9. Energy absorbing shaft
10. Nut
11. Oil plug
12. Adjust shim
13. Adjust screw
14. Side cover
15. Gasket
16. Shim, End cover
17. Oil seal
18. Sector Shaft
19. Pitman arm
20. Shim
21. Bolt
22. Set plate
23. Dust cover
24. Dust cover

SPECIAL TOOLS

49 0118 850C	Ball joint puller
49 0180 510A	Preload checking tool
49 0223 695D	Pitman arm puller

BRAKES

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11

DESCRIPTION

The brakes consist of two systems, the foot brake, and the parking brake. The front brakes are of a disc brake type.

The rear brakes are of a drum type with leading and trailing shoes. The brake pedal is of a pendant type.

The parking brake operates the brake shoes of the rear wheels through the wire linkage.

11–A. BRAKE ADJUSTMENT

11–A–1. Adjusting Brake Pedal

1. Disconnect the stop light switch wiring terminals.
2. Loosen the lock nut and adjust the pedal height to **185 mm (7.3 in)** between the pedal and the floor mat by turning the stop light switch. Next, tighten the lock nut.

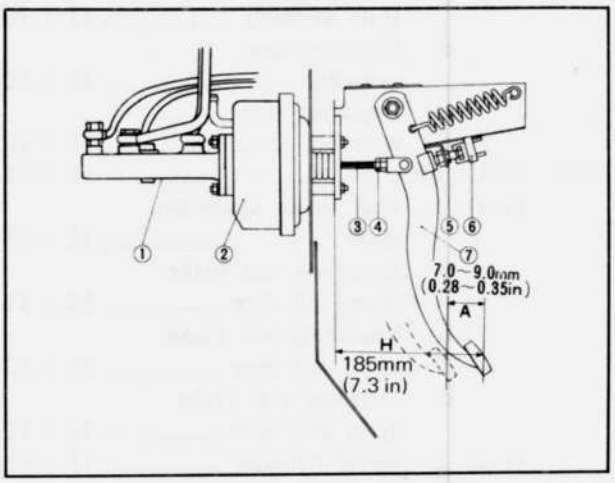

Fig. 11–1 Adjusting brake pedal

A: Free play (Before power piston starts to move)
H: Pedal height (Height from toe board to pedal)

1. Master cylinder
2. Power brake unit
3. Push rod
4. Lock nut
5. Lock nut
6. Stop light switch
7. Brake pedal

3. There should always be a free pedal travel of from 7 ~ 9 mm (0.28 ~ 0.35 in) before the power brake piston operates.

To adjust free travel, loosen the lock nut and turn the push rod connected to the brake pedal. After adjustment, tighten the lock nut. Further, it must be away **more than 20 mm (0.79 in)** from the toe board when the brake is fully locked.

11–A–2. Bleeding Hydraulic System

The front and rear hydraulic brake systems are individual systems and are bled separately.

When bleeding the brake system, bleed one bleeder screw at a time, begining at the bleeder screw with the longest hydraulic line first.

Note:

a. During bleeding operation, the reservoir of the master cylinder must be kept at least 3/4 full of the brake fluid.
b. Do not mix low temperature brake fluid with the specified fluid.
c. Never re-use brake fluid which has been drained from the hydraulic system.
d. Do not use the secondary piston stop screw, located on the side of the master cylinder to bleed the brake system. Loosening or removing this screw could result in damage to the secondary piston or stop screw.

1. Remove the rubber cap from the bleeder screw on the right rear wheel cylinder and attach a vinyl tube to the bleeder screw. The end of the vinyl tube should fit snugly around bleeder screw.
2. Insert the free end of the vinyl tube into a suitable container while bleeding the brake system.
3. Depress the brake pedal several times quiclky, then with the brake pedal depressed, open the bleeder screw to expel the air. Close the screw, then return the pedal to the full-released position.
4. Repeat this operation until air bubbles cease to appear at the free end of the vinyl tube.

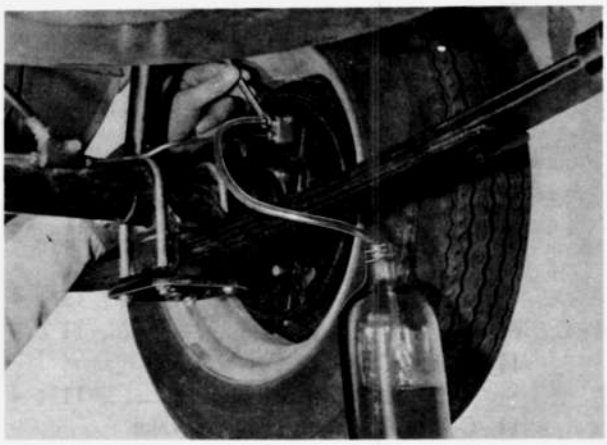

Fig. 11–2 Bleeding rear brake

5. Repeat this procedrue at the left rear wheel cylinder.

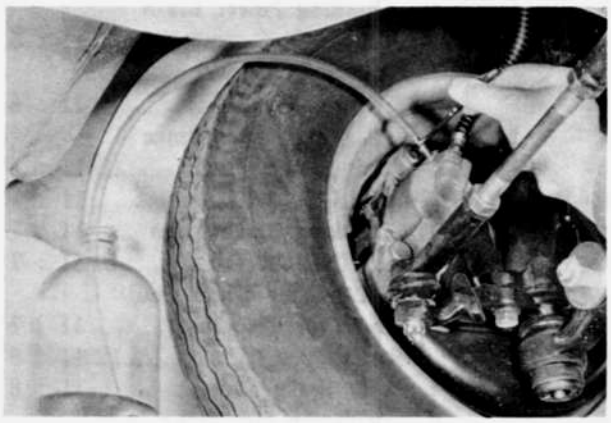

Fig. 11–3 Bleeding front brake

6. If the rear brake system is to be bled, repeat Step 1 through 4 at the right front cylinder and left front cylinder.
7. Centralize the brake fail indicator, as described in Par. 11–E–1.

11–A–3. Adjusting Brake Shoe

To adjust the brake shoe, proceed as follows:

1. Jack the rear end of the vehicle, then support with stands.
2. Make sure that the parking brake is fully released.
3. Remove the shoe adjusting hole plug from the backing plate, and expand one brake shoe by turning the adjuster toward the arrow direction marked on the backing plate until the wheel locks. At this time, pump the brake pedal several times to make sure that the shoes contact the drum on the entire surface. If the wheel turns after removing the foot from the brake pedal, turn the star wheel further until the wheel locks firmly.

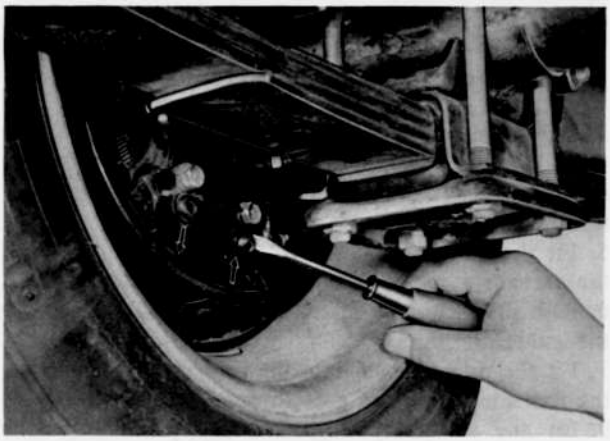

Fig. 11–4 Removing plug

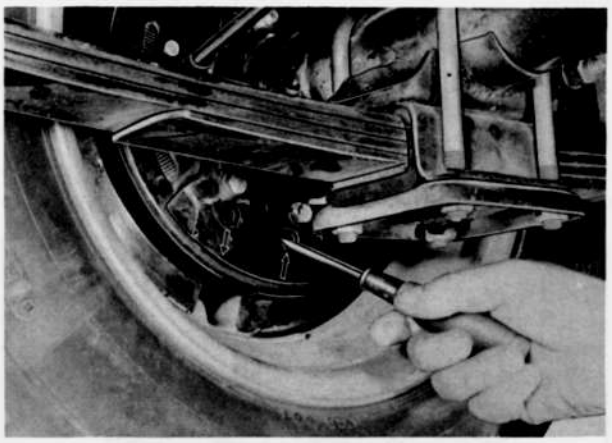

Fig. 11–5 Adjusting brake shoe

4. Back off the adjuster about four to five notches so that the drum rotates freely without any drag.
5. Check that the wheel rotates freely after pumping the brake pedal several times. Next, install the adjusting hole plug onto the backing plate.

Note:
If the wheel does not rotate freely, check and repair the drum, shoes or other necessary parts.

6. Perform the same adjustment on the other three shoes of the rear wheels. The adjustments must be equal at all shoes.

11–B. BRAKE MASTER CYLINDER

11–B–1. Removing Brake Master Cylinder

1. Disconnect the fluid pipes (reservoir tank ~ master cylinder) at the brake master cylinder and plug the end of the pipes to prevent fluid leakage.
2. Disconnect the fluid pipes at the brake master cylinder outlets.
3. Remove the nuts that attach the brake master cylinder to the power brake unit.
4. Remove the brake master cylinder assembly from the power brake unit.

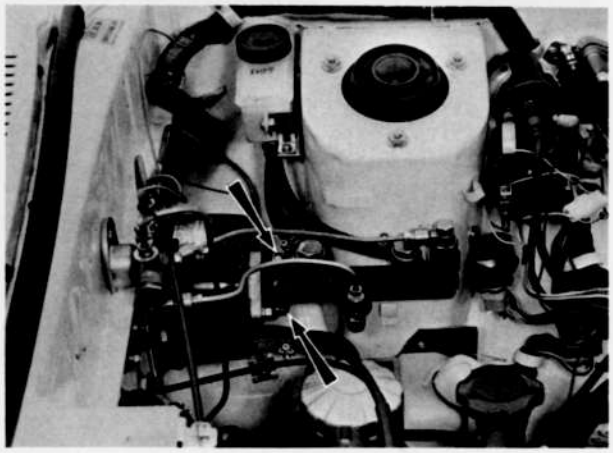

Fig. 11–6. Removing brake master cylinder

Note:
Never allow the brake fluid to drop on any painted surface.

11–B–2. Disassembling Brake Master Cylinder

1. Clean the outside of the master cylinder thoroughly and drain the brake fluid.
2. Using snap ring pliers, remove the snap ring and remove the stop washer.
3. Remove the primary piston, cups, spacer and spring seat assembly and return spring from the cyliner.

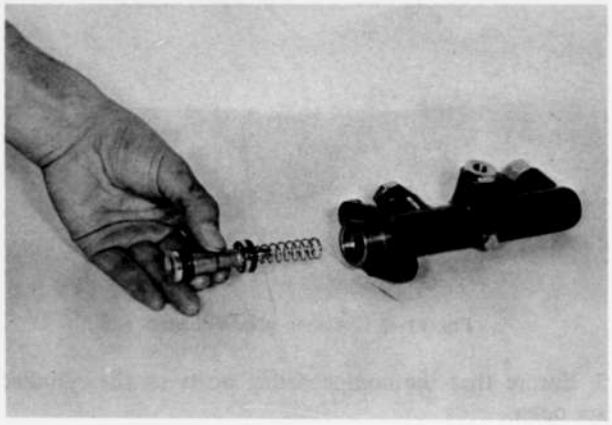

Fig. 11–7 Removing primary piston

4. Loosen the secondary piston stop bolt. Do not remove it.
5. Pushing in the secondary piston with a screwdriver, remove the stop bolt and insert the guide pin in its place. Then, gradually take out the screwdriver and

remove the secondary piston and cups assembly and spring from the cylinder. (See Fig. 11–8.)
If necessary, blow out with compressed air from the outlet hole.

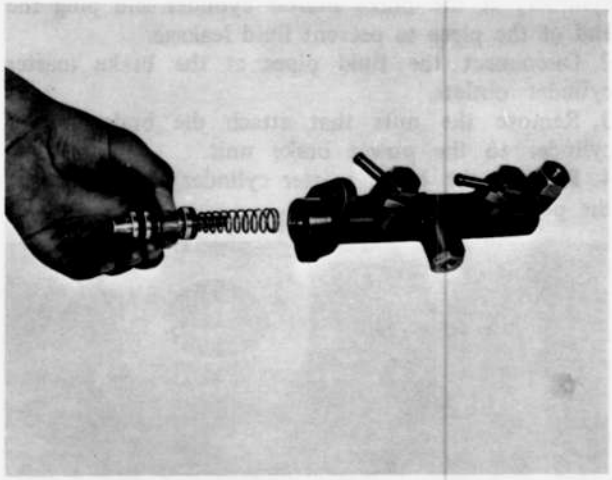

Fig. 11–8 Removing secondary piston

6. Remove the fluid pipe fittings and gaskets from the cylinder, and then remove the check valves and springs.

11–B–3. Checking Brake Master Cylinder

1. Wash the parts in clean alcohole or brake fluid. **Never use gasoline or kerosene.**
2. Check the piston cups and replace if they are damaged, worn, softened, or swelled.
3. Examine the cylinder bore and pistons for wear, roughness or scoring.
4. Check the clearance of the cylinder bore and piston. If it is **more than 0.15 mm (0.006 in)**, replace the cylinder or piston.

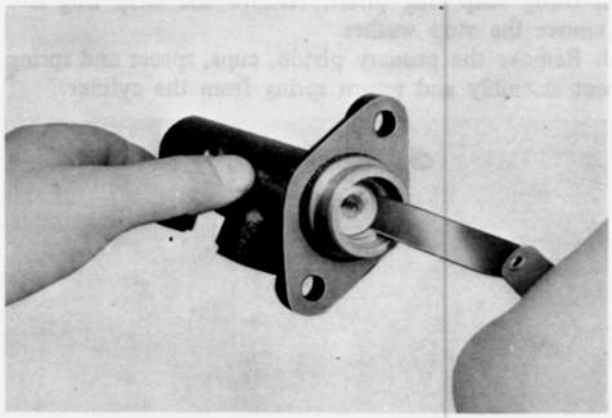

Fig. 11–9 Checking piston clearance

5. Ensure that the compensating ports on the cylinder are open.

11–B–4. Assembling Brake Master Cylinder

1. Dip the pistons and the cups in clean brake fluid.
2. Fit the check valve springs and check valves into the outlet holes. Install the pipe fittings and gaskets to the outlet holes. Tighten the fittings to **6.0 ~ 7.0 m-kg (43 ~ 51 ft-lb).**

Note:
Be sure to fit the valve which has a hole in the center of it to the front side outlet hole (disc brake).

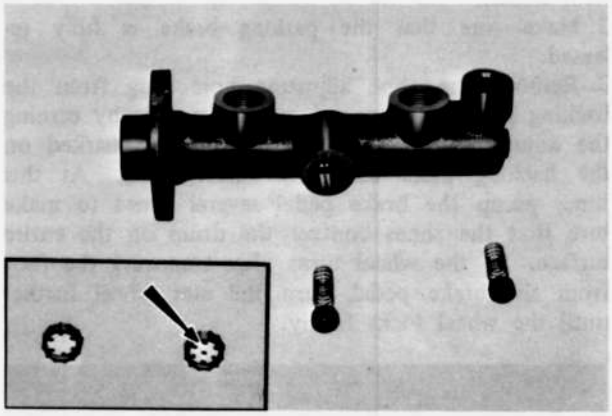

Fig. 11–10 Check valves and springs

3. Insert the return spring into the cylinder.
4. Fit the secondary cup and primary cup onto the secondary piston so that the flat side of the cup goes toward the piston.
5. Fit the guide pin into the stop bolt hole and insert the secondary piston assembly into the cylinder.
6. Push the secondary piston as far as it will go, remove the guide pin, and install the stop bolt and "O" ring.
7. Fit the primary cup onto the primary piston so that the flat side of the cup goes toward the piston.
8. Fit the secondary cup onto the primary piston, with the edge side of the cup facing the secondary piston.
9. Insert the return spring and the primary piston assembly.
10. Install the stop washer and snap ring.

Note:
Make sure that the piston cups do not cover the compensating ports.

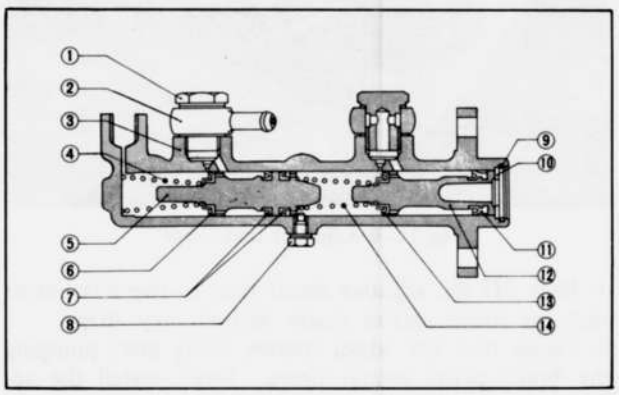

Fig. 11–11 Brake master cylinder cross section

1. Connector bolt
2. Connector union
3. Cylinder
4. Secondary spring
5. Secondary piston
6. Primary cup
7. Secondary cup
8. Set bolt
9. Snap ring
10. Washer
11. Secondary cup
12. Primary piston
13. Primary cup
14. Primary spring

11–B–5. Installing Brake Master Cylinder

To install the master cylinder, carry out the removing operation in the reverse order. After installing, bleed the brake system, and check for proper brake operation.

11–C. POWER BRAKE UNIT

11–C–1. Checking Power Brake Unit on Vehicle

1. Road test the brakes by making a brake application at about 30 km (20 miles) to determine if the vehicle stops evenly and quickly. If pedal has a spongy feel when applying brakes, air may be present in hydraulic system. Bleed the system as described in **Par. 11–A–2.**
2. With the engine stopped and transmission in neutral, apply brakes several times to deplete all vacuum reverse in the power brake unit. Depress brake pedal, hold light-foot pressure on the pedal and start the engine. If vacuum system is operating, pedal will tend to fall away under foot pressure and less pressure will be required to hold pedal in applied position. If no action is felt, vacuum system is not functioning.
3. Stop the engine. Again deplete all vacuum reverse in system. Depress the brake pedal and hold foot pressure on the pedal. If pedal gradually falls away under foot pressure, hydraulic system is leaking internally or externally.
4. Start the engine with brakes off and transmission in neutral. Run the engine to medium speed and turn off ignition switch. Immediately close throttle. This build up vacuum. Wait no less than 90 seconds, then try brake action. If not vacuum assisted for two or more applications, vacuum check valve is faulty or there is a leak in vacuum system.

11–C–2. Removing Power Brake Unit

1. Disconnect the fluid pipes at the brake master cylinder outlets.
2. Disconnect the vacuum hose at the power brake unit.
3. Disconnect the push rod from the brake pedal by removing the cotter pin at the fork end.
4. Remove the nuts that attach the power brake unit to the dash panel.
5. Remove the power brake unit and master cylinder assembly from the dash panel, being careful not to allow brake fluid to drip on exterior paint.

11–C–3. Disassembling Power Brake Unit

1. Remove the master cylinder and check valve from the power brake unit.
2. Place the power brake unit in a vice with push rod up. Clamp the unit firmly on the flange.
3. Scribe a mark on the bottom center of the front and rear shells to facilitate reassembly.
4. Remove the dust boot.
5. Attach a suitable wrench to the studs of the rear shell as shown in Fig. 11–13. Rotate the rear shell clockwise to unlocked postion.

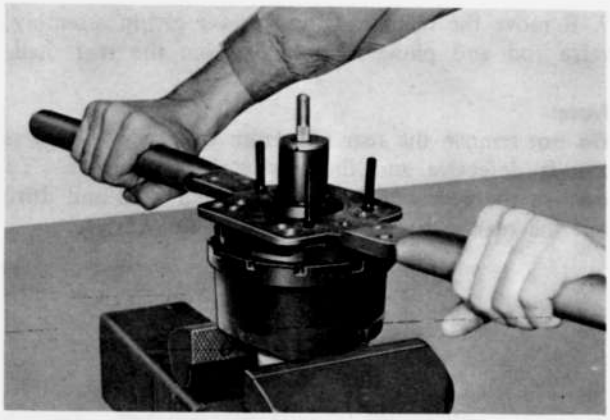

Fig. 11–13 Removing rear shell

Note:
Loosen the rear shell carefully as it is spring-loaded.

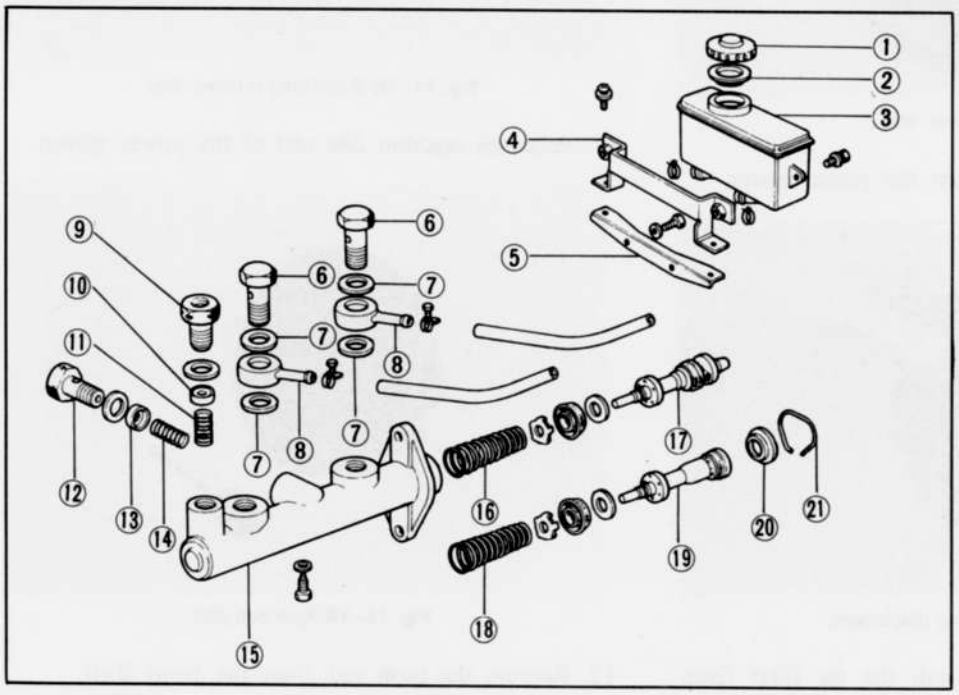

Fig. 11–12 Brake master cylinder components

1. Cap
2. Oil baffle
3. Reservoir
4. Holder
5. Holder
6. Connector bolt
7. Gasket
8. Union joint
9. Outlet fitting
10. Outlet valve
11. Spring
12. Outlet fitting
13. Check valve
14. Spring
15. Master cylinder body
16. Spring
17. Secondary piston
18. Spring
19. Primary piston
20. Washer
21. Snap ring

6. Lift the rear shell, diaphragm and power piston assembly and valve rod and plunger assembly from the unit. Then, remove the return spring.

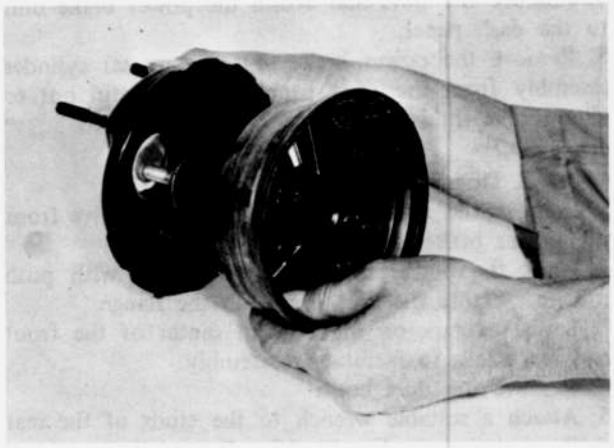

Fig. 11–14 Removing power piston assembly

7. Remove the diaphragm and power piston assembly, valve rod and plunger assembly from the rear shell.

Note:
Do not remove the rear seal from the rear shell unless seal is defective and the new seal is available. To remove the rear seal, support the rear shell and drive out the rear seal with a punch or a screwdriver.

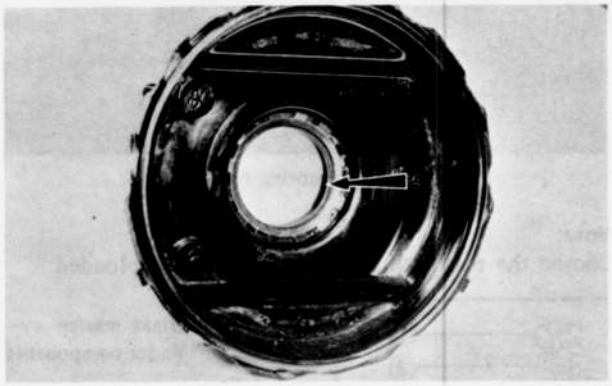

Fig. 11–15 Rear seal

8. Remove the diaphragm from the power piston.

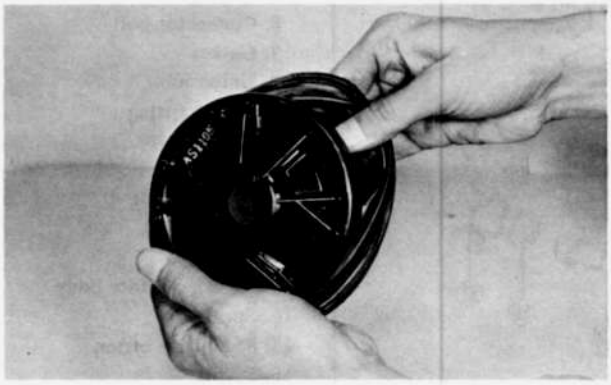

Fig. 11–16 Remvoing diaphragm

9. Remove the air silencer with the air filter from the power piston, being careful not to chip plastic.



Fig. 11–17 Removing air filter

10. Press in on the valve rod to remove the valve retainer key.
Remove the valve rod and plunger assembly.

Note:
The valve rod and plunger are serviced as an assembly only.

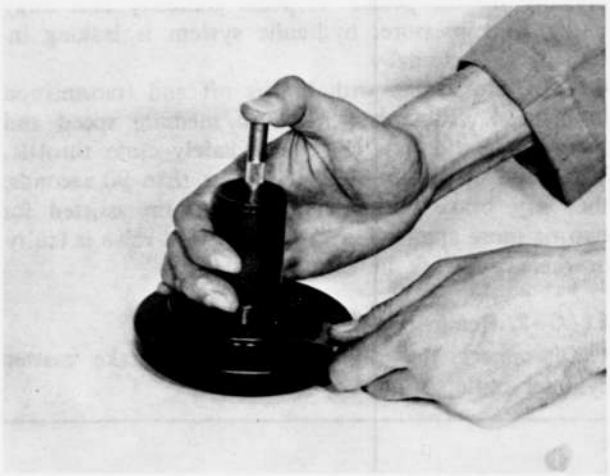

Fig. 11–18 Remvonig retainer key

11. Press the reaction disc out of the power piston.

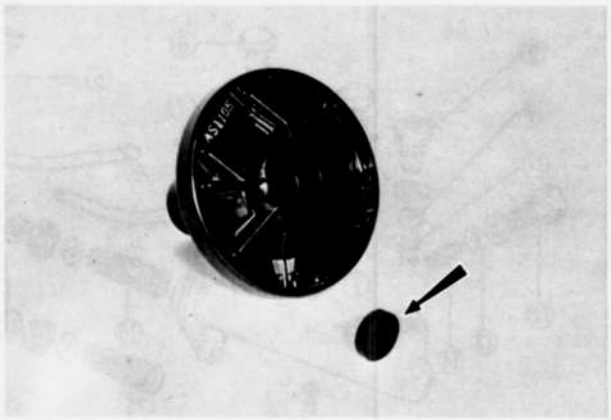

Fig. 11–19 Reaction disc

12. Remove the push rod from the front shell.

13. Remove the front seal from the front shell if necessary.

11–C–4. Checking Power Brake Unit

1. Check the clearance between primary piston and the push rod of the power brake unit and if necessary, adjust the push rod so that the correct clearance is obtained. The standard clearance is **0.1 ~ 0.5 mm (0.004 ~ 0.020 in)**.

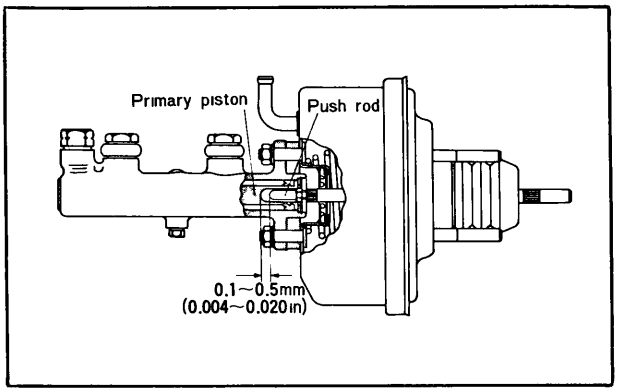

Fig. 11–20 Clearance between piston and rod

2. Inspect all rubber parts. Wipe free of fluid and carefully inspect each rubber part for cuts, nicks or other damage.
3. Check the power piston for cracks, distortion, chipping and damaged seats.
4. Inspect the reaction disc for deterioration of rubber.
5. Check the valve rod and plunger for all seats to be smooth and free of nicks and dents. Replace with a new one if defective.
6. Inspect the front and rear shells for scratches, scores, pits, dents or other damage.
7. Check the diaphragm for cuts, or other damage.

11–C–5. Assembling Power Brake Unit

1. Apply power brake lubricant to the inner surface of the tube section of the power piston and to the surfaces of the valve rod and plunger.
2. Insert the valve rod and plunger assembly into the tube section of the power piston.
3. Press down on the valve rod and align the groove in the valve plunger with the slot of the power piston. Insert the retainer key.
4. Install the diaphragm on the power piston making certain the diaphragm is seated in the groove.

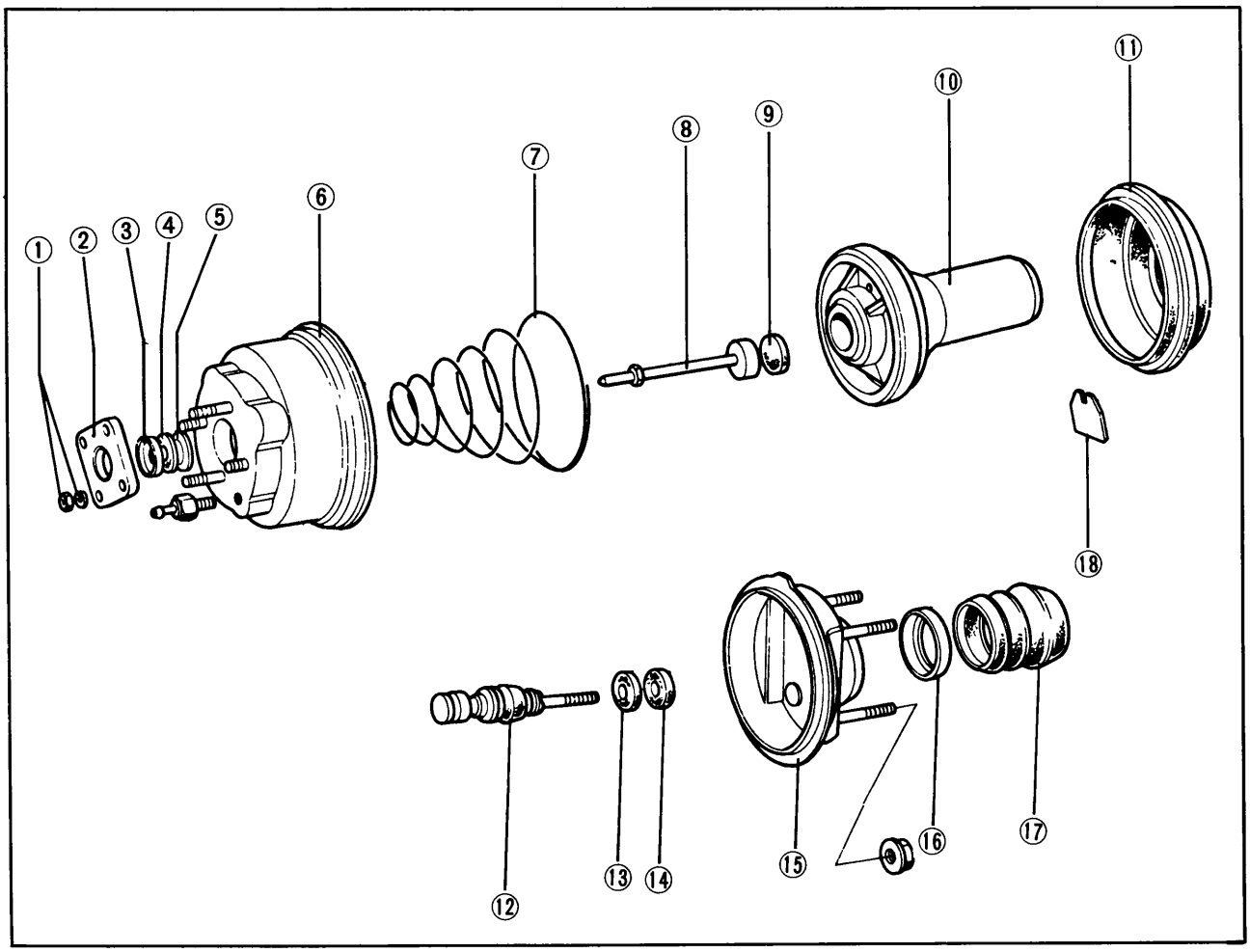

Fig. 11–21 Power brake unit components

1. Nut and washer
2. Flange
3. Retainer
4. Front seal
5. Support plate
6. Front shell
7. Return spring
8. Push rod
9. Reaction disc
10. Power piston
11. Diaphragm
12. Valve rod and plunger assembly
13. Air filter
14. Air silencer
15. Rear shell
16. Air silencer retainer
17. Boot
18. Retainer key

5. Assemble the air filter and the air silencer over the rod and position in the power piston.
6. Apply power brake lubricant liberally to the entrie surface of the reaction disc and install the reaction disc into the power piston.
7. Coat the outer bead of the diaphragm with power brake lubricant where it bears against the outer rims of the front and rear shells to aid in assembly.
8. Apply power brake lubricant to the seal in the rear shell.
Carefully guide tube end of the power piston, through the seal in the rear shell.
9. Install the power piston into the rear shell.
10. Install the push rod through the front of the power piston.
11. Install the return spring.
12. Install the rear shell assembly by using the wrench to rotate the rear shell counter-clockwise until scribe marks align.

Note:
Press the front shell down firmly, maintaining a pressure until the shell flanges are fully locked.

13. Install the dust boot down against the rear shell.
14. Install the master cylinder and check valve.

11–C–6. Installing Power Brake Unit
Follow the removal procedures in the reverse order.

Note:
After installing the unit, bleed the hydraulic system according to the procedure described in Par. **11–A–2.**

11–D. HYDRAULIC LINES

11–D–1. Checking Brake Lines
Inspect all brake lines for any leakage with the foot brakes applied. Check all brake pipes, hoses and connections for signs of chafing, deterioration or any other damage.

11–E. BRAKE FAIL INDICATOR

11–E–1. Centralizing Brake Fail Indicator
After any repair or bleeding of the front or rear brake system, the brake warning light will usually continue to be illuminated due to the brake fail indicator remaining in the off center position.
To centralize the brake fail indicator, turn off the warning light after a repair operation.
1. Turn the ignition switch to the ON position.
2. Check the fluid level in the master cylinder reservoir and fill them to 3/4 full of the brake fluid.
3. Depress the brake pedal and the piston will center itself causing the brake warning light to go out.
4. Turn the ignition switch to the OFF position.
5. Before driving the vehicle, check operation of the brakes and be sure that a firm pedal is obtained.

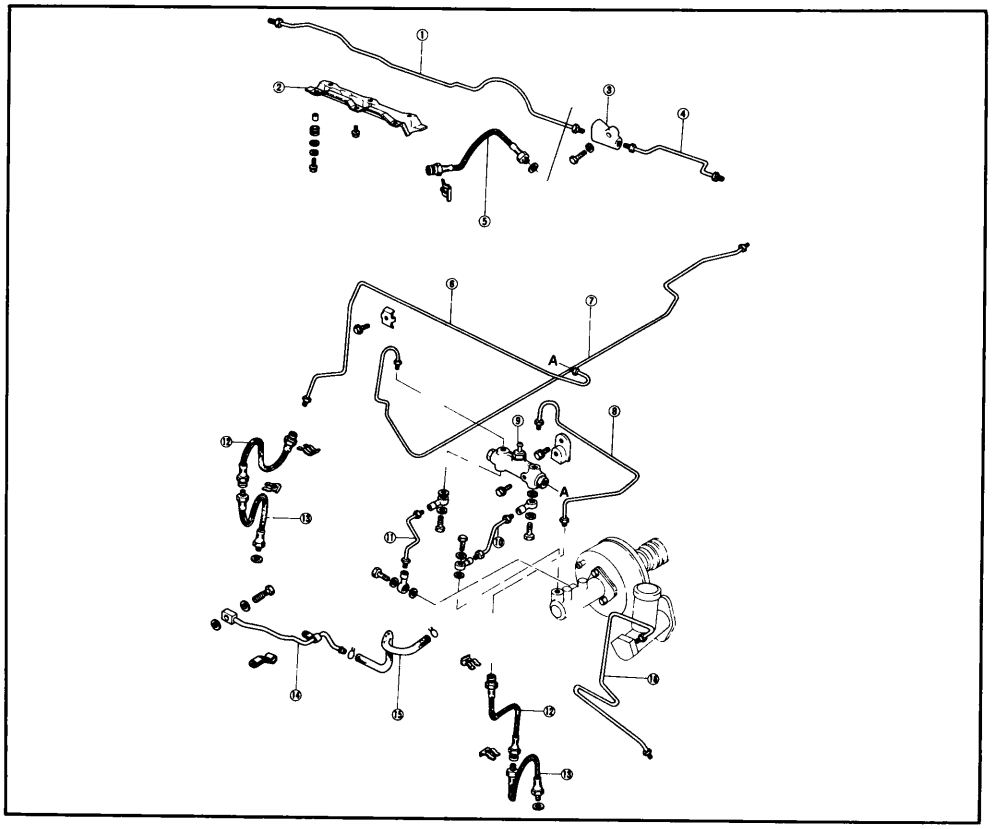

Fig. 11–22 Hydraulic lines

1. Rear pipe No. 2
2. Protector
3. Rear pipe joint
4. Rear pipe No. 1
5. Rear flexible hose
6. Brake pipe (Frt., R)
7. Brake pipe (Rr.)
8. Brake pipe (Frt., L)
9. Brake fail indicator
10. Main brake pipe (Frt.)
11. Main brake pipe (Rr.)
12. Front flexible hose
13. Flexible hose
14. Vacuum pipe
15. Vacuum hose
16. Clutch pipe

11–F. FRONT BRAKE

11–F–1. Disc Brake Shoe

a. Replacing disc brake shoe

The lining should be inspected whenever the wheels are removed for any reason. The shoe and lining assembly should be replaced, if the thickness of the shoe and lining assembly is **6.5 mm (0.256 in)** or less due to wear.

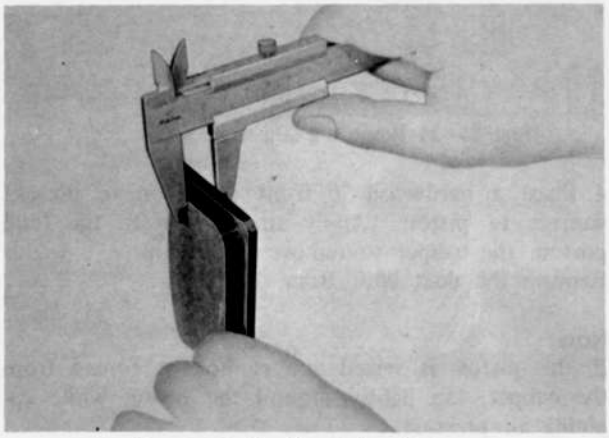

Fig. 11–23 Checking lining thickenss

1. Raise the front end of the vehicle and support with stands.
2. Remove the front wheel.
3. Remove the clips and pull out the locating pins.

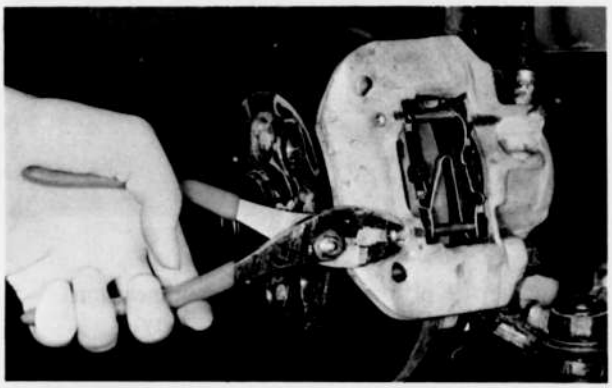

Fig. 11–24 Removing locating pins

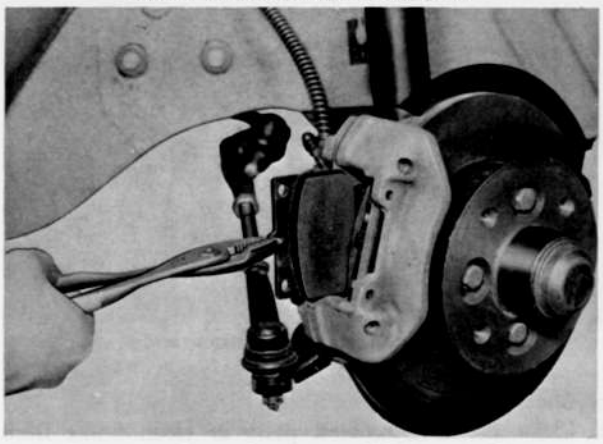

Fig. 11–25 Removing shoe and lining assembly

4. Remove the shoe return spring and pull out the brake shoes.
5. Remove the rubber cap from the bleeder screw, and connect a vinyl drain tube onto the bleeder screw. Submerge the other end of the vinyl tube into a suitable container.
6. Open the bleeder screw and press the piston into the cylinder with the **piston retracting tool** (Part No. 49 0221 600C).

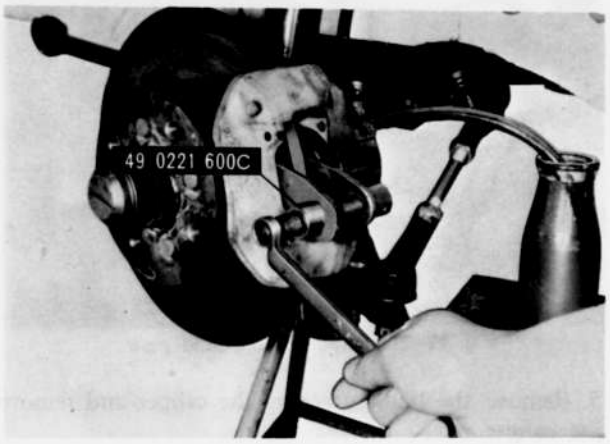

Fig. 11–26 Pressing piston

7. Tighten the bleeder screw and remove the vinyl tube and retracting tool.
8. Install new brake shoes and shims on the caliper.

Note:

(a) When the disc brake shoes are replaced, replace all shoes on both wheels at the same time.

(b) **Do not** mix different types of linings when replacing.

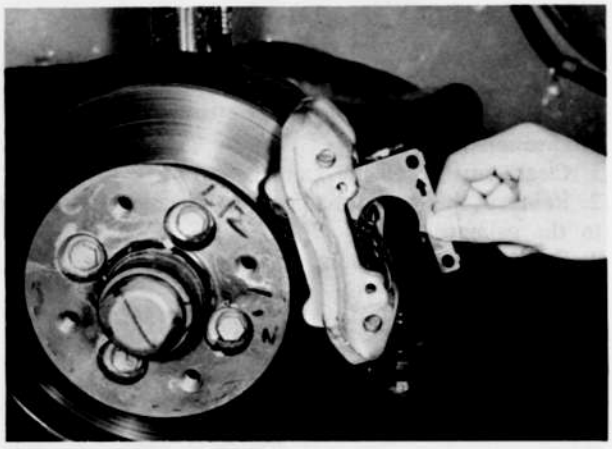

Fig. 11–27 Installing shim

9. Install the shoe return spring, locating pins and clips.
10. Install the front wheel and lower the vehicle.

11–F–2. Caliper

a. Removing caliper

1. Raise the front end of the vehicle and support with stands.

2. Remove the front wheel.
3. Remove the shoe and lining assembly as described in **Par. 11–F–1.**
4. Disconnect the brake fluid pipe from the caliper and plug the end of the fluid pipe to prevent entrance of dirt and loss of fluid.

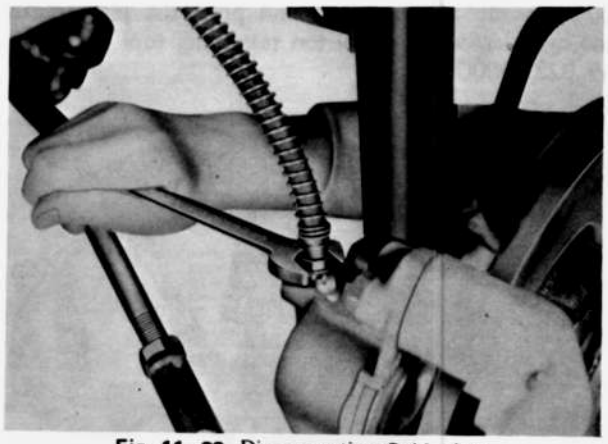

Fig. 11–28 Disconnecting fluid pipe

5. Remove the bolts attaching the caliper and remove the caliper.

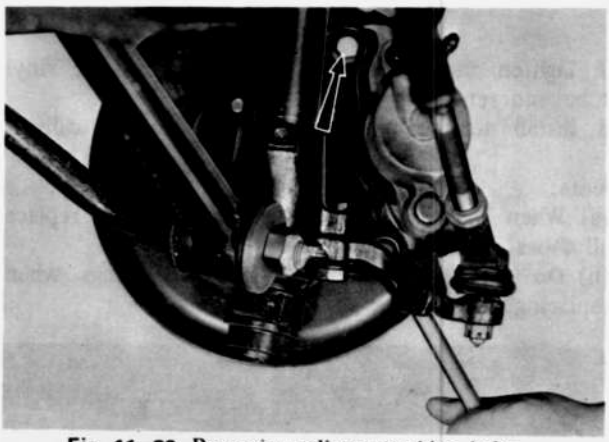

Fig. 11–29 Removing caliper attaching bolts

b. Disassembling caliper

1. Clean outside of the caliper.
2. Remove the bolts that attach the caliper bracket to the caliper.
3. Remove the dust boot retainer.

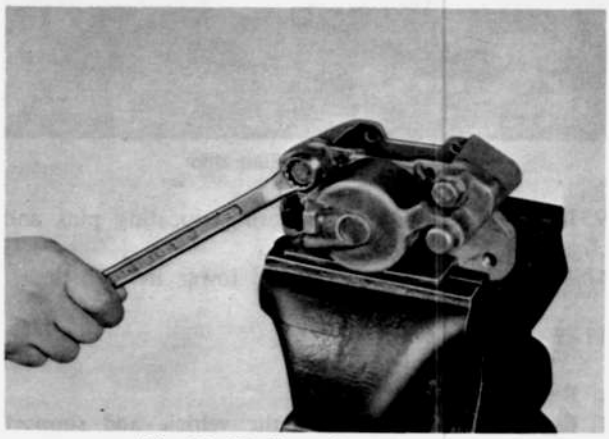

Fig. 11–30 Removing caliper

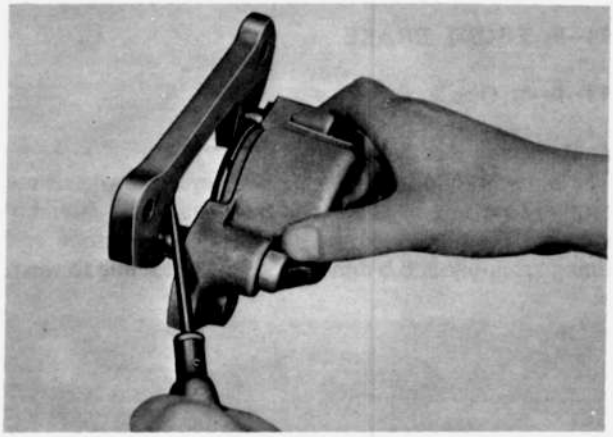

Fig. 11–31 Removing caliper bracket

4. Place a hardwood in front of piston to prevent damage to piston. Apply air pressure to the fluid port in the caliper to remove the piston.
Remove the dust boot from the piston.

Note:
If the piston is seized and cannot be forced from the caliper, tap lightly around the piston while applying air pressure.

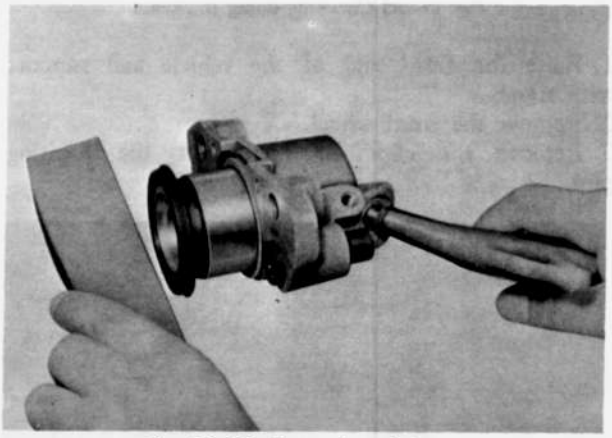

Fig. 11–32 Removing piston

5. Remove the piston seal from the caliper bore.
6. Remove the bleeder screw, if necessary.

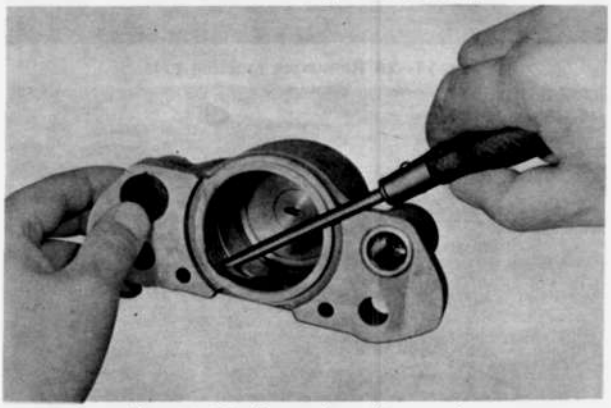

Fig. 11–33 Removing piston seal

c. Checking caliper

1. Clean the disassembled parts in clean brake fluid or alcohol and dry with compressed air.

Note:
Never use gasoline or kerosene.

2. Inspect the caliper bore and piston for scoring, scratches or rust. If any of these conditions are found, replace with a new piston or caliper. Minor damage can be eliminated by polishing with crocus cloth.
3. Discard the old piston seal and dust boot, and use new ones when reassembling.

d. Assembling caliper
1. Apply brake fluid to the piston seal and install it into the groove of the caliper bore.

Note:
Be sure the piston seal does not become twisted and that it is seated fully in the groove.

2. Lubricate the piston and caliper bore.
3. Spread the dust boot over the piston as it is installed and seat the dust boot in the piston groove. Insert the piston and dust boot assembly into the cylinder bore.
4. Install the dust boot by setting the flange squarely in the outer groove of the caliper bore. Install the dust boot retainer.

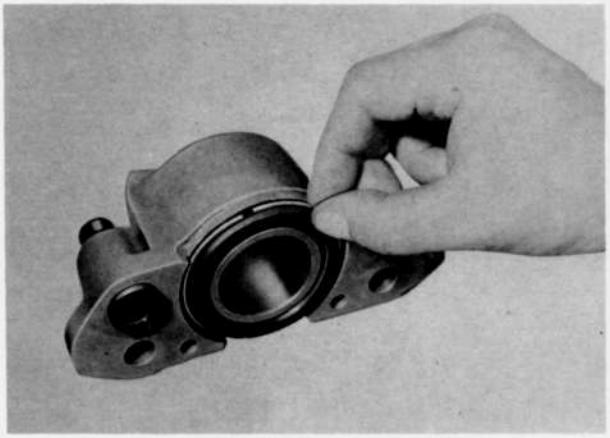

Fig. 11–34 Installing dust boot retainer

5. Install the caliper bracket to the caliper and tighten attaching bolts.

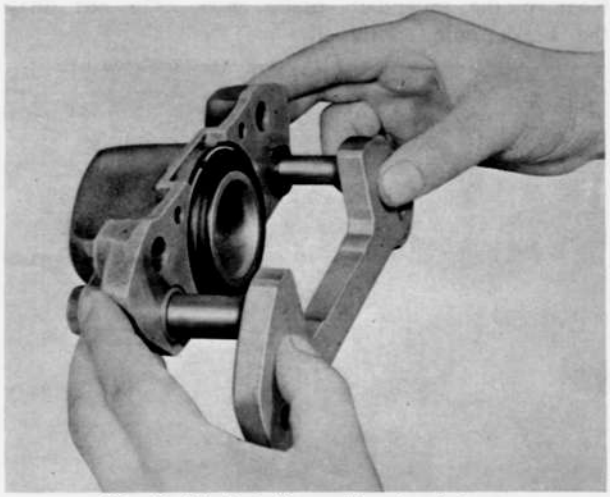

Fig. 11–35 Installing caliper bracket

e. Installing caliper
Follow the removal procedures in the reverse order and bleed the hydraulic system.

11–F–3. Disc and Front Wheel Hub Assembly

a. Checking disc assembly
1. Inspect the friction surface of the disc and recondition if it is scored, scratched or rusted.
2. Check the run-out of the disc with a dial indicator.

Note:
Make sure that the wheel bearings are correctly adjusted, before checking the run-out of the disc.

If the run-out is more than **0.1 mm (0.0039 in)**, reface the disc. **Do not** reface any more than necessary to clean up the disc.

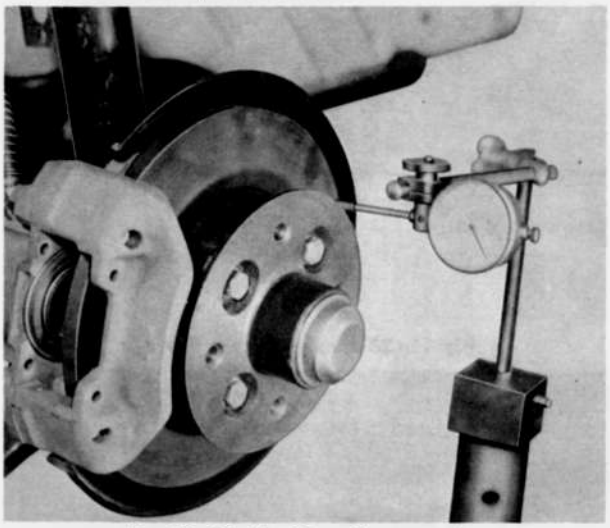

Fig. 11–36 Checking disc run-out

3. Check the disc for thickness. If the thickness of the disc becomes less than **10 mm (0.3937 in)** from excessive refacing, the disc should be replaced.

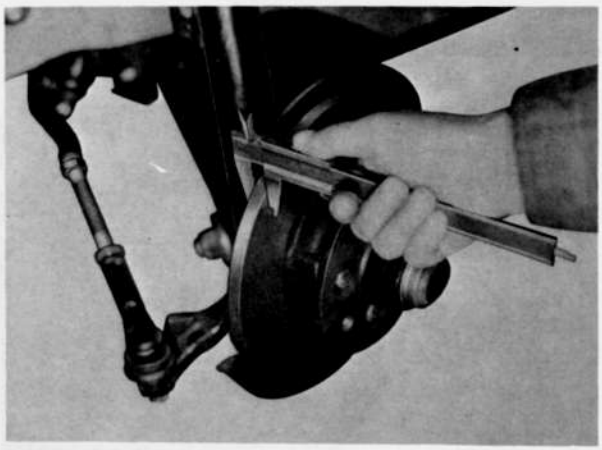

Fig. 11–37 Checking disc thickness

b. Replacing disc assembly
Replace the disc and front wheel hub assembly, as described in **Par. 12–C–1.**

11–G. REAR BRAKE

11–G–1. Rear Brake Drum and Shoe

a. Removing rear brake drum and shoe

1. Raise the rear end of the vehicle and support with stands.
2. Remove the rear wheel.
3. Make sure that the parking brake is fully released.
4. Remove the bolts that attach the brake drum to the rear axle shaft flange and pull the drum off the axle shaft flange. If the drum will not come off, place the drum attaching bolts into the tapped holes on the drum. Then, tighten in evenly to force the drum away from the axle shaft flange.

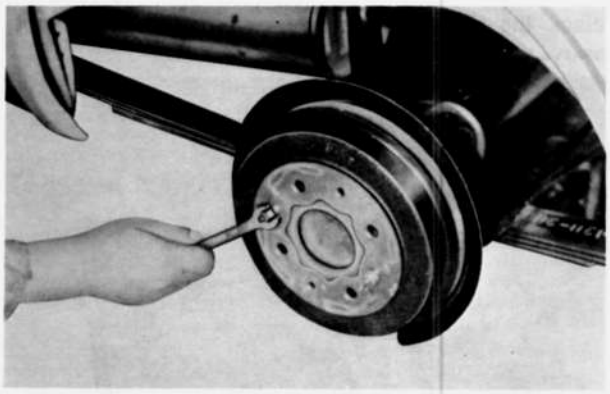

Fig. 11–38 Removing brake drum

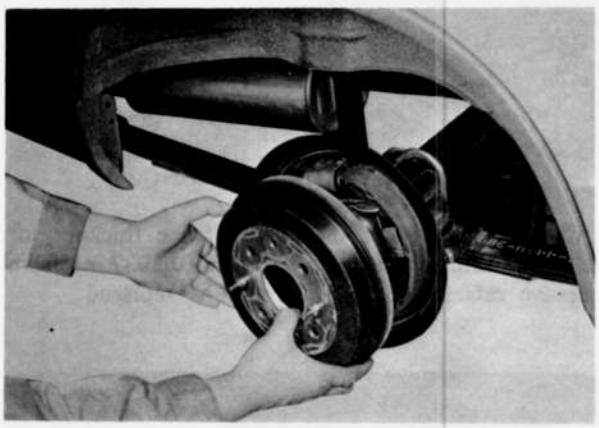

Fig. 11–39 Removing brake drum

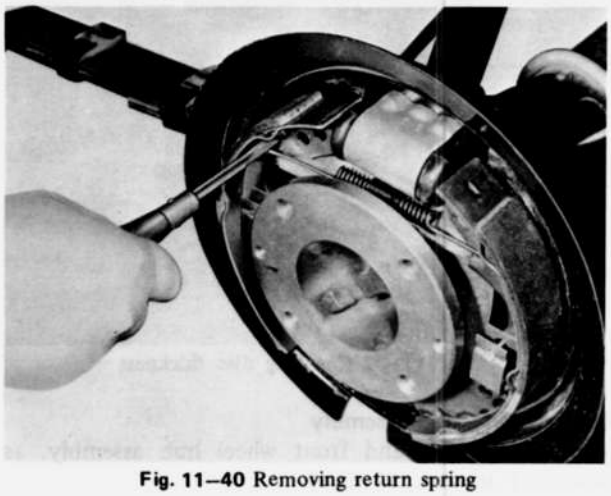

Fig. 11–40 Removing return spring

5. Remove the return spring located on the upper side of the brake shoes using a suitable tool, then remove the return spring located on the lower side of the brake shoes.
6. Remove the shoe hold-down spring from the brake shoe by removing the shoe hold-down spring pin with a plier.

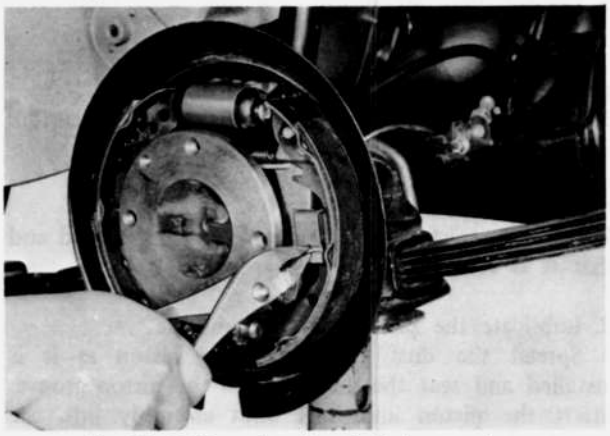

Fig. 11–41 Removing shoe hold-down spring

7. Remove the primary brake shoe and the parking brake link.

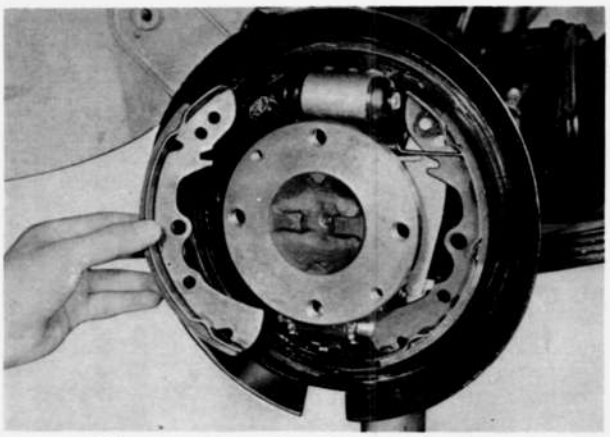

Fig. 11–42 Removing primary brake shoe

8. Disconnect the parking brake lever from the secondary brake shoe by removing the retaining clip. Remove the secondary brake shoe. **Do not** dirty the brake lining with oil.

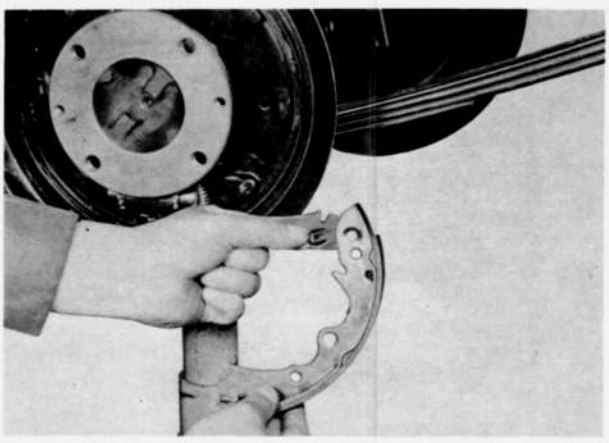

Fig. 11–43 Removing secondary brake shoe

b. Inspecting rear brake drum and shoe

1. Brush all dust from the backing plate and interior of the brake drum.
2. Inspect the springs for weakness.
3. Inspect the brake shoes for excessive lining wear or shoe damage. If the lining is excessively worn or if the shoes are damaged, they must he replaced. Replace any lining that had been contaminated with oil, grease or brake fluid.

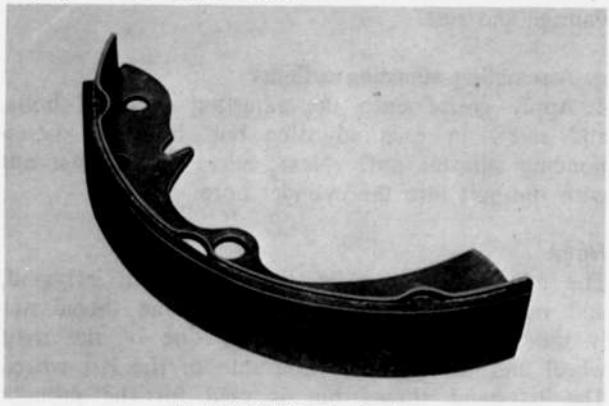

Fig. 11–44 Rear brake shoe

4. Examine the lining contact pattern. To inspect, chalk the entire inner surface of the drum and slide the lining along the chalked surface. The lining should show a uniform contact across the entire width, extending from toe to heel. Shoes having sufficient lining but improper contact should be re-ground to obtain proper contact.
5. Inspect the brake drum and, if necessary, refinish. Minor scores on the brake drum can be removed with sandpaper. The drum that is excessively scored or shows an out-of-roundness over **0.15 mm** should be turned down. Remove only enough stock to eliminate the scores and true up the drum. The refinished diameter must not exceed 201 mm (7.9135 in). The standard inner diameter of the drum is 200 mm (7.8741 in). After the drum is turned down, wipe the refinished surface with a cloth soaked in clean denatured alcohol. If one drum is turn down, the opposite drum on the same axle should also be cut down to the same size.
6. Check the condition of the brake shoes, return springs, hold-down springs and drum for signs of overheating. If the shoes and drums are head spotted, indicating a overheated condition, replace with new ones.

c. Installing rear brake drum and shoe

Follow the removal procedures in the reverse order.

Note:

Adjust the brake shoe clearance.

11–G–2. Wheel Cylinder

a. Removing Wheel Cylinder

1. Remove the rear brake shoes, as described in **Par. 11–G–1.**
2. Disconnect the brake fluid pipe from the wheel cylinder by removing the flare nut located on the rear side of the backing plate.
3. Remove the nuts that attach the wheel cylinder to the backing plate and remove the wheel cylinder.

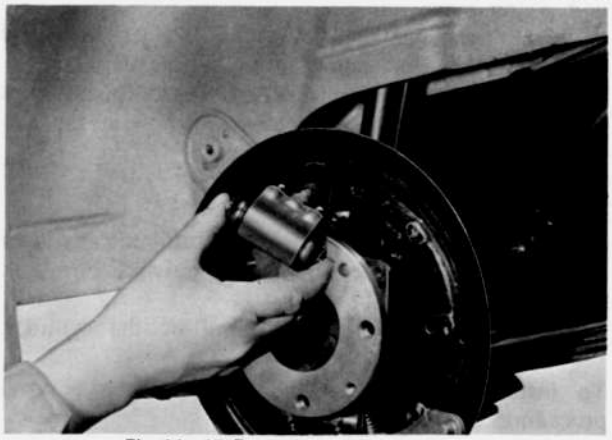

Fig. 11–45 Removing wheel cylinder

b. Disassembling Wheel Cylinder

1. Remove the boots from both ends of the wheel cylinder.
2. Remove the pistons, piston cups, filling blocks and return spring.
3. Remove the bleeder screw and steel ball, if necessary.

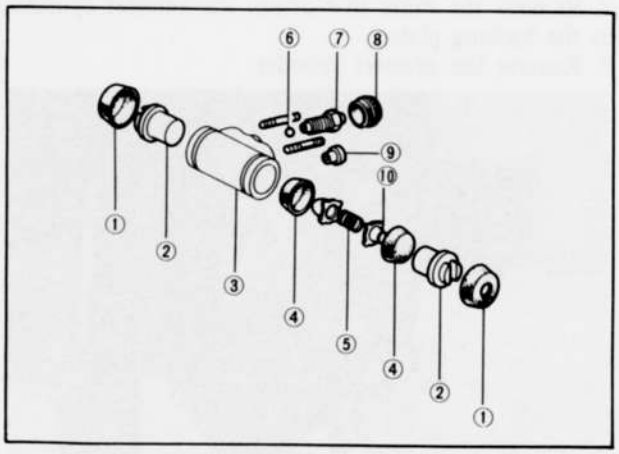

Fig. 11–46 Wheel cylinder componets

1. Boot
2. Piston
3. Cylinder
4. Piston cup
5. Spring
6. Steel ball
7. Bleeder screw
8. Cap
9. Tube seat
10. Filling block

c. Checking Wheel Cylinder

1. Wash all parts in clean alcohol or brake fluid. **Never** use gasoline or kerosene.
2. Examine the cylinder bore, piston, and adjuster for wear, roughness, or score.
3. Check the clearance between the piston and the cylinder. If it is **more than 0.15 mm (0.006 in),** replace with new parts.
4. Check the piston cups for wear, softening, swelling, or any damage. If any of these conditions exists, replace the cups.

d. Assembling Wheel Cylinder
1. Apply clean brake fluid to the cylinder bore, pistons and piston cups.
2. Insert the steel ball into the bleeder hole and thread the bleeder screw into the bleeder hole.
3. Insert the return spring, filling blocks, piston cups and pistons into their respective position in the cylinder bore.

Note:
When inserting the piston cups into the cylinder bore, face the flat side of the cups outward.

4. Place the boots over each end of the cylinder.

To install the wheel cylinder, follow the removal procedures in the reverse order.

Note:
Bleed the hydraulic system and adjust the brake shoe clearance.

11–G–3. Adjuster Cylinder

a. Removing adjuster cylinder
1. Remove the rear brake shoes, as described in **Par. 11–G–1.**
2. Remove the bolts that attach the adjuster cylinder to the backing plate.
3. Remove the adjuster cylinder.

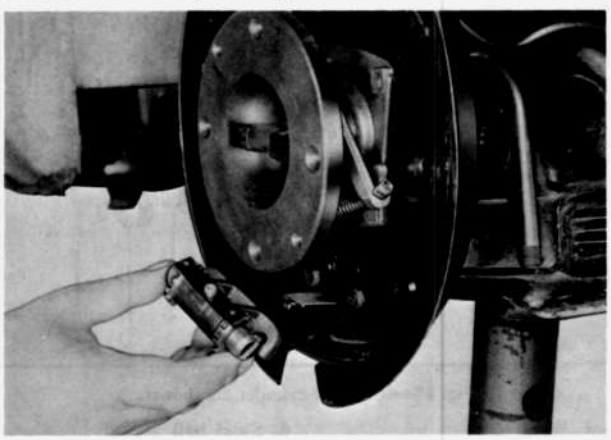

Fig. 11–47 Removing adjuster cylinder

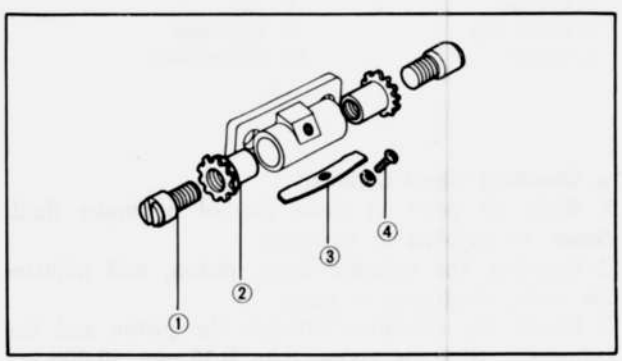

Fig. 11–48 Adjuster cylinder (Anchor block) components

1. Adjusting bolt
2. Adjusting nut
3. Locking spring
4. Screw

b. Disassembling adjuster cylinder
1. Remove the adjuster locking spring from the cylinder by removing the attaching screw.
2. Remove the adjusting nut with the adjusting bolt from the cylinder body. Next remove the adjusting bolt from adjusting nut.

c. Checking adjuster cylinder
Check the cylinder, adjusting nut, adjusting bolt for damage and rust.

d. Assembling adjusting cylinder
1. Apply grease onto the adjusting nuts and bolts, and screw in each adjusting bolt into the corresponding adjuster nut. Next, insert the adjuster nut with the bolt into the cylinder bore.

Note:
The adjusting bolt is of two types with left-hand, and right-hand threads. The right-hand thread nut is used for the secondary shoe side of the right wheel and the primary shoe side of the left wheel. The left-hand thread nut is used for the primary shoe side of the right wheel and the secondary shoe side of the left wheel.

2. Install the adjuster locking spring onto the cylinder with the attaching screw.

e. Installing adjuster cylinder
Follow the removal procedures in the reverse order and adjust the brake shoe clearance.

11–H. PARKING BRAKE

11–H–1. Parking Brake Adjustment
To adjust, proceed as follows:
After adjusting the rear brake shoe clearance, adjust the parking brake lever adjusting screw so that the brake begins to apply when pulling the parking brake lever three to seven notches.



Fig. 11–49 Parking brake adjustment

SPECIAL TOOL

49 0221 600C	Piston retracting tool

WHEELS AND TIRES

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12

DESCRIPTION

Each front wheel is bolted to its respective front hub and disc assembly. Two opposed tapered roller bearings are installed in each hub. A grease seal is installed at inner end of the hub to prevent grease from leaking on the disc. The entire assembly is retained to its spindle by the adjusting nut, nut lock and cotter pin.

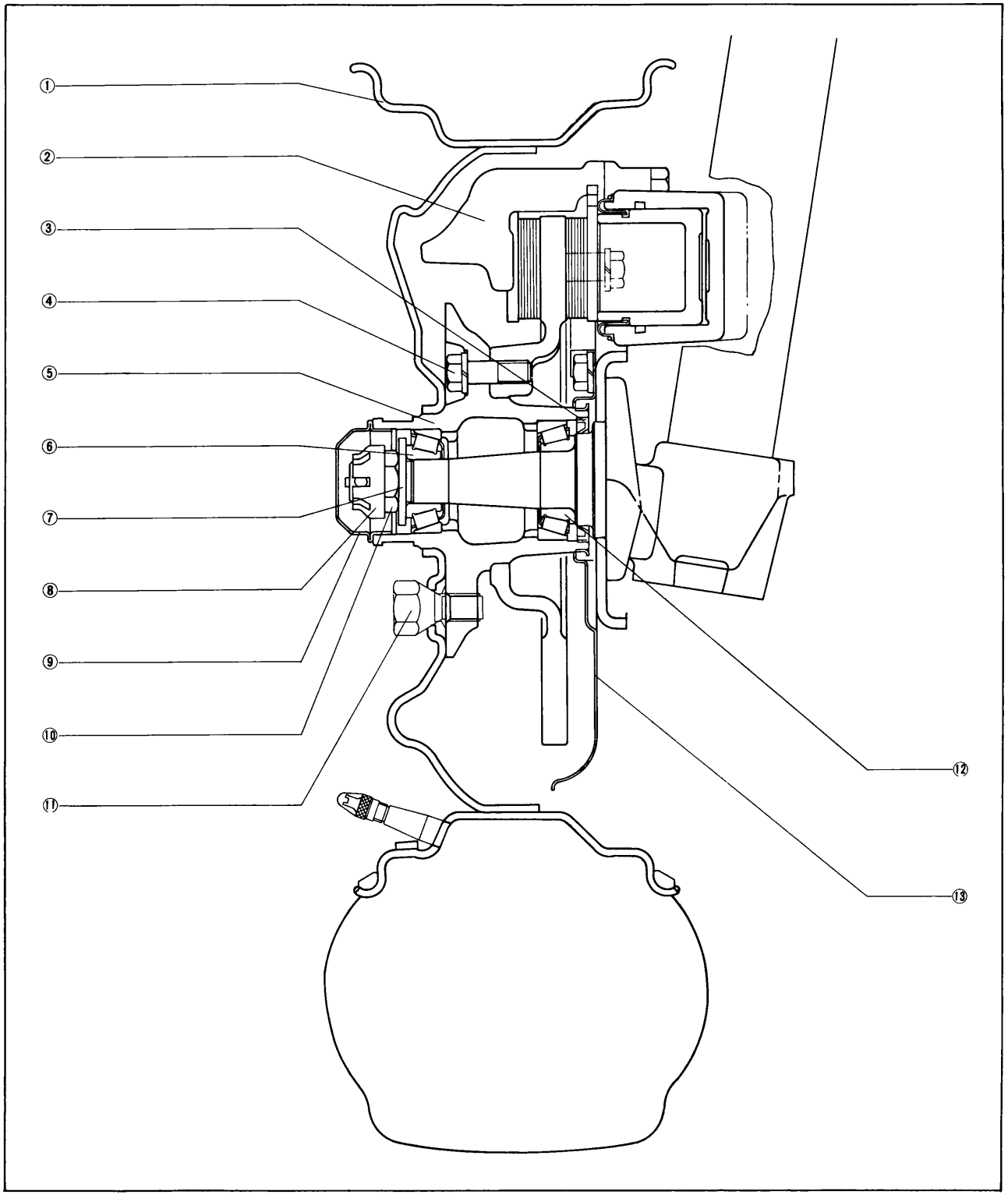

Fig. 12–1 Front wheel cross section

1. Disc wheel
2. Caliper
3. Grease seal
4. Bolt
5. Hub
6. Outer bearing
7. Flat washer
8. Nut lock (Set cover)
9. Grease cap (Hub cap)
10. Adjusting nut
11. Wheel bolt
12. Inner bearing
13. Dust plate

The rear wheel is bolted to the rear axle shaft flange. The rear wheel bearing is pressed onto axle shaft just inside the shaft flange and entire assembly is retained to the rear axle housing by the bearing retainer which is attached to the housing flange.

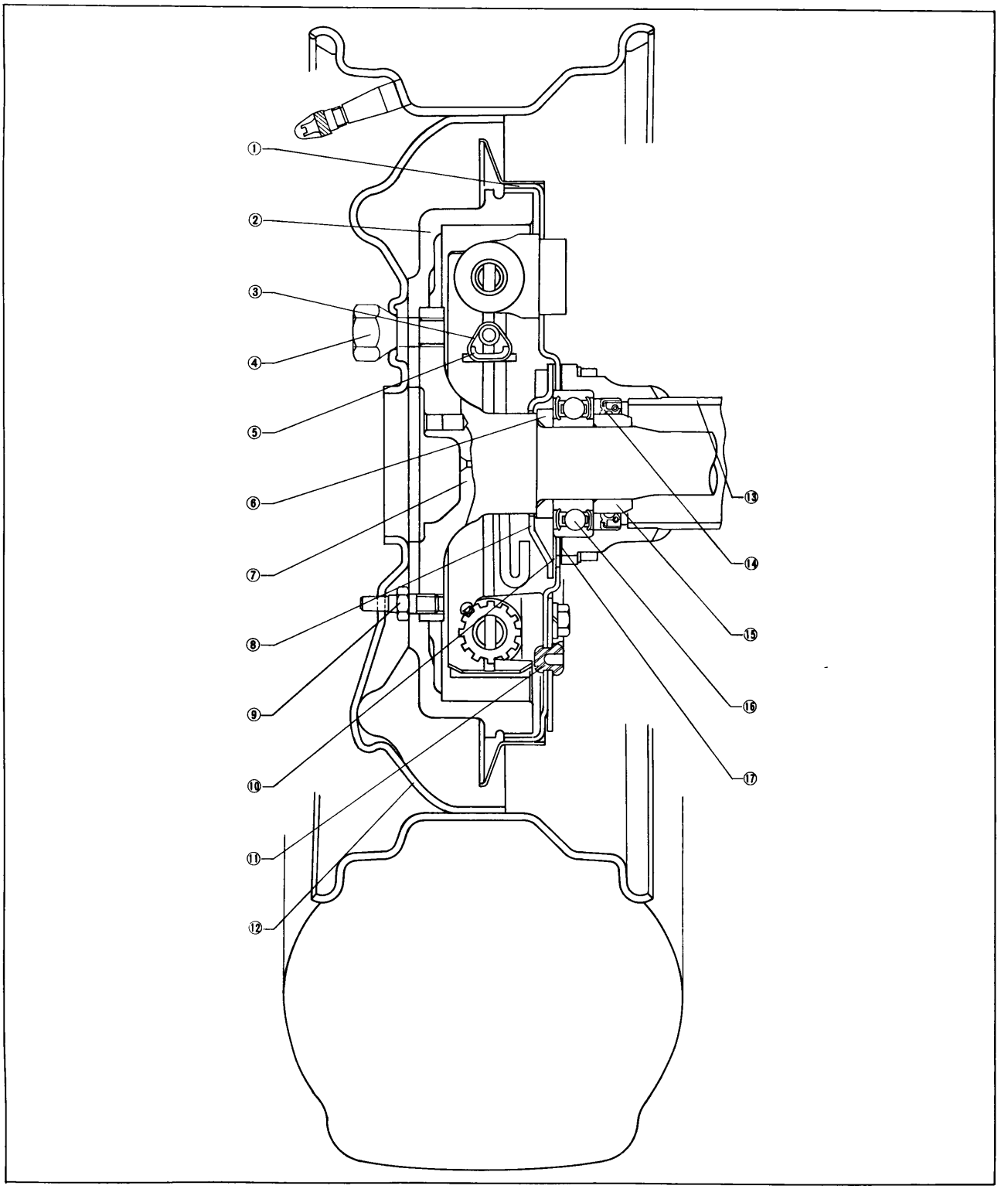

Fig. 12–2 Rear wheel cross section

1. Backing plate
2. Brake drum
3. Holder
4. Wheel bolt
5. Parking brake link (Parking brake operating strut)
6. Spacer
7. Rear axle shaft
8. Bearing retainer
9. Brake drum attaching bolt
10. Gasket
11. Plug
12. Disc wheel
13. Rear axle housing
14. Oil seal
15. Bearing retaining collar
16. Bearing
17. Adjusting shim

12–A. WHEELS AND TIRES

12–A–1. Tire Inflation

Maintenance of correct inflation pressure is one of the most important elements of tire care.

Excessive inflation pressure will cause:
1. Hard rides
2. Damage to tire carcas
3. Poor traction
4. Premature thread wear in center of tire

Low inflation pressure will cause:
1. Hard steering
2. Rapid and uneven wear on the edges of tire thread
3. Increased cord fatigue or broken tire cords
4. High tire temperature
5. Blow outs

Check the inflation pressure with a reliable gauge when the tires are cold. Refer to Par. Technical Data.

After checking or inflating the pressure, place the valve cap back on and tighten by hand. It helps to maintain the air pressure in the tires in case of any valve leak and keeps dust and water out of the valve.

12–A–2. Interchanging Tire

To minimize the possibility of tire noise and to equalize tire wear, it is recommended that tires be interchanged **every 6,250 miles** as shown in Fig. 12–3 or more frequently in the case of extremely heavy wear.

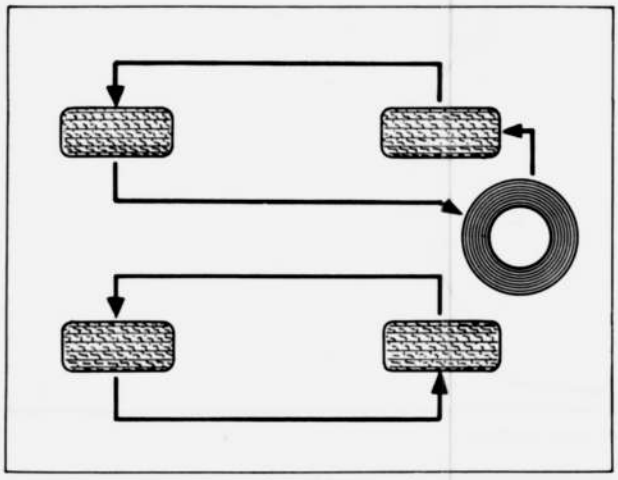

Fig. 12–3 Interchanging tire

When interchanging the tires, inspect for signs of abnormal wear, bulging, etc., stones, gloss, and nails should be removed before reinstallation.

12–A–3. Changing Wheels

1. Pry off the wheel cover and loosen the wheel bolts.

Note:
The wheel bolts are loosend by turning these in the counter-clockwise direction.

2. Raise the vehicle until the wheel and tire clear the gound.
3. Remove the wheel bolts and change the wheel.
4. Install the wheel bolts and alternately tighten the diametrically opposite bolts until the wheel closely touches the rear axle flange.
5. Lower the vehicle and firmly tighten the bolts to **9.0 ~ 10.0 m-kg (65 ~ 72 ft-lb).**
6. Refit the wheel cover.

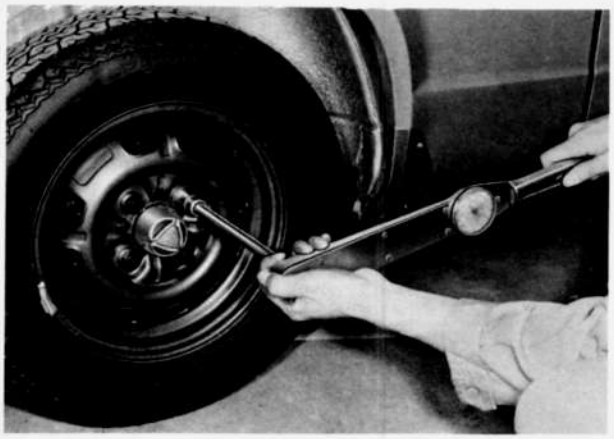

Fig. 12–4 Tightening wheel bolt

12–A–4. Balancing Wheel

The allowable unbalance is 360 cm-gr (5.0 in-oz), which is less than 20 gr (0.7 oz) at the rim. Excessive wheel unbalance will cause shimmy at high speed. If unbalance exceeds **360 cm-g (5.0 in-oz)**, or when a tire is disassembled for repair, the tire and wheel assembly should be statically and dynamically balanced with a wheel balancer.

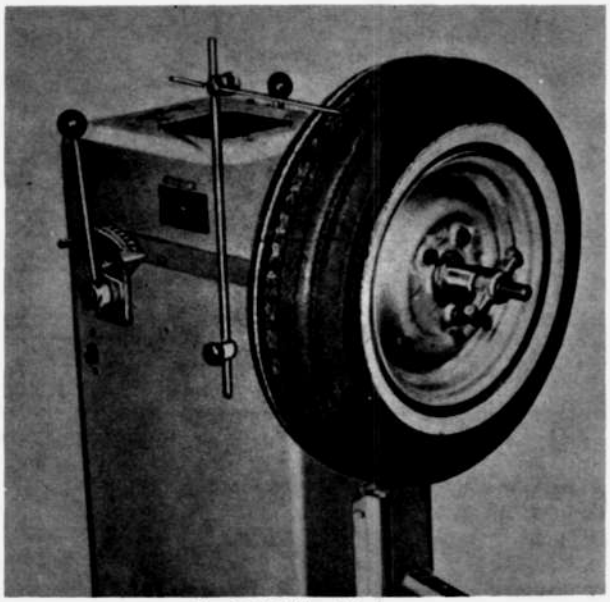

Fig. 12–5 Wheel balancer

12–A–5. Wheel and Tire Run-out

Wheel and tire should be measured for both radial and lateral run-out. The radial run-out is the difference between the high and low points on the tread of tire; while the lateral run-out is the wobble of the wheel. To measure the radial run-out, apply a dial indicator against the center rib of the tire tread and rotate the wheel slowly. This measurement should **not exceed 2.0 mm (0.08 in).** To measure the lateral run-out, position a dial indicator against the side of the tire. The reading of the indicator should be **within 2.5 mm (0.10 in).**

12–B. TUBELESS TIRE

12–B–1. Repairing Tubeless Tire

A leak in the tubeless tire may be located by inflating the tire to recommended pressure and then submerging the tire and wheel assembly in water, or by applying water to the tire with a hose if wheel is mounted on vehicle. Remove water from area where air bubbles show and mark the area with a crayon. After removal of the puncturing object from tire, the puncture must be sealed to prevent entrance of dirt and water which would cause damage to the tire carcass. Tire repair kits are available through tire dealers. These materials should be used as directed in the instructions supplied with kits.

12–C. FRONT WHEEL HUB

12–C–1. Removing Front Wheel Hub

1. Raise the vehicle with a jack until the front wheels clear the ground.
2. Pry off the wheel cover and remove the wheel.
3. Remove the bolts that attach the caliper to the spindle. Remove the caliper from the disc and wire it to the underbody to prevent damage to the brake hose.
4. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut and flat washer from the spindle.

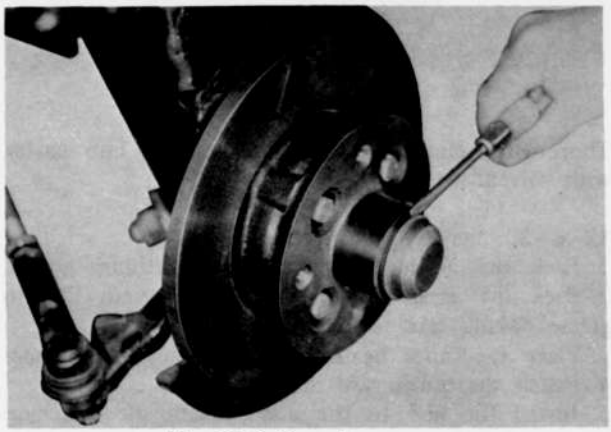

Fig. 12–6 Removing grease cap

5. Pull the hub and disc assembly with the outer bearing off the spindle.

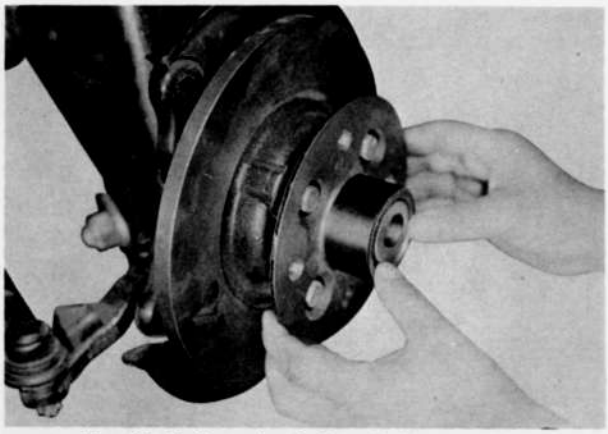

Fig. 12–7 Removing hub and disc assembly

6. Remove the outer bearing from the hub.

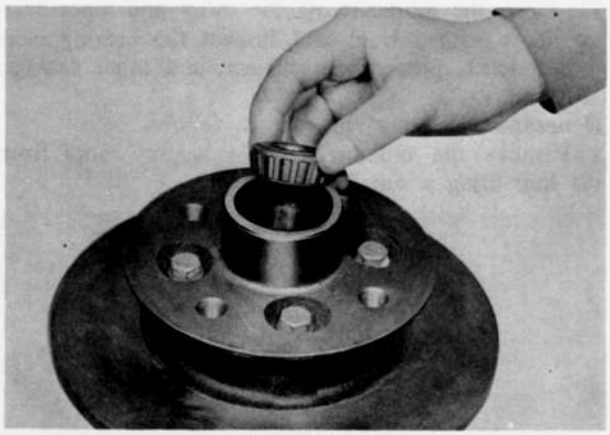

Fig. 12–8 Removing outer bearing

7. Thoroughly clean the spindle and the inside of the hub with solvent to remove all old grease.
8. Apply the identification marks on the hub and disc for convenience in reassembly.
9. Remove the bolts that attach the hub to the disc. Remove the hub from the disc.

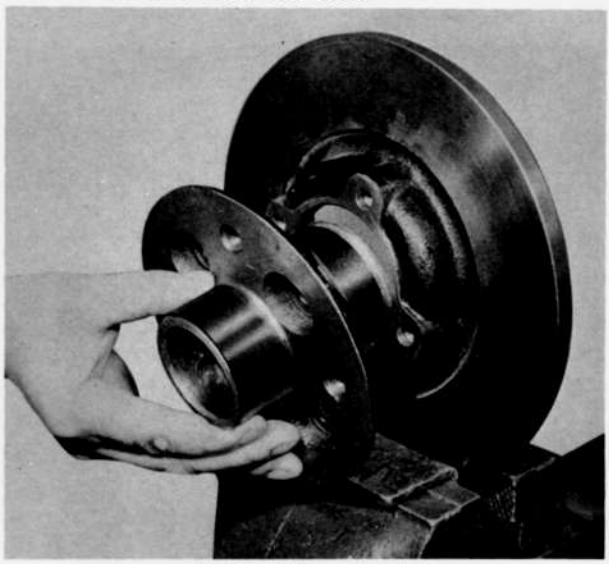

Fig. 12–9 Removing hub

10. Drive out the grease seal and remove the inner bearing from the hub.

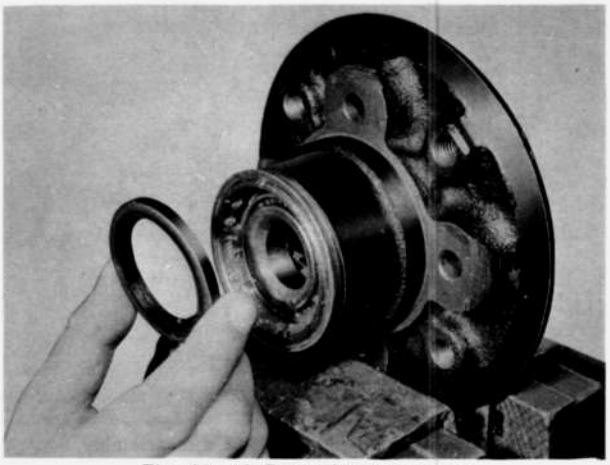

Fig. 12–10 Removing grease seal

11. Clean the lubricant off the outer and inner bearing races with solvent and inspect the bearing races for scratches, pits, excessive wear, and other damage.

If necessary, replace the race as follows:
1) Remove the outer and inner bearing races from the hub using a suitable brass rod.

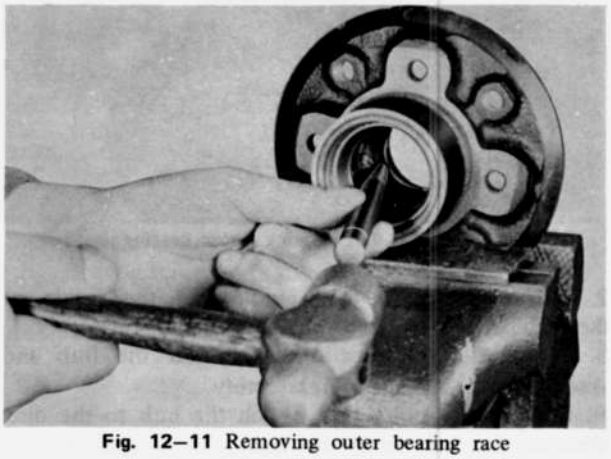

Fig. 12–11 Removing outer bearing race

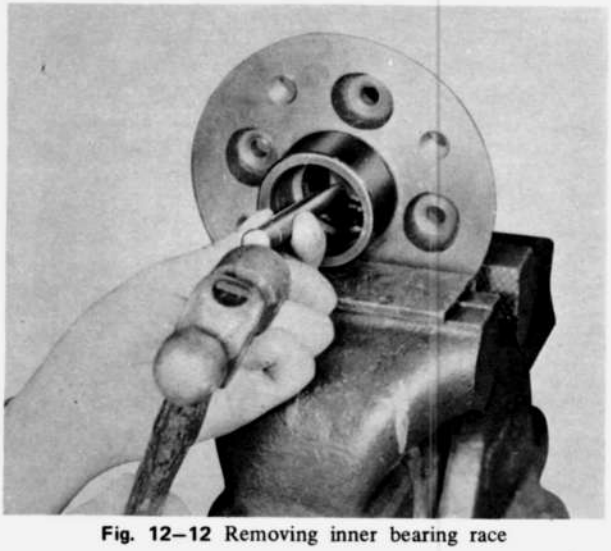

Fig. 12–12 Removing inner bearing race

2) Install the inner and outer bearing races into the hub using a suitable tool. Be sure to seat the races properly in the hub.

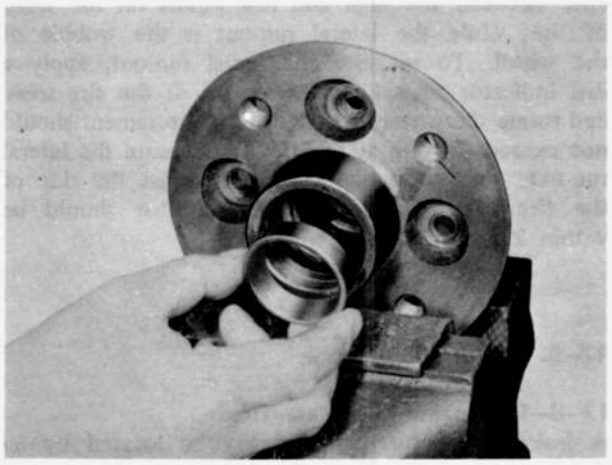

Fig. 12–13 Installing outer bearing race

12–C–2. Checking Front Wheel Hub

Thoroughly clean the inner and outer bearings with solvent, and dry them thoroughly.

Note:
Do not spin the bearings dry with compressed air.

Inspect the bearing for wear and damage, and replace them if necessary. The bearing and bearing race should be replaced as a set if damage to either is encountered.
Check the disc for thickness. If the thickness of the disc is less than **10 mm (0.3937 in)**, disc should be replaced.

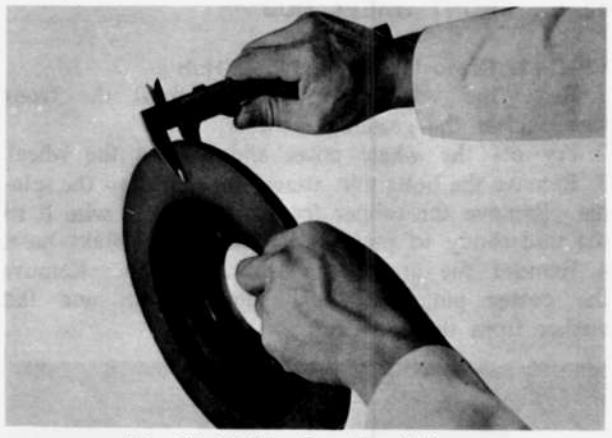

Fig. 12–14 Checking disc thickness

Thoroughly clean the spindle and the hub cavity with solvent to remove all old lubricant.

12–C–3. Installing Front Wheel Hub

1. Pack the inside of the hub with lithium grease.
2. Pack the inner and outer bearings with lithium grease, taking care to fill between rollers.
3. Place the inner bearing in the inner bearing race.
4. Install the grease seal into the hub.
5. Install the hub to the disc. Install the attaching bolts and tighten the bolts to **5.0 m-kg (36.2 ft-lb)**.

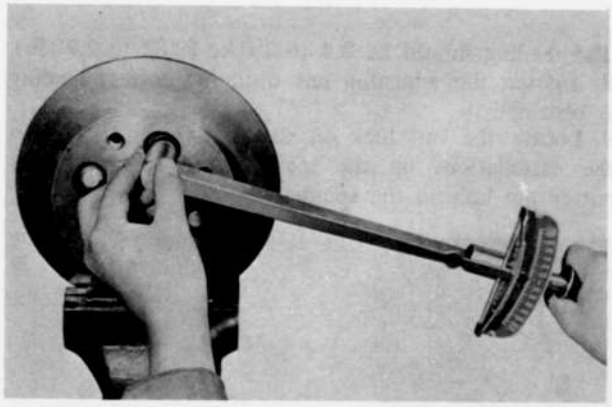

Fig. 12–15 Tightening hub attaching bolt

6. Install the hub and disc assembly on the spindle.
7. Install the outer bearing, flat washer and adjusting nut.
8. Adjust the wheel bearing preload as described in **Par. 12–D–2** on page 12 : 7 and install the nut lock and a new cotter pin. Pack the grease cap with lithium grease and install the grease cap.

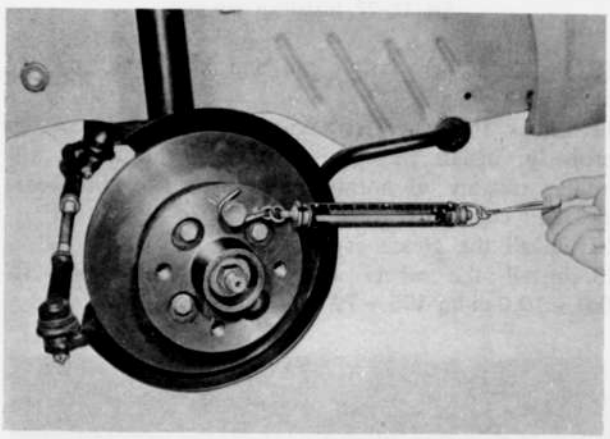

Fig. 12–16 Checking wheel bearing preload

9. Install the caliper to the steering knuckle and tighten the attaching bolts.

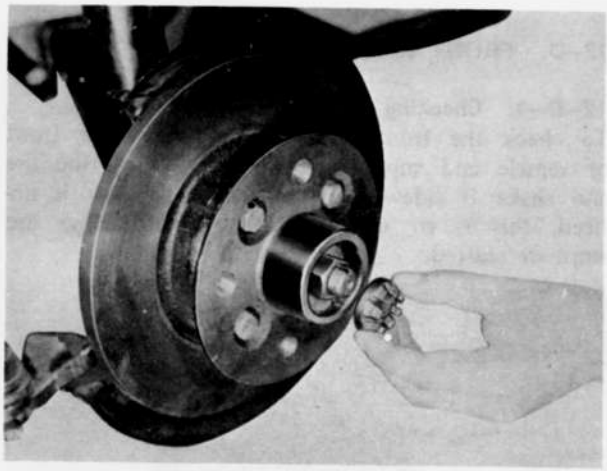

Fig. 12–17 Installing nut lock

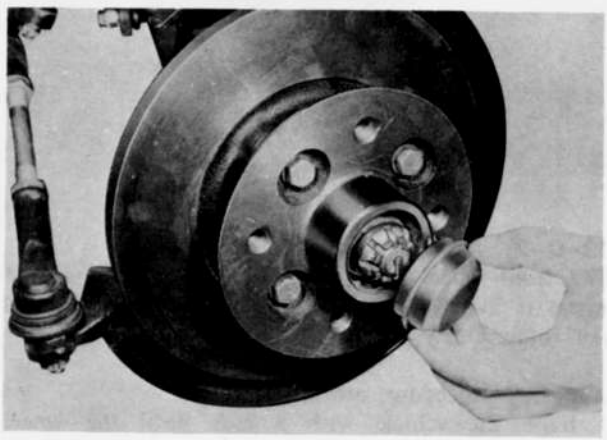

Fig. 12–18 Installing grease cap

10. Position the wheel on the hub. Install the wheel bolts and tighten them alternately in order to draw the wheel evenly against the hub.
11. Install the wheel cover.
12. Pump the brake pedal several times to obtain normal brake lining to disc clearance and restore normal brake pedal travel.

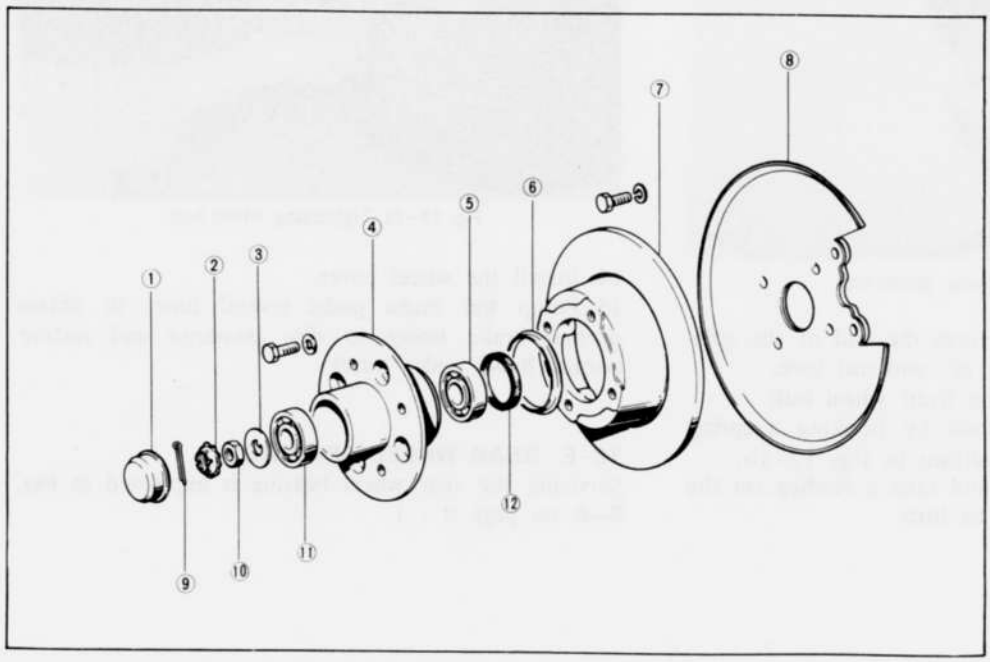

Fig. 12–19 Front wheel hub

1. Grease cap
2. Nut lock
3. Flat washer
4. Hub
5. Inner bearing
6. Dust ring
7. Disc
8. Dust plate
9. Cotter pin
10. Adjusting nut
11. Outer bearing
12. Grease seal

12–D. FRONT WHEEL BEARING

12–D–1. Checking Front Wheel Bearing

To check the front wheel bearings, raise the front of vehicle and support with stands. Grip the tire and shake it sideways. If considerable play is noticed, this is an indication that the bearings are worn or scarred.

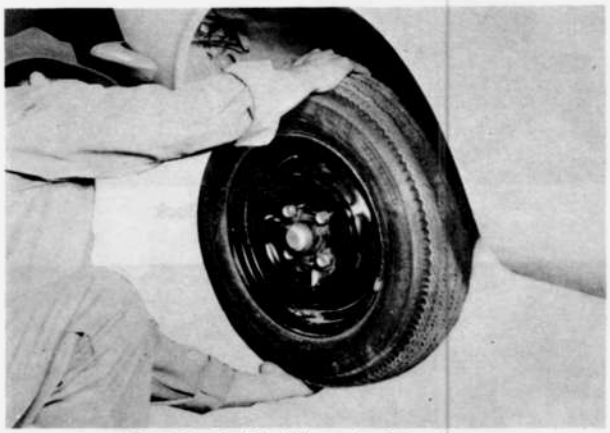

Fig. 12–20 Checking wheel bearing

12–D–2. Adjusting Front Wheel Bearing

The front wheel bearings should be adjusted if the wheel is loose on the spindle or if the wheel does not rotate freely.

Adjusting procedures are as follows:

1. Raise the vehicle with a jack until the wheel clears ground.
2. Pry off the wheel cover and remove the wheel.
3. Remove the grease cap from the hub.

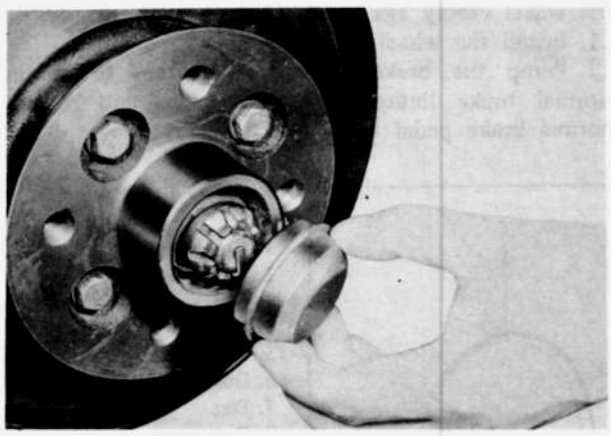

Fig. 12–21 Removing grease cap

4. Wipe the excess grease from the end of the spindle, and remove the cotter pin and nut lock.
5. Install a hub bolt on the front wheel hub.
6. Check the bearing preload by hooking a spring scale on the hub bolt, as shown in Fig. 12–16.
7. Pull the scale squarely and take a reading on the scale when the hub starts to turn.

The reading should be 0.4 to 1.0 kg (0.88 to 2.20 lb).

8. Tighten the adjusting nut until the correct reading is obtained.
9. Locate the nut lock on the adjusting nut so that the castellations on the lock are aligned with the cotter pin hole in the spindle.

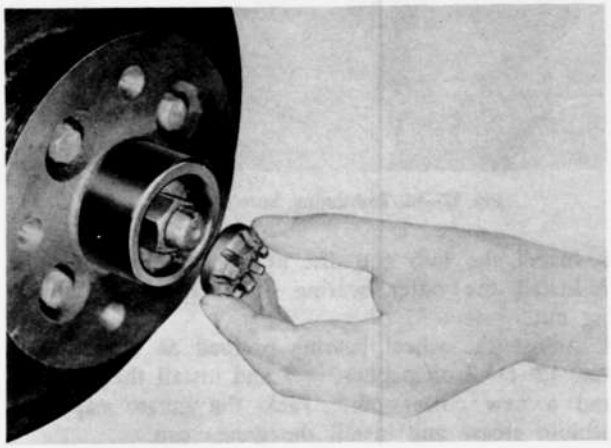

Fig. 12–22 Installing nut lock

10. Install a new cotter pin and bend the ends of the cotter pin.
11. Check the wheel rotation. If the wheel rotates properly, install the grease cap. If the wheel still rotates roughly or noisily, clean or replace the bearings and cups as required.
12. Install the grease cap.
13. Install the wheel and tighten wheel bolts to **9.0 ~ 10.0 m-kg (65 ~ 72 ft-lb).**

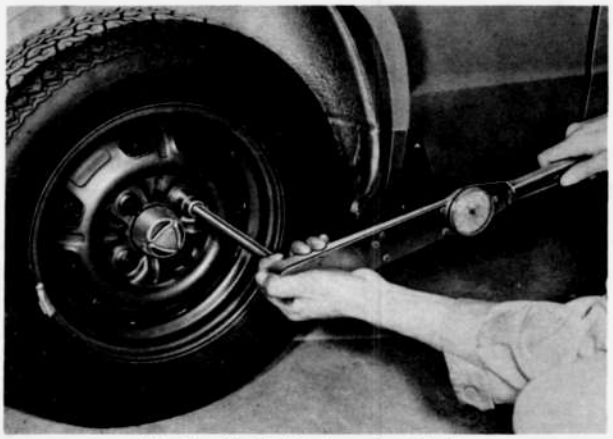

Fig. 12–23 Tightening wheel bolt

14. Install the wheel cover.
15. Pump the brake pedal several times to obtain normal brake lining to disc clearance and restore normal brake pedal travel.

12–E. REAR WHEEL BEARING

Servicing the rear wheel bearing is explained in **Par. 9–A** on page 9 : 1.

SUSPENSION

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13

DESCRIPTION

The front suspension consists mainly of the vertical shock absorbers integrally made with each steering knuckle, suspension arms and stabilizer bar. This front suspension **does not require lubrication, except the lower ball joints** which are provided with plugs to attaching the grease fittings when required.

The rear suspension consists mainly of leaf springs and De Carbon type shock absorbers. The De Carbon type shock absorbers **should not be disassembled** as it contains a highly compressed gas. If it is found to be defective, replace it as assembly.

13–A. FRONT SUSPENSION

13–A–1. Front Shock Absorber

a. Removing front shock absorber

1. Open the hood and remove the three nuts that attach the shock absorber support to the fender apron.



Fig. 13–1 Removing nuts

2. Raise the front end of the vehicle and support with stands.
3. Pry off the wheel cover and remove the wheel.
4. Disconnect the fluid pipe and plug the end of the fluid pipe to prevent entrance of the dirt and loss of the fluid.
5. Remove the bolts attaching the caliper and pull the caliper off the rotor.

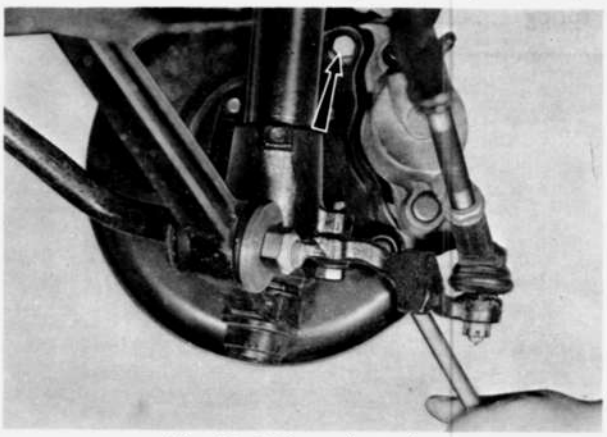

Fig. 13–2 Removing caliper

6. Remove the hub grease cap, cotter pin, nut lock and bearing adjusting nut from the steering knuckle spindle. Pull the hub and rotor assembly off the steering knuckle spindle.

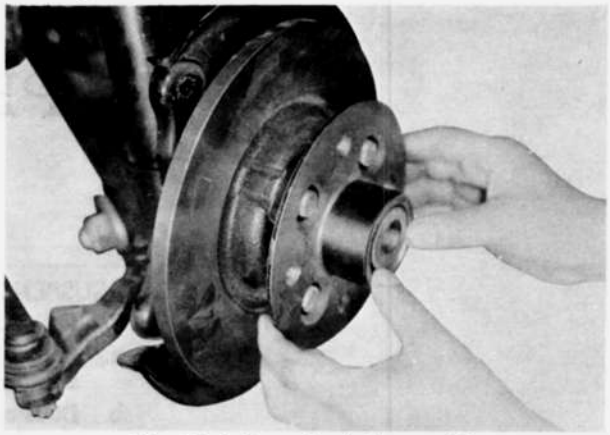

Fig. 13–3 Removing hub assembly

7. Remove the two bolts that attach the lower end of the shock absorber onto the steering knuckle arm.

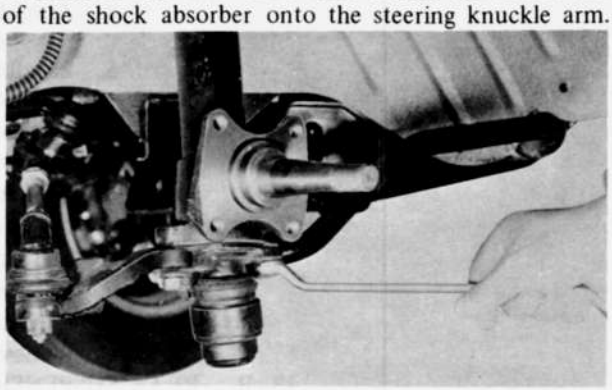

Fig. 13–4 Removing bolts

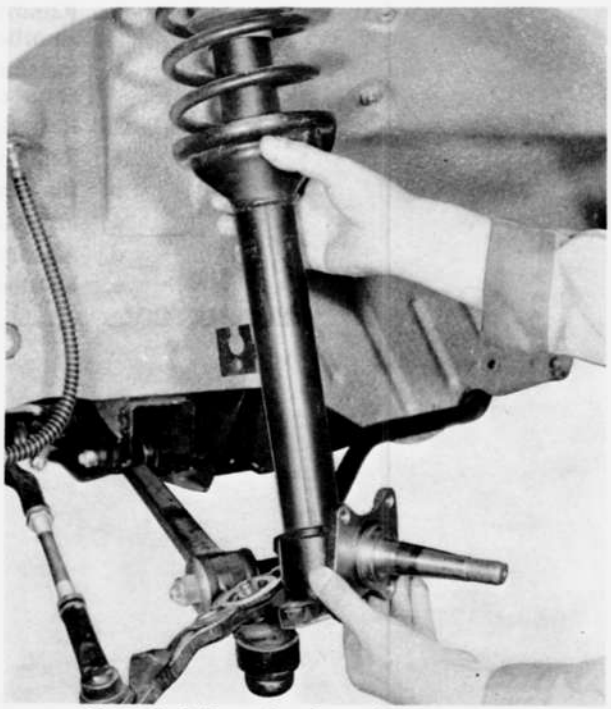

Fig. 13–5 Removing front shock absorber

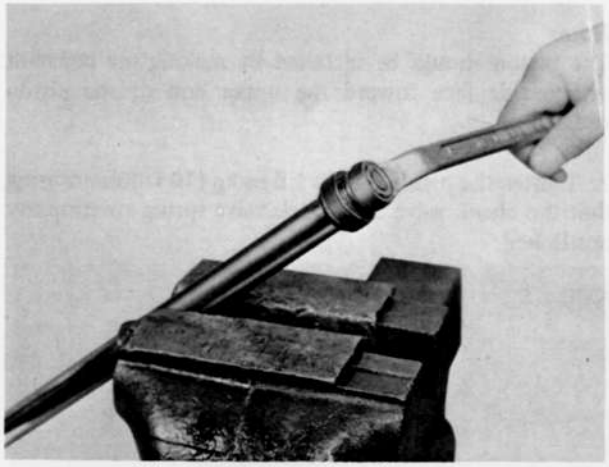

Fig. 13–18 Removing piston nut

piston rod in that order. Then, remove the piston ring from the piston.

To replace the piston ring from the piston, proceed as follows:
1) Expand the open ends of the ring and remove the ring. **Do not** over-expand the ring.
2) Install a new piston ring.

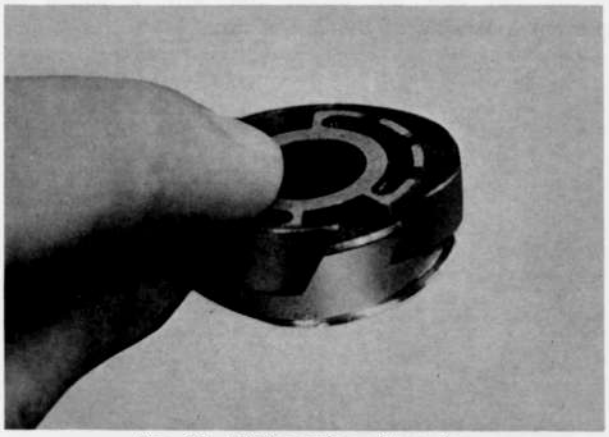

Fig. 13–19 Removing piston ring

c. Checking front shock absorber
1. Check the piston rod for wear, scores and bend. The piston rod diameter should be more than **19.94 mm (0.785 in)** and the piston rod run-out should

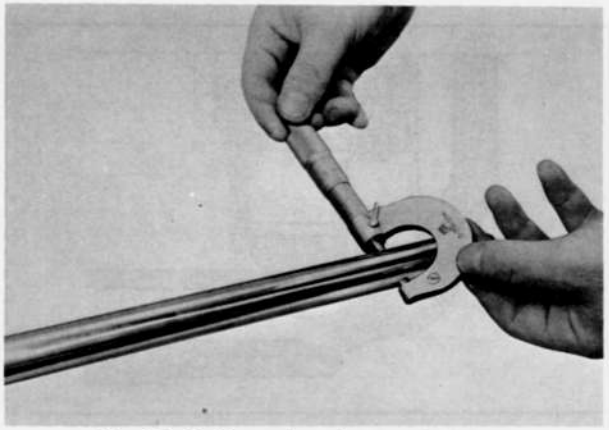

Fig. 13–20 Measuring piston rod diameter

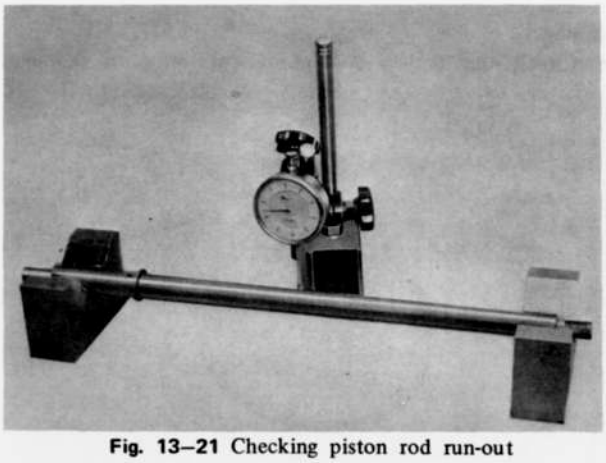

Fig. 13–21 Checking piston rod run-out

be less than **0.15 mm (0.006 in).**
2. Check the contacting surface of the piston with the check valve and relief valve for wear or damage.
3. Check the relief valve and check valve for wear, damages and flatness. The flatness is less than **0.02 mm (0.0008 in).**
4. Check the reservoir tube for fluid leak or deformation and check the steering knuckle for crack.
5. Check the coil spring for weakness.
6. Inspect the pressure tube for inner diameter and bend. The inner diameter of the pressure tube should be **30.07 mm (1.184 in)** and the tube run-out should be less than **0.2 mm (0.008 in).**

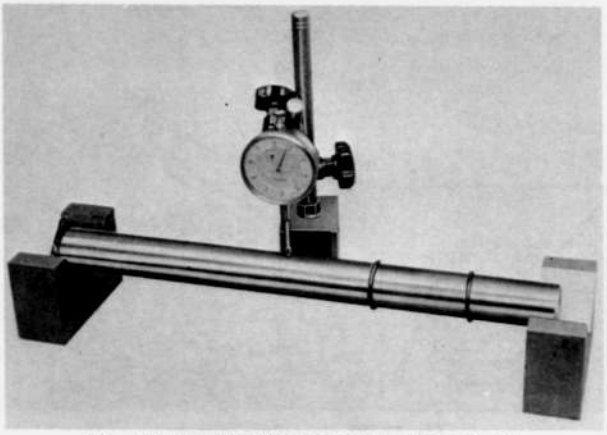

Fig. 13–22 Checking pressure tube run-out

7. Check the cap nut for damaged thread and check the oil seal lip in the cap nut for wear or other

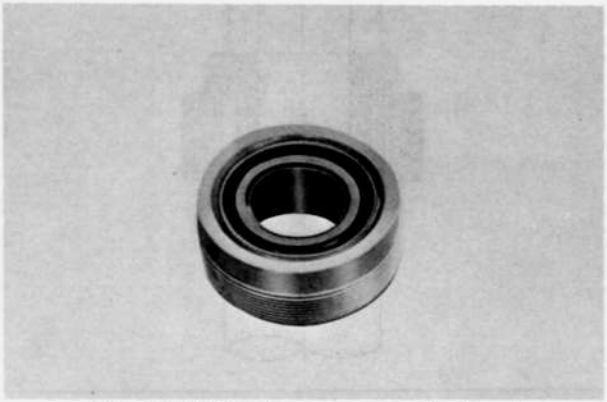

Fig. 13–23 Checking cap nut and oil seal

damages.
8. Check the piston rod guide for wear or damage.

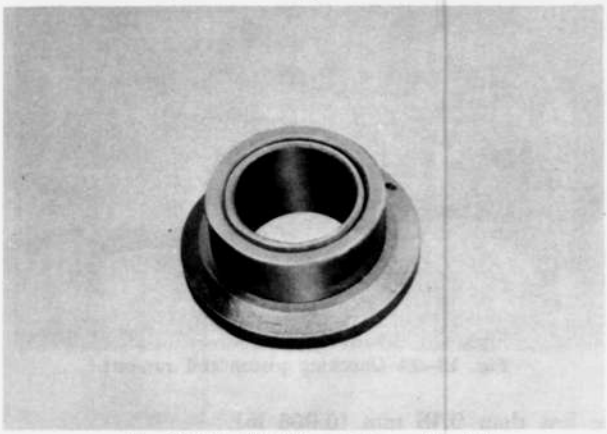

Fig. 13–24 Checking piston rod guide

9. Check the base valve and relief valve for wear, damage or flatness. The flatness should be **0.02 mm (0.0008 in).**

d. Assembling front shock absorber
1. Place the top end of the piston rod in a vise, being careful to protect it with alminum plates, and install the washer, check valve spring, check valve, piston, two relief valves, centering washer, four relief valves and washer.

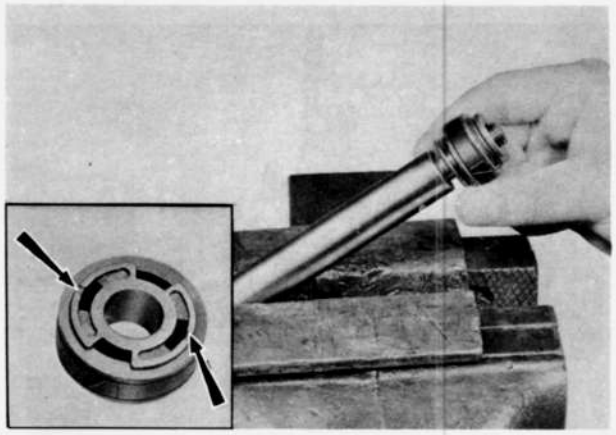

Fig. 13–25 Installing piston

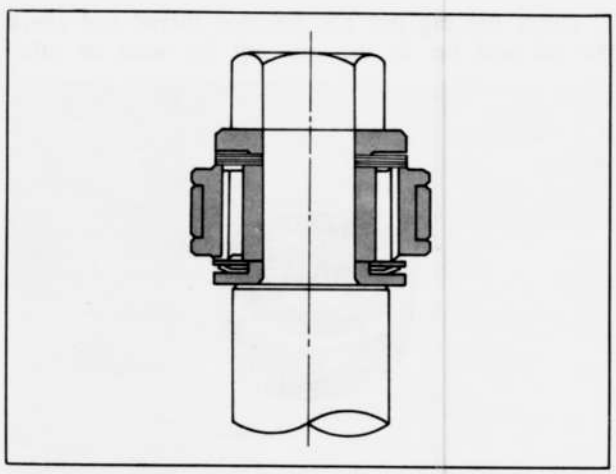

Fig. 13–26 Piston cross section

Note:
The piston should be installed by making the constant orifice side face toward the upper end of the piston rod.

2. Tighten the piston nut to **1.5 m-kg (10 ft-lb)**, ensuring that the check valve and check valve spring are properly positioned.

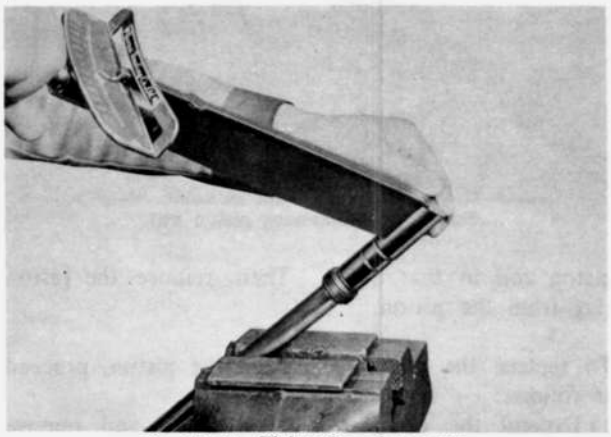

Fig. 13–27 Tightening piston nut

3. Punch two portions of the threads between the piston nut and the piston rod with a punch to prevent loosening of the piston nut.

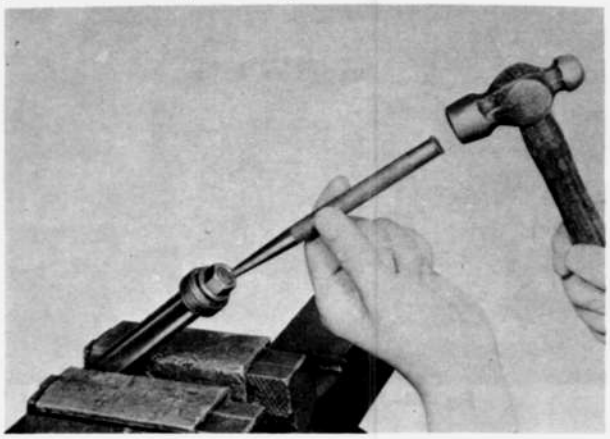

Fig. 13–28 Punching threads

4. Fit the four relief valves onto the base valve bolt and install it into the base valve casing.

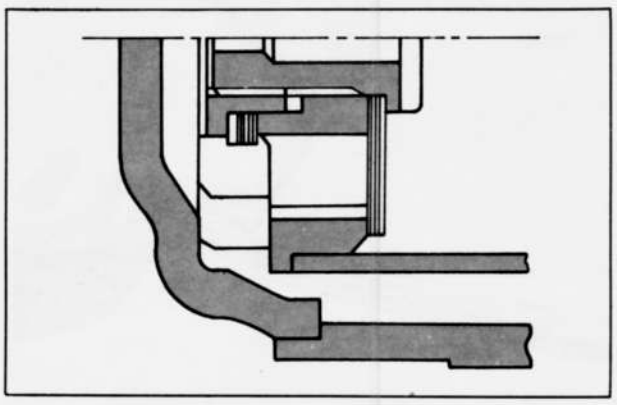

Fig. 13–29 Base valve cross section

5. Fit the five relief valves, washer and nut to the base valve casing and tighten the nut to **0.15 m-kg (1.08 ft-lb).**
6. After tightening the nut, punch the center of the bolt with a punch.

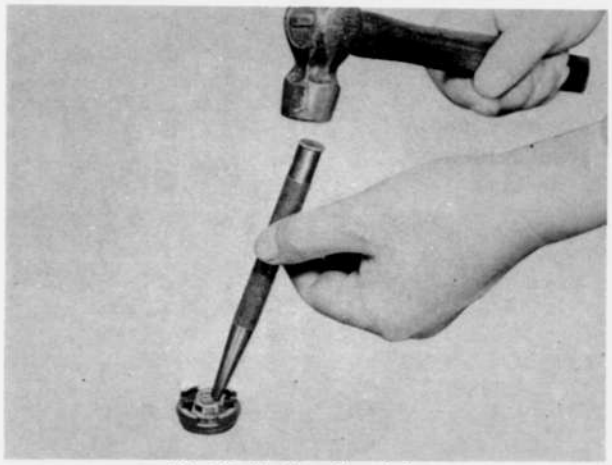

Fig. 13–30 Punching bolt

7. Insert the piston rod into the pressure tube from the bottom side.

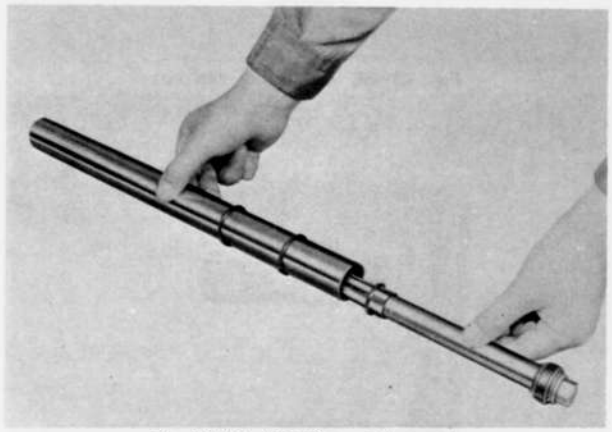

Fig. 13–31 Inserting piston rod

8. Install the stopper guide onto the piston rod with the grooves of the stopper guide toward the base valve.
9. Install the stopper and back-up ring onto the piston rod.

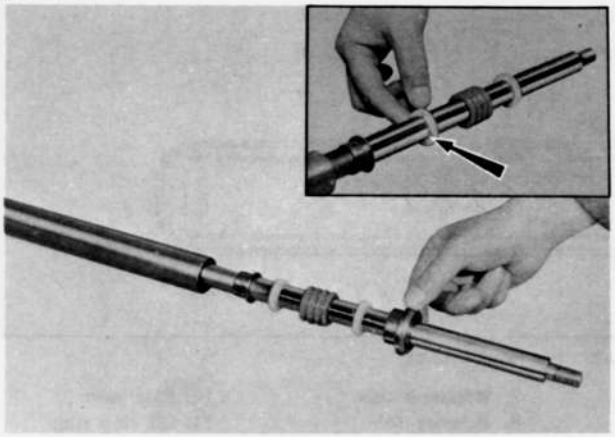

Fig. 13–32 Installing stopper guide

10. Install the base valve assembly into the bottom of the pressure tube.

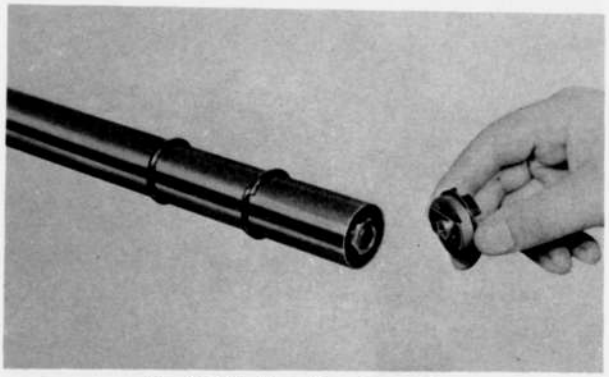

Fig. 13–33 Installing base valve

11. Install the two oil stop rings onto the bottom side of the pressure tube as shown in Fig. 13–34.

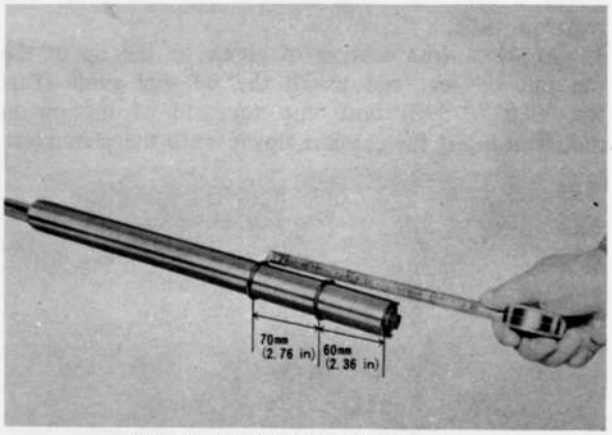

Fig. 13–34 Installing oil stop rings

12. Insert the pressure tube and piston rod assembly into the reservoir tube.

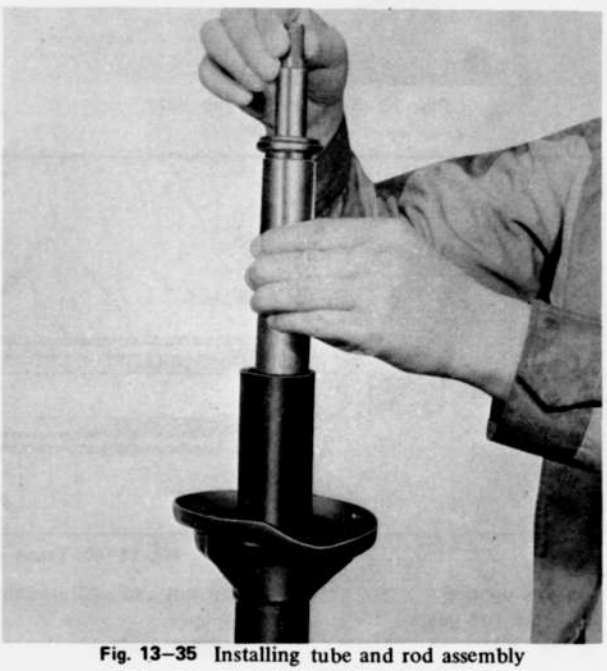

Fig. 13–35 Installing tube and rod assembly

13. Fill the reservoir tube with shock absorber fluid. The capacity of reservoir tube should be exactly **270 cc (16.5 cu–in).**

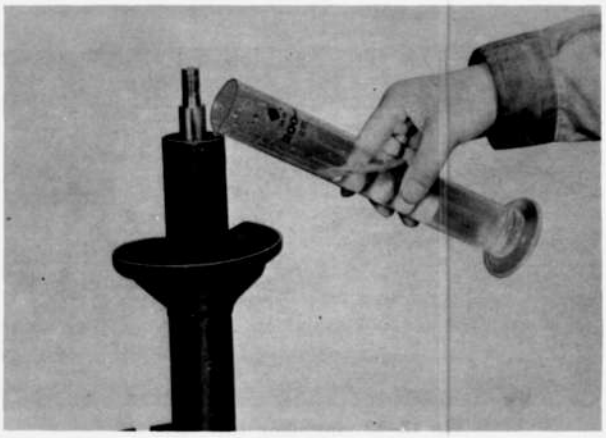

Fig. 13–36 Filling with fluid

14. Install the rod guide into the reservoir tube and install a new "0" ring between the rod guide and reservoir tube.
15. Apply a light coating of grease at the lip of the cap nut oil seal and install the **oil seal guide** (Part No. 49 0370 590) onto the top end of the piston rod, then insert the cap nut slowly onto the piston rod.

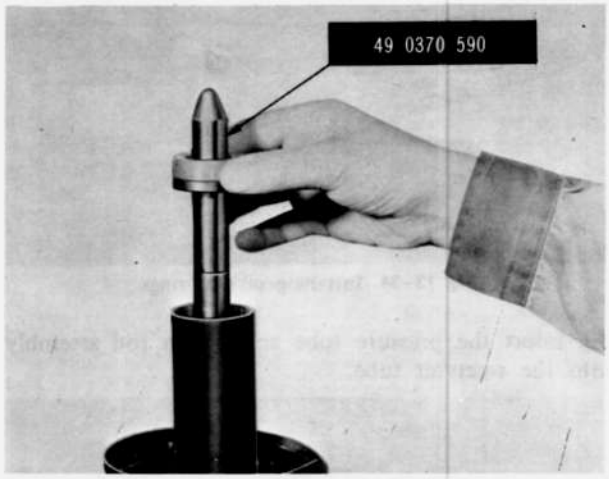

Fig. 13–37 Inserting cap nut

16. Tighten the cap nut temporarily, ensuring that the piston rod is extended to its maximum length, with the **cap nut wrench** (Part No. 49 0259 702).

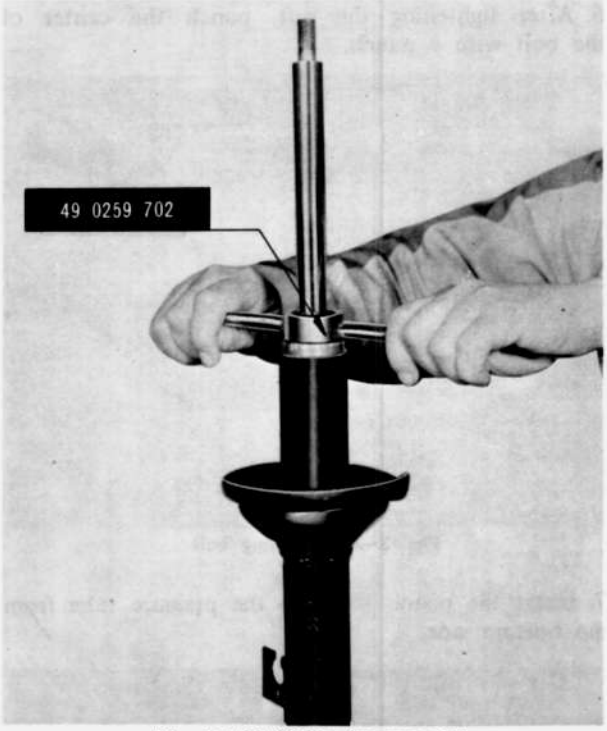

Fig. 13–38 Tightening cap nut

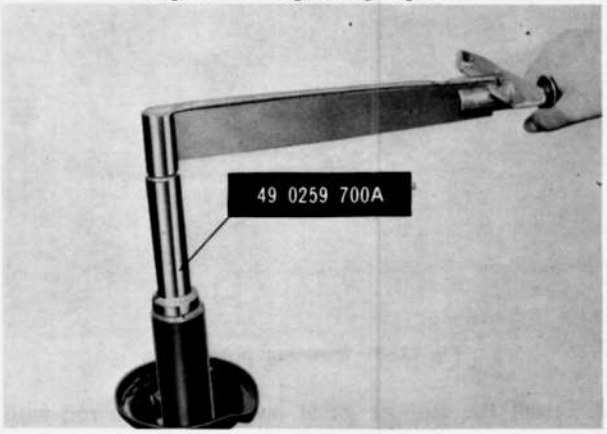

Fig. 13–39 Tightening cap nut

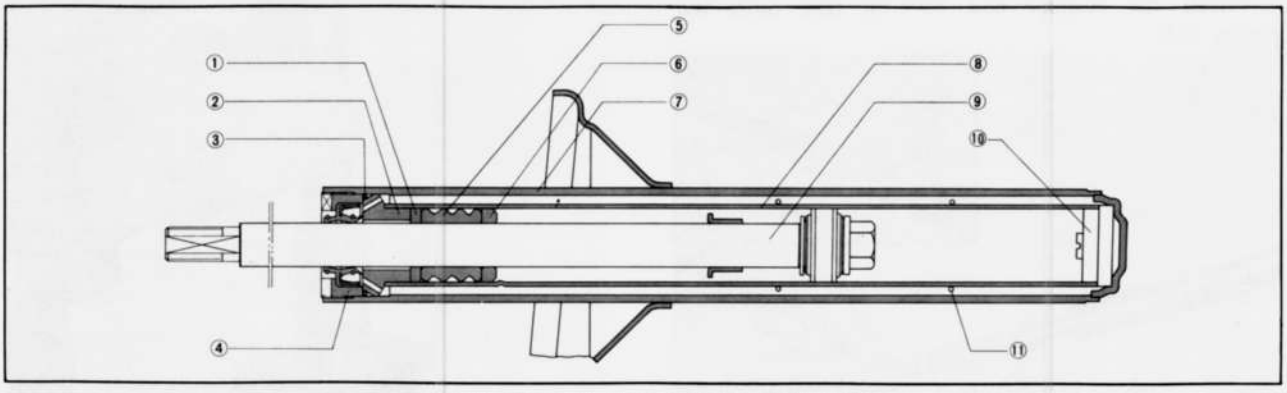

Fig. 13–40 Front shock absorber cross section

1. Back up ring
2. Piston rod guide
3. "O" ring
4. Cap nut and seal assembly
5. Stopper
6. Stopper guide
7. Reservoir tube
8. Pressure tube
9. Piston rod
10. Base valve
11. Oil stop ring

17. Fully lower the piston rod and tighten the cap nut to **5.0 ~ 6.0m-kg (36.2 ~ 43.4ft-lb)** with the **cap nut wrench** (Part No. 49 0259 700A). Then, install the dust cover.
18. Install the damper stopper onto the piston rod.
19. Install the dust boot onto the piston rod.

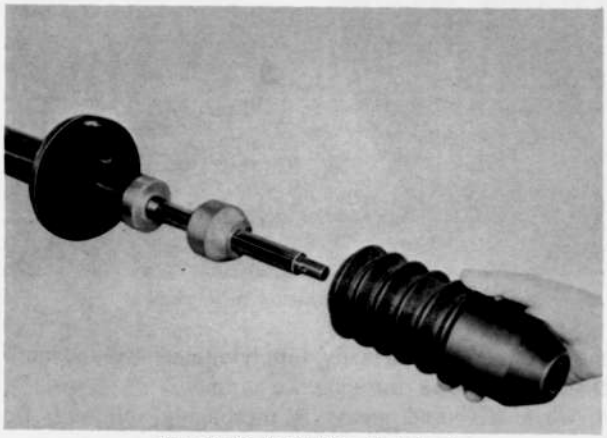

Fig. 13–41 Installing dust boot

20. Install the rubber spring seat and coil spring onto the reservoir tube.
21. Install the spring seat, washer, thrust washer, and shock absorber support in that order.
22. Tighten the support nut.

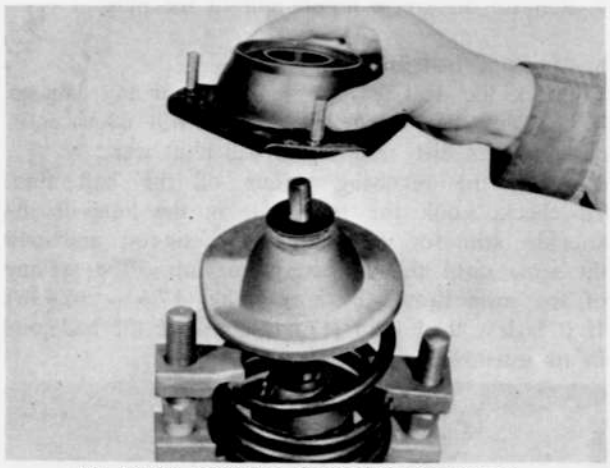

Fig. 13–42 Installing shock absorber support

e. Installing front shock absorber

Follow the removal procedures in the reverse order.

Note:

When replacing the coil spring or adjusting the road clearance, install a suitable coil spring and adjusting plate to equal road clearance both on the right and left. **Do not** use more than two adjusting plates at one side.

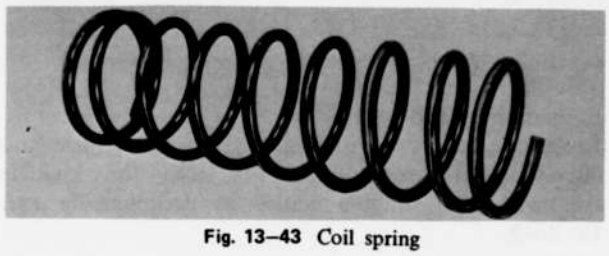

Fig. 13–43 Coil spring

13–A–2. Suspension Arm

a. Removing suspension arm

1. Raise the front end of the vehicle and support with stands.
2. Remove the front wheel.
3. Disconnect the tie-rod from the knuckle arm with the **puller** (Part No. 49 0118 850C).

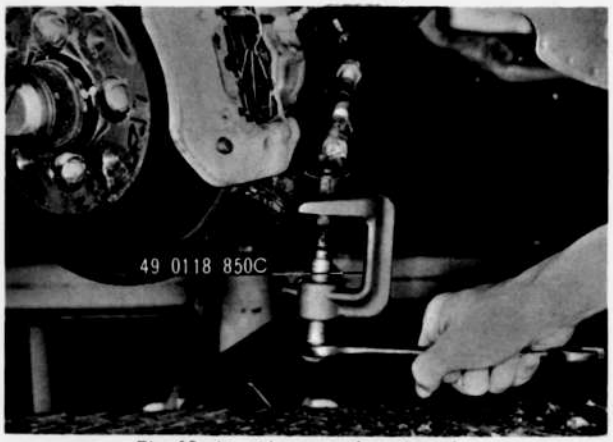

Fig. 13–44 Disconnecting tie-rod

4. Remove the bolts attaching the knuckle arm to the lower end of the front shock absorber.
5. Refer to Par. 13–A–3 and check the ball joint revolving torque with a pull scale, as shown in Fig. 13–45. The reading of the scale is **8 ~ 14 kg (17.6 ~ 30.9 lb).**
6. Remove the suspension arm to stabilizer attaching

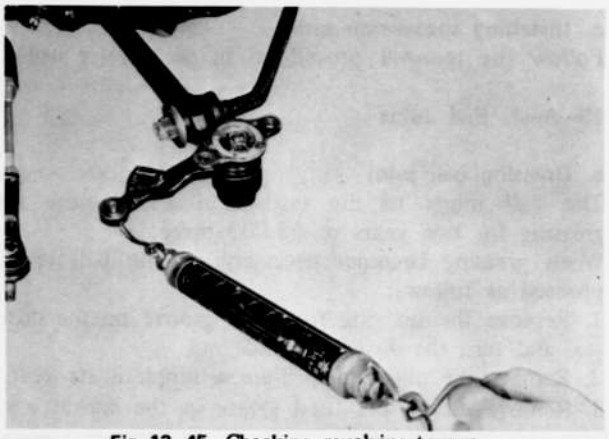

Fig. 13–45 Checking revolving torque

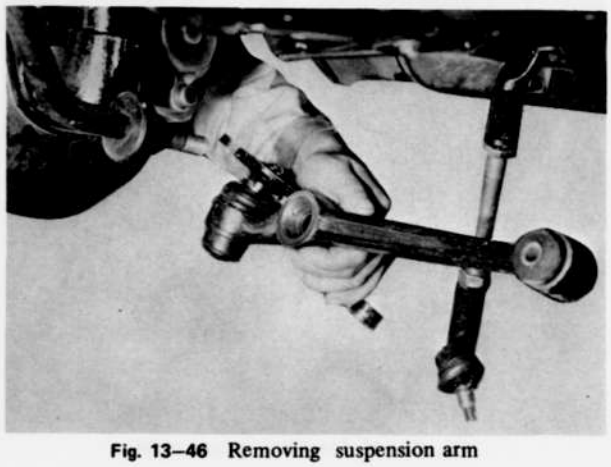

Fig. 13–46 Removing suspension arm

nut.
7. Remove the bolt attaching the suspension arm end to the cross member.
8. Pull the front shock absorber outward and remove the suspension arm end from the cross member.
9. Remove the suspension arm.
10. Remove the cotter pin and nut, and disconnect the knuckle arm from the suspension arm with the **puller** (Part No. 49 0727 575).



Fig. 13–47 Disconnecting knuckle arm

b. Inspecting suspension arm
Inspect the suspension arm and knuckle arm for any crack or damage. Check the rubber bushes for weakness, wear or damage. If necessary, replace with new ones.

c. Installing suspension arm
Follow the removal procedures in the reverse order.

13–A–3. Ball Joint

a. Greasing ball joint
The ball joints of the suspension arm require no greasing for two years or 25,000 miles.
When greasing becomes necessary on the ball joint, proceed as follows:
1. Remove the set ring from the groove on the dust seal and turn the dust seal inside out.
2. Remove the plug and fit a grease nipple in its stead.
3. Remove all of the used grease in the socket and

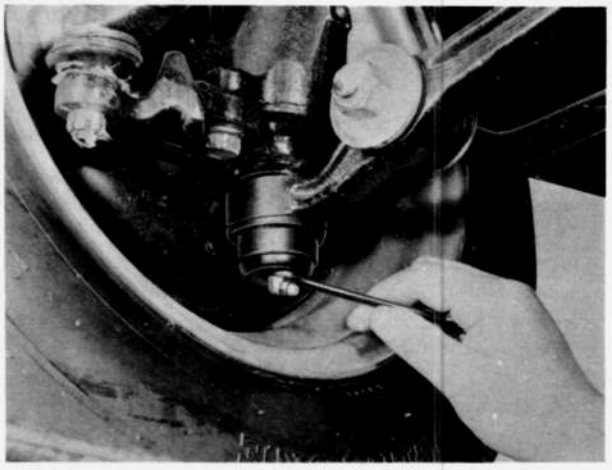

Fig. 13–48 Installing grease nipple

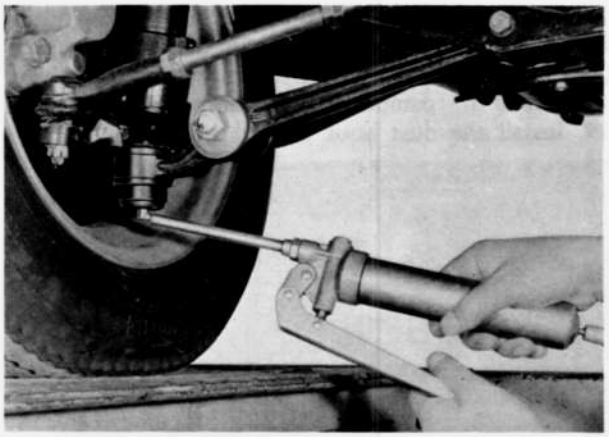

Fig. 13–49 Supplying new grease

the dust seal by gradually supplying new **Molybdenum Disulphide grease** through the nipple.
4. When the used grease is thoroughly removed, fit the dust seal to the groove on the socket and secure it in place with the set ring.
5. Add new Molybdenum Disulphide grease until the dust seal begins to balloon. Then, depress the dust seal with the fingers so that about half of the grease remains in the dust seal.
6. Wipe off excess grease around the ball joint.
7. Remove the grease nipple and fit the plug.

b. Checking ball joint
1. Check the dust seal for wear, flaw or any damage. If the dust seal is defective, this will allow entry of water and dirt, resulting in ball joint wear.
2. Check the revolving torque of the ball stud. To check, hook the pull scale in the hole of the knuckle arm for connecting the tie-rod and pull the scale until the ball starts to turn. The reading of the scale should be 8 ~ 14 kg (17.6 ~ 30.9 lb). If it is less than **8 kg (17.6 lb),** replace the ball joint in its assembled form.

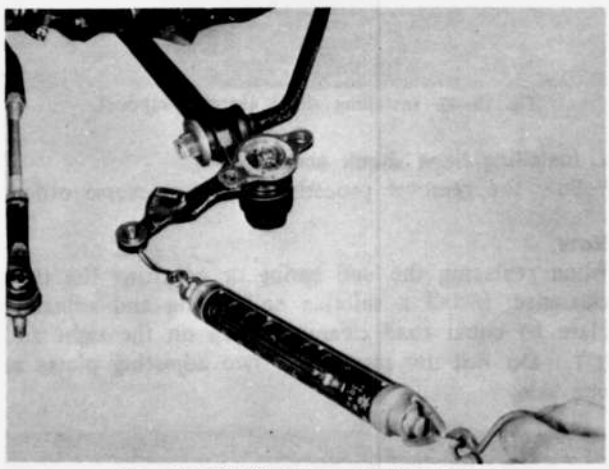

Fig. 13–50 Checking revolving torque

c. Removing ball joint
1. Remove the suspension arm from the vehicle and disconnect the suspension arm from the knuckle arm with the suitable puller as described in **Par. 13–A–2.**

2. Remove the set ring and dust seal from the ball joint.
3. Press the ball joint out of the suspension arm with the **ball joint remover** (Part No. 49 0370 860).

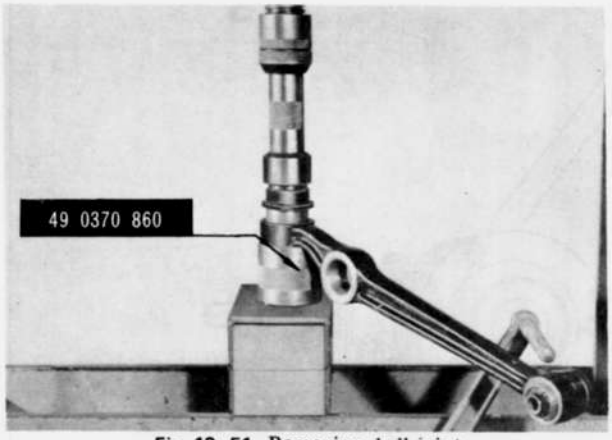

Fig. 13–51 Removing ball joint

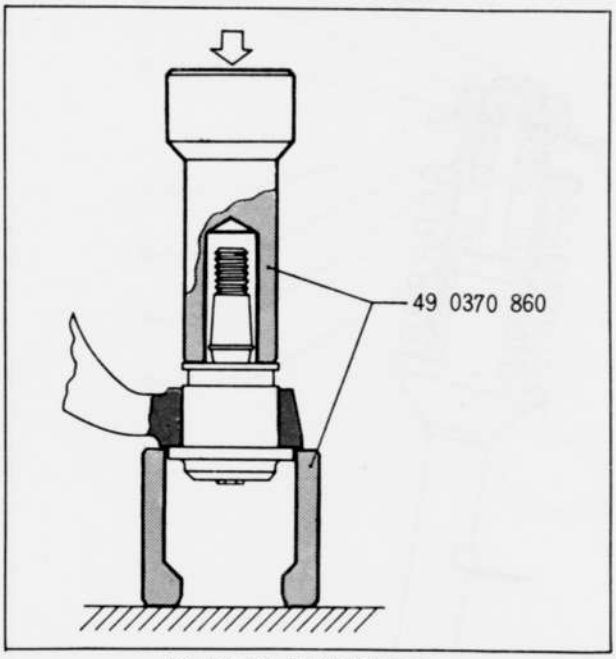

Fig. 13–52 Ball joint remover

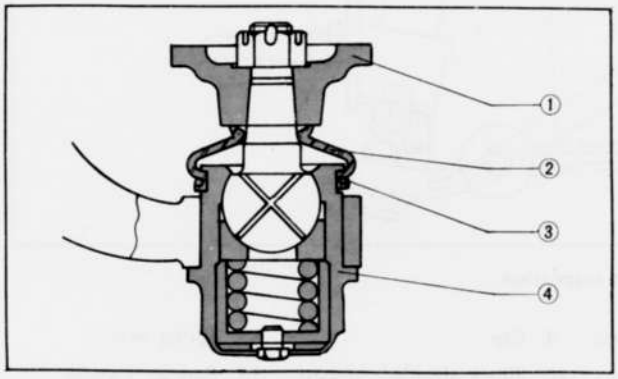

Fig. 13–53 Ball joint cross section

1. Steering knuckle arm
2. Dust seal
3. Set ring
4. Ball joint assembly

Note:
Before pressing out the ball joint, clean the ball joint and suspension arm so as not to damage the mounting bore of the suspension arm.

4. Clean the mounting bore of the suspension arm and apply kerosene.
5. Press fit the ball joint to the suspension arm with the **ball joint installer** (Part No. 49 0370 860).

Note:
If the pressure to press in the ball joint is less than **1,500 kg (3,300 lb)**, the suspension arm should be replaced.

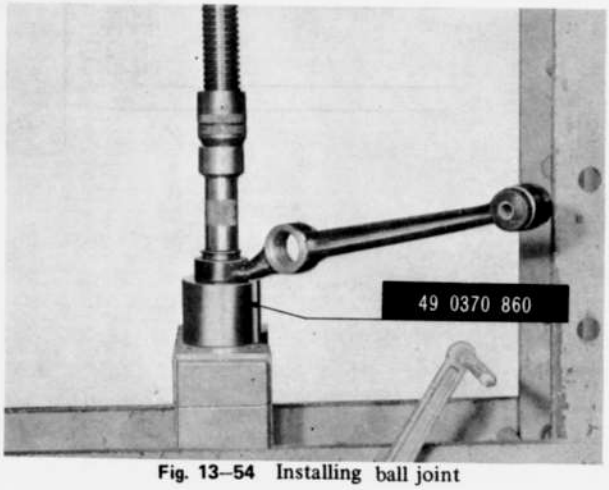

Fig. 13–54 Installing ball joint

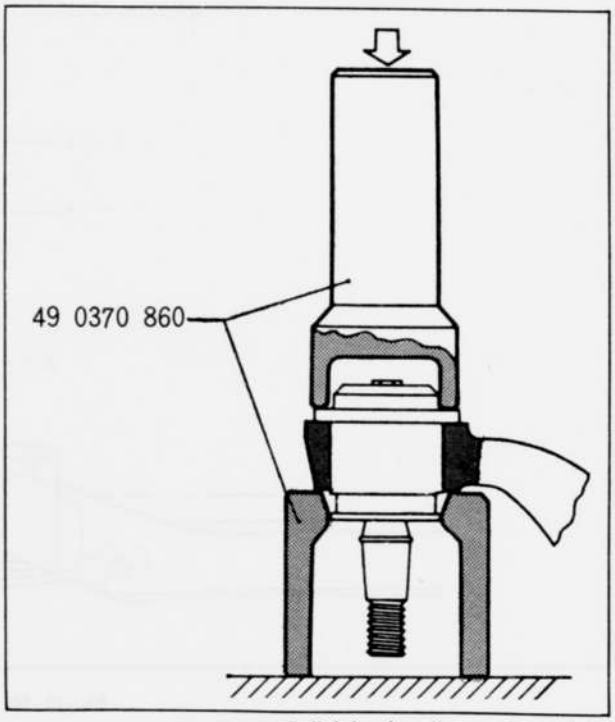

Fig. 13–55 Ball joint installer

6. Install the ball joint and suspension arm assembly to the steering knuckle Tighten the nut to 8.0 m-kg (60 ft-lb) and install the cotter pin.
7. Install the suspension assembly.

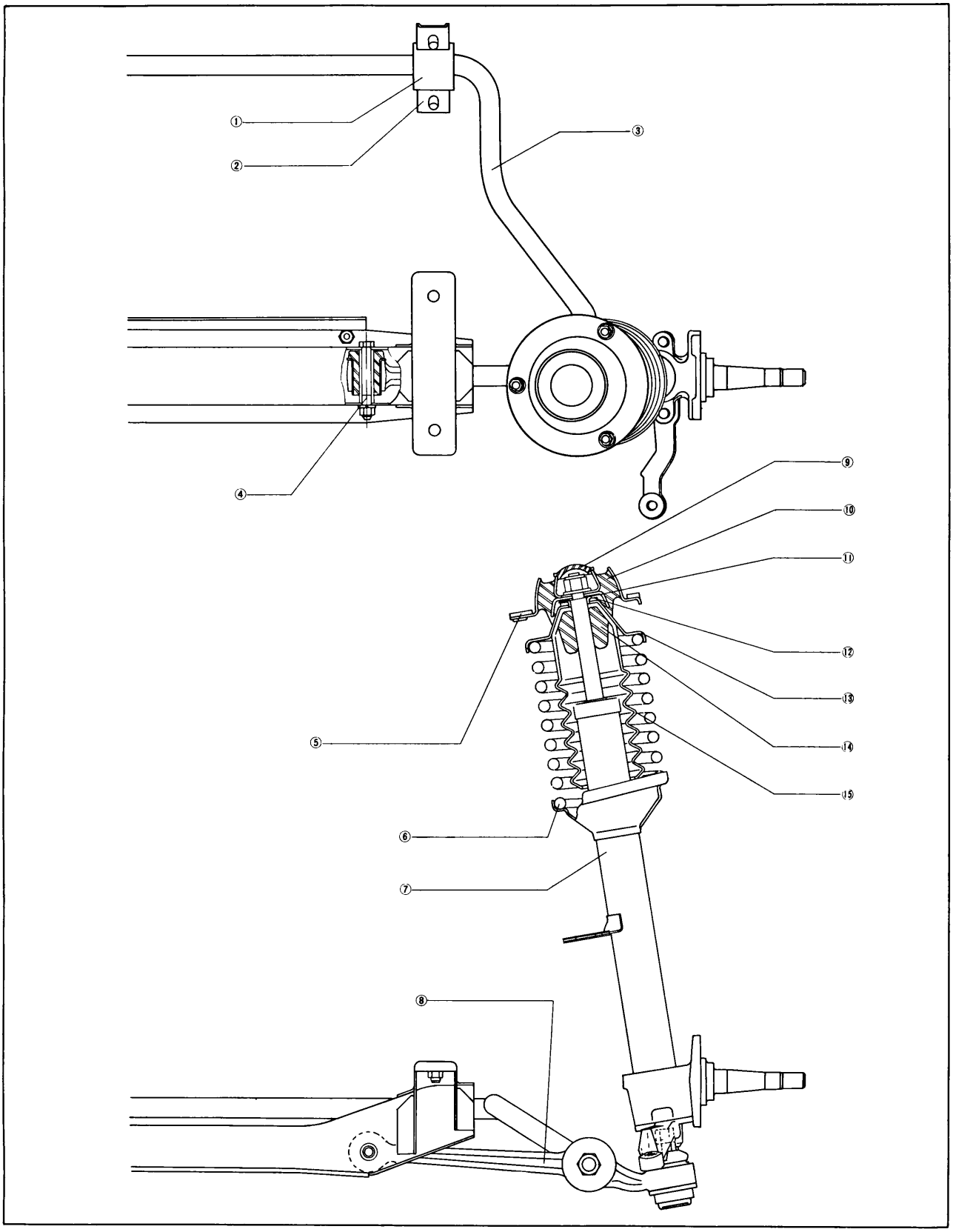

Fig. 13–56 Front suspension

1. Bush
2. Stabirizer bracket
3. Stabirizer
4. Bolt
5. Road clearance adjusting plate
6. Coil spring
7. Front shock absorber
8. Suspension arm
9. Cap
10. Shock absorber support (Mounting rubber)
11. Washer
12. Thrust washer
13. Spring seat
14. Damper stopper
15. Dust seal

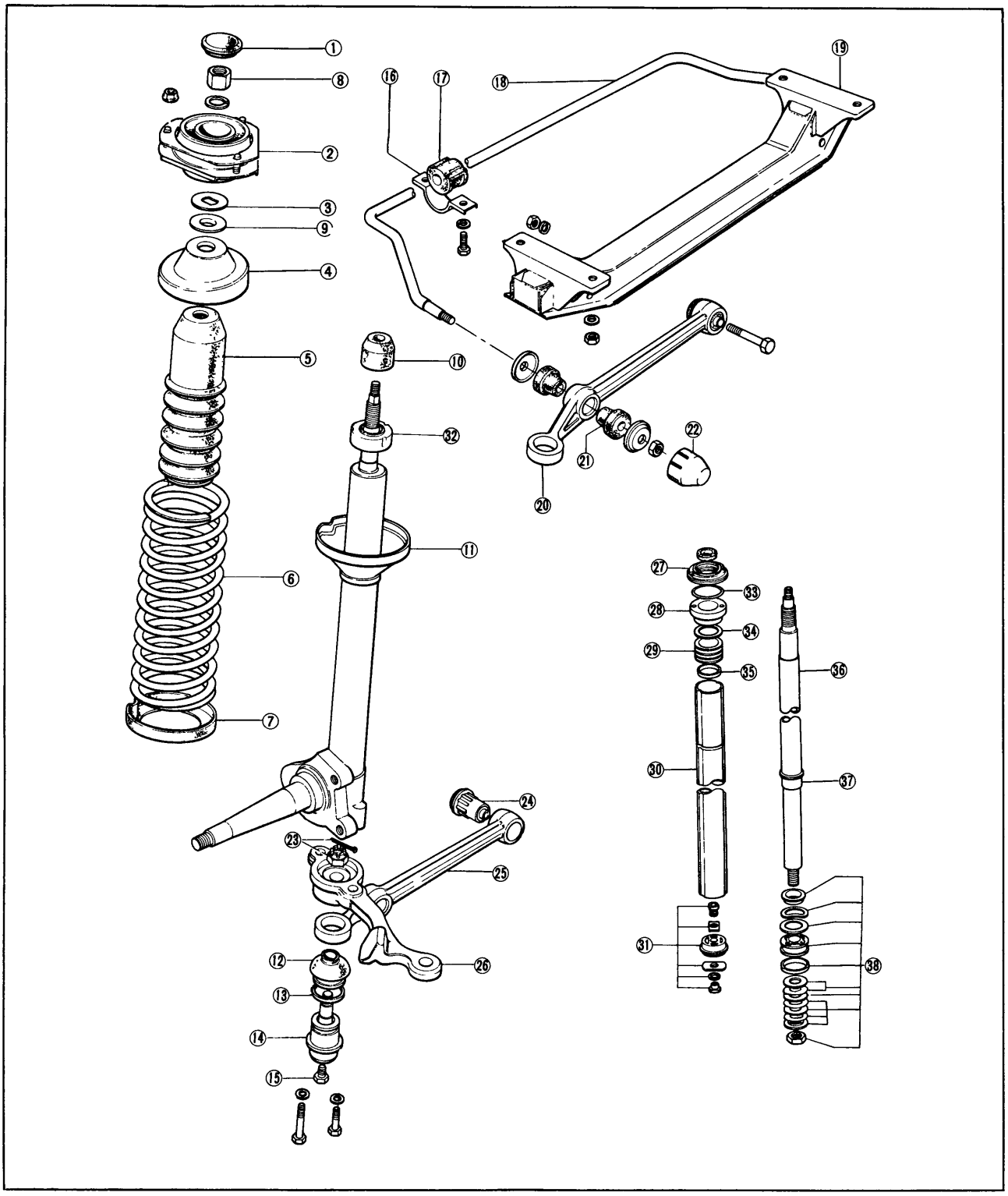

Fig. 13–57 Front suspension components

1. Cap
2. Shock absorber support (Mounting rubber)
3. Thrust washer
4. Spring seat
5. Dust boot
6. Coil spring
7. Spring seat
8. Nut
9. Washer
10. Damper stopper
11. Front shock absorber
12. Dust seal
13. Set ring
14. Ball joint
15. Plug
16. Stabilizer bracket
17. Bush
18. Stabilizer
19. Cross member
20. Suspension arm
21. Bush
22. Stopper
23. Castellated nut and cotter pin
24. Bush
25. Suspension arm
26. Knuckle arm
27. Cap nut and seal assembly
28. Piston rod guide
29. Stopper
30. Reservoir tube
31. Base valve assembly
32. Dust cover
33. "O" ring
34. Stopper guide
35. Back-up ring
36. Piston rod
37. Oil stop ring
38. Piston assembly

13–B. REAR SUSPENSION

13–B–1. Rear Shock Absorber

a. Removing rear shock absorber

1. Open the luggage compartment door, and remove the package trim.

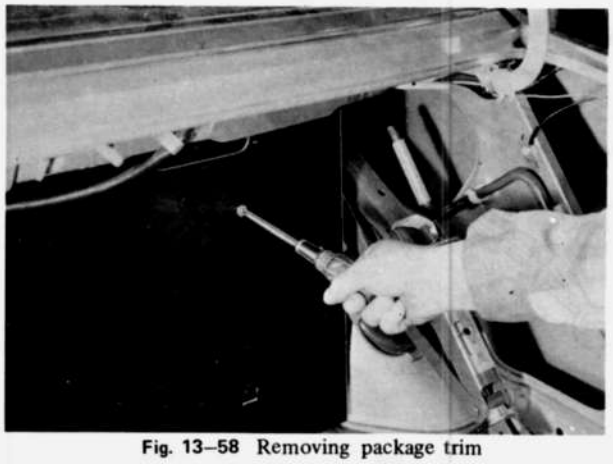

Fig. 13–58 Removing package trim

2. Remove the nuts, washers and rubber bushes from upper ends of the shock absorber.

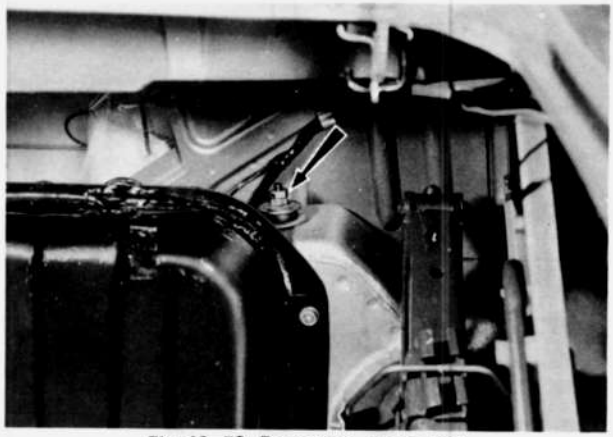

Fig. 13–59 Removing upper nuts

3. Remove nut and bolt attaching the lower end of the shock absorber to the rear axle housing, and remove the shock absorber.

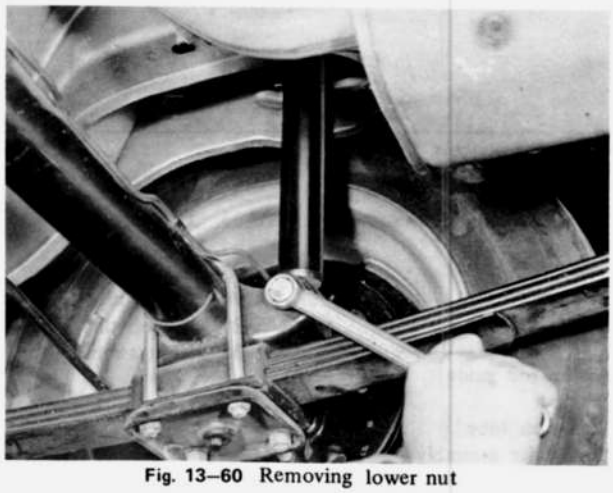

Fig. 13–60 Removing lower nut

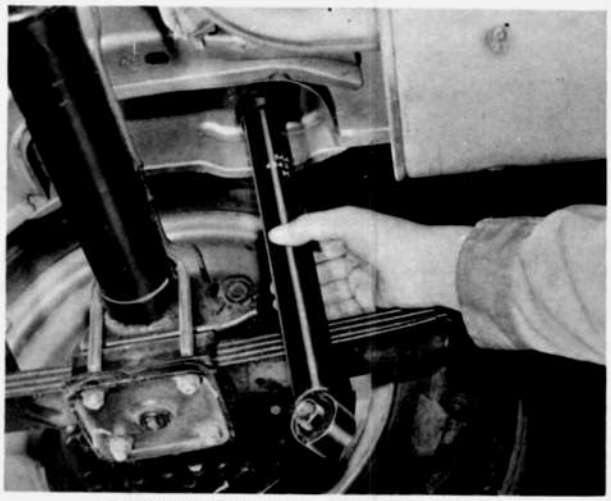

Fig. 13–61 Removing rear shock absorber

b. Installing rear shock absorber

Follow the removal procedures in the reverse order.

Note:

Tighten the rear shock absorber upper nuts to the dimension shown in Fig. 13–62.

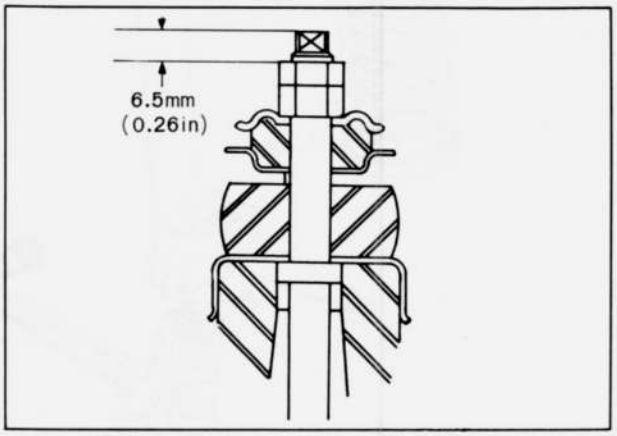

Fig. 13–62 Tightening upper nut

13–B–2. Rear Spring

a. Removing rear spring

1. Raise the rear end of the vehicle and support the body (rear side frame).

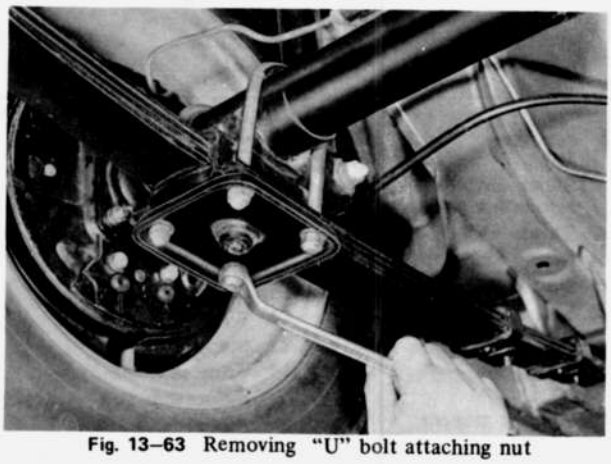

Fig. 13–63 Removing "U" bolt attaching nut

2. Remove the rear wheel and support the rear axle housing with stands.
3. Remove the "U"-bolt attaching nuts, and then remove the "U"-bolt seat, rubber pad, plate and "U"-bolts.
4. Remove the two bolts and one nut attaching the spring pin located at the front end of the rear spring. Insert a suitable tool as a screwdriver between the spring pin and bracket of the body, and pry them.

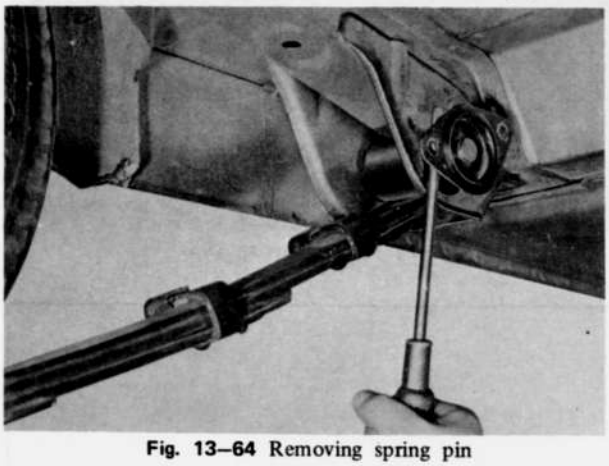

Fig. 13–64 Removing spring pin

5. Remove the two nuts and one bolt attaching the shackle hanger to the body and remove the rear spring with the shackle hanger.
6. Remove the shackle plate, shackle, shackle hanger and bushes from the rear end of the rear spring.

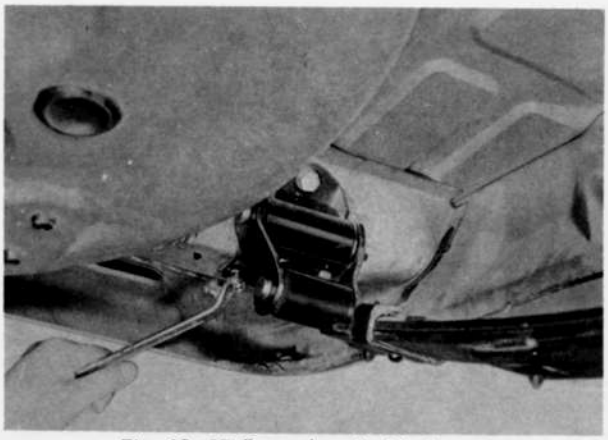

Fig. 13–65 Removing shackle hanger

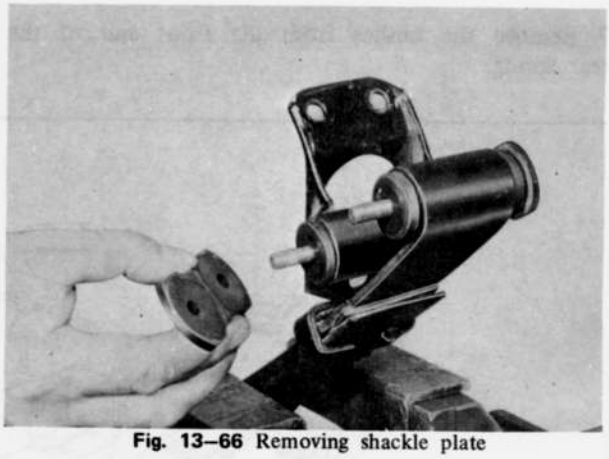

Fig. 13–66 Removing shackle plate

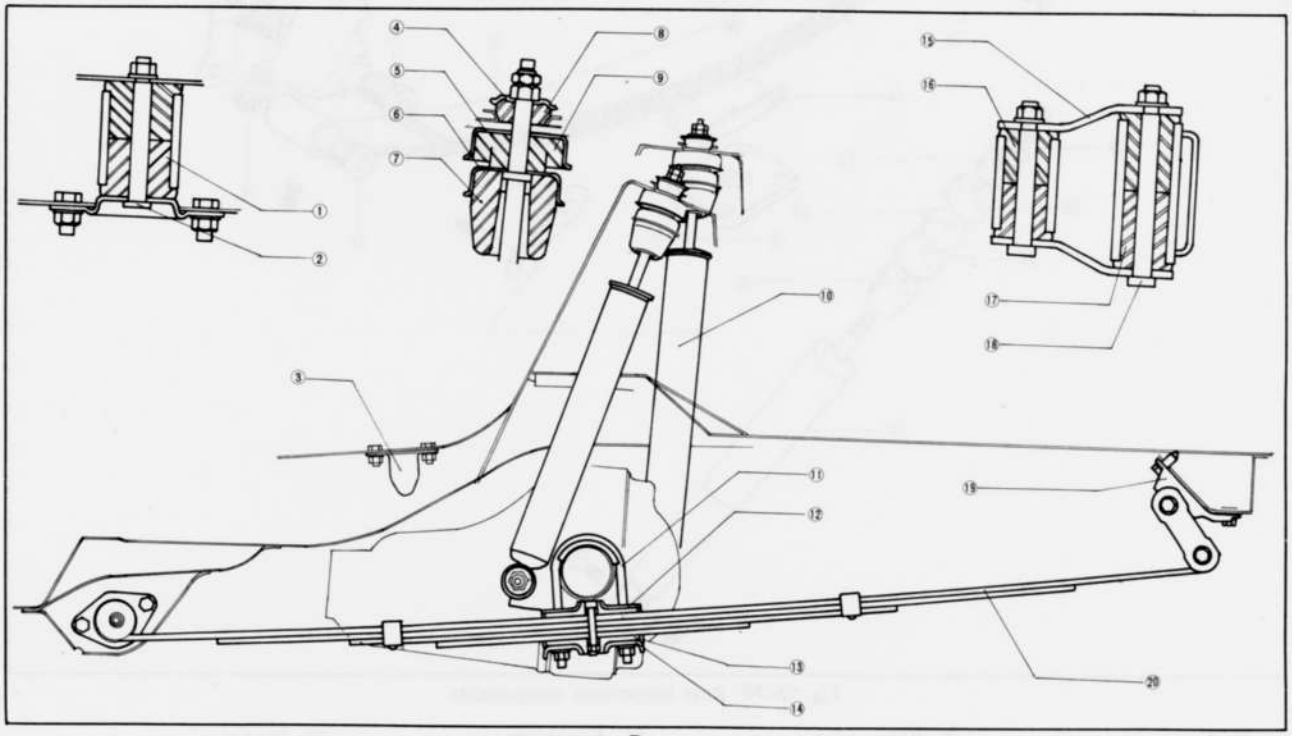

Fig. 13–67 Rear suspension

1. Bush
2. Spring pin
3. Stopper rubber
4. Retainer
5. Bush holder
6. Stopper casing
7. Bound bumper
8. Bush
9. Bush
10. Rear shock absorber
11. "U"-bolt
12. "U"-bolt seat
13. Rubber pad
14. Spring clamp
15. Shackle plate
16. Bush
17. Bush
18. Shackle pin
19. Shackle hanger
20. Leaf spring (Rear spring)

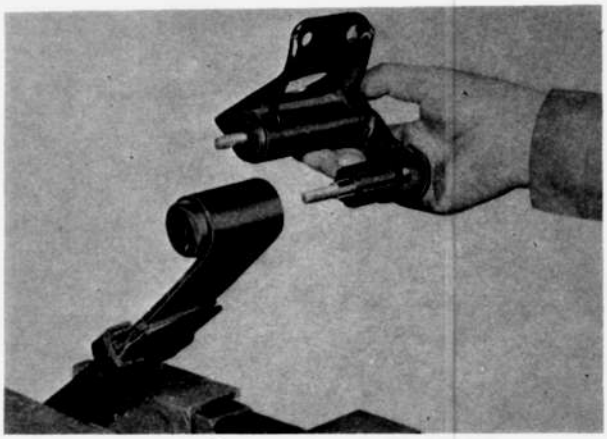

Fig. 13–68 Removing shackle hanger

7. Remove the bushes from the front end of the rear spring.

b. Disassembling rear spring

1. Pry the four clips with a suitable tool.

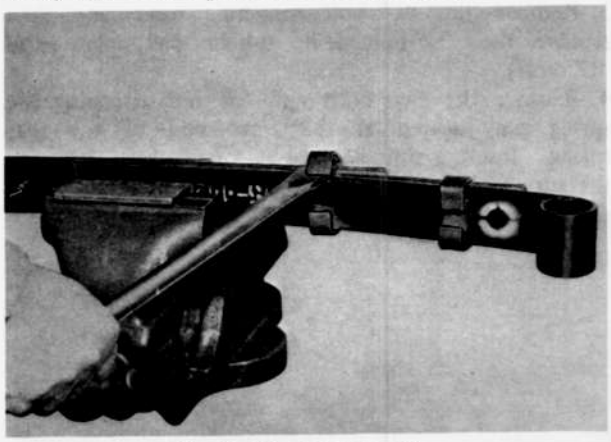

Fig. 13–69 Removing clips

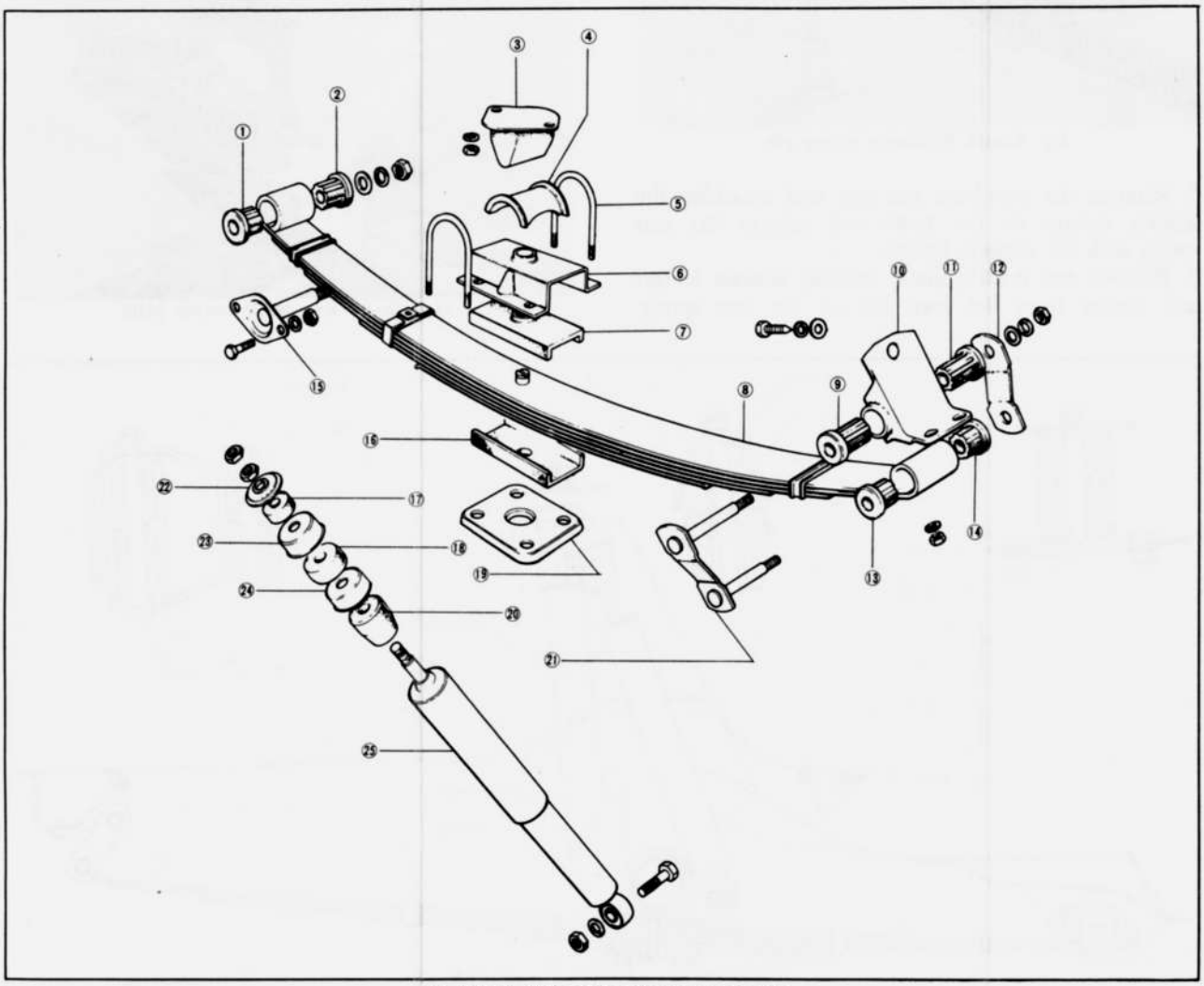

Fig. 13–70 Rear suspension components

1. Bush
2. Bush
3. Bound stopper
4. "U"-bolt seat
5. "U"-bolt
6. Plate
7. Rubber pad
8. Rear spring
9. Bush
10. Shackle hanger
11. Bush
12. Shackle plate
13. Bush
14. Bush
15. Spring pin
16. Rubber pad
17. Bush
18. Bush
19. Spring clamp
20. Damper stopper
21. Shackle
22. Washer
23. Holder
24. Damper stopper casing
25. Rear shock absorber

2. Remove the center bolt and nut, and disassemble the rear spring.

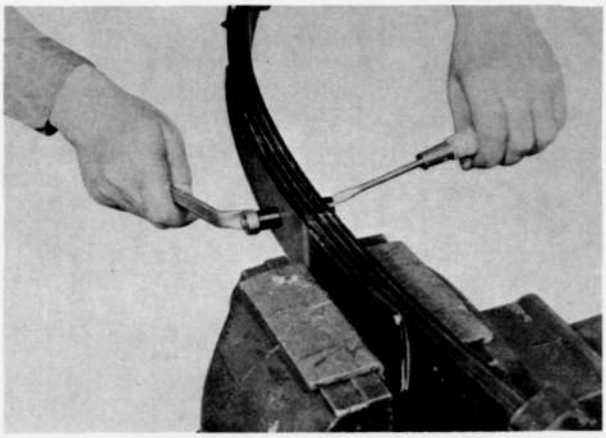

Fig. 13–71 Removing center bolt

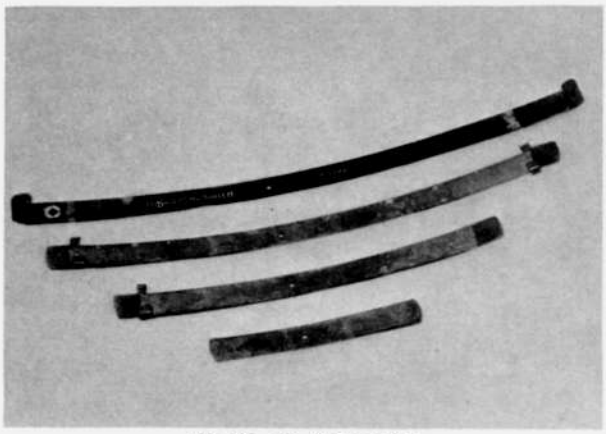

Fig. 13–72 Rear spring

Note:
According to the size of camber, the rear springs are classified into the three categories of –, 0, and +. They are marked on the main leaf. Since difference in camber between the right and left springs results in a difference in road clearance causing inclination of the vehicle, those with the same mark should be installed on both sides.

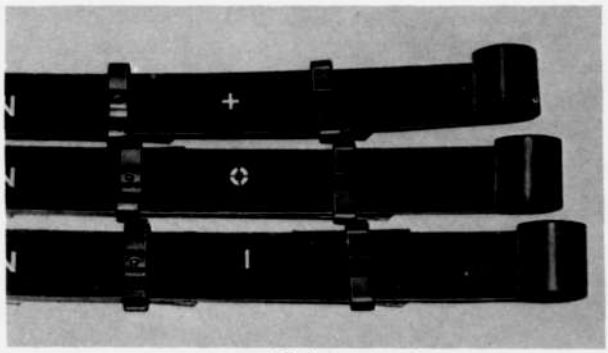

Fig. 13–73 Mark rear spring

c. Inspecting rear spring
1. Check the bush and spring rubber pad for wear or weakness.
2. Check the rear springs for breakage, cracks or weak leaves.
3. Check the shackle, and "U"-bolt for wear or any damage.
4. Check the leaves, center bolt and clips for defects.

d. Assembling rear spring
Follow the disassembly procedures in the reverse order.

Note:
(a) Bend the clips until the leaves are firmly contacted.

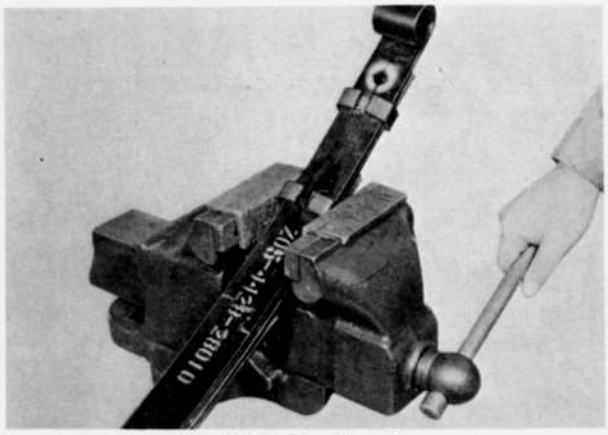

Fig. 13–74 Bending clips

(b) After tightening the center bolt and nut, punch the nut to prevent loosening of the bolt.

e. Installing rear spring
Follow the removal procedures in the reverse order.

Note:
Tighten the "U"-bolt attaching nuts to 3.8 ~ 4.6 m-kg (27 ~ 33 ft-lb).

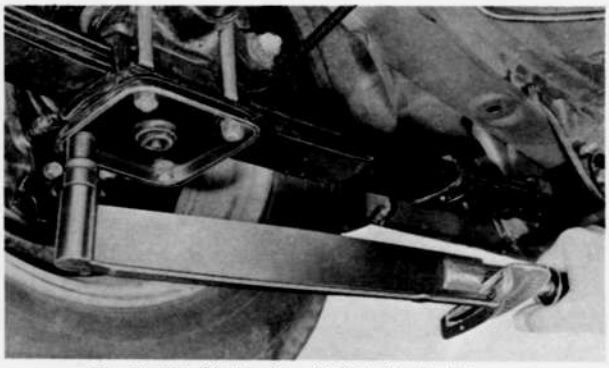

Fig. 13–75 Tightening "U" bolt attaching nuts

SPECIAL TOOLS

49 0370 860	Ball joint remover and installer	49 0259 702	Cap nut wrench
49 0223 640A	Spring compressor	49 0370 590	Cap nut oil seal guide
49 0370 641	Spring compressor	49 0118 850C	Ball joint puller
49 0259 700A	Cap nut wrench	49 0727 575	Knuckle arm puller

SUSPENSION

RX-3 Rotary Wagon

DESCRIPTION ..... 13A : 1
13A–A. REAR SHOCK ABSORBER ..... 13A : 1
13A–A–1. Removing Rear Shock Absorber ..... 13A : 1
13A–A–2. Installing Rear Shock Absorber ..... 13A : 1
SPECIAL TOOL ..... 13A : 1
REAR SUSPENSION COMPONENTS ..... 13A : 2

DESCRIPTION

The rear shock absorbers on RX-3 Rotary Wagon is of the gas sealed type. The procedures for removing and installing the rear shock absorber are explained in this section. The rear shock absorbers should not be disassembled as it contains a high compressed gas. Servicing the other components is the same as that Sedan, which is explained in section 13.

13A–A. REAR SHOCK ABSORBER

13A–A–1. Removing Rear Shock Absorber

1. Jack up the rear end of the vehicle and support the body with safety stands.
2. Remove the lock nuts, washers and rubber bush from lower end of the shock absorber.

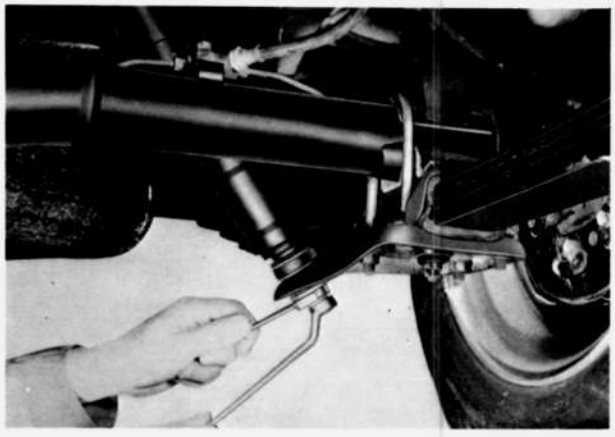

Fig. 13A–1 Removing lock nuts

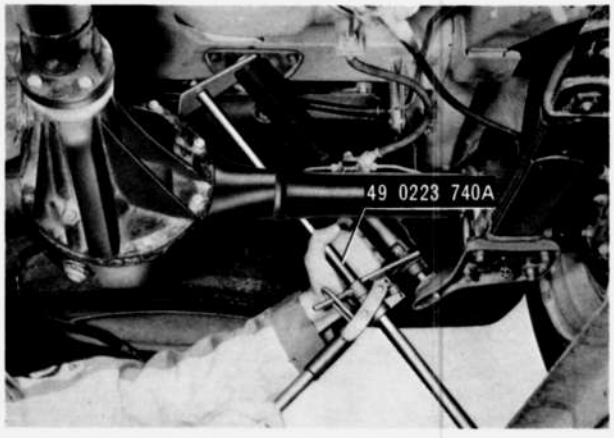

Fig. 13A–2 Compressing shock absorber

3. Compress the shock absorber with a **shock absorber lifter** (49 0223 740A) as shown in Fig. 13A–2.
4. Remove the bolts that attach the shock absorber bracket to the body and remove the shock absorber together with the lifter.

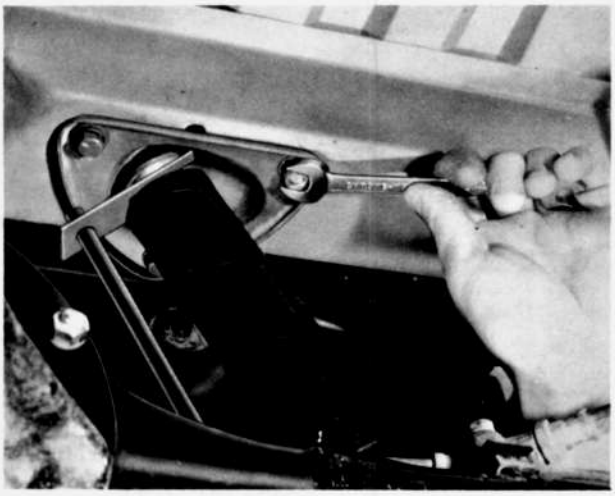

Fig. 13A–3 Removing shock absorber bracket

5. Remove the lifter from the shock absorber.
6. Remove the nuts, washers, rubber bush, bracket and rubber bush from the shock absorber.
7. If the rubber bushes appear worn, damaged or deteriorated, replace with new ones.

13A–A–2. Installing Rear Shock Absorber

Install the shock absorber in the reverse order of removing, noting the following points:

1. Position the washer, rubber bush, bracket and rubber bush to the upper end of the shock absorber in this order.
2. Tighten the shock absorber upper nuts to the dimension shown in Fig. 13A–4.

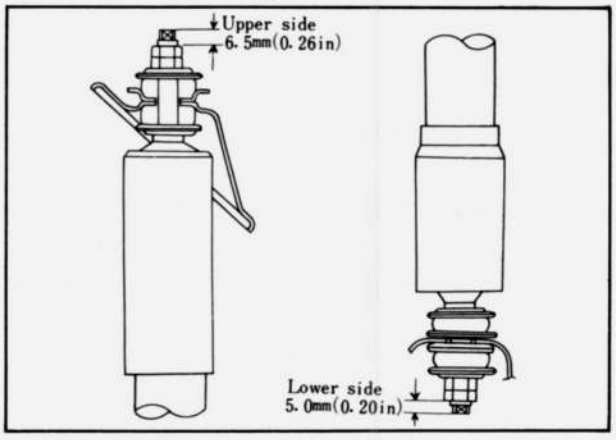

Fig. 13A–4 Tightening lock nut

SPECIAL TOOL

49 0223 740A	Shock absorber lifter

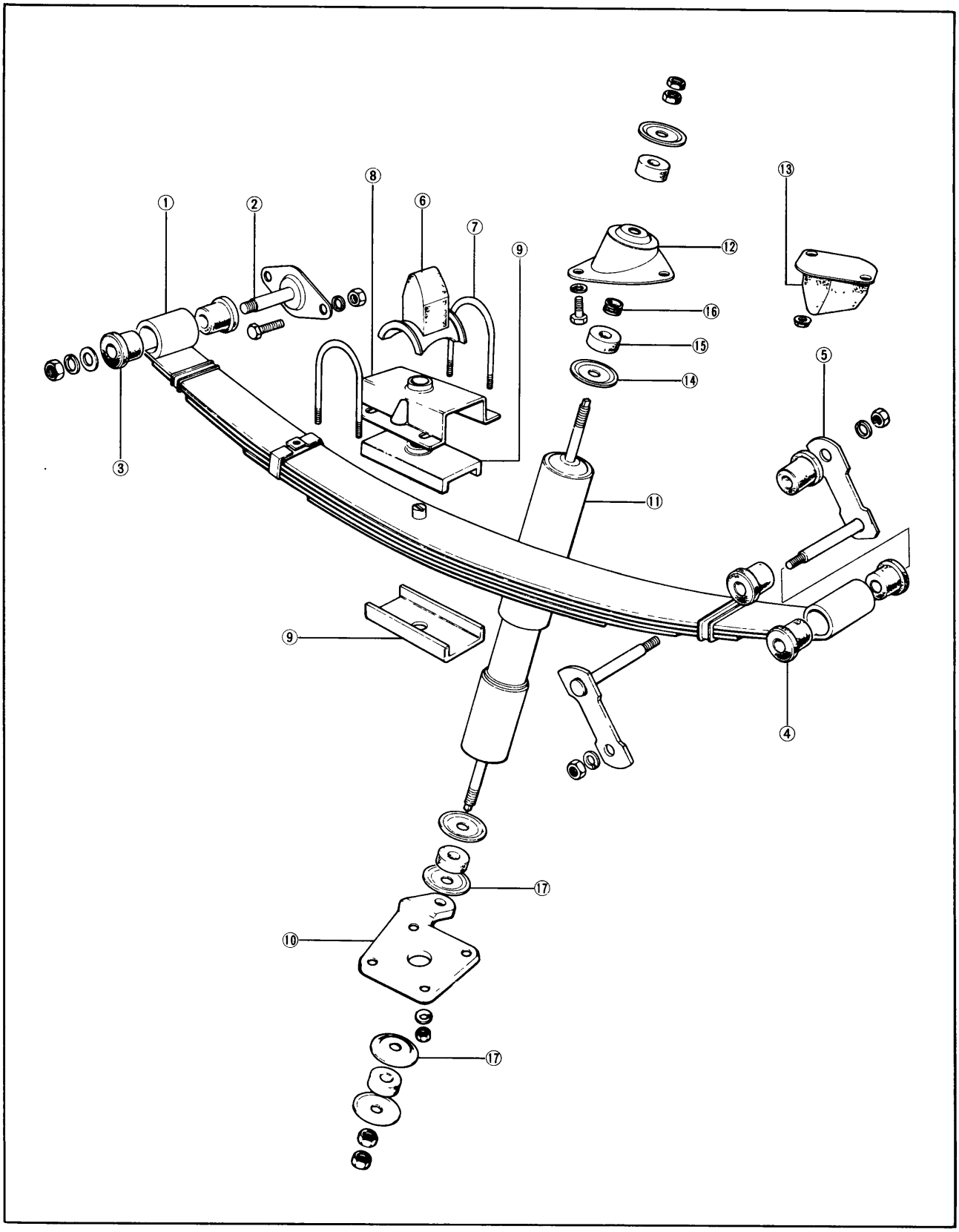

Fig. 13A–5 Rear suspension components

1. Rear spring
2. Spring pin
3. Bush (Frt.)
4. Bush (Rr.)
5. Shackle plate
6. Bound bumper
7. "U"-bolt
8. Rubber pad holder
9. Rubber pad
10. Spring clamp
11. Rear shock absorber
12. Bracket
13. Stopper rubber
14. Retainer
15. Rubber bush
16. Grommet
17. Centering washer

BODY

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DESCRIPTION

The body is designed to give an unitary construction with the body and chassis frame unified for light, rigid and durable construction. This section explains service procedures of the hood, luggage compartment, bumper, door, seat, top ceiling, windshield, and nose panel.

14–A. HOOD

14–A–1. Removing Hood

1. Open the hood and support the hood in the open position. Mark the hood hinge locations on the hood.
2. Remove the hood support from the hood.

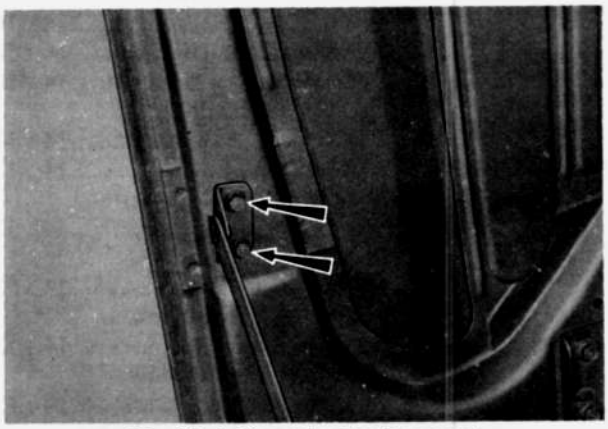


Fig. 14–1 Removing hood support

3. Remove two bolts attaching each hinge to the hood taking care not to let the hood slip when the bolts are removed.

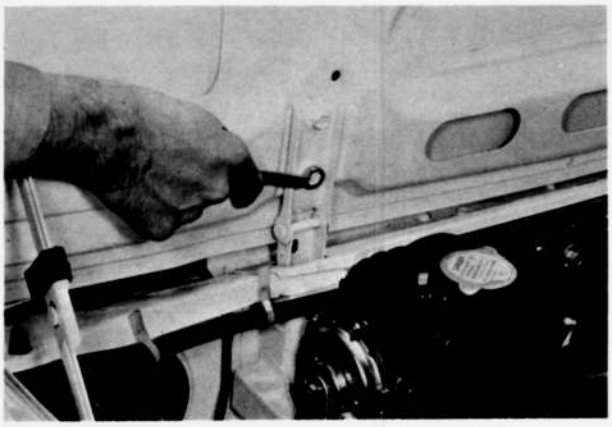


Fig. 14–2 Removing hinge attaching bolts

4. Remove the hood from the vehicle.

14–A–2. Installing Hood

Follow the removal procedures in the reverse order and adjust the hood by applying the procedures explained in the following paragraph.

14–A–3. Adjusting Hood

The hood is provided with to-and-fro, up-and-down and side-to-side adjustments.

To make the to-and-fro and side-to-side adjustments, loosen the hood attaching bolts and move the hood to the proper position, then tighten the attaching bolts shown in Fig. 14–4.

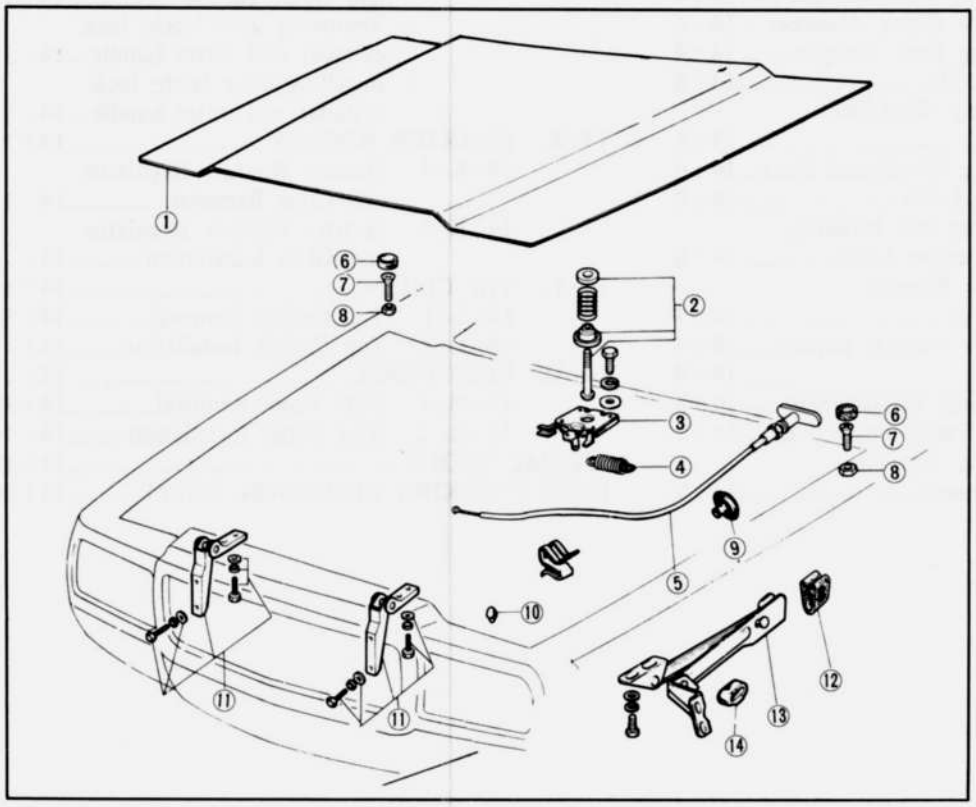


Fig. 14–3 Hood components

1. Hood (Bonnet)
2. Hook set
3. Hood lock
4. Spring
5. Release wire
6. Cushion
7. Cushion screw
8. Nut
9. Grommet
10. Cushion
11. Hinge set
12. Cushion rubber
13. Stop
14. Cushion rubber

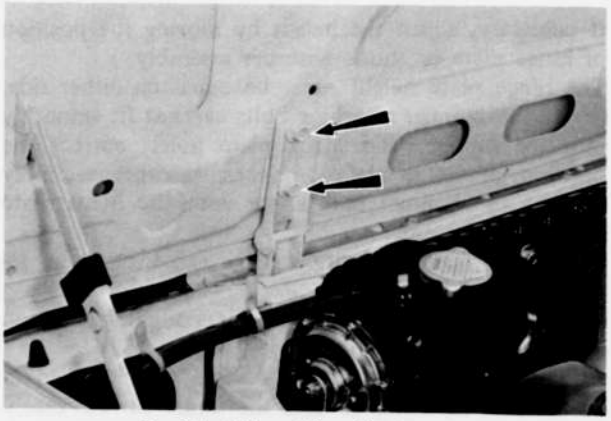


Fig. 14–4 To-and-fro adjustment

To make the up-and-down adjustment at the rear edge of the hood, loosen the hood stop bolts and move the hood to proper position, then tighten the attaching bolts.

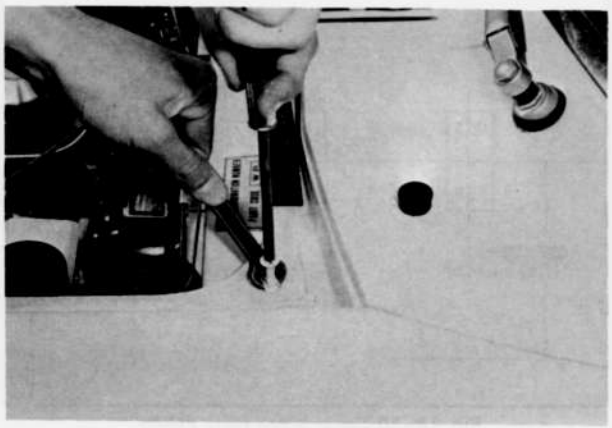


Fig. 14–5 Up-and-down adjustment

14–A–4. Adjusting Hood Latch

1. Make certain that it is properly aligned.
2. Loosen the hood latch attaching bolts. Move them as required to align with the latch dowel. Tighten the attaching bolts.
3. Loosen the lock nut on the hood latch dowel, and turn the dowel clockwise to pull the hood tighter or counterclockwise to loosen it. The proper height is when the top of the hood is flush with the fenders.

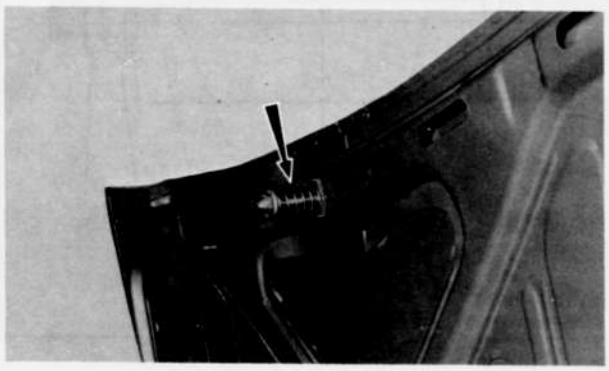


Fig. 14–6 Adjusting hood latch

4. Tighten the dowel lock nut after the proper adjustment has been obtained.

14–B. LUGGAGE COMPARTMENT DOOR

14–B–1. Removing Luggage Compartment Door

1. Open the luggage compartment door and support the door in the luggage compartment.
2. Remove the two bolts attaching the hinge to the luggage compartment door.
3. Remove the luggage compartment door from the vehicle.

14–B–2. Installing Luggage Compartment Door

Follow the removal procedures in the reverse order and adjust the luggage compartment door by applying procedures explained in the following paragraph.

14–B–3. Adjusting Luggage Compartment Door

To make the to-and-fro or side-to-side adjustment, loosen the luggage compartment door attaching bolts, and move the door as required.

To make the up-and-down adjustment, loosen the hinge-to-hinge support attaching bolts and raise or lower the hinge as required.

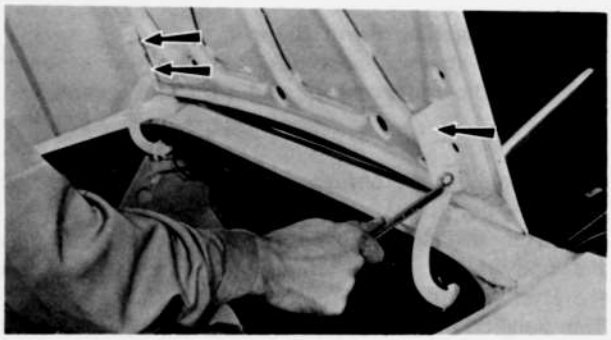


Fig. 14–7 Up-and-down adjustment

14–B–4. Adjusting Luggage Compartment Door Latch

To adjust the door latch, loosen the door latch striker attaching bolts, and move the striker as required, then tighten the attaching bolts.

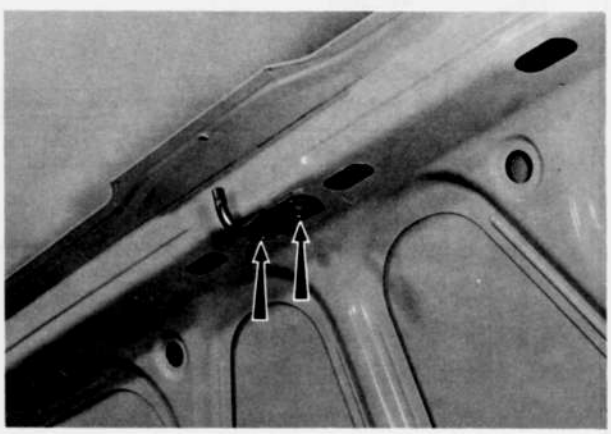


Fig. 14–8 Adjusting door latch

14–C. FRONT BUMPER

14–C–1. Removing Front Bumper

1. Remove the screws attaching the left and right

turn signal lights to the bumper and remove the turn signal lights from the bumper.
2. Remove the bolts attaching the left and right bumper ends to the fender.
3. Remove the nuts and bolts attaching the bumper to the left and right hinge plate.
Then, remove the bumper.
4. Remove the bolts attaching the left and right splash shields to the skirt panel and remove the splash shields.
5. Remove the bolts attaching the shock absorber bracket to the front frame. Then, remove the shock absorber and bracket assembly.
6. Remove the nuts from the piston rod end, then separates shock absorber from the bracket.

14–C–2. Checking Front Shock Absorber

To check the shock absorber, measure the dimension (A) shown in Fig. 14–9.
This measurement should be **42 ± 2 mm (1.65 ± 0.08 in).**
If this measurement is not within the specification, replace the shock absorber with a new one.

14–C–3. Installing Front Bumper

Follow the removal procedures in the reverse order and align the bumper for good fit and appearance.

Note:
When installing the bumper care must be taken in the following point:
(a) After installing the shock absorber assembly to the body frame, check the hinge plate height from the level ground surface.
The height should be **457 ± 29 mm (17.99 ± 1.14 in)** as shown in Fig. 14–10.
If necessary, adjust the height by moving the position of hinge plate or shock absorber assembly.
The hinge plate height must be equal on either side.
(b) If the bumper attaching bolts can not fit smoothly into the bumper and hinge plate holes, correct the position of hinge plate or shock absorber assembly so that the bumper hole aligns with the hinge plate hole on either side.
Incorrectly installed bumper may cause its poor recovery.
(c) The bumper attaching bolt has a slight inclination on the under surface of the bolt head.
So, the bumper attaching bolt should be installed in the correct direction so that the under surface nicely fits the bumper surface.
(d) Tighten the bumper attaching bolt to **1.8 ~ 2.7 m-kg (13 ~ 19 ft-lb).**
(e) Tighten the shock absorber bracket attaching bolt to **1.8 ~ 2.7 m-kg (13 ~19 ft-lb).**

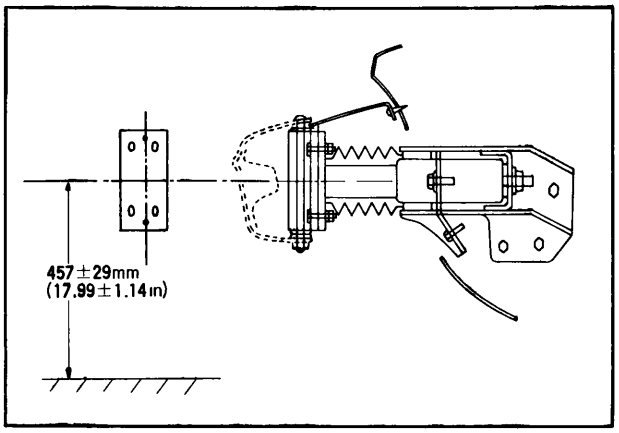


Fig. 14–10 Front hinge plate height

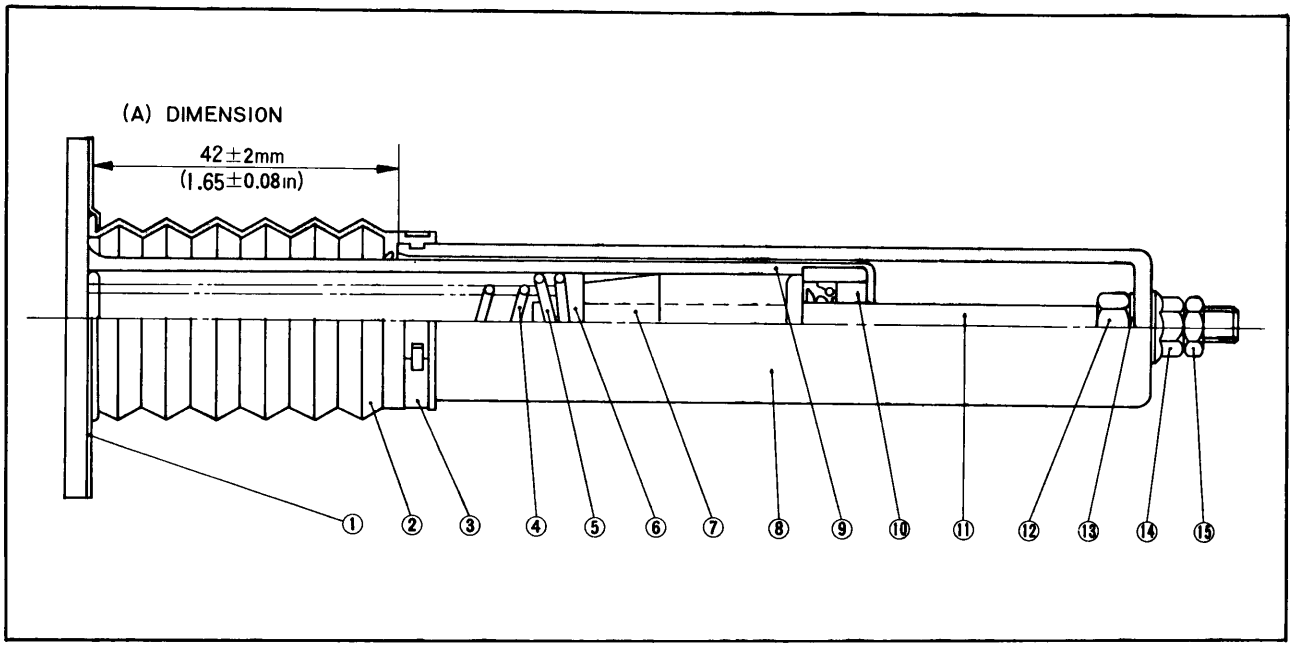


Fig. 14–9 Front shock absorber

1. Boot plate
2. Boot
3. Boot clamp
4. Inner coil spring
5. Outer coil spring
6. Guide
7. Rubber bush
8. Outer casing
9. Inner casing
10. Inner casing end
11. Piston rod
12. Nut
13. Seal washer
14. Nut
15. Nut

14–D. REAR BUMPER

14–D–1. Removing Rear Bumper

1. Remove the bolts attaching the left and right bumper ends to the fender.
2. Remove the nuts and bolts attaching the bumper to the left and right hinge plates. Then, remove the bumper.
3. Remove the bolts attaching the shock absorber bracket to the rear frame and nuts attaching the piston rod end to the rear frame. Then, remove the shock absorber and bracket assembly.
4. Remove the shock absorber from the bracket.

14–D–2. Checking Rear Shock Absorber

To check the rear shock absorber, make the same inspection as for the front shock absorber described in **Par. 14–C–2.**

The measurement of the dimension (A) should be 50 ± 2 mm (1.97 ± 0.08 in) for coupé or 60 ± 2 mm (2.36 ± 0.08 in) for wagon.

14–D–3. Installing Rear Bumper

Follow the removal procedures in the reverse order and align the bumper for good fit and appearance.

Note:

When installing the rear bumper, care should be taken the same as in the case of the front bumper installation described in **Par. 14–C–3.**

The height should be 457 ± 29 mm (17.99 ± 1.14 in) as shown in Fig. 14–11.

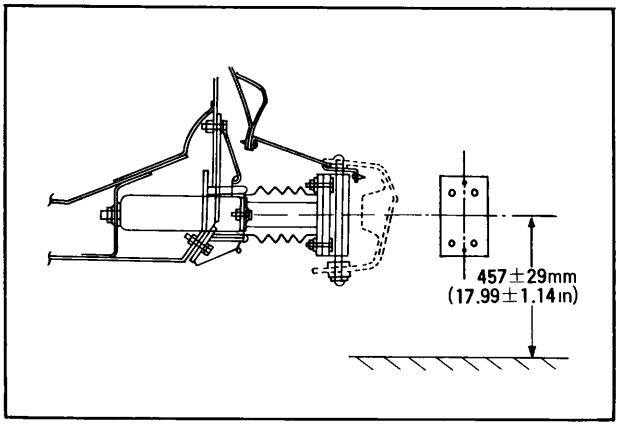


Fig. 14–11 Rear hinge plate height

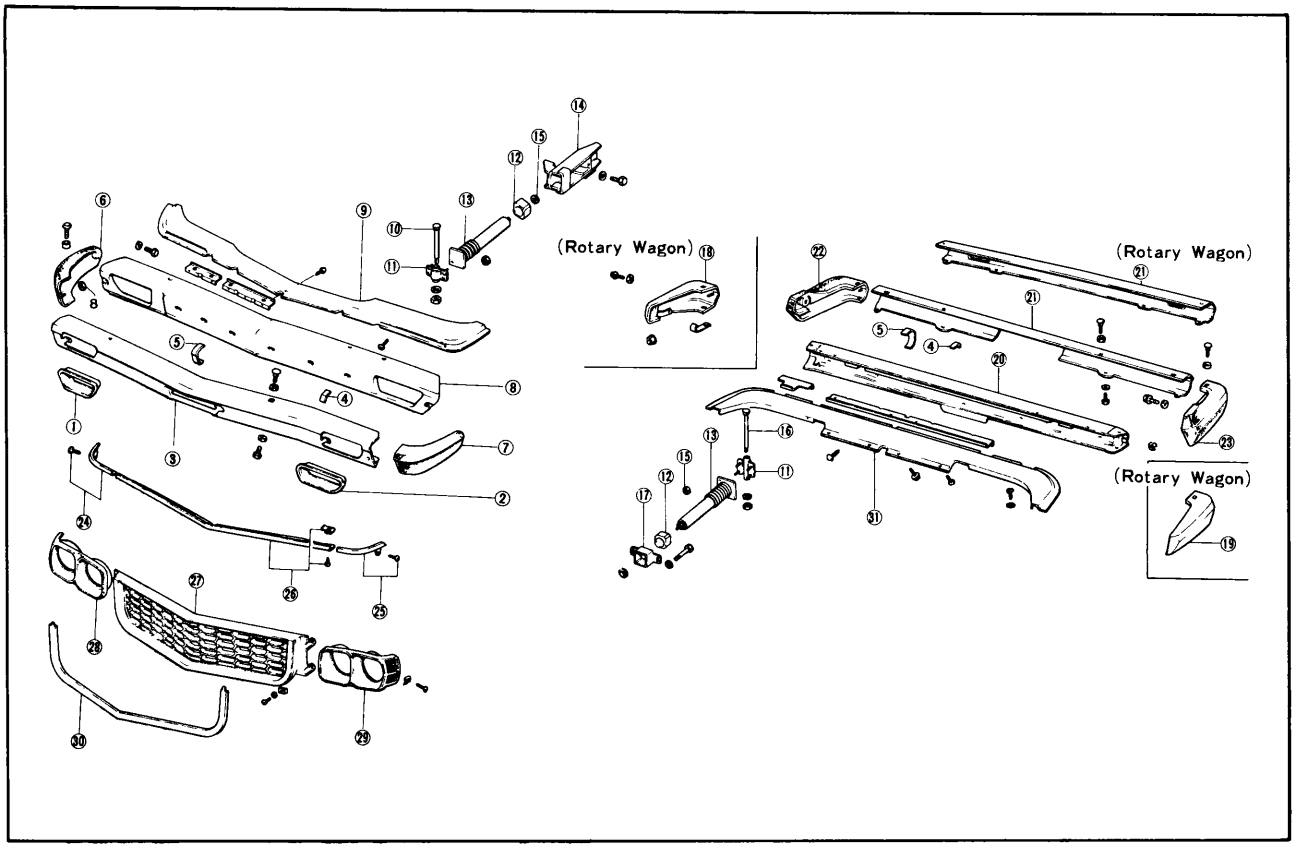


Fig. 14–12 Bumper and Grille Components

1. Ring (R)
2. Ring (L)
3. Outer bumper (Frt.)
4. Spacer
5. Spacer
6. Side bumper (R)
7. Side bumper (L)
8. Front bumper
9. Front bumper cover
10. Bolt
11. Hinge plate
12. Mounting rubber
13. Shock absorber
14. Bracket
15. Nut
16. Bolt
17. Bracket
18. Side bumper (R)
19. Side bumper (L)
20. Rear bumper
21. Outer bumper (Rr.)
22. Side bumlper (R)
23. Side bumper (L)
24. Mould set (R)
25. Mould set (L)
26. Mould set
27. Grille
28. Lamp bezel (R)
29. Lamp bezel (L)
30. Grille mould
31. Rear bumper cover

14–E. WINDSHIELD GLASS

14–E–1. Removing Windshield Glass

To replace the windshield glass, use the **window service tool set** (Part No. 49 0305 870K).

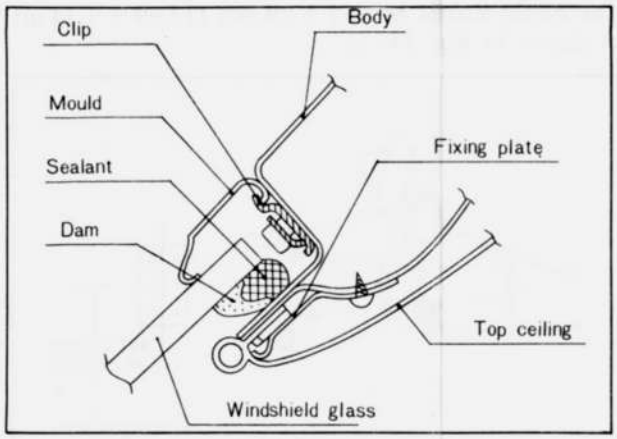


Fig. 14–12 Windshield cross section

1. Remove the interior mirror and also right and left front pillar trims from the interior of the vehicle.
2. Remove the windshield wiper arms and blades.

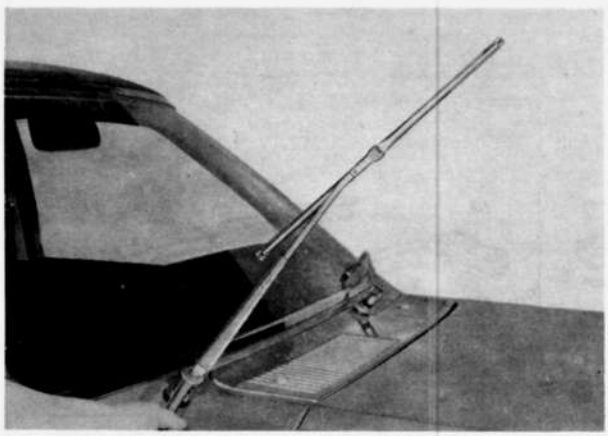


Fig. 14–13 Removing wiper arm

3. Insert the mould remover between the mould and the glass and pull the retaining clip to remove the mould upward. Remove the mould.

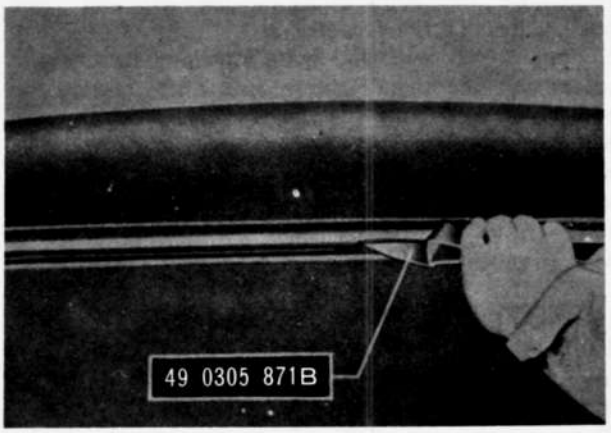


Fig. 14–14 Removing mould

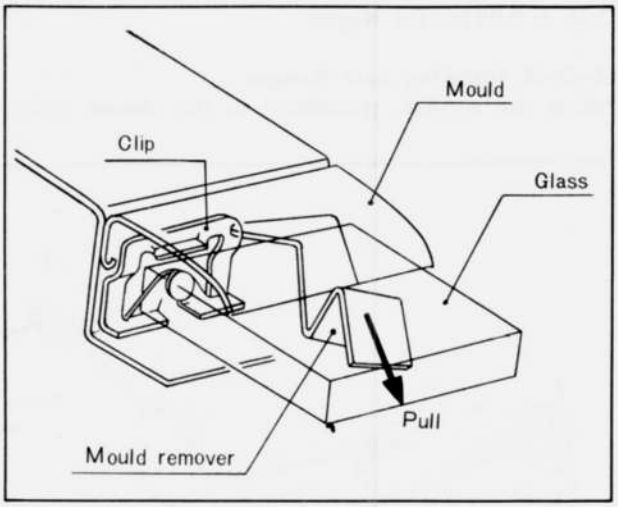


Fig. 14–15 Removing mould

4. Remove the mould retaining clips.
5. Pierce the needle between the glass and the sealant and insert the 500 mm (20 in) length of piano

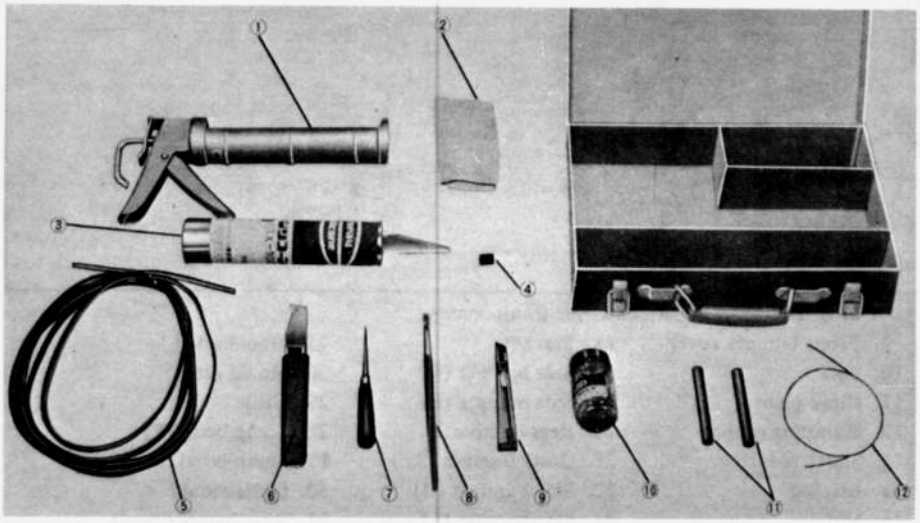


Fig. 14–16 Window service tool set (49 0305 870K)

1. Sealant gun
2. Guaze
(3. Sealant : 0305 77 739)
4. Spacer
5. Dam
6. Mould remover
7. Needle
8. Brush
9. Cutting knife
10. Primer
11. Bar
12. Piano wire

wire into the pierced hole. Wrap each end of the wire around the bars.

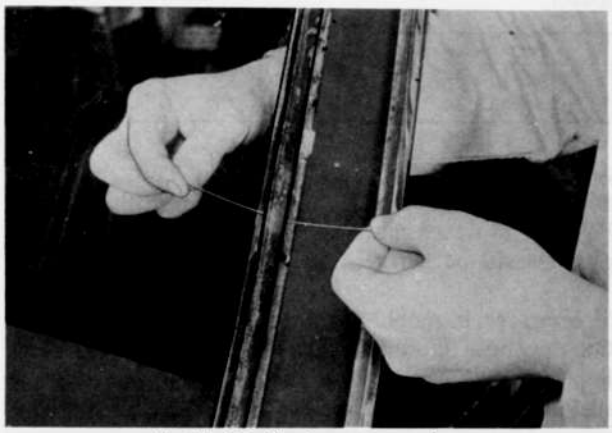


Fig. 14–17 Piercing piano wire

6. With the aid of an assistant, cut the sealant all the way around the glass with a sawing motion and remove the glass.

Note:
(a) When cutting the sealant with the piano wire, cut it along the border between the window glass and the sealant.
(b) The piano wire is liable to snap if only a certain section is constantly used and becomes hot. Therefore, when cutting the sealant ensure that the piano wire is kept cool (it should be cooled slowly) or the section of the wire being used is constantly rotated.

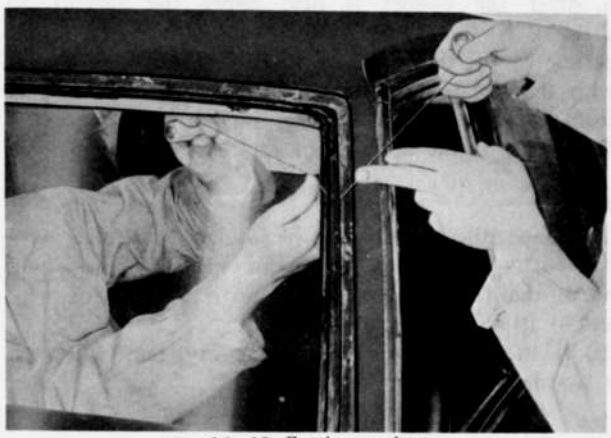


Fig. 14–18 Cutting sealant

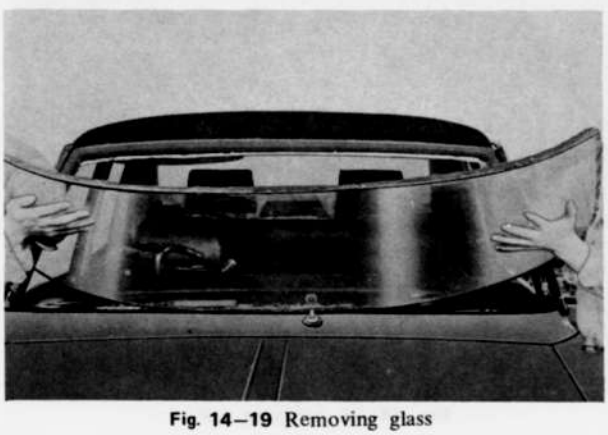


Fig. 14–19 Removing glass

14–E–2. Installing Windshield Glass

1. Using the cutting knife, cut the sealant off smoothly so that **1 to 2 mm (0.04 to 0.08 in)** of the sealant remains along the glass opening flange.

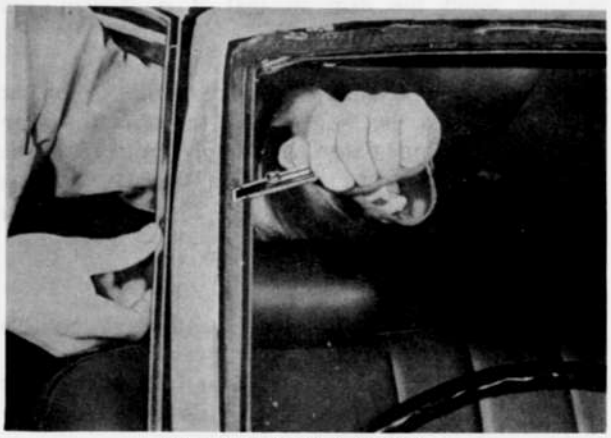


Fig. 14–20 Cutting sealant

If the thickness of the sealant left along the glass opening flange is too small, first, clean with a solvent. Then, apply primer with the brush and leave it to dry for **20 to 30 minutes**. Then, apply sealant until a thickness of **1 to 2 mm (0.04 to 0.08 in)** is obtained.



Fig. 14–21 Applying primer

2. Clean the glass thoroughly and bond the dam with bonding agent parallel to the edge of the glass

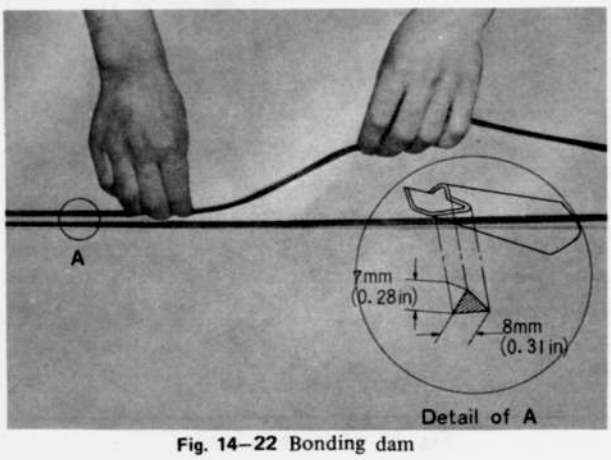


Fig. 14–22 Bonding dam

at a position **7 mm (0.028 in)** away from it. Bond the dam in the direction shown in Fig. 14–22.

Note:
Securely bond the dam so that it is straight and will not come apart.

3. Apply primer around the entire perimeter of the glass in the area that will contact the sealant. Clean the glass opening flange and apply primer to the entire perimeter of the sealant on the glass opening flange. Allow the primer to dry **30 minutes** before installation of glass.

Note:
(a) Apply as thin the sealant coating as possible to the glass.
(b) **Do not** allow any dust, water, oil, etc. to get on the coating surface and also **do not** touch the coating surface with hand.

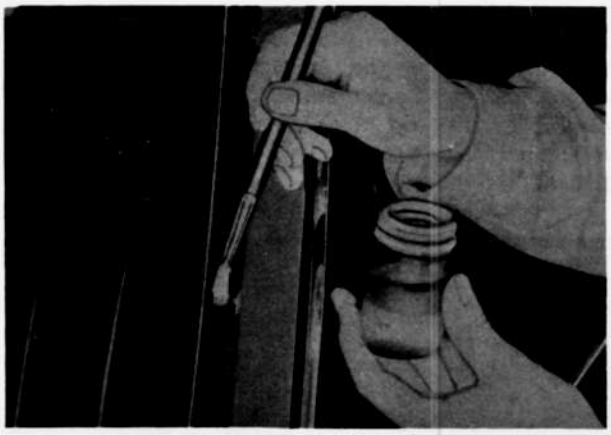


Fig. 14–23 Applying primer

4. Bond each spacer to the glass opening flange with bonding agent. Fig. 14–24 shows the directions and positions of each spacer. There are two kinds of spacer.

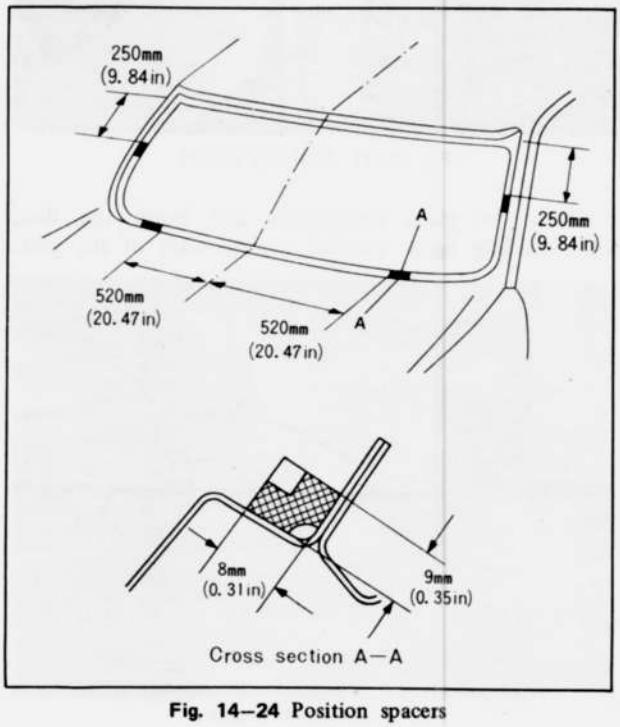


Fig. 14–24 Position spacers

Part Nos.	Name of Part	Color
0305 70 448A	Spacer	Gray
0839 70 449	Spacer	Black

Although the spacer is bonded on both the right and the left hand sides of the windshield glass in Fig. 14–24, the spacer on only one side of the glass should be sufficient.

5. Insert each mould retaining clip to the clip insertion portion in the manner shown in Fig. 14–25. Repalce the retaining clips as required to insure adequate mould retention.

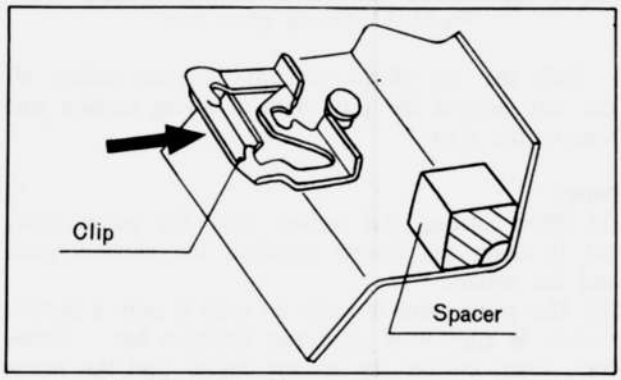


Fig. 14–25 Installing mould retaining clip

6. After the primer is dry, apply the sealant so that it is **8 mm (0.31 in)** high along the entire perimeter of the glass with the sealant gun fitted with the sealant cartridge. If the sealant comes apart from the painted surface on the body side, use the remainder of the sealant for rectification.

Note:
(a) Shape the nozzle of the sealant cartridge with the cutting knife as shown in Fig. 14–26. Then, break the film of the sealant with a piece of wire and it is ready for application.
(b) If the application is unsatisfactory, rectify it with a wooden spatula.

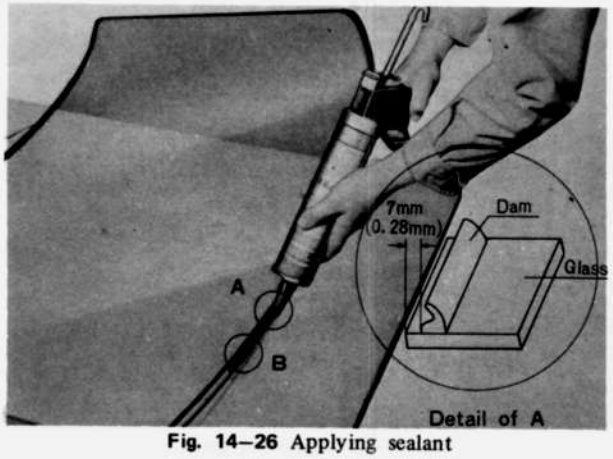


Fig. 14–26 Applying sealant

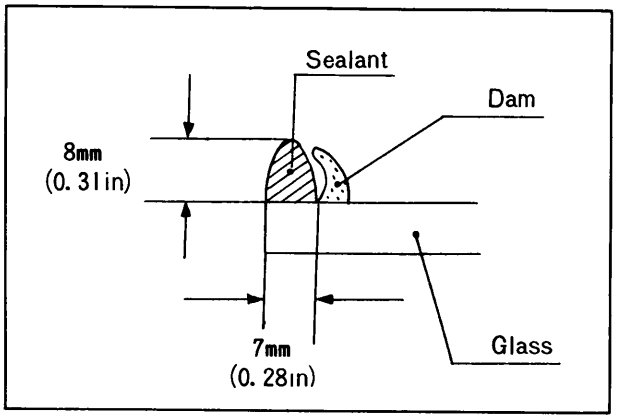


Fig. 14–27 Detail B of Fig. 14–26

(c) If any seal adheres to your hand, it should be removed immediately.

7. Place the glass in the opening flange, locating the best position for equal sealant contact.
8. Firmly press the glass against the sealant with hand pressure. Then, inspect the appearance of the sealant through the glass. A dull spot indicates an area where the sealant does not contact glass surface. Additional hand pressure will seal most areas. When installing the glass, **5.8 mm (0.23 in)** clearance should exist between the body and the glass. Check the clearance at the four positions shown in Fig. 14–27.

Note:
If possible, **do not** apply any force to the glass until the sealant has hardened. Time required for the seal to harden after it is applied.

Summer (20°C or 68°F)	5 hours
Winter (5°C or 41°F)	24 hours

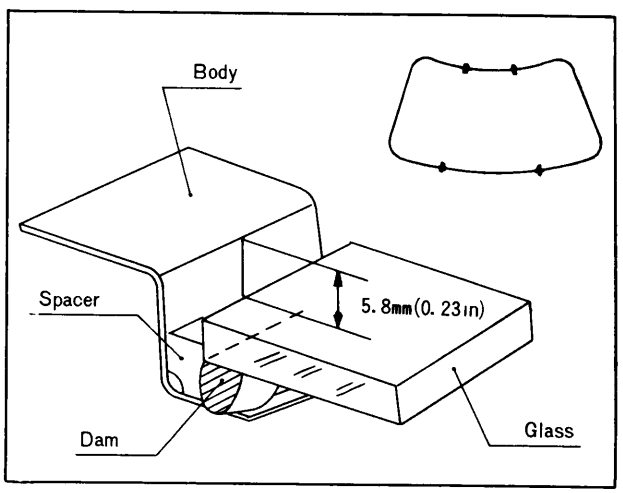


Fig. 14–28 Adjusting clearance

9. Remove any excess primer from the glass with a wooden spatula and wipe with a clean solvent.
10. Water test the installation around the entire perimeter of the glass. Repair any leaks by applying the sealant around the edge of the glass.
11. Install the moulds, interior mirror, front pillar trims, windshield wiper arms, etc.

Note:
(a) Keep the door windows open until the sealant has hardned to some extent.
(b) If the vehicle is to be repainted, remove all the sealant from the body and then after baking the paint on, apply the sealant so that it is **10 mm (0.4 in)** high. **Never apply** air setting paint to the surface on which the sealant is to be applied.

14–F. REAR WINDOW GLASS

14–F–1. Removing and Installing Rear Window Glass

The removal and installation of the rear window glass can be made in the same way as those of the windshield glass. But care should be taken to the following points:
1. In the case of a vehicle equipped with a heatable window, perform the works of disconnection and connection of the relevant wiring.
2. When installing the glass, **7.8 mm (0.31 in)** clearance should exist between the body and the glass. Check the clearance at the four portions shown in Fig. 14–29.

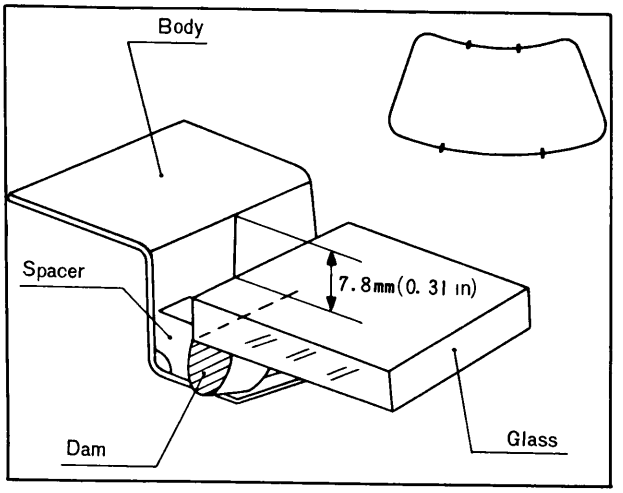


Fig. 14–29 Adjusting clearance

3. The directions and positions each spacer to be bonded are shown in Fig. 14–30.

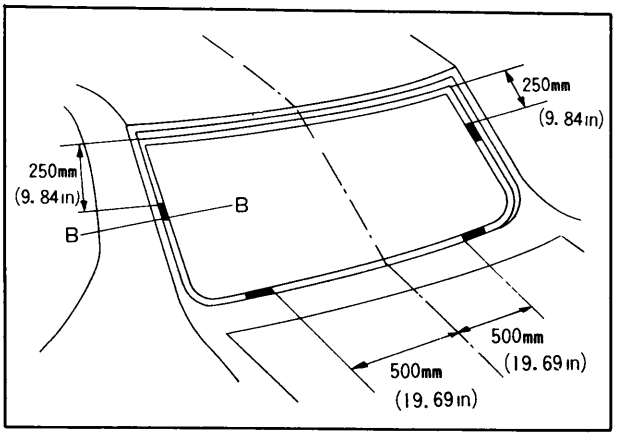


Fig. 14–30 Position of spacers

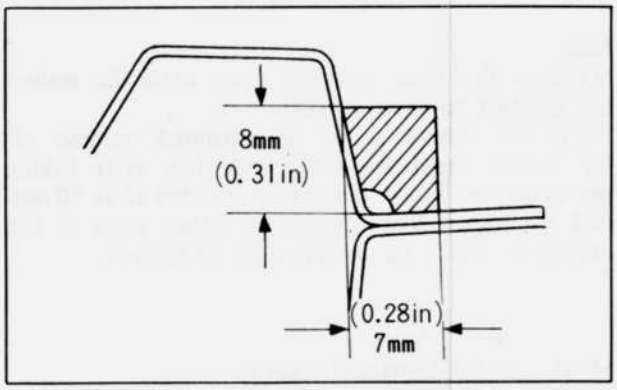


Fig. 14–31 B-B section of Fig. 14–30

14–F–2. Heatable Window Inspection

1. Turned on the heater switch.
2. Ground the negative terminal of the voltmeter on the body and touch the positive terminal on the center of each filament to measure the voltage. Normal filament registers approximately **6 volts** at the center. A high voltage on the order of **12 volts** shows that breakage is on the negative side from the center (grounded side) and a voltage close to **0 volt** shown that breakage is on the positive side.
3. Move the positive terminal to the side where breakage is known to exist, and you will note sudden change in voltage at a portion. That portion is where the filament is broken.

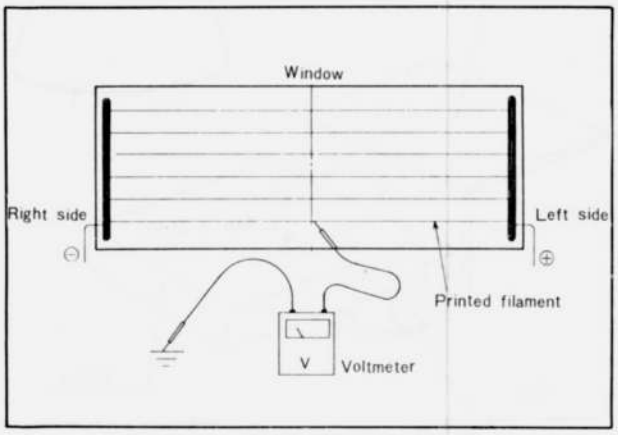


Fig. 14–32 Inspecting heatable window

14–F–3. Heatable Window Repair

1. Clean the broken portion with solvent.
2. By using a small brush or a drawing pen, apply the **conductive silver paint** (Part No. 2835 77 600), i.e., Dupont No. 4817 to the broken section.
3. Completely dry the painted section by leaving it intact for 24 hours in the case of 20°C (68°F) (for 30 minutes when the painted section is heated up to 60°C (140°F) with a dryer).

Note:

(a) **Never turn** on the heater before the paint has completely dried.
(b) **Do not** use any alkaline chemical cleaner to clean the section thus repaired.
(c) The life of Dupont No. 4817, conductive silver paint, is one year and must be kept at a dry place having a temperature of less than 20°C (68°F).

14–G. FRONT SEAT

14–G–1. Front Seat Replacement

1. Remove the front seat by removing the two attaching bolts and two attaching nuts.
2. To install, reverse the removal procedures.

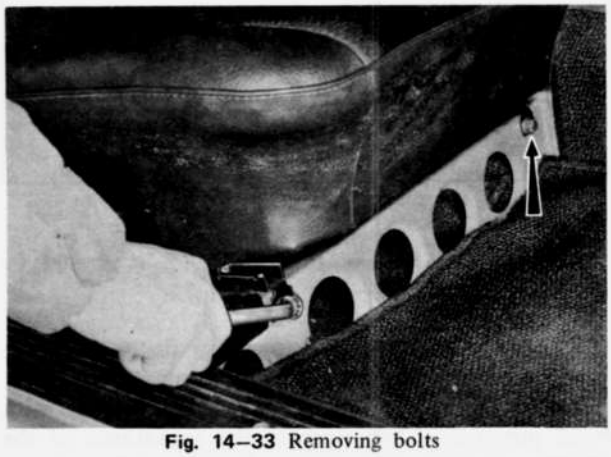


Fig. 14–33 Removing bolts



Fig. 14–34 Removing nuts

14–G–2. Seat Adjuster Inspection

1. Inspect the seat adjuster for smooth operation by moving the seat back and forth. If necessary, apply grease to the seat adjuster.
2. Inspect the seat adjusting lever for wear. If defective, repair or replace it.

14–G–3. Reclining Knuckle Replacement

To replace the reclining knuckle, **use the tool** (Part No. 49 0259 855).

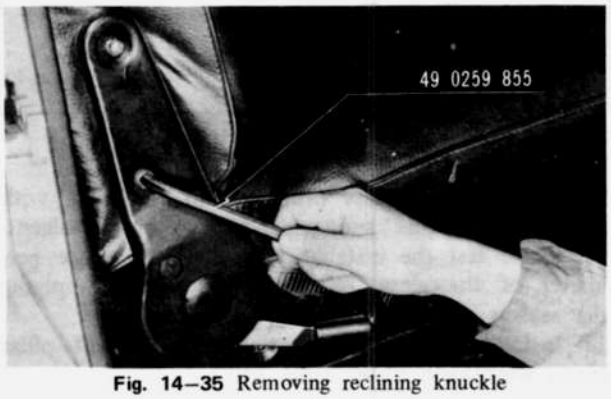


Fig. 14–35 Removing reclining knuckle

14–H. REAR SEAT

14–H–1. Rear Seat Replacement

1. Remove the two bolts attaching the seat cushion and remove the seat cushion.



Fig. 14–36 Removing seat cushion

2. Open the luggage compartment door and remove the package trim by removing the two attaching screws.
3. Remove the rear seat back attaching nuts from the inside of the luggage compartment door.

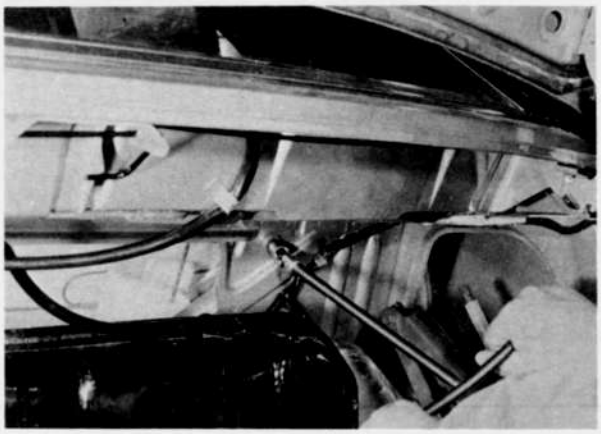


Fig. 14–37 Removing seat back attaching nut

4. Remove the rear seat back attaching bolts and remove the seat back.

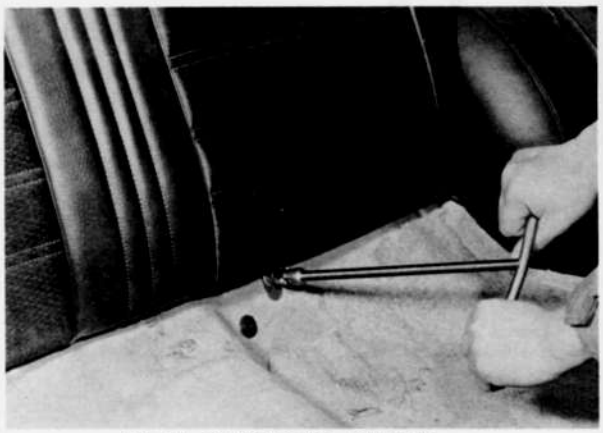


Fig. 14–38 Removing seat back

5. To install, reverse the removal procedures.

14–I. DOOR

14–I–1. Door Adjustment

a. Adjusting door latch striker

The striker can be adjusted laterally and vertically as well as fore and aft. The striker should not be adjusted to correct door sag.

1. Loosen the striker attaching screws and move the striker as required.
2. Tighten the attaching screws and check the door fit.

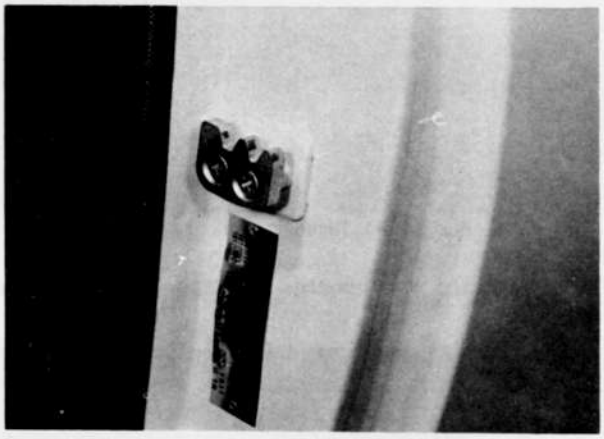


Fig. 14–39 Adjusting striker

b. Adjusting door alignment

The door hinges provide sufficient adjustment latitude to correct most door misalignment conditions. **Do not** cover up a poor door alignment with the door latch striker adjustment.

1. Loosen the hinge attaching bolts and move the hinge as required.
2. Tighten the attaching bolts and check the door fit.

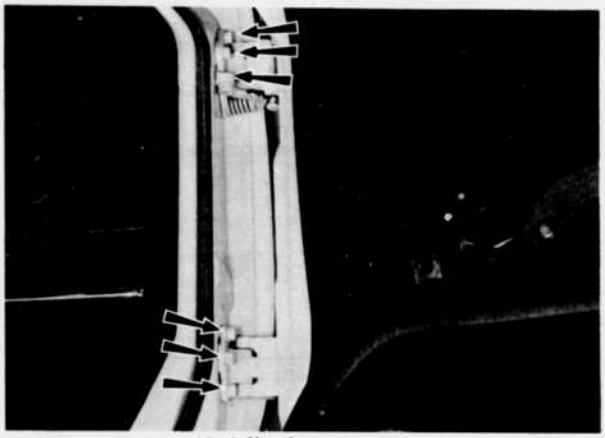


Fig. 14–40 Adjusting door alignment

14–I–2. Door Hinge Replacement

1. Support the door.
2. Remove the hinge-to-body attaching bolts.
3. Remove the hinge-to-door attaching bolts and remove the hinge.
4. Position the hinge to the door and body, and install the attaching bolts.
5. Adjust the door as described in **Par. 14–I–1** and tighten the attaching bolts.

14–I–3. Door Weatherstrip Replacement

1. Pull the weatherstrip from the retaining clips, and remove the weatherstrip without damaging the rubber if the weatherstrip is to be used again.

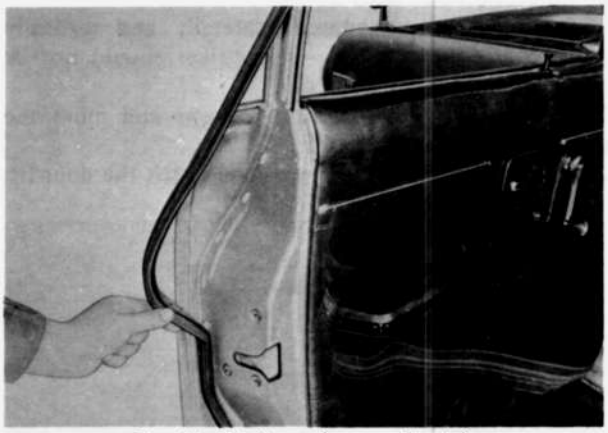


Fig. 14–41 Removing weatherstrip

2. Remove the weatherstrip retaining clips from the door.

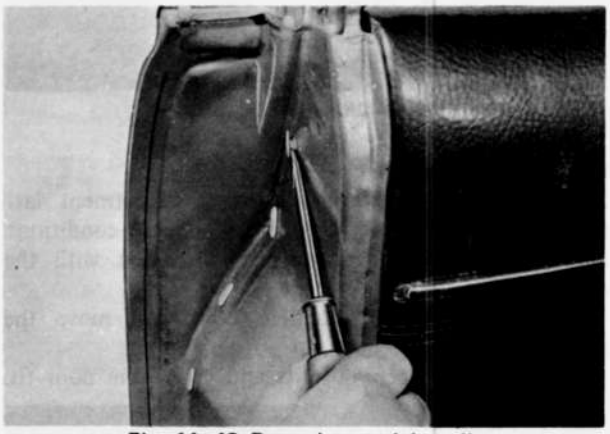


Fig. 14–42 Removing retaining clip

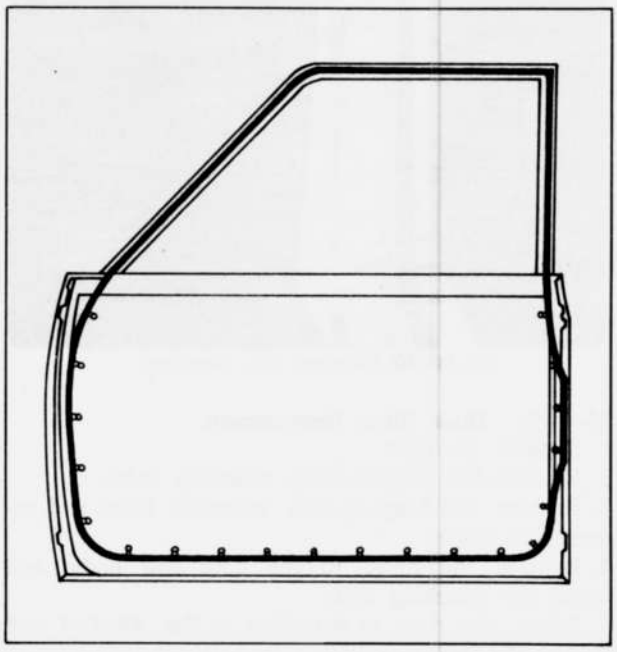


Fig. 14–43 Position retaining clip

3. Inspect the weatherstrip for crack, deformation and damage. If defective, replace it.

4. Fit the retaining clips to the weatherstrip with a plier.

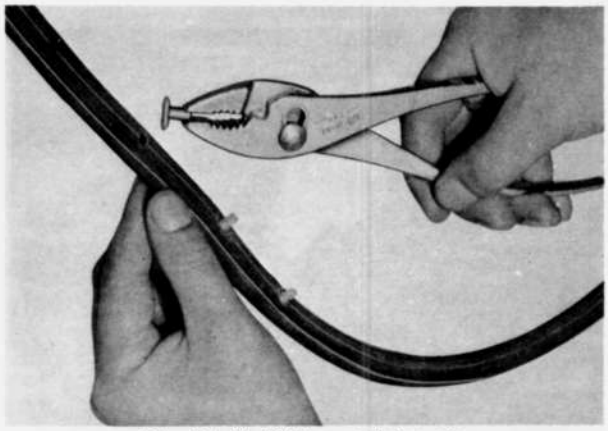


Fig. 14–44 Fitting retaining clip

5. Position the weatherstrip to the door and fit the retaining clips into place.

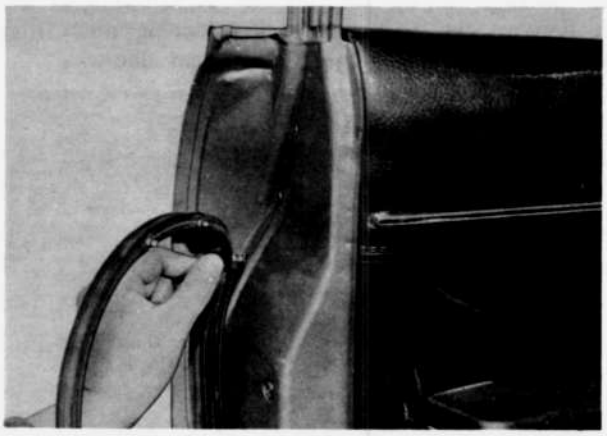


Fig. 14–45 Installing weatherstrip

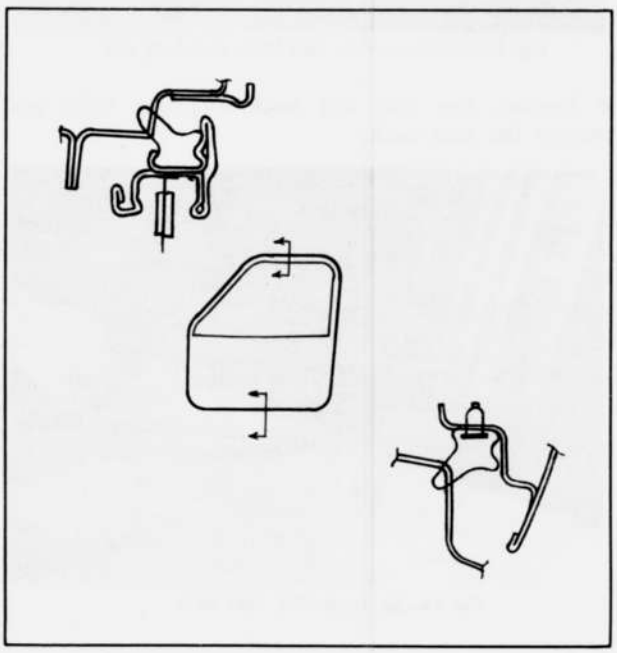


Fig. 14–46 Weatherstrip cross section

14–J. FRONT DOOR

14–J–1. Door Window Regulator and Glass

a. Removing door window regulator and glass

1. Remove the regulator handle by removing the attaching screw.
2. Remove the door latch knob.
3. Remove the arm rest by removing the attaching screws.
4. Remove the inner handle cover by removing the attaching screw.
5. Remove the trim panel and watershield.
6. Remove the regulator attaching bolts, and lower the regulator to disconnect the regulator roller from the glass channel, then remove the regulator assembly.
7. Remove the glass.

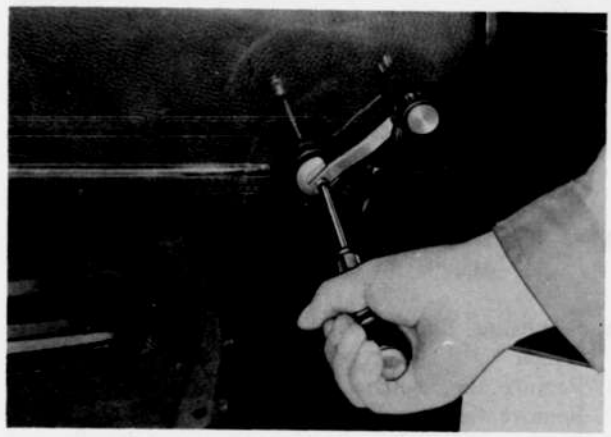


Fig. 14–47 Removing regulator handle

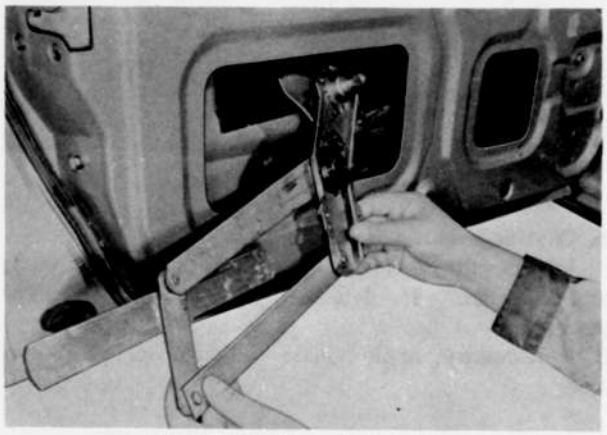


Fig. 14–48 Removing regulator

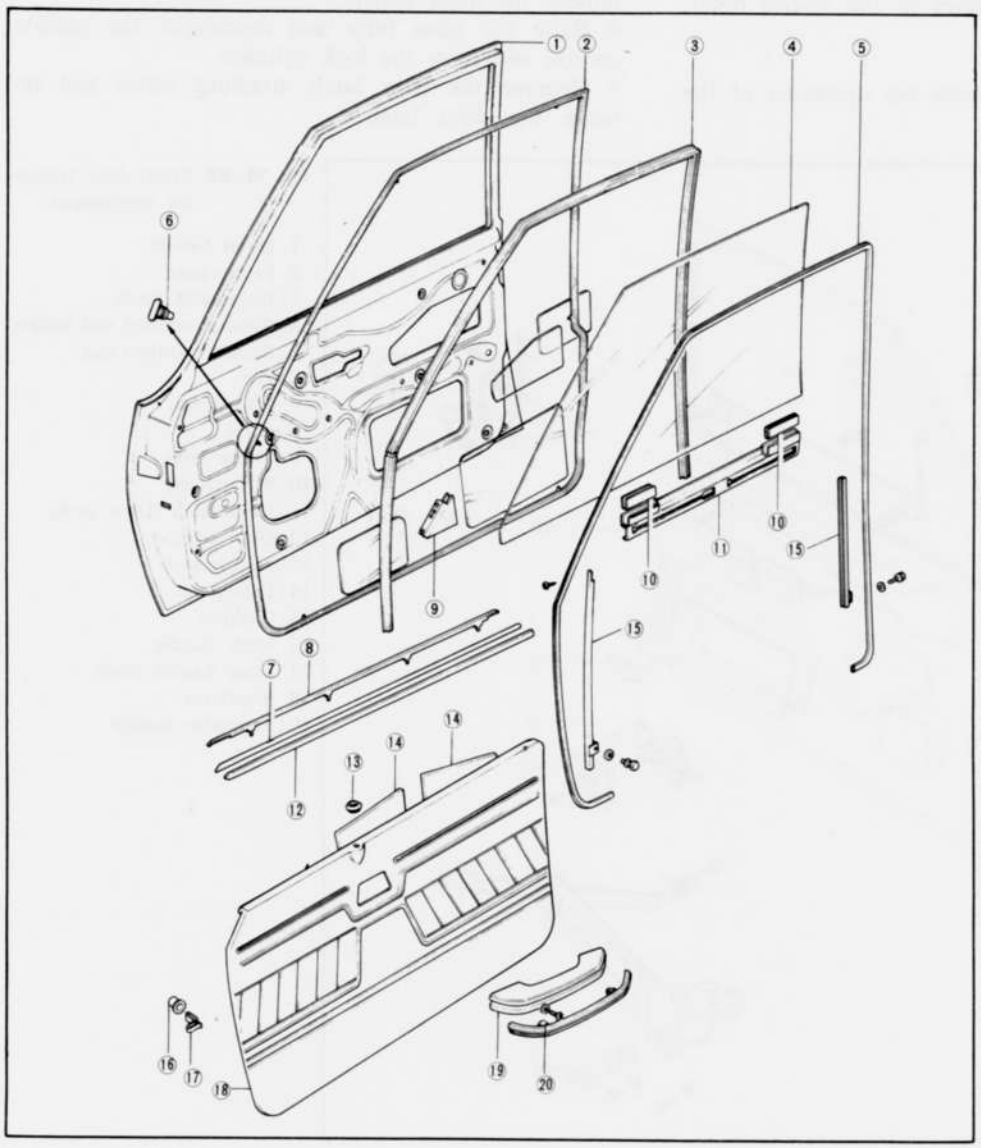


Fig. 14–49 Front door glass

1. Front door
2. Weatherstrip
3. Run channel
4. Glass
5. Seaming welt
6. Weatherstrip retaining clip
7. Weatherstrip
8. Mould
9. Corner bracket
10. Rubber strip
11. Glass channel (Glass holder)
12. Weatherstrip
13. Trim panel grommet
14. Insulation
15. Glass guide
16. Trim panel fastener seal
17. Trim panel fastener
18. Trim panel
19. Arm rest
20. Garnish

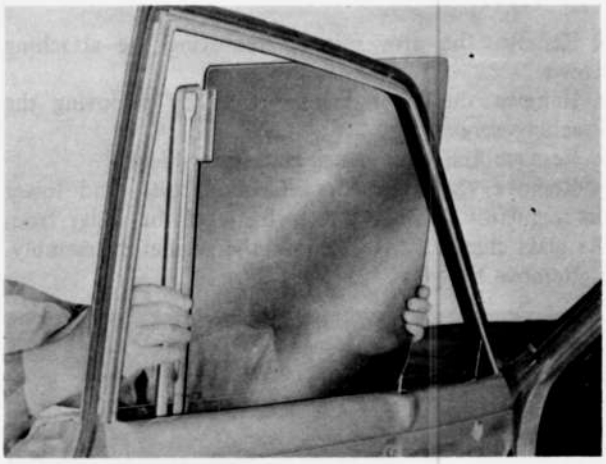


Fig. 14–50 Removing glass



Fig. 14–51 Adjusting regulator

b. Checking door window regulator

1. Inspect the regulator gear and spring for wear and damage. If defective, replace the regulator assembly.
2. If necessary, apply grease to each operation portion.

c. Installing door window regulator and glass

Follow the removal procedures in the reverse order.

Note:

Adjust the regulator and check the operation of the regulator.

14–J–2. Door Latch, Lock Cylinder and Outer Handle

a. Removing door latch, lock cylinder and outer handle

1. Remove the regulator handle, arm rest, etc.
2. Remove the trim panel and watershield.
3. Remove the bolts attaching the inner handle and remove the inner handle.
4. Raise the glass fully and disconnect the remote control rod from the lock cylinder.
5. Remove the door latch attaching screw and remove the door latch.

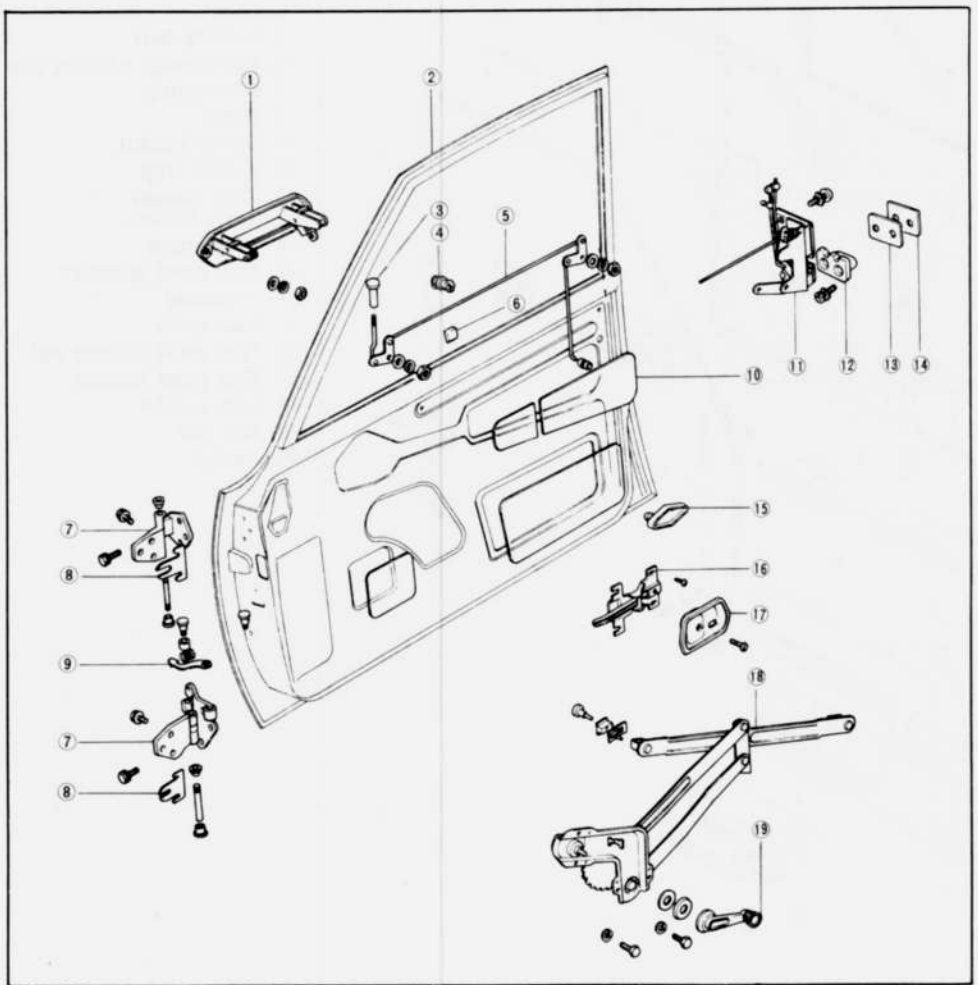


Fig. 14–52 Front door regulator components

1. Outer handle
2. Front door
3. Door latch knob
4. Remote control rod holder
5. Remote control rod
6. Pad
7. Door hinge
8. Shim
9. Check lever
10. Watershield
11. Door latch (Door lock)
12. Door striker
13. Striker seat
14. Base plate
15. Cushion
16. Inner handle
17. Inner handle cover
18. Regulator
19. Regulator handle

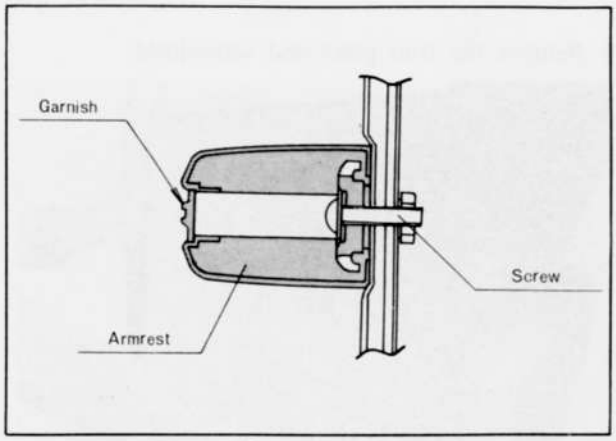


Fig. 14–53 Removing arm rest

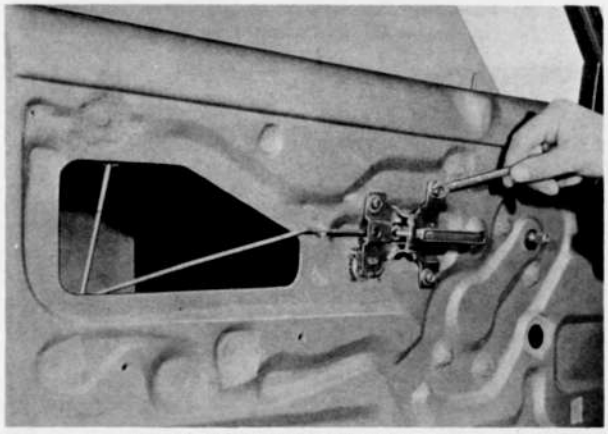


Fig. 14–54 Removing inner handle

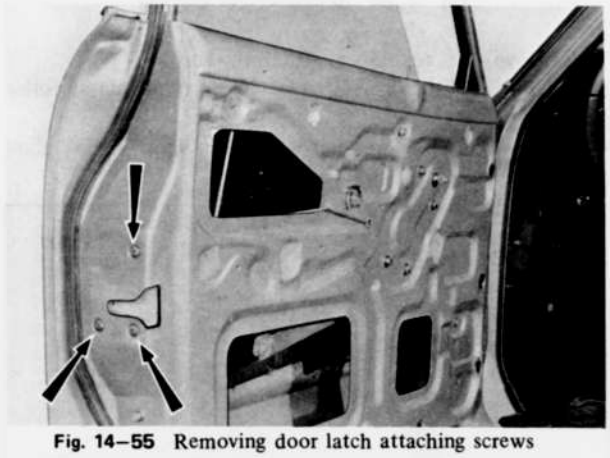


Fig. 14–55 Removing door latch attaching screws

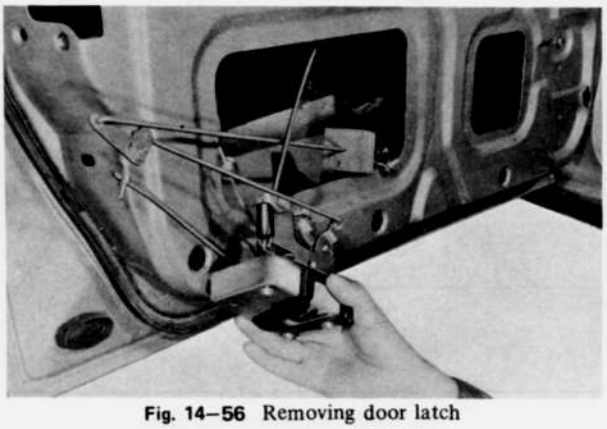


Fig. 14–56 Removing door latch

6. Remove the retainer that secure the lock cylinder to the door inner panel and remove the lock cylinder.

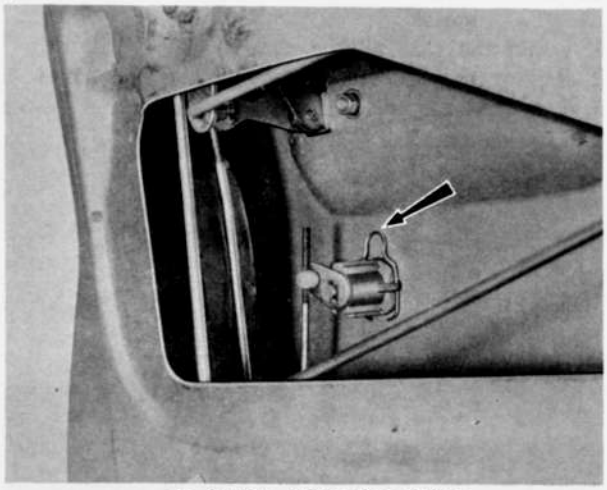


Fig. 14–57 Removing retainer

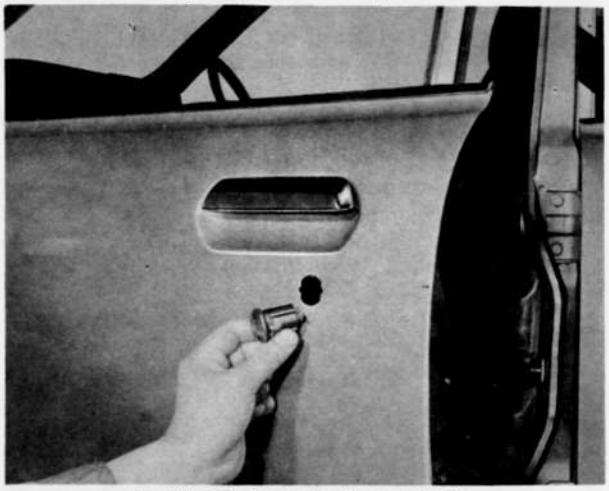


Fig. 14–58 Removing lock cylinder

7. Remove the outer handle by removing the attaching nuts.

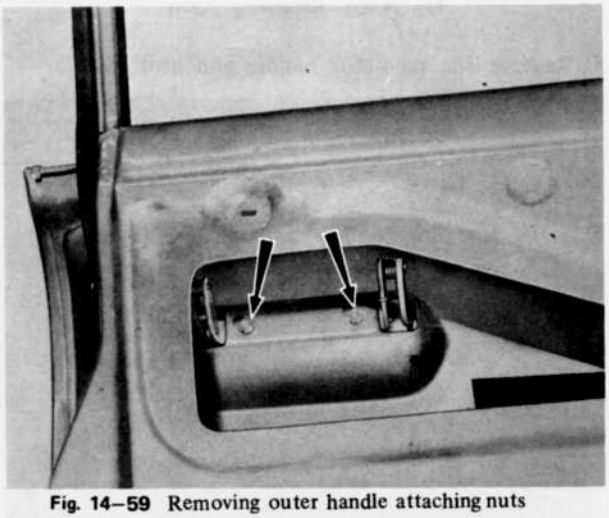


Fig. 14–59 Removing outer handle attaching nuts

b. Installing door latch, lock cylinder and outer handle

Follow the removal procedures in the reverse order.

14–K. QUARTER WINDOW (COUPÉ)

14–K–1. Quarter Window Regulator and Glass Removal

1. Lower the glass all the way.
2. Remove the rear seat as described in **Par. 14–H–1**.
3. Remove the glass stopper as shown in Fig. 14–60.

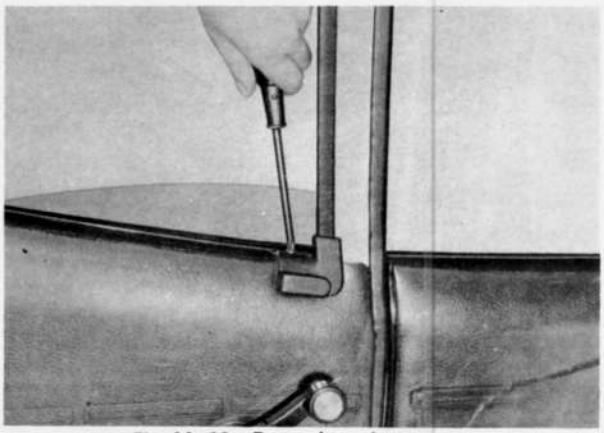


Fig. 14–60 Removing glass stopper

4. Remove the scarf plate attaching screw as shown in Fig. 14–61.

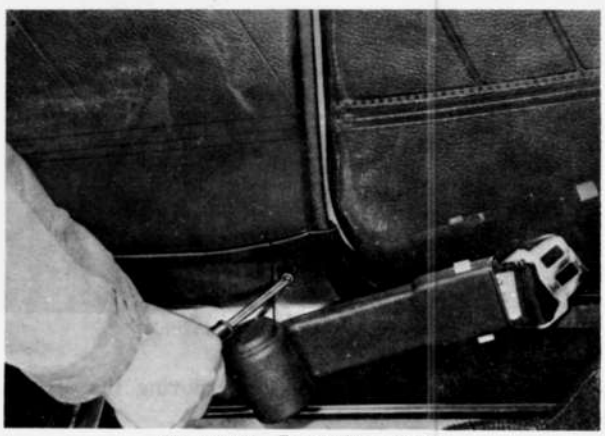


Fig. 14–61 Removing screw

5. Remove the regulator handle and arm rest.



Fig. 14–62 Removing arm rest

6. Remove the trim panel and watershield.

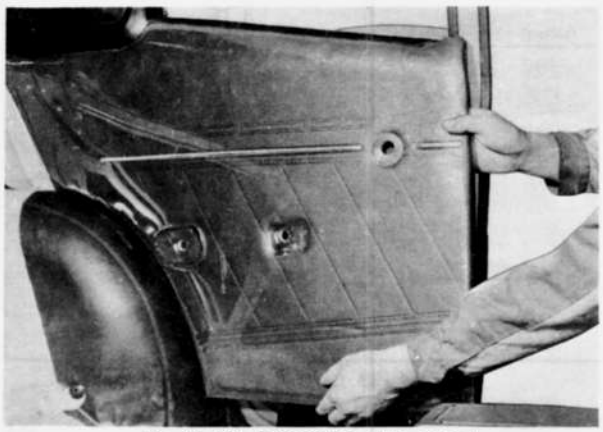


Fig. 14–63 Removing tirm panel

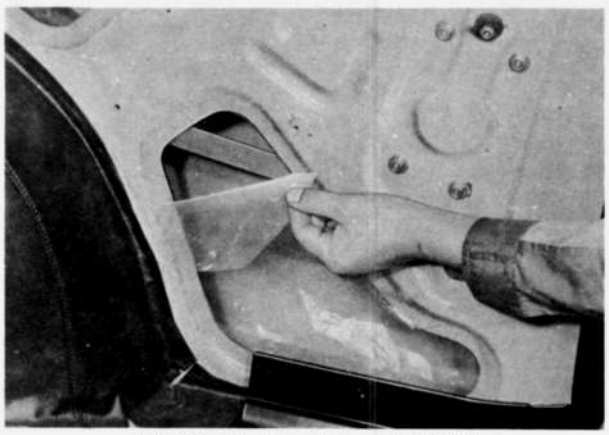


Fig. 14–64 Removing watershield

7. Remove the regulator attaching screws.
8. Disconnect the glass roller from the glass roller guide.
9. Disconnect the regulator roller from the glass channel.

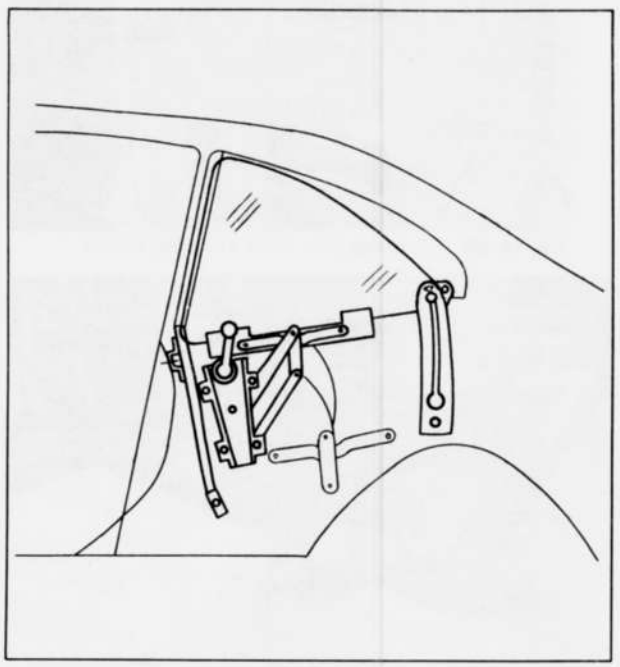


Fig. 14–65 Regulator and glass

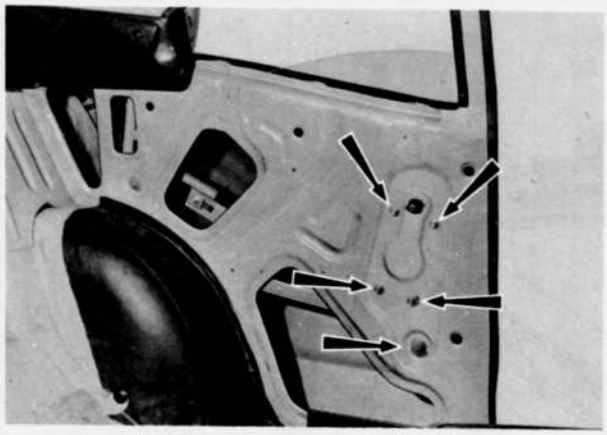


Fig. 14–66 Removing regulator attaching screw

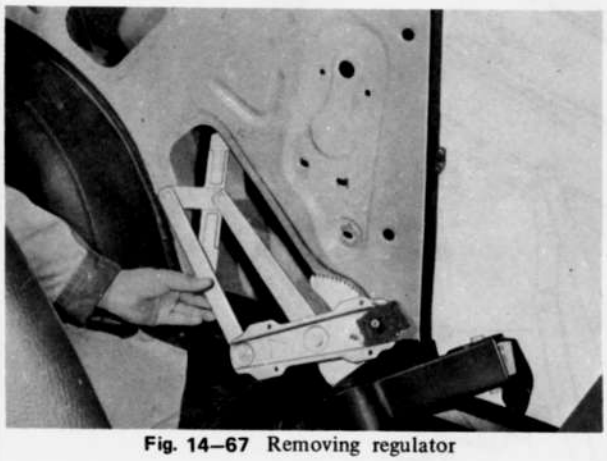


Fig. 14–67 Removing regulator

10. Remove the regulator.
11. Remove the glass.

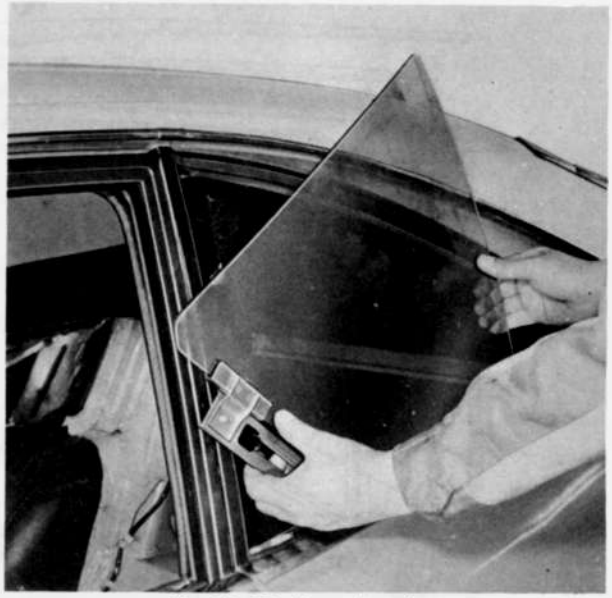


Fig. 14–68 Removing glass

14–K–2. Quarter Window Regulator and Glass Installation

Follow the removal procedures in the reverse order.

Note:
Adjust the regulator and check the operation of the regulator.

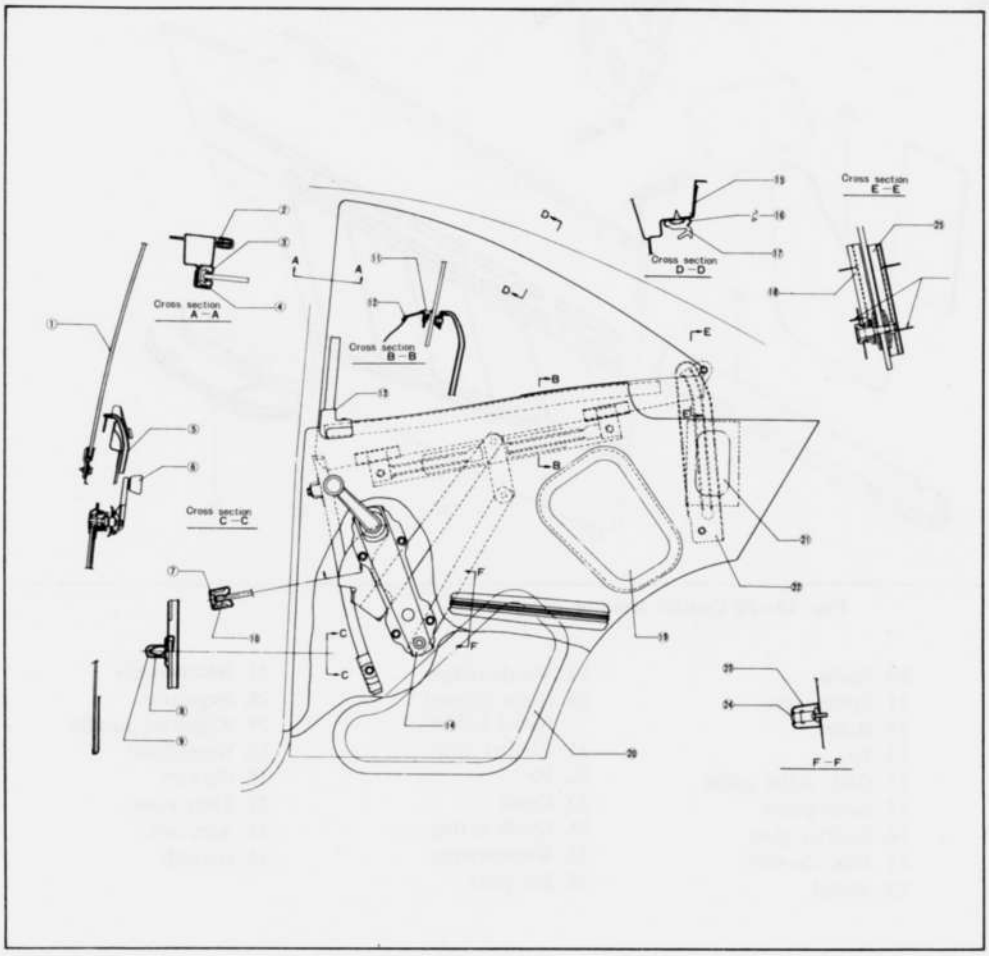


Fig. 14–69 Quarter window

1. Glass
2. Seaming welt
3. Run channel
4. Garnish
5. Trim panel
6. Regulator handle
7. Glass guide
8. Trim fastener
9. Fastener cap
10. Run channel
11. Weatherstrip
12. Mould
13. Glass stopper
14. Regulator
15. Mould
16. Retainer
17. Weatherstrip
18. Weatherstrip
19. Watershield
20. Watershield
21. Watershield
22. Glass roller guide
23. Arm rest
24. Garnish
25. Weatherstrip

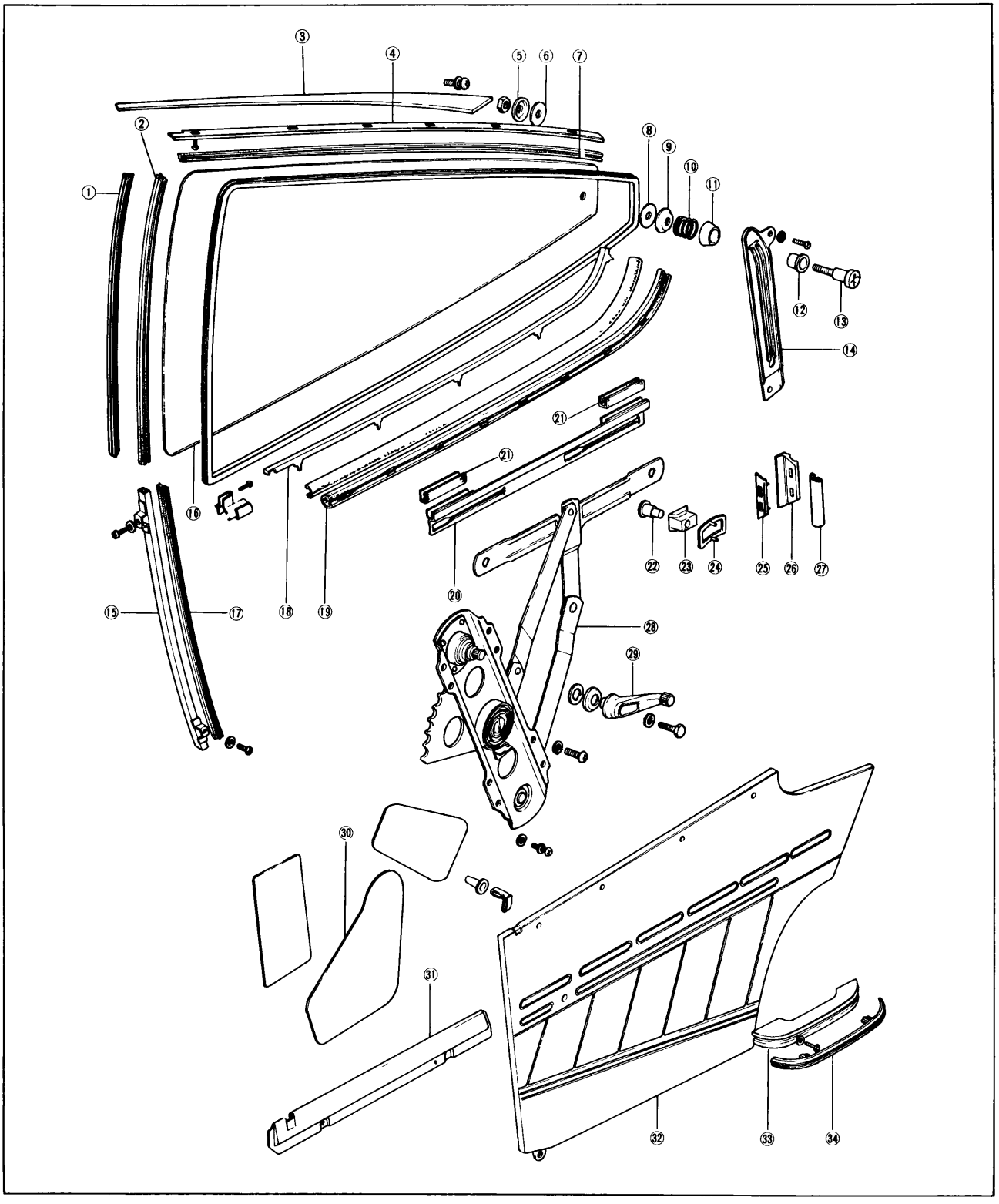


Fig. 14–70 Quarter window components

1. Garnish
2. Run channel
3. Mould
4. Retainer
5. Washer
6. Seat
7. Weatherstrip
8. Seat
9. Washer
10. Spring
11. Spring seat
12. Roller
13. Pin
14. Glass roller guide
15. Glass guide
16. Quarter glass
17. Run channel
18. Mould
19. Weatherstrips
20. Glass channel (Glass holder)
21. Rubber strip
22. Pin
23. Guide
24. Guide spring
25. Weatherstrip
26. Set plate
27. Weatherstrip
28. Regulator
29. Regulator handle
30. Watershield
31. Garnish
32. Trim panel
33. Arm rest
34. Garnish

14–L. TOP CEILING

14–L–1. Top Ceiling Removal

1. Remove the sun visors, interior mirror, interior lamps, coat hanger, etc.



Fig. 14–71 Removing interior lamp

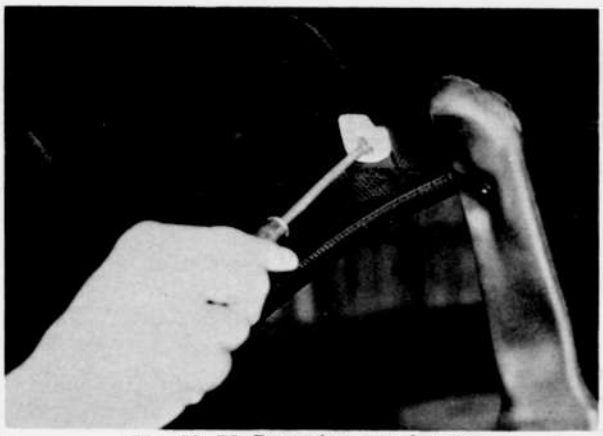


Fig. 14–72 Removing coat hanger

2. Remove the front pillar trims and rear package tray trim panel.

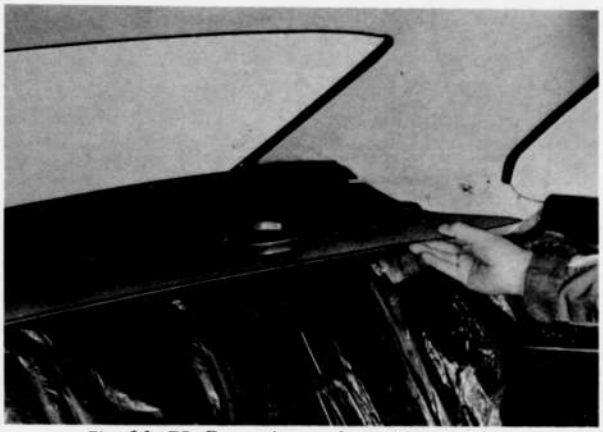


Fig. 14–73 Removing package trim panel

3. Strip off the seaming welts from the body flange and tear the cemented surface of the top ceiling from the outside of the flange.
4. Remove the polyethylene plates of the top ceiling from the inserting points of the body.
5. Remove the listing wires and top ceiling.

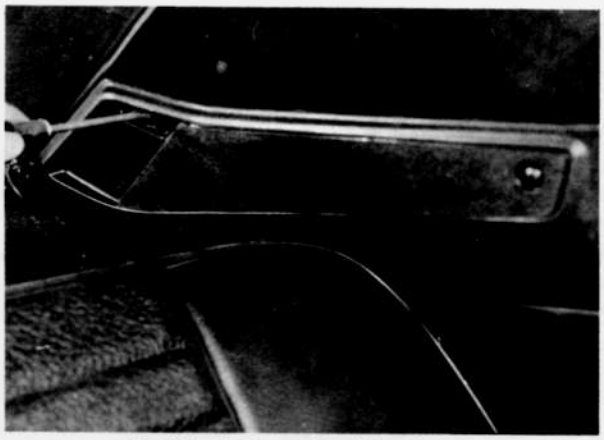


Fig. 14–74 Removing pillar trim



Fig. 14–75 Removing seaming welt

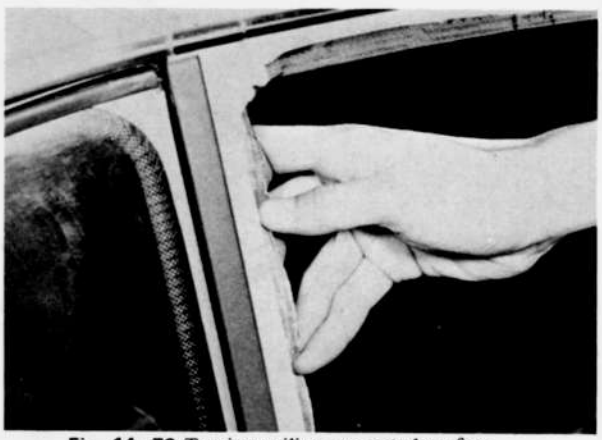


Fig. 14–76 Tearing ceiling cemented surface

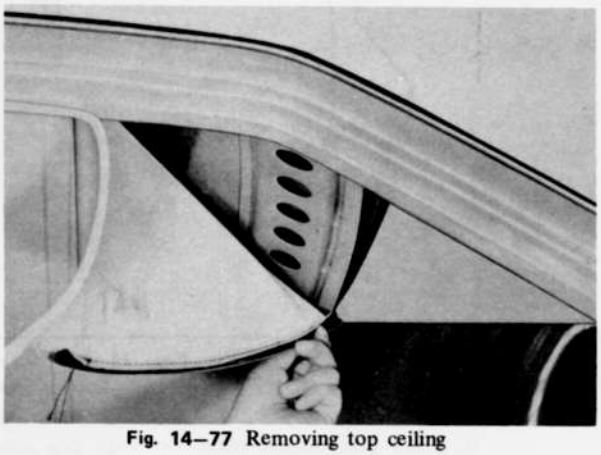


Fig. 14–77 Removing top ceiling

14–L–2. Top Ceiling Installation

Follow the removal procedures in the reverse order.

Note:

(a) After applying the adhesive cement to the outside of the body flange and allow the adhesive cement to dry.

(b) When inserting the polyethylene plates of the top ceiling, if the guide made of platsic plate is used, you can insert it without touching the wearing point.

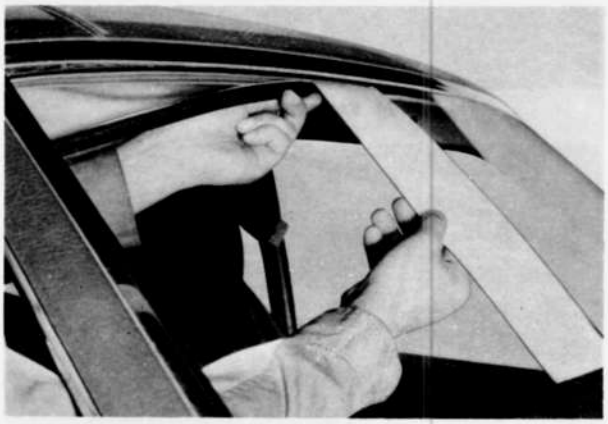


Fig. 14–78 Installing top ceiling

14–M. NOSE PANEL

14–M–1. Nose Panel Removal

1. Remove the hood as described in **Par. 14–A–1.**
2. Remove the front bumper as described in **Par. 14–C–1.**
3. Disconnect the wirings of the turn signal lamps and head lamps.

14–M–2. Nose Panel Installation

Follow the removal procedures in the reverse order and align the nose panel for good fit and appearance.

SPECIAL TOOLS

49 0305 870K	Window service tool set
49 0259 855	Seat reclining knuckle remover

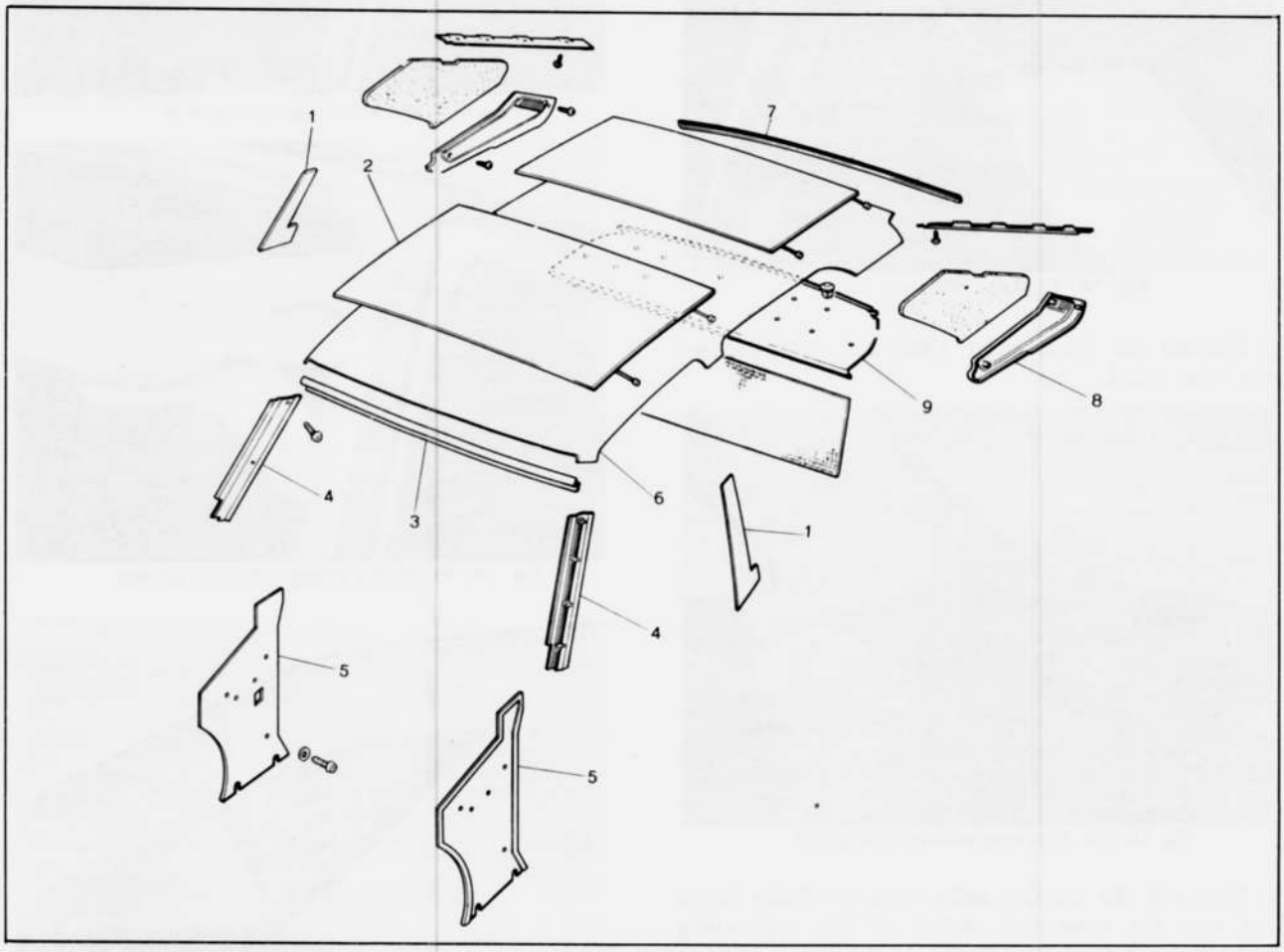
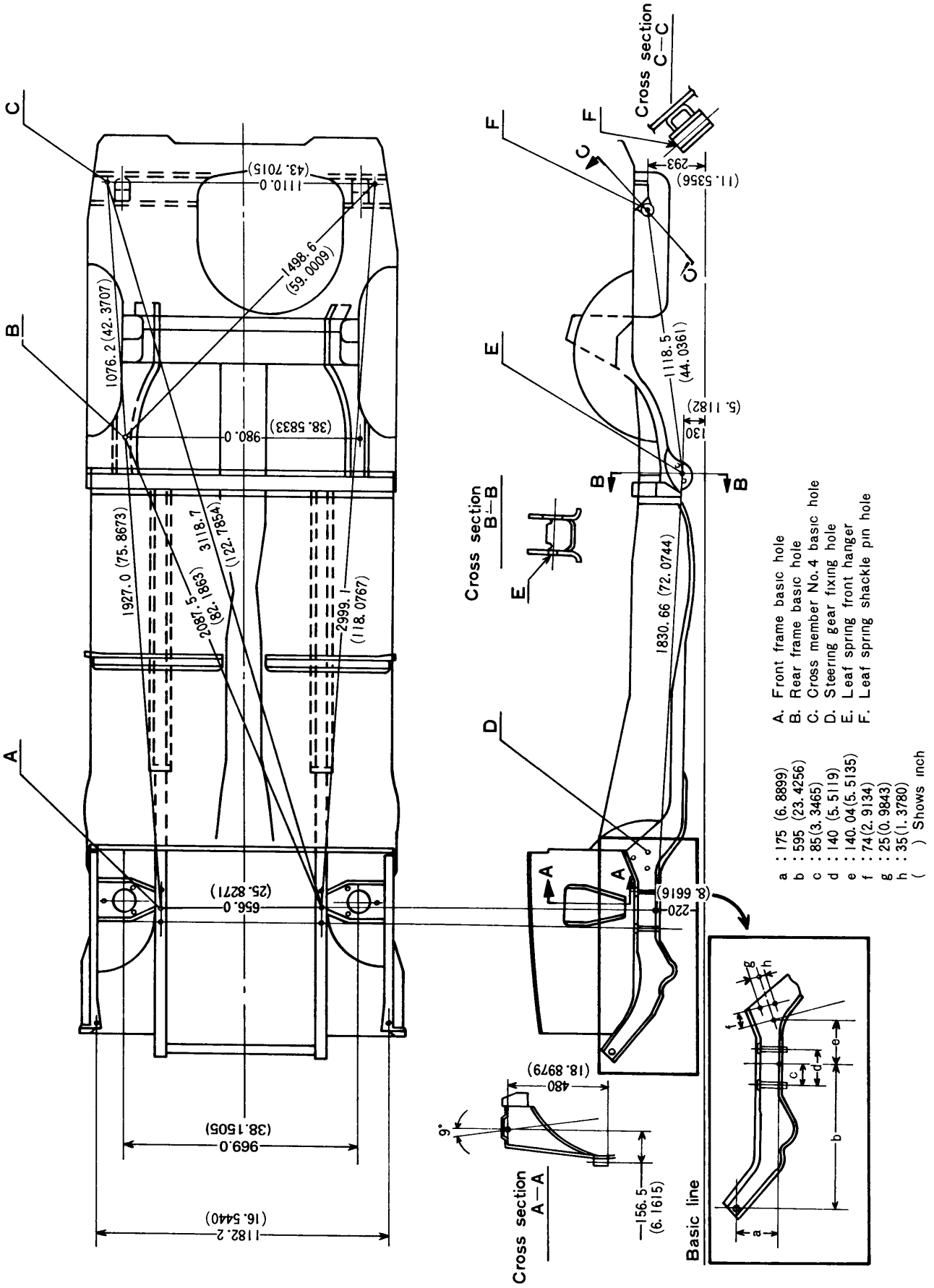


Fig. 14–79 Top ceiling components

1. Center pillar trim
2. Head lining
3. Front polyethylene plate
4. Front pillar trim
5. Front side trim
6. Top ceiling
7. Rear polyethylene plate
8. Rear pillar trim
9. Rear package tray trim panel

BODY CHECKING DIMENSION (COUPÉ)



BODY

RX-3 Rotary Wagon

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DESCRIPTION

The front body of the RX-3 Rotary Wagon is the same as that of their coupé versions. When the seat back is folded forward, the seat back rear surface will be at the same level with the luggage space floor surface.

14A–A. BACK DOOR

14A–A–1. Removing Back Door

1. Open the back door, and remove the back door trim.
2. Disconnect the licence plate light wiring and heatable window wirings (if equipped).

Pull out the wiring harness from the hole (A) of the back door as shown in Fig. 14A–1.

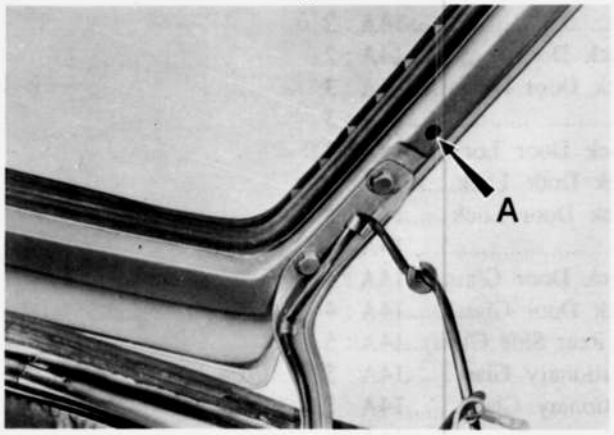


Fig. 14A–1 Disconnecting wiring harness

3. Remove the back door and hinge arm tightening bolts, and remove the back door.

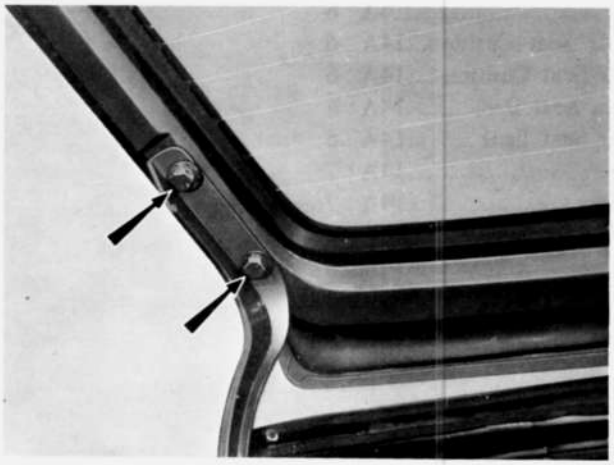


Fig. 14A–2 Removing back door

14A–A–2. Installing Back Door

Follow the removal procedures in the reverse order.

14A–A–3. Adjusting Back Door

1. To adjust the back door for **to-and-fro** position, loosen the back door hinge bracket attaching bolts on the body side and the dovetail attaching screws on the door side.

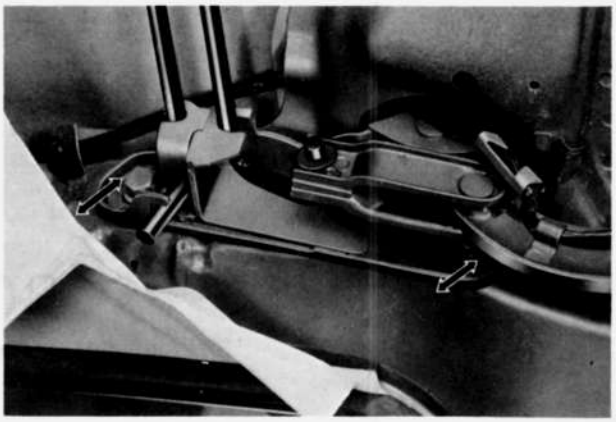


Fig. 14A–3 Adjusting to-and-fro

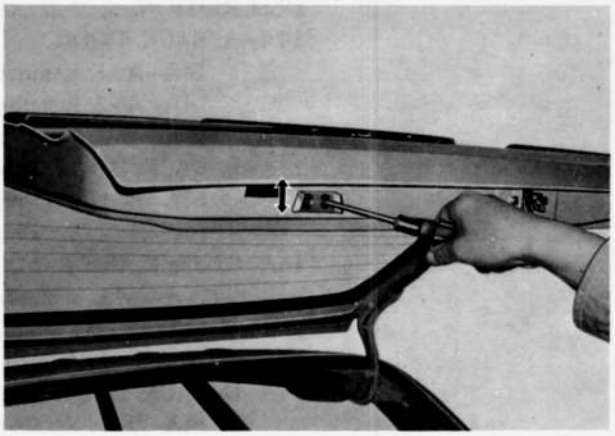


Fig. 14A–4 Adjusting dovetail

2. To adjust the back door for **up-and-down** position, loosen the back door hinge arm tightening bolts on the back door side.

When the up-and-down adjustment is made, the striker also should be adjusted by using the shims.

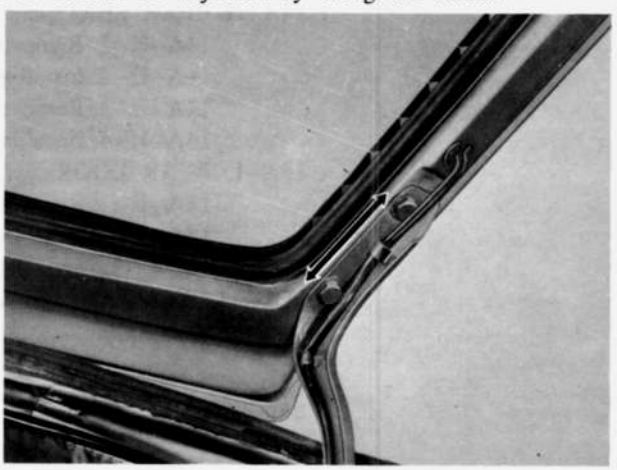


Fig. 14A–5 Adjusting up-and-down

3. Adjust the back door for closing, by moving the back door lock striker as shown in Fig. 14A–6, or inserting the shims of proper thickness between the striker and the body.

The adjusting shims are of 1.0 mm (0.039 in) and 2.0 mm (0.079 in) in thickness.



Fig. 14A–6 Adjusting striker

4. The back door can be shifted from **side to side** by moving the upper wedge to fore-and-aft.

Note:
Care should be taken not to distort the back door or mar the surrounding body.

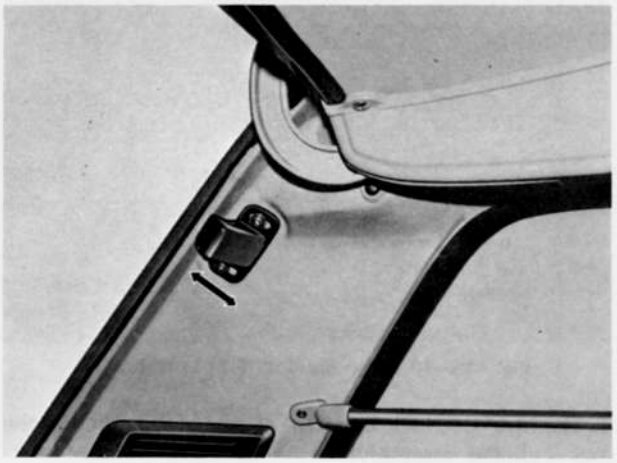


Fig. 14A–7 Adjusting side-to-side

14A–B. BACK DOOR HINGE

14A–B–1. Removing Back Door Hinge

1. Remove the back door as described in **Par. 14A–A–1.**
2. Remove the back door hinge cover attaching screws, and remove the hinge cover.

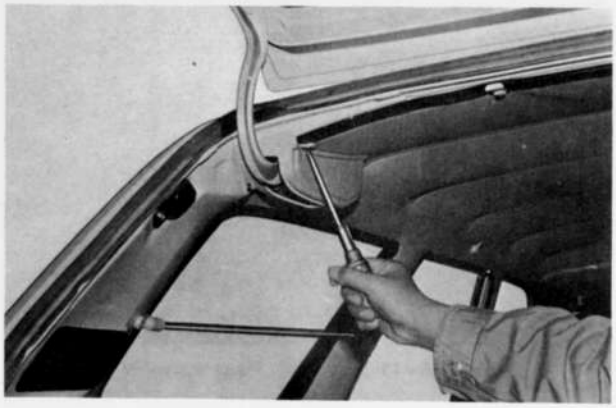


Fig. 14A–8 Removing hinge cover

3. Remove the screws attaching the top ceiling fixing

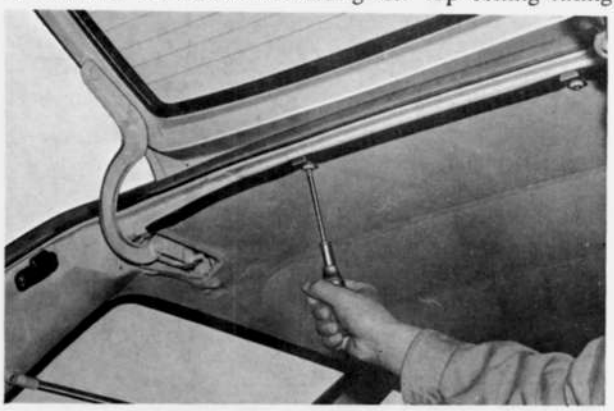


Fig. 14A–9 Removing fixing plate

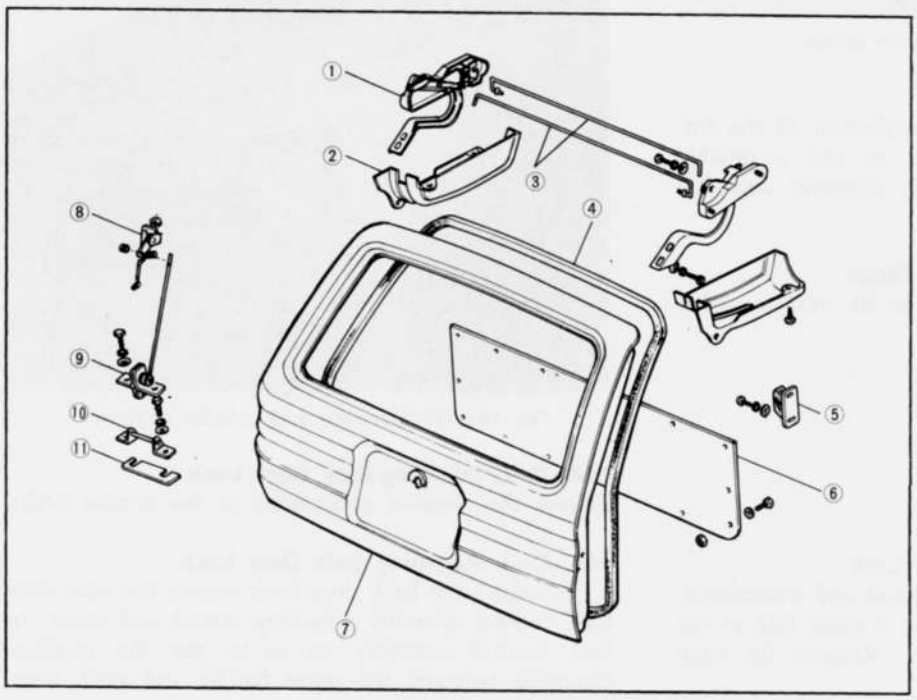


Fig. 14A–10
Back door components

1. Back door hinge
2. Back door hinge cover
3. Torsion springs
4. Weatherstrip
5. Upper wedge
6. Trim board
7. Back door
8. Back door lock control link assembly
9. Back door lock assembly
10. Striker
11. Adjusting shim

plate. Remove the rear end of the top ceiling.
4. Remove the back door hinge bracket attaching bolts, and remove the back door hinge assembly.

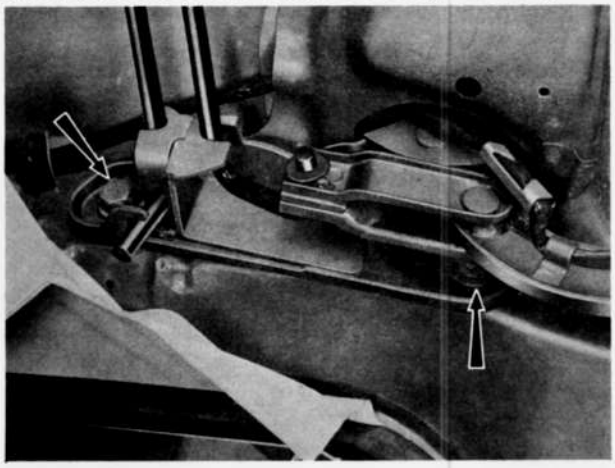


Fig. 14A–11 Removing hinge assembly

5. Hold the back door hinge assembly in a vice.
6. Remove the torsion springs with a suitable tool as shown in Fig. 14A–12.

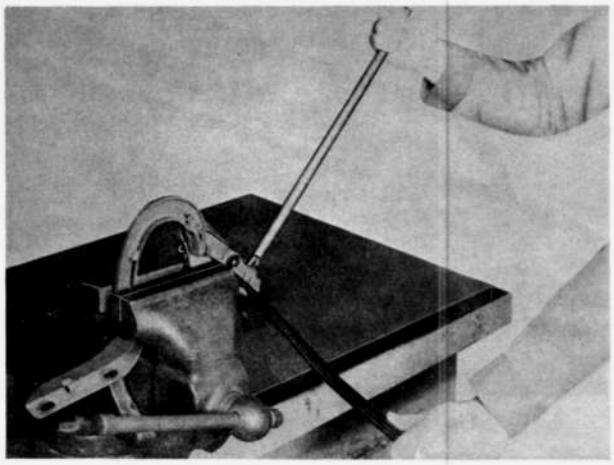


Fig. 14A–12 Removing torsion springs

Note:
To perform the removal and installation of the torsion spring, it is recommended to use a suitable pipe of 9 mm (0.35 in) in inner diameter and 400 mm (15.7 in) in length.

14A–B–2. Installing Back Door Hinge
Follow the removal procedures in the reverse order.

14A–C BACK DOOR LOCK

14A–C–1. Removing Back Door Lock
1. Remove the back door trim board and watershield.
2. Disconnect the back door lock control link at the joint as shown in Fig. 14A–13. Remove the back door lock control assembly.

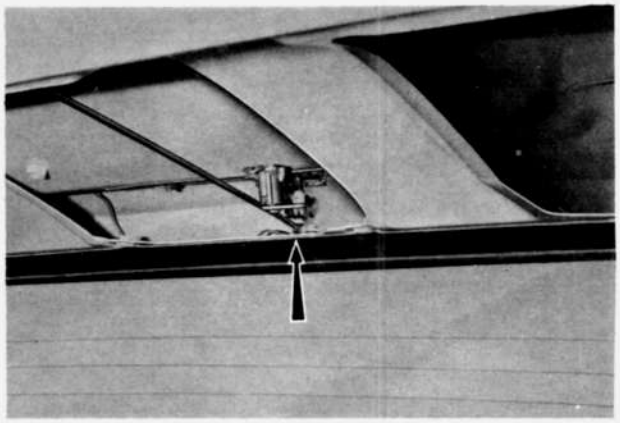


Fig. 14A–13 Disconnecting door lock control link

3. Remove the two back door lock attaching bolts, and remove the back door lock assembly.

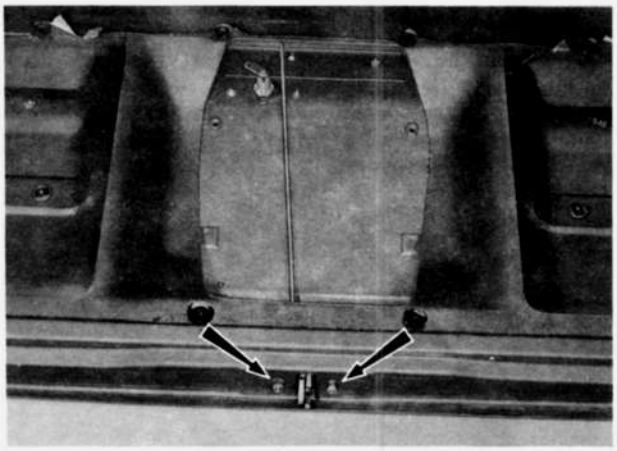


Fig. 14A–14 Removing door lock assembly

4. Remove the lock cylinder retainer, and remove the lock cylinder assembly.

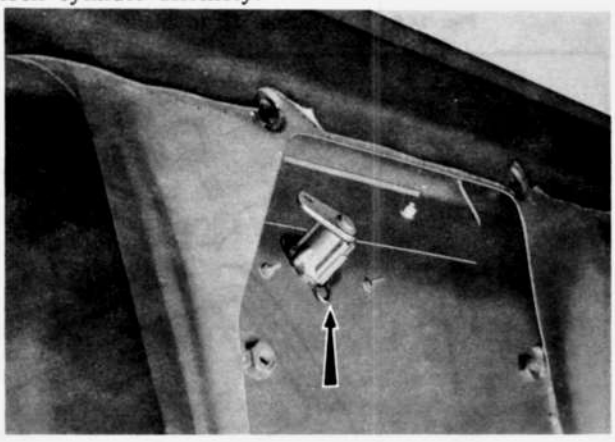


Fig. 14A–15 Removing lock cylinder retainer

14A–C–2. Installing Back Door Lock
Follow the removal procedures in the reverse order.

14A–C–3. Adjusting Back Door Lock
1. To adjust the back door lock, loosen the back door lock control assembly attaching screws and move the lock control assembly so as to give the specified clearance between the outer handle and push lever.

The specified clearance should be **0.5 ~ 1.5 mm (0.02 ~ 0.06 in)**. Tighten the screws attaching the back door lock control assembly and apply lubricant to the assembly.

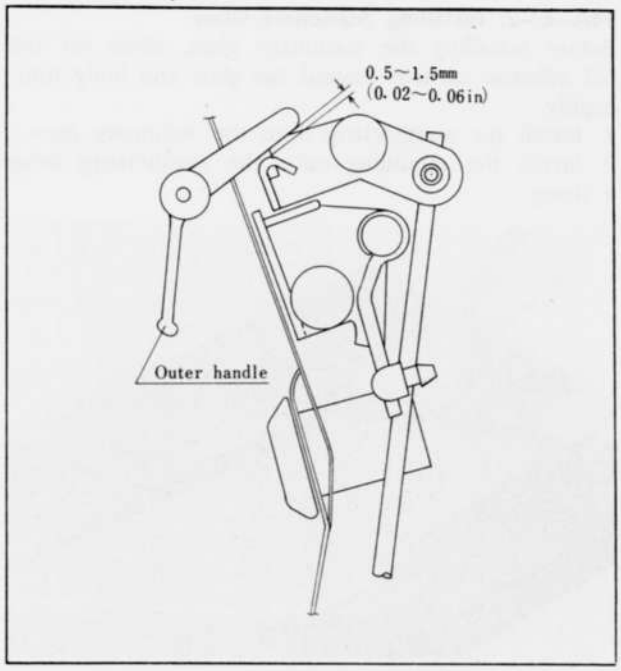


Fig. 14A–16 Adjusting door lock control assembly

2. To adjust the back door lock striker, refer to **Par. 14A–A–3, 3**.

14A–D. BACK DOOR GLASS

14A–D–1. Removing Back Door Glass

1. Remove the back door trim board and disconnect the heatable window wirings from the wiring harness.
2. Tear the weatherstrip cemented surface from the body with a wooden spatula.
3. Drive out the inner lip of the weatherstrip with a suitable tool from the inside of the vehicle while pushing the back door glass outwards.

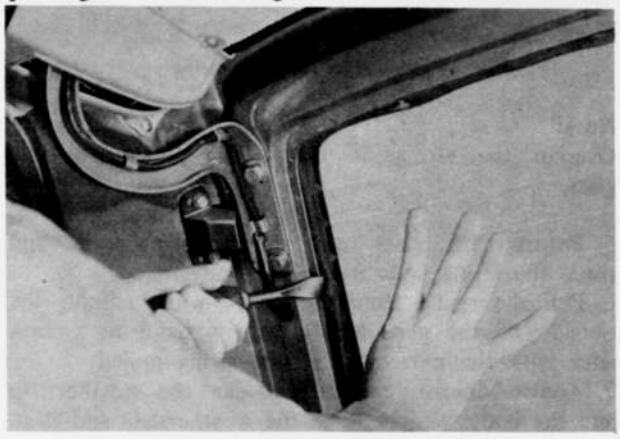


Fig. 14A–17 Drive out weatherstrip

4. Remove the back door glass together with the weatherstrip.
5. Remove the moulding and glass from the weatherstrip.

Note:
When removing the heatable window, be careful not to damage the filament surface.

14A–D–2. Installing Back Door Glass

Before installing the back door glass, clean off the old adhesive cement around the glass and body thoroughly.
1. Install the weatherstrip onto the back door glass and align the corners of the weatherstrip and glass.

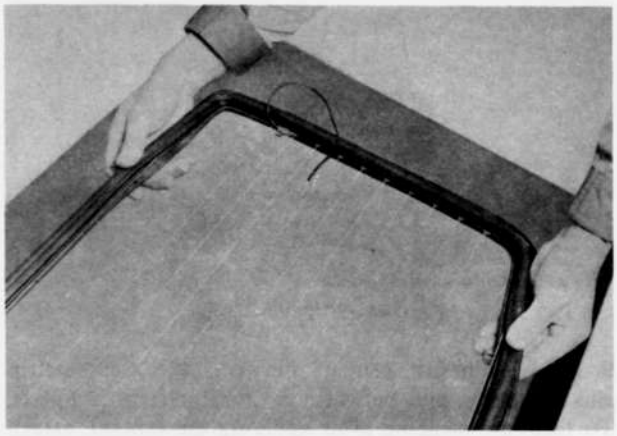


Fig. 14A–18 Installing weatherstrip

2. Fit a string of 4 mm (0.16 in) in diameter into the mould fitting groove of the weatherstrip with a suitable tool.
3. Apply water and soap lightly onto the weatherstrip groove.
4. Connect the right, left, upper and lower mouldings with four joints. Push the moulding against the groove of the weatherstrip and pull the string to fit the moulding.
5. Apply water and soap lightly onto the weatherstrip groove, which is fitted to the body flange.
6. Insert a string into the weatherstrip groove by using a suitable tool.

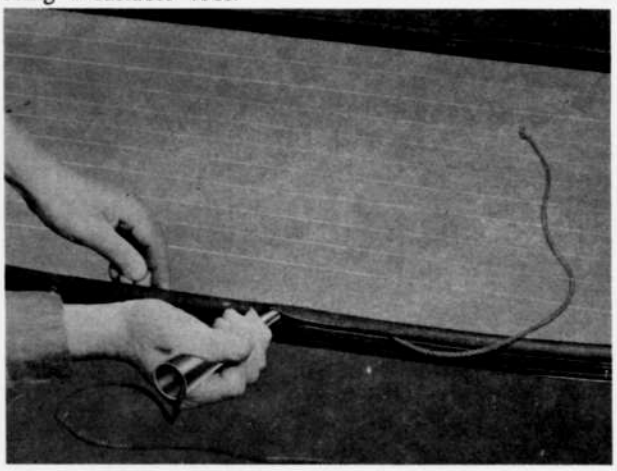


Fig. 14A–19 Inserting string

Note:
Overlap the string at the center portion of the glass.

7. Position the glass onto the body properly, and place the string ends inside the body. To facilitate the procedure, apply water and soap lightly onto the body flange.
8. Pull the string from the inside while tapping the outside of the glass lightly with a hand in accordance with the movement of the string pulled.

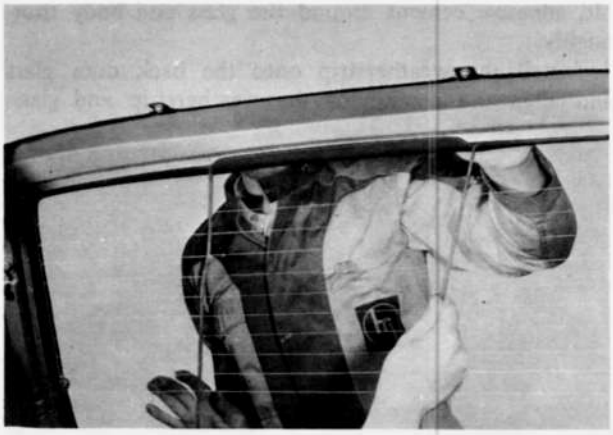


Fig. 14A–20 Pulling string

9. Apply adhesive cement between the weatherstrip and the body, and between the weatherstrip and glass. To facilitate cleaning after applying the cement, attach a suitable tape onto the glass and body.
10. Clean off the excessive adhesive cement together with the tape.

14A–E. STATIONARY GLASS (Rear Side Glass)

14A–E–1. Removing Stationary Glass

1. Remove the guard pipe (if equipped).
2. Drive out the inner lip of the weatherstrip with a suitable tool from the inside of the vehicle while pushing the stationary glass.

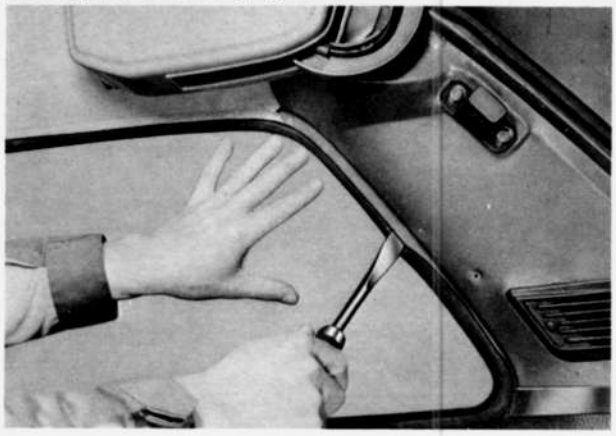


Fig. 14A–21 Drive out weatherstrip

3. Remove the stationary glass together with the weatherstrip.
4. Remove the mould and glass from the weatherstrip.

14A–E–2. Installing Stationary Glass

Before installing the stationary glass, clean off the old adhesive cement around the glass and body thoroughly.
1. Install the weatherstrip onto the stationary glass.
2. Install the moulding onto the weatherstrip using a string.

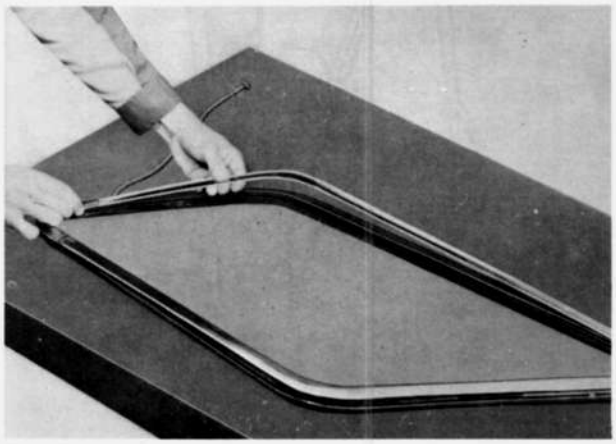


Fig. 14A–22 Installing moulding

3. Apply water and soap lightly onto the weatherstrip groove, which is fitted to the body flange.
4. Insert a string into the weatherstrip groove by using a suitable tool.

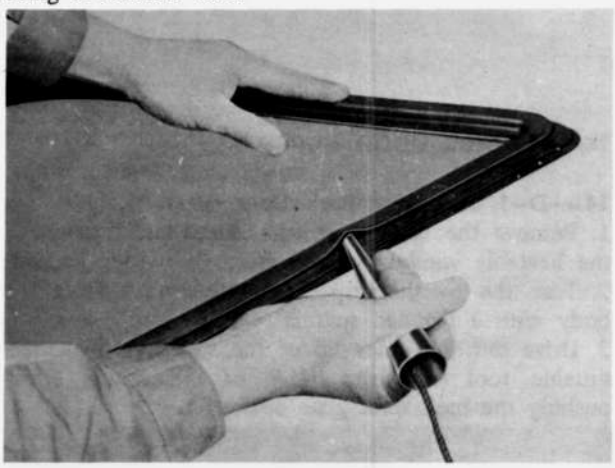


Fig. 14A–23 Inserting string

Note:
Overlap the string at the center portion of the glass.

5. Position the glass onto the body properly, and place the string ends inside the body.
6. Pull the string from the inside while tapping the outside of the glass lightly with a hand in accordance with the movement of the string pulled.
7. Apply adhesive cement between the weatherstrip and the body, and between the weatherstrip and glass.
8. Clean off the excessive adhesive cement.

14A–F. TOP CEILING

To remove and install the top ceiling, refer to **Par. 14–L (TOP CEILING)** on page 14–18.

14A–G. SEAT BACK LOCK

14A–G–1. Removing Seat Back Lock

1. Fold the rear seat back frontward.
2. Remove the rear side trim.
3. Drill a hole of 5.0 mm (0.20 in) in diameter into the rivet hole which holds the seat back lock on the body.
4. Remove the seat back lock assembly from the body.

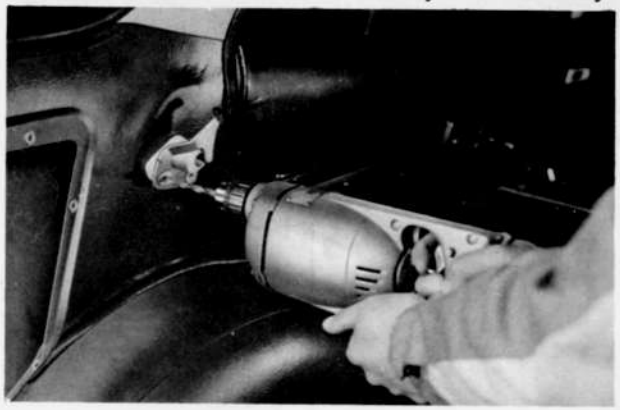


Fig. 14A–24 Drilling hole

14A–G–2. Installing Seat Back Lock

Place the seat back stopper, bush, return spring and lock plate on the body, and insert the rivet into the rivet hole of the body through the lock plate hole. Securely fix the seat back lock assembly with a suitable rivet gun as shwon in Fig. 14A–25.

Note:

There are two types of rivets, the long one is for the seat back lock plate and the other short one for the seat back stopper.



Fig. 14A–25 Securing seat back lock assembly

14A–H. REAR SEAT

14A–H–1. Removing Rear Seat Cushion

1. Lift up the rear end of the rear seat cushion.
2. Remove the clips from the hinge pins and pull out the hinge pins.

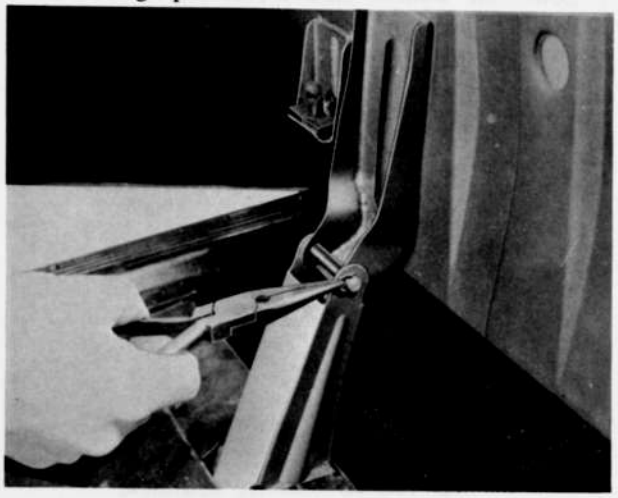


Fig. 14A–26 Removing clip

3. Remove the rear seat cushion.

14A–H–2. Installing Rear Seat Cushion

Follow the removal procedures in the reverse order.

14A–H–3. Removing Rear Seat Back

1. Fold the rear seat back frontward.
2. Remove the screws attaching the floor mat and remove the floor mat.
3. Bend back and straighten the tabs that secure the retainer to the bracket and remove the retainer from the rear seat back bracket.

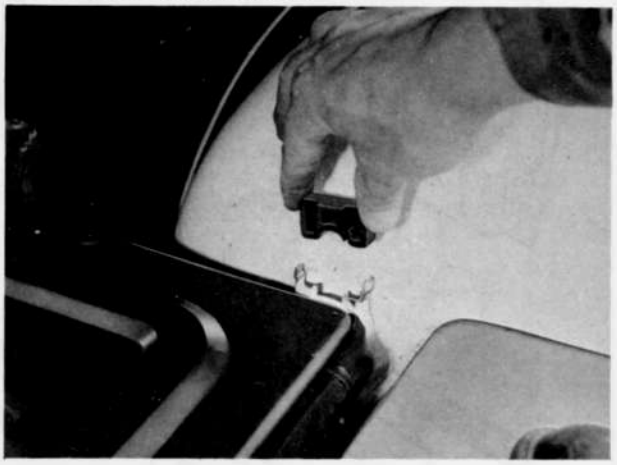


Fig. 14A–27 Removing retainer

4. Remove the rear seat back.

14A–H–4. Installing Rear Seat Back

Follow the removal procedures in the reverse order.

14–I. REAR DOOR

14–I–1. Stationary Glass

a. Removing stationary glass

1. Lower the window glass all the way.
2. Remove the trim panel and watershield.

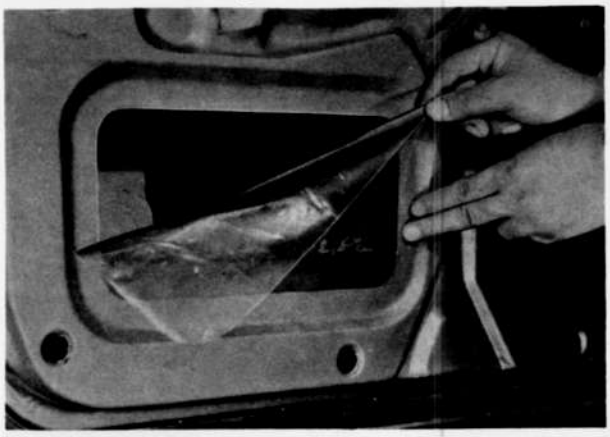


Fig. 14A–28 Removing watershield

3. Remove the screws attaching the upper end of the division bar to the window frame.

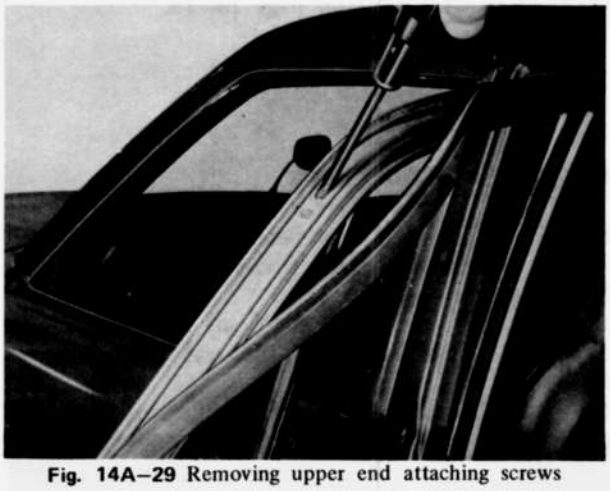


Fig. 14A–29 Removing upper end attaching screws

4. Remove the bolt attaching the lower end of the division bar to the door panel.
5. Pull the division bar off the stationary glass and

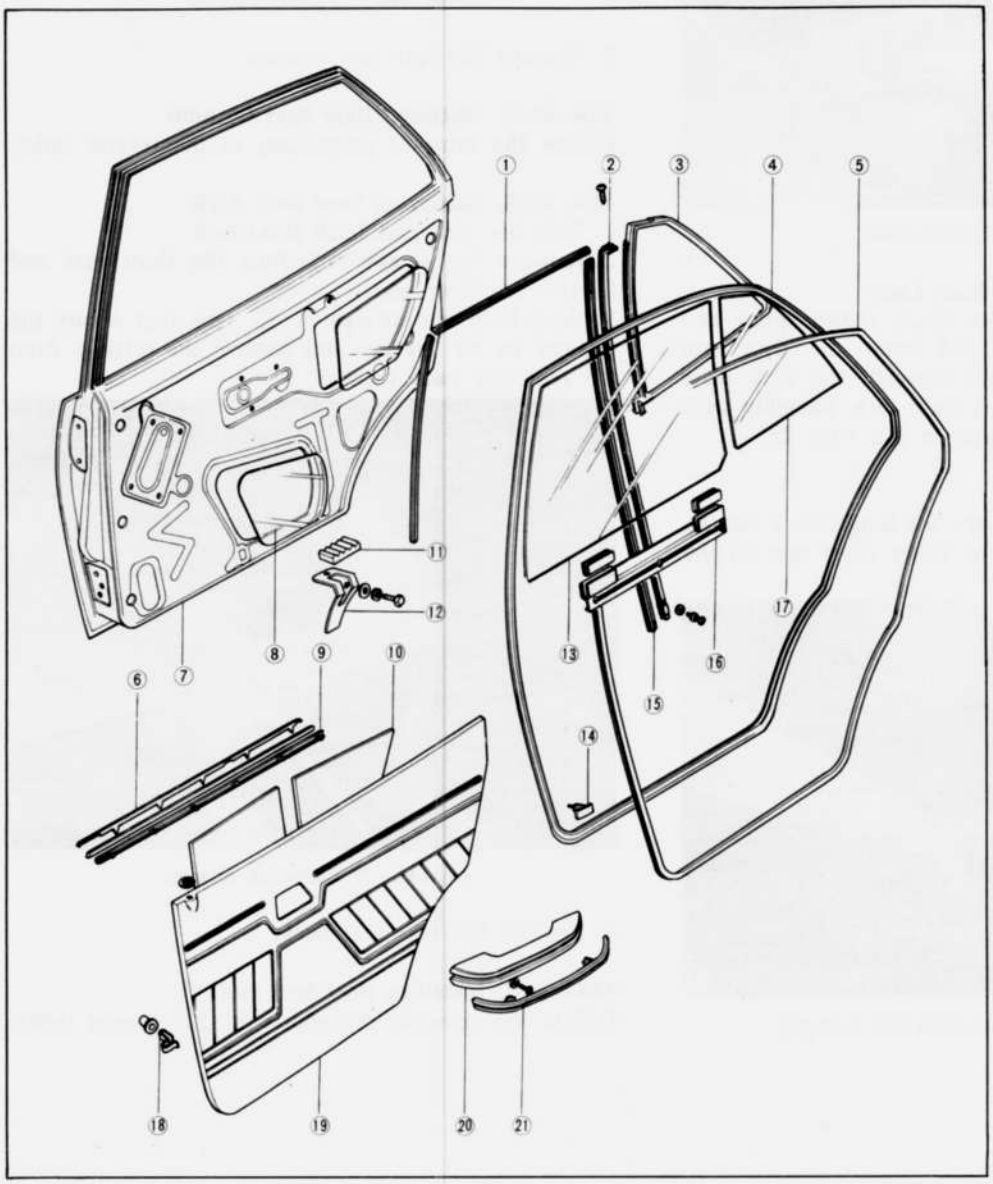


Fig. 14A–30 Rear door glass

1. Run channel
2. Division bar (sash)
3. Weatherstrip
4. Weatherstrip
5. Seaming welt
6. Mould
7. Rear door
8. Watershield
9. Weatherstrips
10. Insulation
11. Pad
12. Glass stop
13. Rear glass
14. Weatherstrip retaining clip
15. Run channel
16. Glass channel (Glass holder)
17. Stationary glass
18. Trim panel fastener
19. Trim panel
20. Arm rest
21. Garnish

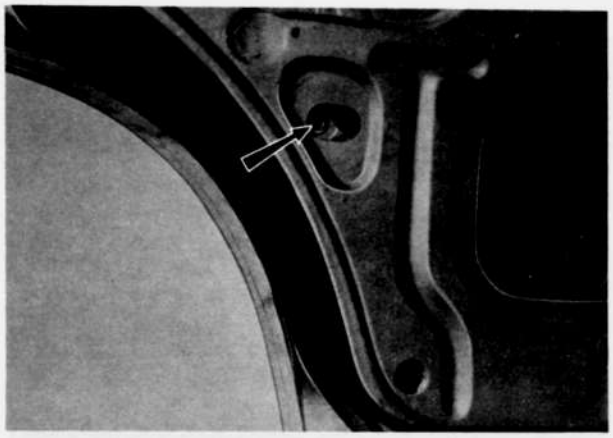


Fig. 14A–31 Removing lower end attaching bolt

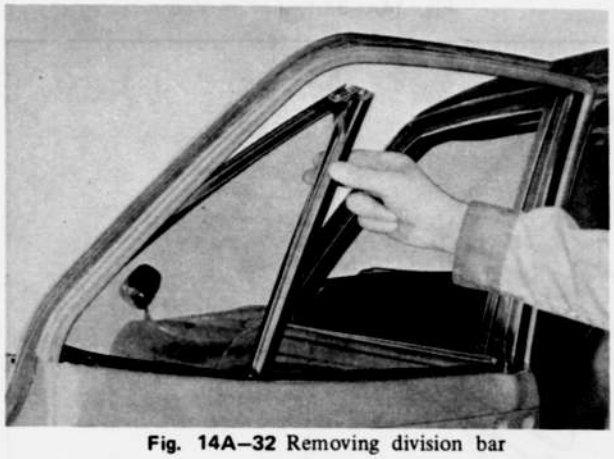


Fig. 14A–32 Removing division bar

remove the stationary glass.
6. Remove the weatherstrip from the stationary glass.

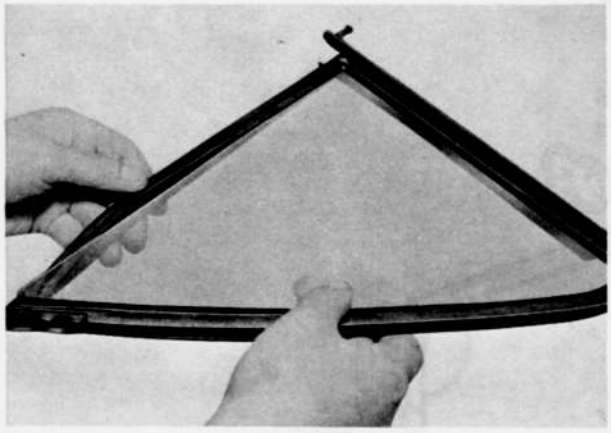


Fig. 14A–33 Removing weatherstrip

b. Installing stationary glass
Follow the removal procedures in the reverse order.

14–I–2. Rear Door Window Regulator and Glass

a. Removing rear door window regulator and glass
1. Lower the window glass all the way.
2. Remove the regulator handle, arm rest, door latch knob, etc.
3. Remove the trim panel and watershield.

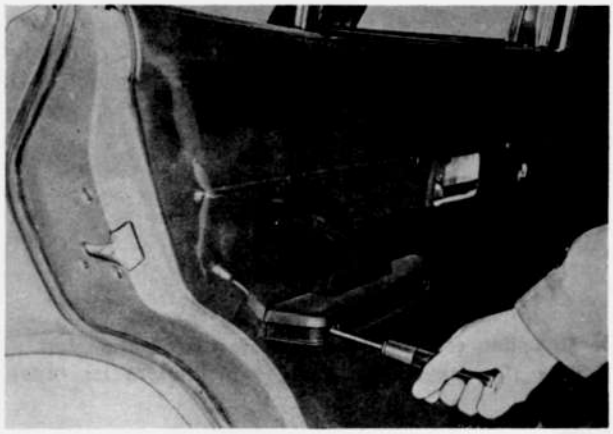


Fig. 14A–34 Removing arm rest

4. Remove the screws attaching the upper end of the division bar to the window frame.
5. Remove the bolt attaching the lower end of the division bar to the door panel.
6. Remove the division bar.



Fig. 14A–35 Removing division bar

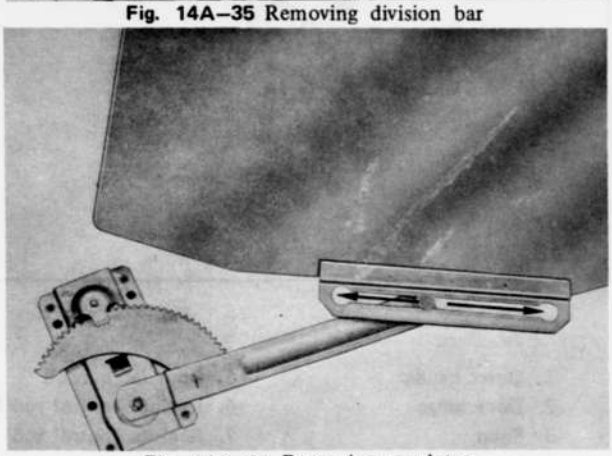


Fig. 14A–36 Removing regulator

7. Remove the regulator attaching bolts and disconnect the regulator roller from the glass channel, then remove the regulator assembly.
8. Remove the glass.



Fig. 14A–37 Removing glass

b. Installing rear door window regulator and glass
Follow the removal procedures in the reverse order.

Note:
Adjust the regulator and check the operation of the regulator.

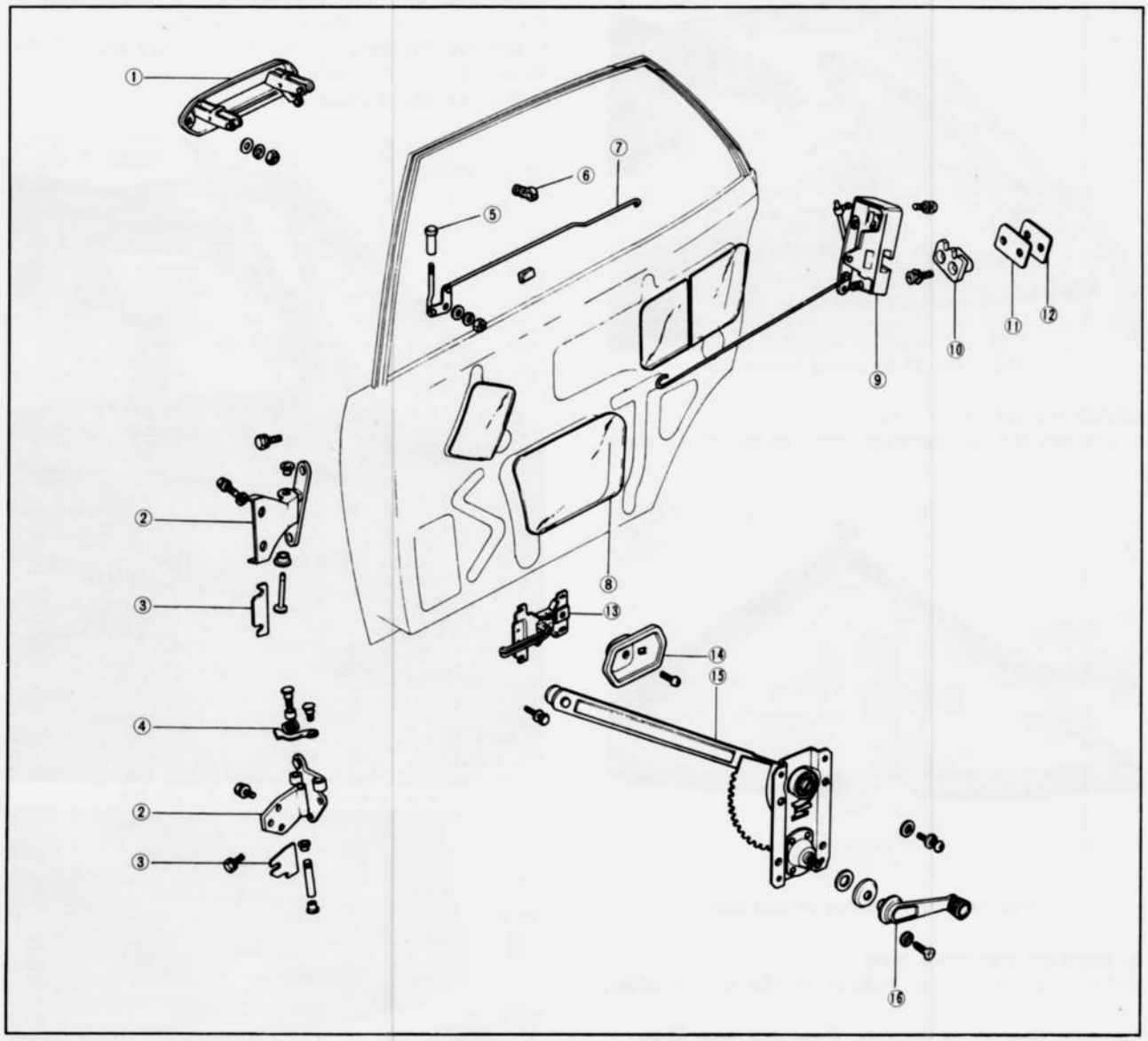
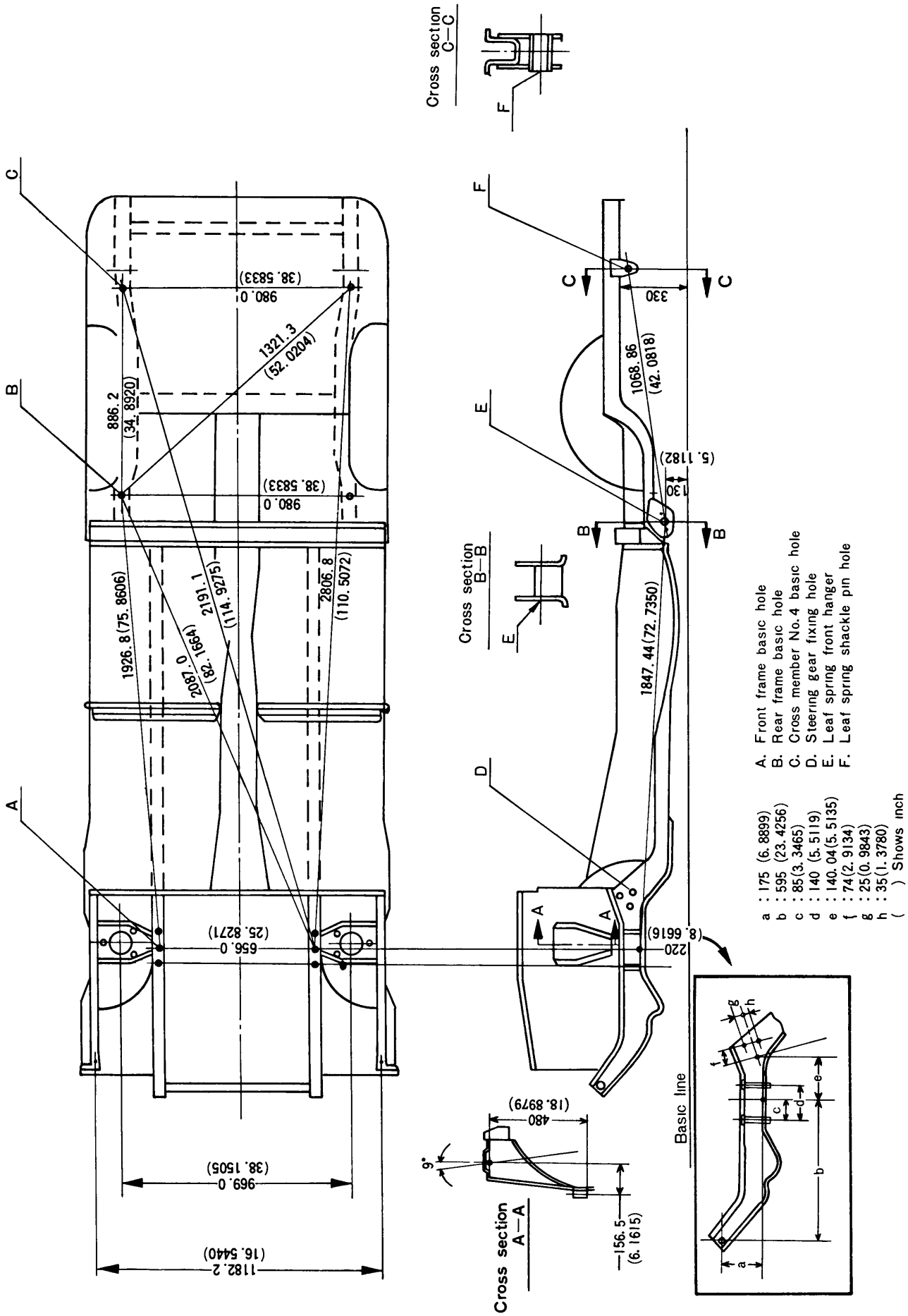


Fig. 14A–38 Rear door regulator components

1. Outer handle
2. Door hinge
3. Shim
4. Check lever
5. Door latch knob
6. Remote control rod holder
7. Remote control rod
8. Watershield
9. Door latch (Door lock)
10. Door striker
11. Striker seat
12. Base plate
13. Inner handle
14. Inner handle cover
15. Regulator
16. Regulator handle

BODY CHECKING DIMENSION (ROTARY WAGON)



ELECTRICAL SYSTEM (BODY)

DESCRIPTION ..... 15 : 1
15–A. COMBINATION SWITCH ..... 15 : 1
15–A–1. Checking Combination Switch .. 15 : 1
15–B. IGNITION SWITCH ..... 15 : 2
15–B–1. Checking Ignition Switch ..... 15 : 2
15–C. HEATER FAN SWITCH ..... 15 : 2
15–C–1. Checking Heater Fan Switch .... 15 : 2
15–D. INHIBITOR SWITCH ..... 15 : 3
15–D–1. Checking Inhibitor Switch ..... 15 : 3
15–E. CENTRAL CONTROL UNIT ..... 15 : 3
15–E–1. Checking Central Control Unit ..... 15 : 3
15–F. WIPER MOTOR ..... 15 : 4
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15–G. METER ..... 15 : 4
15–G–1. Checking Meter Set ..... 15 : 4

DESCRIPTION

As a simple method of inspecting each unit of the body electrical equipment, a circuit tester has been taken up in the Workshop Manual. In this case, however, possible contact resistance is not taken into account. Accordingly, please note that even when the circuit tester shows that the continuity to a unit is satisfactory, in case contact resistance has increased, there is a possibility of the unit not working properly. So pay due attention to this point.

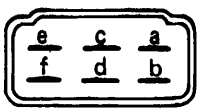
15–A. COMBINATION SIWTCH

15–A–1. Checking Combination Switch

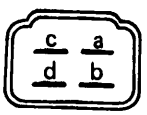
Check the continuity between the coupler terminals using the circuit tester according to the following switch interconnection diagram.

1. Turn Signal and Hazard Switch

Switch Position \ Terminal	TFU	HFU	TL	TR	TIG	TFB	HBA	HFB	SS	SS	
Right Turn	●			●	●	●					Turn Signal
Neutral					●	●					
Left Turn	●		●		●	●					
OFF							●				Hazard
ON		●	●	●			●	●	●	●	



a : TIG ..... Turn signal switch power source (GY)
b : TFB ..... Turn signal flasher switch power source (GL)
c : TL ..... Turn signal left (GB)
d : HFB ..... Hazard flasher power source (WG)
e : HBA ..... Hazard switch power source (WL)
f : TR ..... Turn signal right (G)



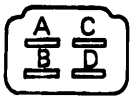
a : TFU ..... Turn signal flasher unit (GR)
b : E ..... Earth (B)
c : HFU ..... Hazard flasher unit (WB)
d : HO ..... Horn switch power source (G)
SS ..... Stop switch (Lg)
SS ..... Stop switch (Lg)
Refer to Fig. 15–3

Fig. 15–1 Turn signal and hazard switch interconnection diagram

2. Wiper and Washer Switch

Switch Position \ Terminal	E	SWL	SWH	INT	SW	
OFF	●					
LOW	●	●				Wiper
HIGH	●		●			
INT	●			●		
OFF	●					Washer
ON	●				●	

E ..... Earth (B), Refer to Fig. 15–1

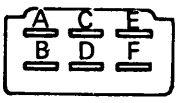


A : SW ..... Washer switch (L)
B : SWL ..... Wiper LOW (W)
C : SWH ..... Wiper HIGH (R)
D : INT ..... Wiper INTERMIT (G)

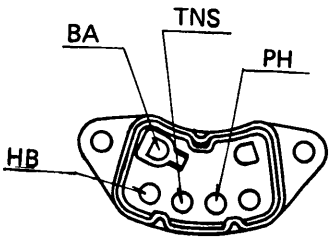
Fig. 15–2 Wiper and washer switch interconnection diagram

3. Light, Dimmer and Passing Switch

Terminal / Switch Position	BA	PH	TNS	HB	HU	HL	
OFF							
Tail, Side, Licence	●	●					Light
Head Lamp	●	●	●				
Upper				●			
Lower				●	●		Dimmer
OFF							
ON		●	●	●	●		Passing



A : BA ..... Power source (R)
B : TNS..... Tail, licence and side lamp (RG)
C : SS ..... Stop switch (Lg)
D : SS ..... Stop switch (Lg)
E : HU ..... Head lamp upper (RW)
F : HL ..... Head lamp lower (RB)



Note:
The terminals PH and HB are connected inside the switch and are not on the coupler. So, please refer to the left diagram.

Fig. 15–3 Light, dimmer and passing switch interconnection diagram

15–B. IGNITION SWITCH

15–B–1. Checking Ignition Switch

Check the continuity between the switch terminals using the circuit tester according to Fig. 15–4, interconnection diagram.

Terminal / Switch Position	B	IG	S	A	R
ACC	●			●	
ON	●	●		●	
START	●	●	●		●

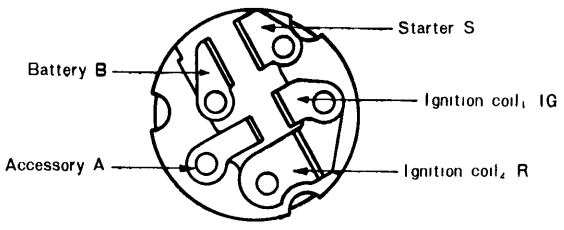


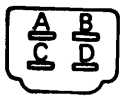
Fig. 15–4 Ignition switch interconnection diagram

15–C. HEATER FAN SWITCH

15–C–1. Checking Heater Fan Switch

Check the continuity between the coupler terminals using the circuit tester according to Fig. 15–5.

Terminal / Switch Position	BA	L	M	H
OFF	●			
LOW	●	●		
MID.	●		●	
HIGH	●			●



A : L..... Heater low (LW)
B : H..... Heater high (LY)
C : BA ..... Power source (LB)
D : M..... Heater medium (LR)

Fig. 15–5 Heater fan switch interconnection diagram

15–D. INHIBITOR SWITCH

15–D–1. Checking Inhibitor Switch

Check the continuity between the coupler terminals using the circuit tester according to Fig. 15–6.

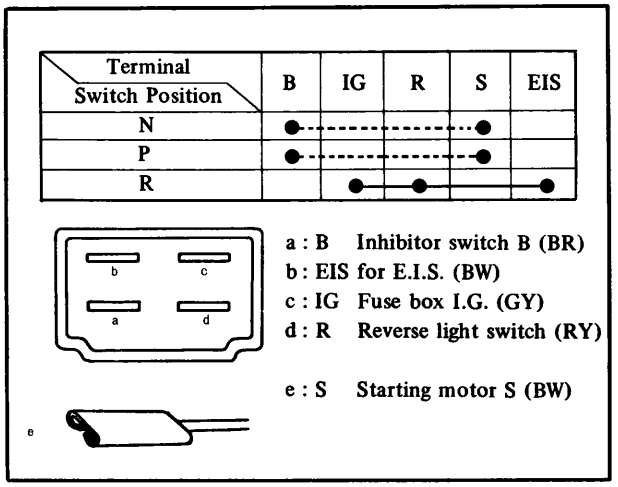


Fig. 15–6 Inhibitor switch interconnection diagram

Note:

a. Solid line shows the connection for indicator light circuit.

b. Dotted lines show the connection for starting circuit.

15–E. CENTRAL CONTROL UNIT

The central control unit is composed of wiper relay (R1 and R2), flasher relay (R3), horn relay (R4) and flasher unit (U1), each of which is a plug-socket connection type. Each relay and unit are easy to replace. In replacing the flasher unit, care should be taken that its capacity differs depending upon area. Also, the "multi-grade relay" has been prepared which is applicable as replacement of any of the relays.

15–E–1. Checking Central Control Unit

Check the central control unit using the battery and circuit tester as follows:

1. Wiper relay (R1)

When the battery ⊕ is connected to the WIG terminal and the battery ⊖ to the S2 terminal, LOW terminal and unit body should be in continuity with each other.

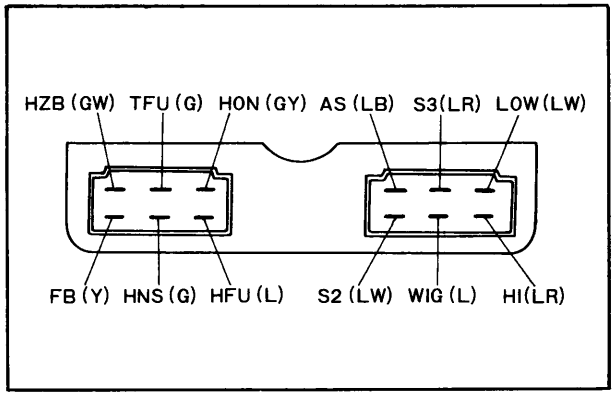


Fig. 15–7 Central control unit coupler

2. Wiper relay (R2)

(a) When the battery ⊕ is connected to the WIG terminal and the battery ⊖ to the S2 and S3 terminals, HI terminal and unit body should be in continuity with each other.

(b) AS terminal and LOW terminal should be in continuity with each other without connecting the battery to them.

3. Horn relay (R4)

When the battery ⊕ is connected to the HZB terminal and the battery ⊖ to the HNS terminal, HZB terminal and HON terminal should be in continuity with each other.

4. Flasher unit (U1)

In checking the flasher unit, connect a prescribed lamp as indicated on the central control unit cover between the unit (with the flasher relay R3) and battery as shown in Fig. 15–8.

(a) Turn signal

When the battery ⊕ is connected to the FB terminal and a prescribed lamp between the battery ⊖ and TFU terminal, the lamp must turn on and off **90 ± 10** times per minute with interval between flasher under **1.5** second.

(b) Hazard

When the battery ⊕ is connected to the HFU terminal and a prescribed lamp between the battery ⊖ and TFU terminal, the lamp must turn on and off **90 ± 10** times per minute with the interval between flasher under **1.5** second.

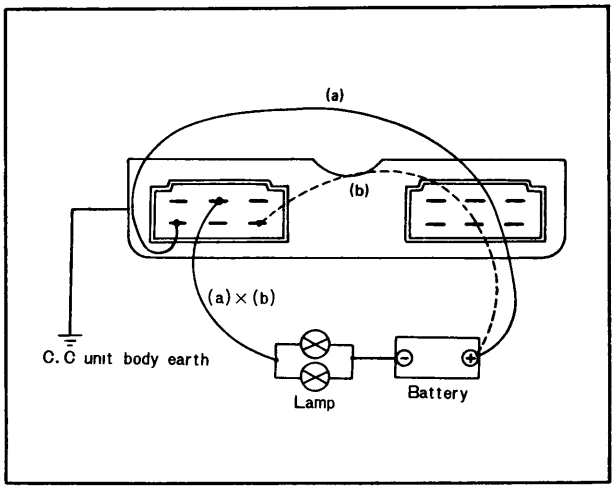


Fig. 15–8 Hazard and flasher unit interconnection diagram

Note:

The flashing on and off of the lamp varies depending upon the lamp capacity and the central control unit earth condition as follows:

Flasher

Faulty unit earth	Lamp remains lighted
Lamp capacity decreased	Flash becomes slower or lamp remains lighted
Lamp capacity increased	Number of flashes remains unchanged

Hazard

Faulty unit earth	Lamp remains lighted
Lamp capacity decreased	Number of flashes remains unchanged
Lamp capacity increased	Number of flashes remains unchanged

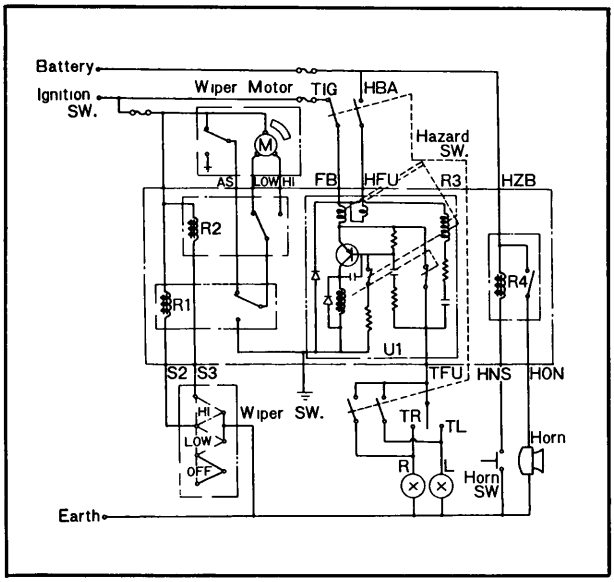


Fig. 15–9 Central control unit circuit

15–F. WIPER MOTOR

15–F–1. Checking Wiper Motor

Connect the wiper motor, ammeter and battery according to the following diagram, and check the number of wiping revolutions and amperage.

Wiper motor	Wiping revolution number	Amperage
Low	42 ~ 55 RPM	Less than 2.5A
High	62 ~ 85 RPM	Less than 2.5A

Notes:

a. The difference in number of revolutions between Low and High should be more than **15 RPM**.

b. The Auto Stop does not work in the case of faulty wiper motor earth.

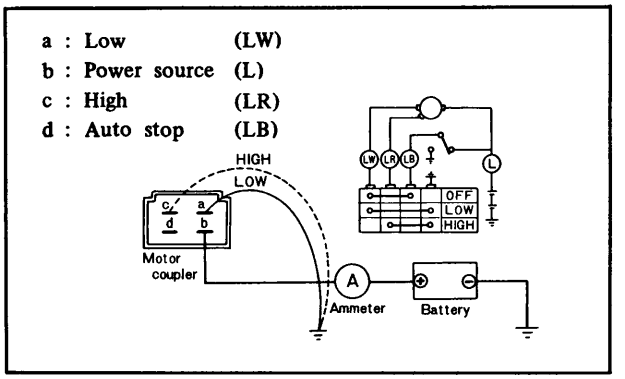
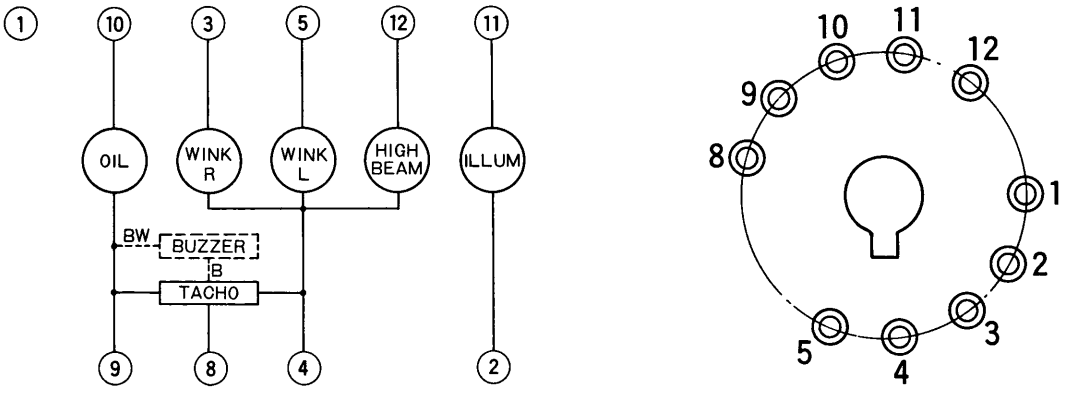


Fig. 15–10 Wiper motor interconnection diagram

15–G. METER

15–G–1. Checking Meter Set

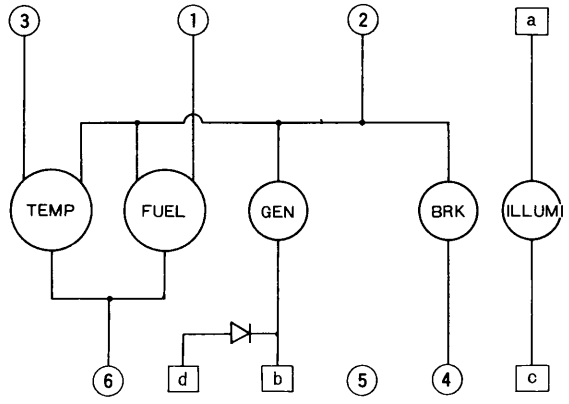
Check the continuity between connector pin and lamp, and that between connector pin and meter using the circuit tester according to the interconnection diagram below.

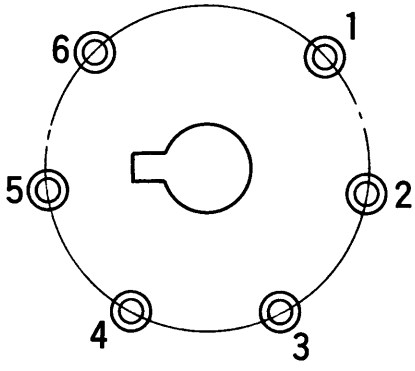


① Vacant
② Illumination light ~ Panel light resistor
③ Combination switch ~ Turn signal indicator light (L)
④ Dash panel earth ~ Meter earth
⑤ Combination switch ~ Turn signal indicator light (R)
⑥ Vacant
⑦ Vacant
⑧ Tachometer ~ Ignition coil ⊖
⑨ Fuse box ~ Meter
⑩ Oil level warning light ~ Oil level sensor
⑪ Fuse box ~ Illumination light
⑫ Fuse box ~ High beam indicator light

(..... Manual Transmission only)

Fig. 15–11 Meter set interconnection diagram





① Fuel tank gauge unit ~ Fuel meter
② Fuse box ~ Combination meter
③ Water thermo unit ~ Water temperature gauge
④ Parking brake switch ~ Brake warning light
⑤ Vacant
⑥ Dash panel earth ~ Meter earth

[a] Fuse box ~ Illumination light
[b] Regulator ~ Generator warning light
[c] Illumination light ~ Panel light resistor ⊕
[d] Oil level warning light ~ Diode

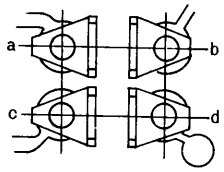


Fig. 15–12 Meter set interconnection diagram

TECHNICAL DATA

T

ENGINE

Type	Rotary piston engine, 2 rotors in line, water cooled
Displacement	573 cc (35.0 cu-in) x 2 rotors
Compression ratio	9.4 : 1
Compression pressure	
Limit	6 kg/cm² (85 lb/in²) at 250 rpm
Max. permissible difference between chambers	0.5 kg/cm² (7 lb/in)
Port timing	
Intake opens	32° ATDC
Intake closes	50° ABDC
Exhaust opens	71° BBDC
Exhaust closes	48.5° ATDC
Side housing (Front, intermediate and rear housing)	
Limit of distortion	0.04 mm (0.0016 in)
Limit of wear (Sliding surface)	0.10 mm (0.0039 in)
Rotor housing	
Width	70 mm (2.756 in)
Max. permissible difference in width	0.06 mm (0.0024 in)
Rotor	
Width	69.85 mm (2.750 in)
Clearance of side housing and rotor (ΔR)	0.10 ~ 0.21 mm (0.0039 ~ 0.0083 in)
Apex seal	
Length	69.85 mm (2.750 in)
Width	3.0 mm (0.118 in)
Height	over 7.0 mm (0.276 in)
Clearance of apex seal and side housing (ΔS)	0.13 ~ 0.30 mm (0.0051 ~ 0.0118 in)
Clearance of apex seal and rotor groove (ΔG)	0.05 ~ 0.15 mm (0.0020 ~ 0.0059 in)
Apex seal spring	
Free height	more than 5.5 mm (0.217 in)
Side seal	
Thickness	1.0 mm (0.039 in)
Height	3.5 mm (0.138 in)
Clearance of side seal and rotor groove (ΔW)	0.04 ~ 0.10 mm (0.0016 ~ 0.0040 in)
Clearance of side seal and corner seal (ΔE)	
Standard	0.05 ~ 0.15 mm (0.0020 ~ 0.0059 in)
Limit	0.40 mm (0.0157 in)
Side seal protrusion	more than 0.5 mm (0.020 in)
Oil seal	
Height	5.6 mm (0.220 in)
Contact width of oil seal lip	less than 0.8 mm (0.031 in)
Oil seal protrusion	more than 0.5 mm (0.020 in)
Corner seal	
Outer diameter (Standard)	11.0 mm (0.433 in)
Height (Standard)	7.0 mm (0.276 in)
Corner seal protrusion	more than 0.5 mm (0.020 in)
Eccentric shaft	
Eccentricity of rotor journal	15.0 mm (0.591 in)
Main journal diameter	43 mm (1.692 in)
Rotor journal diameter	74 mm (2.913 in)
Max. permissible run-out	0.06 mm (0.0024 in)
End play	0.04 ~ 0.09 mm (0.0016 ~ 0.0035 in)
Bearing clearance	
Clearance of main journal and main bearing	0.04 ~ 0.10 mm (0.0016 ~ 0.0039 in)
Clearance of rotor journal and rotor bearing	0.04 ~ 0.10 mm (0.0016 ~ 0.0039 in)
Alternator belt tension (Slack)	
(Between alternator and eccentric shaft) Belt deflection	15 ± 2 mm (0.60 ± 0.08 in)
Air pump belt tension (Slack)	
(Between air pump and water pump) Belt deflection	10 ± 1 mm (0.40 ± 0.04 in)

LUBRICATING SYSTEM

Oil pump	
Type	Rotor
Feeding capacity at 1,000 rpm of engine	6 liter/min (1.59 U.S. gal/min)
Oil pump driven by	Chain and sprockets
Limit of chain adjuster protrusion	12 mm (0.47 in)
Outer rotor and body clearance	0.20 ~ 0.30 mm (0.008 ~ 0.012 in)
Clearance between rotor lobes	0.01 ~ 0.15 mm (0.0004 ~ 0.006 in)
Rotor end float	0.03 ~ 0.15 mm (0.001 ~ 0.006 in)
Oil pressure at 3,000 rpm of engine	5.0 kg/cm² (71.1 lb/in²)
Oil pressure at idling	2.5 kg/cm² (35.6 lb/in²)
Pressure regulator valve (Rear housing)	
Operating pressure	5.0 kg/cm² (71.1 lb/in²)
Free length of spring	46.4 mm (1.83 in)
Pressure control valve (Front cover)	
Operating pressure	11.0 kg/cm² (156 lb/in²)
Free length of spring	73.0 mm (2.874 in)

By-pass valve (Oil cooler)	
Starts to close	60 ~ 65°C (140 ~ 149°F)
Fully closes	70 ~ 75° C (158 ~ 167°F)
Opening pressure	3.56 kg/cm² at 70° C (50.7 lb/in² at 158°F)
Oil filter	
Type	Full flow, cartridge
Relief valve opens at	0.8 ~ 1.2 kg/cm² (11 ~ 17 lb/in²)
Oil metering pump	
Feeding capacity at 2,000 rpm of engine	2.0 ~ 2.5cc/6min (0.068 ~ 0.085 U.S. oz/6 min)
Lubricant	
−10°C ~ 50°C (15°F ~ 120°F)	MS, SAE 20W-50
−10°C ~ 40°C (15°F ~ 100°F)	MS, SAE 20W-40
−18°C ~ 50°C (0°F ~ 120°F)	MS, SAE 10W-50
−18°C ~ 40°C (0°F ~ 100°F)	MS, SAE 10W-40
−18°C ~ 30°C (0°F ~ 85°F)	MS, SAE 10W-30
Below −18°C (0°F)	MS, SAE 5W-30
Below −18°C (0°F)	MS, SAE 5W-20
Oil capacity	
Oil pan	4.2 liters (4.4 U.S. quarts)
Full capacity	5.2 liters (5.5 U.S. quarts)

COOLING SYSTEM

Water pump	
Type	Centrifugal impeller
Feeding capacity at 6,500 rpm of engine	160 ~ 170 litters/min (42 ~ 45 U.S. gal/min)
Pump driven by	"V" belt
Pulley ratio of eccentric shaft and pump	1 : 1.18
Fan	
Fan diameter	410 mm (16.1 in)
Number of fan blades	7
Fan drive	
Standard revolution of fan	1,500 ± 200 rpm at 4,200 rpm of engine
Thermostat	
Type	Wax pellet
Starts to open	82 ± 1.5°C (180 ± 2.7°F)
Fully opens at	95°C (203°F)
Lift	More than 8 mm (0.315 in)
Radiator	
Type	Corrugated fin, with expansion tank
Pressure cap opens at	0.9 kg/cm² (13 lb/in²)
Vacuum release valve opens at	−0.1 kg/cm² (−1.4 lb/in²)
Cooling capacity	
With heater	9.1 liters (9.6 U.S. quarts)

FUEL SYSTEM

Fuel tank capacity	Sedan & Coupé 60 liters (15.9 U.S. gal) Wagon 55 liters (14.5 U.S. gal)	
Fuel pump		
Type	Electrical, plunger	
Fuel pressure	0.3 ~ 0.38 kg/cm² (4.26 ~ 5.41 lb/in²)	
Feeding capacity	more than 1,150 cc/min (1.2 U.S. quart/min)	
Fuel filter	Cartridge, paper element	
Carburetor		
Type	Down draft, 2 stage 4 barrel	
Throat diameter		
Primary	28 mm (1.10in)	
Secondary	34 mm (1.34in)	
Venturi diameter		
Primary	22 x 13 x 6.5 mm (0.87 x 0.51 x 0.26in)	
Secondary	28 x 10 mm (1.10 x 0.39 in)	
Main jet	Manual transmission	Automatic transmission
Primary	# 106	# 106
Secondary	# 125	# 125
Main air bleed		
Primary	# 70	# 80
Secondary	# 90	# 100
Slow jet		
Primary	# 45	# 45
Secondary	# 80	# 80
Slow air bleed		
Primary	# 200	# 200
Secondary	# 100	# 100
Richer jet	# 80	——
Richer air bleed (No.1)	# 190	——
(No.2)	# 150	——
Power jet	——	# 45
Vacuum jet	# 80	# 80
Vacuum diaphragm stroke	3.3 ± 0.1 mm (0.130 ± 0.004in)	4.5 ± 0.1 mm (0.177 ± 0.004in)
Fast idle adjustment	1.75 ~ 2.15 mm (0.069 ~ 0.085in)	
(Clearance between primary throttle valve and bore when choke lever is fully pulled)		
Float level (from surface of gasket)	10 mm (0.39in)	
Float drop (from surface of gasket)	52 ± 0.5 mm (2.05 ± 0.02in)	
Idle Speed		
Manual transmission	$800 \begin{smallmatrix}+50\\-0\end{smallmatrix}$ rpm	
Automatic transmission ("D" range)	$750 \begin{smallmatrix}+50\\-0\end{smallmatrix}$ rpm	
Fast idle Speed	3,000 ~ 3,500 rpm	
Sub-zero starting assist fluid	Anti-freeze 90% Water 10%	

ELECTRICAL SYSTEM

Battery	
Type	Y110-5
Voltage	12 Volt
Capacity (20 hour rate)	60 amp-hr
Terminal ground	Negative
Specific gravity at 20°C (68°F)	
Fully charged	1.28
Recharge at	1.22
Distributor	
Breaker point	
Number	3
Dwell angle	58 ± 3°
Point gap	0.45 ± 0.05 mm (0.018 ± 0.002 in)
Arm spring tension	0.5 ~ 0.65 kg (1.1 ~ 1.4 lb)
Centrifugal advance	
Leading	Starts: 0 ± 1° at 500 rpm Maximum: 7.5 ± 1° at 1,250 rpm
Trailing	Starts: 0 ± 1.5° at 500 rpm Maximum: 7.5 ± 1.5° at 1,250 rpm
Condenser capacity	0.24 ~ 0.30 μF
Firing order	1 – 2
Ignition timing	
Leading	Normal 0 ± 1° TDC Retarded 20 ± 2° ATDC
Trailing	15 ± 2° ATDC
Timing mark location	Eccentric shaft pulley
Spark plug initial gap	0.65 ± 0.05 mm (0.026 ± 0.002 in)
Alternator	
Ground	Negative
Rated output	12 V 50 A
Number of poles	12
No load test	
Voltage	14 V
Current	0 amp
Revolution	less than 1,050 rpm
Load test	
Voltage	14 V
Current	40 amp
Revolution	less than 2,500 rpm
Number of brushes	2
Brush length	16 mm (0.63in)
Wear limit	10 mm (0.39in)
Brush spring pressure	330 ~ 450 gr (12 ~ 16 oz)
Pulley ratio of eccentric shaft and alternator	1 : 2.08
Regulator	
Constant voltage relay	
Air gap	0.7 ~ 1.3 mm (0.028 ~ 0.051in)
Point gap	0.3 ~ 0.45 mm (0.012 ~ 0.018in)
Back gap	0.7 ~ 1.5 mm (0.028 ~ 0.059in)
Regulated voltage without load at 4,000 rpm of alternator	14.5 ± 0.5 V
Pilot lamp relay	
Air gap	0.9 ~ 1.4 mm (0.035 ~ 0.055in)
Point gap	0.7 ~ 1.1 mm (0.028 ~ 0.043in)
Back gap	0.7 ~ 1.5 mm (0.028 ~ 0.059in)
Pilot lamp lights on	0.5 ~ 3.0 V
Pilot lamp lights out	4.2 ~ 5.2 V
Ignition coil (Leading)	
Type	HP5-13J
Primary resistance	1.35Ω at 20°C (68°F)
External resistance	1.4Ω at 20°C (68°F)
Ignition coil (Trailing)	
Type	HP5-13E
Primary resistance	1.5Ω at 20°C (68°F)
External resistance	1.6Ω at 20°C (68°F)

Starting motor	Manual transmission	Automatic transmission
Capacity	1.2 KW	2.0KW
Lock test		
Voltage	5.0 volt	5.0 volt
Current	less than 780 amp.	less than 1,100 amp.
Torque	1.1 m –kg (8.0 ft-lb)	2.4 m –kg (17.4 ft-lb)
Free running test		
Voltage	11.5 volt	11.5 volt
Current	less than 75 amp.	less than 100 amp.
Speed	more than 4,900 rpm	more than 7,800 rpm
Number of brushes	4	4
Brush length	18.5 mm (0.73in)	18.5 mm (0.73in)
Wear limit	11.5 mm (0.45 in)	11.5 mm (0.45 in)
Brush spring pressure	1.4 ~ 1.8 kg (49 ~ 63 oz)	1.4 ~ 1.8 kg (49 ~ 63 oz)
Control switch	Solenoid	Solenoid
Voltage required to close solenoid contacts	less than 8 volt	less than 8 volt
Undercutting mica	0.5 ~ 0.8 mm (0.020 ~ 0.032 in)	0.5 ~ 0.8 mm (0.020 ~ 0.032 in)
Clearance between armature shaft and brush	less than 0.2 mm (0.008 in)	less than 0.2 mm (0.008 in)
Armature shaft end play	0.1 ~ 0.4 mm (0.004 ~ 0.016 in)	0.1 ~ 0.4 mm (0.004 ~ 0.016 in)
Clearance between pinion and stop collar	0.5 ~ 2.0 mm (0.020 ~ 0.079 in)	0.5 ~ 2.0 mm (0.020 ~ 0.079 in)

CLUTCH

Type	Single dry plate diaphragm spring
Pressure plate	
Permissible lateral run-out	0.05 mm (0.0020 in)
Clutch disc	
Lateral run-out of clutch disc	
Limit	1.0 mm (0.039 in)
Clutch release mechanism	Hydraulic
Clutch pedal free travel (Before push rod contacts with piston)	0.5 ~ 3.0 mm (0.02 ~ 0.12 in)
Master cylinder bore	15.87 mm (5/8 in)
Clearance between piston and master cylinder bore	
New	0.032 ~ 0.102 mm (0.0013 ~ 0.0040 in)
Wear limit	0.15 mm (0.006 in)
Release cylinder bore	19.05 mm (3/4 in)
Clearance between piston and release cylinder bore	
New	0.040 ~ 0.125 mm (0.0016 ~ 0.0049 in)
Wear limit	0.15 mm (0.006 in)

MANUAL TRANSMISSION

Type	4-Speed manual transmission
Gear ratio	
First	3.683
Second	2.263
Third	1.397
Top	1.000
Reverse	3.692
Oil capacity	1.7 liters (1.8 U.S. quarts)
Main shaft	
Max. permissible run-out	0.03 mm (0.0012 in)
Clearance between main shaft and gear bush	
Wear limit	0.15 mm (0.006 in)
Reverse idle gear	
Clearance between reverse idle gear bush and shaft	
Wear limit	0.15 mm (0.006 in)
Shift fork and rod	
Clearance between shift fork and clutch sleeve	
Wear limit	0.5 mm (0.020 in)
Clearance between shift fork and reverse idle gear	
Wear limit	0.5 mm (0.020 in)
Clearance between shift rod gate and control lever	
Wear limit	0.8 mm (0.031 in)
Synchronizer ring	
Clearance between synchronizer ring and side of gear when fitted	
New	1.5 mm (0.059 in)
Wear limit	0.8 mm (0.031 in)
Lubricant	
Above −18°C (0°F)	EP. SAE90
Below −18°C (0°F)	EP. SAE80

AUTOMATIC TRANSMISSION

Model	JATCO R3A
Gear ratio	
First	2.458
Second	1.458
Top	1.000
Reverse	2.181
Torque converter	
Type	Symmetrical 3-element 1-stage 2-phase torque converter coupling
Stall torque ratio	2.0 : 1
Fluid type	M2C33F (Type F)
Fluid capacity	6.2 liters (6.6 U.S. quarts, 5.5 Imp. quarts)
Drive plate run-out	
New	Less than 0.3 mm (0.012 in)
Limit	0.5 mm (0.020 in)
Oil pump	
Side play of inner gear and outer gear	
New	0.02 ~ 0.04 mm (0.001 ~ 0.002 in)
Limit	0.08 mm (0.003 in)
Clearance between outer gear and crest	
New	0.14 ~ 0.21 mm (0.006 ~ 0.008 in)
Limit	0.25 mm (0.010 in)
Clearance between outer gear and housing	
New	0.05 ~ 0.20 mm (0.002 ~ 0.008 in)
Limit	0.25 mm (0.010 in)
Side clearance between oil seal ring and groove on oil pump cover	0.04 ~ 0.16 mm (0.002 ~ 0.006 in)
Front clutch	
Number of drive plates or driven plates	3
Thickness of drive plate	1.60 mm (0.063 in)
Total clearance measured between retaining plate and stopper	1.6 ~ 1.8 mm (0.063 ~ 0.071 in)
End play of front clutch drum	0.5 ~ 0.8 mm (0.020 ~ 0.031 in)
Governor	
Type	38 Type
Rear clutch	
Number of drive plates or driven plates	4
Thickness of drive plate	1.6 mm (0.063 in)
Total clearance measured between retaining plate and stopper	0.8 ~ 1.5 mm (0.031 ~ 0.059 in)
Low and reverse brake	
Number of friction plates or steel plates	4
Thickness of friction plate	2.0 mm (0.079 in)
Total clearance measured between retaining plate and stopper	0.8 ~ 1.05 mm (0.031 ~ 0.041 in)
Gear assembly	
Total end play	0.25 ~ 0.50 mm (0.010 ~ 0.020 in)

Planetary gear side play	
New	0.2 ~ 0.7 mm (0.008 ~ 0.028 in)
Limit	0.8 mm (0.031 in)
Engine stall speed	
In break-in period	2100 ~ 2350 rpm
After break-in period	2150 ~ 2400 rpm

Shift Speed

Throttle condition (manifold vacuum)		Mile/h
Kick down (0 ~ 100 mm-Hg / 0 ~ 3.94 in-Hg)	$D_1 \rightarrow D_2$	33 ~ 46
	$D_2 \rightarrow D_3$	61 ~ 80
	$D_3 \rightarrow D_2$	52 ~ 68
	$D_2 \rightarrow D_1$	20 ~ 32
Half throttle (200 ± 10 mm-Hg / 7.87 ± 0.39 in-Hg)	$D_1 \rightarrow D_2$	8 ~ 19
	$D_2 \rightarrow D_3$	18 ~ 41
Fully closed throttle	$D_3 \rightarrow D_1$	6 ~ 12
Manual 1	$1_2 \rightarrow 1_1$	25 ~ 33

Line Pressure

Manual range	Engine idling condition		Engine stall condition	
	kg/cm²	lb/in²	kg/cm²	lb/in²
R	4.0 ~ 7.0	57 ~ 100	15.5 ~ 19.0	220 ~ 270
D	3.0 ~ 4.0	43 ~ 57	9.5 ~ 11.0	135 ~ 156
2	10.0 ~ 12.0	142 ~ 171	10.0 ~ 12.0	142 ~ 171
1	3.0 ~ 4.0	43 ~ 57	9.5 ~ 11.0	135 ~ 156

Governor pressure

Driving speed	Output shaft speed	Governor pressure	
Mile/h	rpm	kg/cm²	lb/in²
20	1050 ~ 1160	0.8 ~ 1.3	11 ~ 18
35	1860 ~ 1990	1.5 ~ 2.2	21 ~ 31
55	2900 ~ 3100	3.0 ~ 4.0	43 ~ 57

PROPELLER SHAFT

Max. permissible run-out	0.4 mm (0.016 in)
Max. permissible unbalance at 4000 rpm	
At front	15 cm-gr (0.21 in-oz)
At rear	15 cm-gr (0.21 in-oz)
Universal joint	
Spider diameter	
Wear limit	14.595 mm (0.5746 in)

REAR AXLE

Type	Semi-floating hypoid gears
Reduction ratio	3.900
Number of gear teeth	39 : 10
Backlash of ring gear and pinion	0.17 ~ 0.19 mm (0.0067 ~ 0.0075 in)
Max. allowable variation of backlash	0.07 mm (0.0028 in)
Pinion bearing preload (Without pinion oil seal)	9 ~ 14 cm-kg (7.8 ~ 12.2 in-lb)
Differential side bearing preload (without pinion)	6 ~ 16 cm kg (5.2 ~ 13.9 in-lb)
Backlash of side gear and pinion gear	0 ~ 0.1 mm (0 ~ 0.004 in)
Rear wheel bearing end play	0 ~ 0.1 mm (0 ~ 0.004 in)
Lubricant	
Above −18°C (0°F)	HP. SAE90
Below −18°C (0°F)	HP. SAE80
Oil capacity	1.4 liters (1.5 U.S. quarts)

STEERING

Type	Recirculating ball nut
Reduction ratio	17 ~ 19 : 1
Maximum wheel angle on full lock	
Wheel on inside of curve	42°0′
Wheel on outside of curve	33°32′
Minimum turning radius	4.3 m (14 ft-2 in)
Free play of steering wheel (Turning direction)	
New	5 ~ 20 mm (0.2 ~ 0.8 in)
Limit	30 mm (1.2 in)
Backlash between rack and sector gear	0 ~ 0.1 mm (0 ~ 0.004 in)
Worm bearing preload	
Without sector shaft and column bush	1 ~ 4 cm-kg (0.9 ~ 3.5 in-lb)
With sector shaft and column bush	9 ~ 15 cm-kg (7.8 ~ 13.0 in-lb)
Clearance between sector shaft and housing	
New	0.027 ~ 0.069 mm (0.0011 ~ 0.0027 in)
Wear limit	0.20 mm (0.008 in)
End clearance of sector shaft	0 ~ 0.1 mm (0 ~ 0.004 in)
Lubricant	EP. SAE90

End play of center link and tie rod ball studs	
New	0 ~ 0.25 mm (0 ~ 0.010 in)
Wear limit	1.0 mm (0.039 in)
Steering geometry	
King pin inclination	8°35′
Camber	0°55′ ± 1°
Maximum permissible difference in camber between sides	30′
Camber offset	42.2 mm (1.66 in)
Caster	1°55′ ± 45′
Maximum permissible difference in caster between sides	40′
Caster trail	8.8 mm (0.35 in)
Toe-in	0 ~ 6 mm (0 ~ 0.24 in)

BRAKES

Brake pedal free travel (Before power brake piston operates)	7 ~ 9 mm (0.28 ~ 0.35 in)
Master cylinder	
Type	Tandem
Bore	20.64 mm (13/16 in)
Clearance between piston and bore	
New	0.040 ~ 0.125 mm (0.0016 ~ 0.0049 in)
Wear limit	0.15 mm (0.006 in)
Front disc brake	
Brake disc outer diameter	230 mm (9.055 in)
Thickness of brake disc	
New	11 mm (0.4331 in)
Limit	10 mm (0.3937 in)
Max. allowable lateral run-out of brake disc	0.10 mm (0.0039 in)
Thickness of lining and shoe	
New	14.2 mm (0.559 in)
Limit	6.5 mm (0.256 in)
Wheel cylinder bore	51.1 mm (2.0118 in)
Rear drum brake	
Type	Leading-and-trailing shoes
Drum diameter	
New	200 mm (7.8741 in)
Max. permissible diameter	201 mm (7.9135 in)
Thickness of lining	
New	5.5 mm (0.217 in)
Wear limit	1.0 mm (0.039 in)
Wheel cylinder bore	15.87 mm (5/8 in)
Clearance between piston and bore	
New	0.032 ~ 0.102 mm (0.0013 ~ 0.0040 in)
Wear limit	0.15 mm (0.006 in)
Parking brake	
Type	Mechanical
Operates at	Rear wheel

WHEELS AND TIRES

Wheel disc	
Front	4 1/2J x 13WDC
Rear	4 1/2J x 13WDC
Tire	
Front	155SR13
Rear	155SR13
Inflation pressure	
Front	26 psi
Rear	26 psi

FRONT SUSPENSION

Type	Strut, coil spring
Coil spring	
Spring constant	2.1 kg/mm (118 lb/in)
Wire diameter	12.3 mm (0.48 mm)
Coil diameter	120 mm (4.72 in)
Free length	355.5 mm (13.98 in)
Fitting length	204.5 mm (8.05 in)
Fitting load	292.5 ~ 317.5 kg (645 ~ 670 lb)

REAR SUSPENSION (Coupe)

Type	Leaf spring
Leaf spring	
Spring constant	2.0 kg/mm (112 lb/in)
Number of leaves	4
Length	1150 mm (45.28 in)
Width	50 mm (1.97 in)
Thickness	
No. 1 & 4	5 mm (0.20 in)
No. 2 & 3	7 mm (0.28 in)

REAR SUSPENSION (Wagon)

Type	Leaf spring
Leaf spring	
Spring constant	2.0 kg/mm (112 lb/in)
Number of leaves	4
Length	1100 mm (43.31 in)
Width	50 mm (1.97 in)
Thickness	6 mm (0.24 in)

DIMENSIONS

COUPE

Overall length	4274 mm (168 in)
Overall width	1595 mm (63 in)
Overall height	1355 mm (53 in)
Wheel base	2310 mm (91 in)
Tread	
Front	1300 mm (51 in)
Rear	1290 mm (51 in)
Minimum road clearance	150 mm (6 in)
Minimum turning radius	4.3 m (14 ft. 2 in)
Seating capacity	4

	m-kg	ft-lb		m-kg	ft-lb
Shackle pin nuts	1.5 ~ 2.3	11 ~ 17	**8T**		
"U" bolts	3.8 ~ 4.6	27 ~ 33	6 mm bolt/nut	0.8 ~ 1.2	6 ~ 9
			8 mm bolt/nut	1.8 ~ 2.7	13 ~ 20
UNLESS OTHERWISE			10 mm bolt/nut	3.7 ~ 5.5	27 ~ 40
SPECIFIED			12 mm bolt/nut	6.4 ~ 9.5	46 ~ 69
6T			14 mm bolt/nut	10.4 ~ 14.0	75 ~ 101
6 mm bolt/nut	0.7 ~ 1.0	5 ~ 7			
8 mm bolt/nut	1.6 ~ 2.3	12 ~ 17			
10 mm bolt/nut	3.2 ~ 4.7	23 ~ 34			
12 mm bolt/nut	5.6 ~ 8.2	41 ~ 59			
14 mm bolt/nut	7.7 ~ 10.5	56 ~ 76			

WAGON	
Overall length	4286 mm (169 in)
Overall width	1595 mm (63 in)
Overall height	1400 mm (55 in)
Wheel base	2310 mm (91 in)
Tread	
Front	1300 mm (51 in)
Rear	1290 mm (51 in)
Minimum road clearance	160 mm (6 in)
Minimum turning radius	4.3 m (14ft. 2 in)
Seating capacity	4

TIGHTENING TORQUE

	m-kg	ft-lb
ENGINE		
Tension bolt	3.2 ~ 3.8	23 ~ 27
Eccentric shaft pulley	7.5 ~ 9.5	54 ~ 69
Oil pump sprocket	3.0 ~ 3.5	22 ~ 25
Oil pan	0.7 ~ 1.0	5 ~ 7
Water temperature switch	1.0 ~ 1.8	7 ~ 13
Temperature gauge unit	0.7 ~ 0.8	5 ~ 6
Intake manifold	1.6 ~ 2.3	12 ~ 17
Thermal reactor	3.0 ~ 5.5	22 ~ 25
Spark plug	1.3 ~ 1.8	9 ~ 13
CLUTCH		
Flywheel	40.0 ~ 50.0	289 ~ 362
Clutch cover	1.8 ~ 2.7	13 ~ 20
MANUAL TRANSMISSION		
Main shaft lock nut	16.0 ~ 24.0	116 ~ 174
Shift lock spring caps	1.0 ~ 1.5	7 ~ 11
Plug for interlock pin hole	1.0 ~ 1.5	7 ~ 11
Control lever to control rod end	2.8 ~ 3.4	20 ~ 25
Shift fork set bolts	0.8 ~ 1.2	6 ~ 9
Reverse lock spring cap	4.5 ~ 5.5	33 ~ 40
Under cover to case	0.6 ~ 0.9	4 ~ 7
Reverse lamp switch	2.8 ~ 4.5	20 ~ 33
Bearing cover	1.6 ~ 2.3	12 ~ 17
AUTOMATIC TRANSMISSION		
Drive plate to counter weight	3.7 ~ 5.5	27 ~ 40
Drive plate to torque converter	3.7 ~ 5.5	27 ~ 40
Converter housing to engine	3.2 ~ 4.7	23 ~ 34
Converter housing to transmission case	4.5 ~ 5.5	33 ~ 40
Extension housing to transmission case	2.0 ~ 2.5	14 ~ 18
Oil pan	0.5 ~ 0.7	3.6 ~ 5.1
Piston stem (when adjusting band brake)	1.2 ~ 1.5	9 ~ 11
Piston stem lock nut	1.5 ~ 4.0	11 ~ 29
Servo piston retainer	1.0 ~ 1.5	7.2 ~ 11
Servo cover	0.5 ~ 0.7	3.6 ~ 5.1
One-way clutch inner race	1.3 ~ 1.8	9 ~ 13
Control valve body	0.55 ~ 0.75	4.0 ~ 5.4
Lower valve body to upper valve body	0.25 ~ 0.35	1.8 ~ 2.5
Side plate to control valve body	0.25 ~ 0.35	1.8 ~ 2.5
Reamer bolt of control valve body	0.5 ~ 0.7	3.6 ~ 5.1
Oil strainer to lower valve body	0.25 ~0.35	1.8 ~ 2.5
Governor valve body to oil distributor	0.5 ~ 0.7	3.6 ~ 5.1
Oil pump cover	0.6 ~ 0.8	4.3 ~ 5.8
Manual shaft lock nut	3.0 ~ 4.0	22 ~ 29
Oil cooler pipe set bolt to transmission	1.6 ~ 2.4	12 ~ 17
Inhibitor switch	0.5 ~ 0.7	3.6 ~ 5.1
Oil pressure test plug	0.5 ~ 1.0	3.6 ~ 7.2
Actuator for parking rod to extension housing	0.8 ~ 1.1	5.8 ~ 8.0
PROPELLER SHAFT		
Yoke to rear axle companion flange	3.5 ~ 3.8	25 ~ 27
REAR AXLE		
Ring gear	6.5 ~ 7.5	47 ~ 54
Differential side bearing caps	3.2 ~ 4.7	23 ~ 34
Companion flange to pinion	13 ~ 18	94 ~ 130
STEERING		
Steering wheel nut	3.0 ~ 4.0	22 ~ 29
Steering gear housing to frame	4.4 ~ 5.5	32 ~ 40
Pitman arm to sector shaft	13.0 ~ 17.0	94 ~ 123
Idler arm bracket to frame	4.4 ~ 5.5	32 ~ 40
Idler arm to center link	2.5 ~ 3.5	18 ~ 25
Pitman arm to center link	2.5 ~ 3.5	18 ~ 25
Tie-rod to center link	2.5 ~ 3.5	18 ~ 25
Tie-rod to knuckle arm	2.5 ~ 3.5	18 ~ 25
Tie-rod lock nut	7.0 ~ 8.0	51 ~ 58
WHEELS		
Wheel bolts	9.0 ~ 10.0	65 ~ 72
FRONT SUSPENSION		
Suspension arm to cross member	4.0 ~ 5.5	29 ~ 40
Knuckle arm to shock absorber	6.4 ~ 9.5	46 ~ 69
Suspension arm ball joint to knuckle arm	6.0 ~ 7.0	43 ~ 51
Front shock absorber		
Piston rod to mounting block	6.5 ~ 8.2	47 ~ 59
Seal cap nut	5.0 ~ 6.0	36 ~ 43
Piston rod nut	1.35 ~ 1.65	10 ~ 12
Base valve nut	0.15	1.0
REAR SUSEPSNION		
Spring pin to flame bracket	1.5 ~ 2.3	11 ~ 17
Spring pin nuts	1.5 ~ 2.3	11 ~ 17