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

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

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

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

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09/16/03

ENGINE

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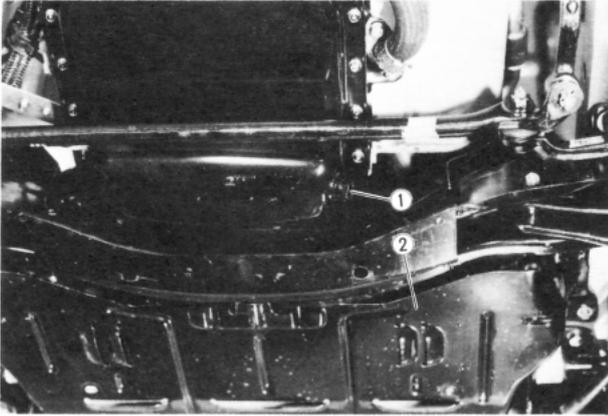


Fig. 1-1

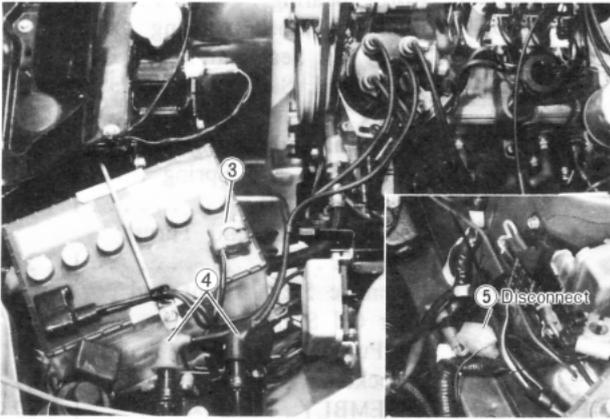


Fig. 1-2

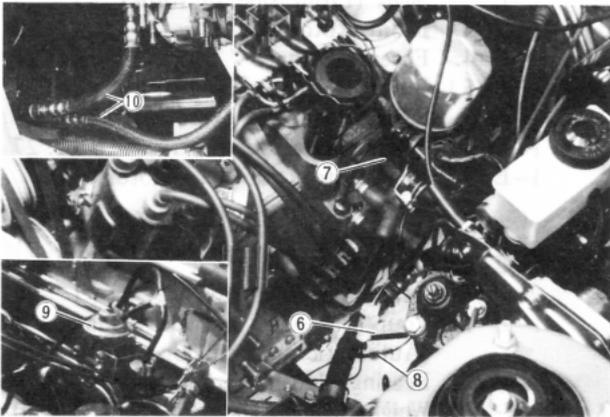


Fig. 1-3

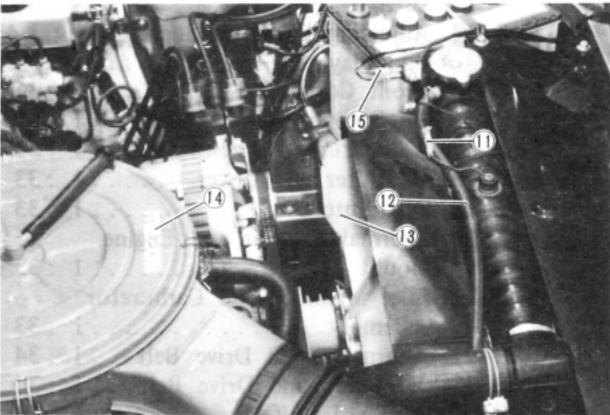


Fig. 1-4

1-A. ENGINE REMOVAL

The procedures for removing the engine from the vehicle are as follows:

Apply the parking brake and block the wheels.

1. Drain the lubricant from the engine.
After draining, clean and reinstall the drain plug.
2. Remove the engine under cover.

3. Open the bonnet and disconnect the battery negative cable.
Remove the bonnet referring to Par. 14-A.
4. Disconnect the high-tension cords at the ignition coils.
5. Disconnect the couplers of pick-up coil wiring and condenser lead.

6. Disconnect the coupler of the oil level sensor lead.
7. Disconnect the coupler from the water temperature gauge unit.
8. Disconnect the coupler from the oil thermo sensor (except for California).
9. Disconnect the vacuum sensing tube for vacuum switch (Automatic transmission and Calif. with manual transmission) and evaporative hose.
10. Disconnect the oil hoses from the oil cooler.

11. Disconnect the coupler from coolant level sensor lead.
12. Disconnect the coolant reservoir hose.
13. Remove the cooling fan and fan drive assembly.
14. Remove the air cleaner assembly.
15. Disconnect the connectors from the No. 2 water temperature switch (Except for California and Canada).

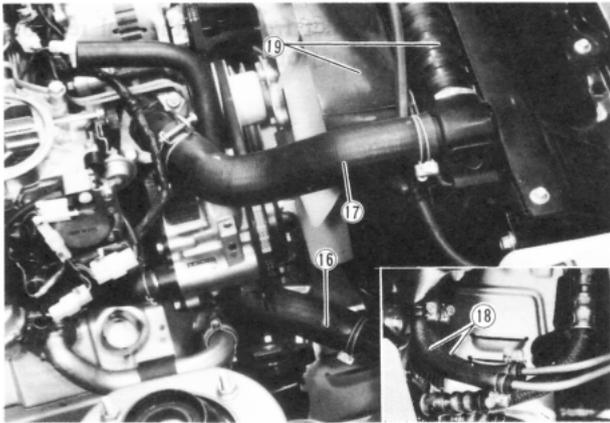


Fig. 1-5

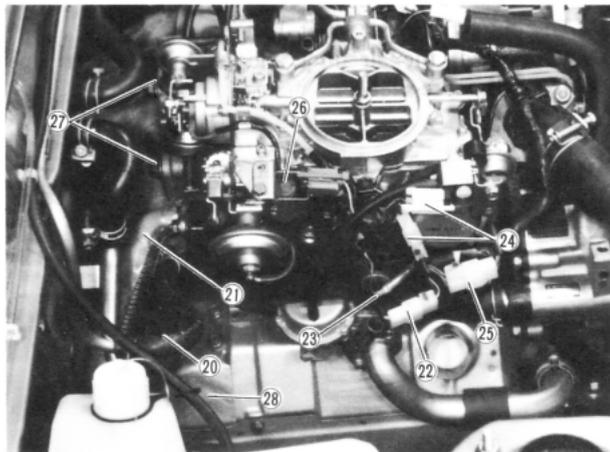


Fig. 1-6

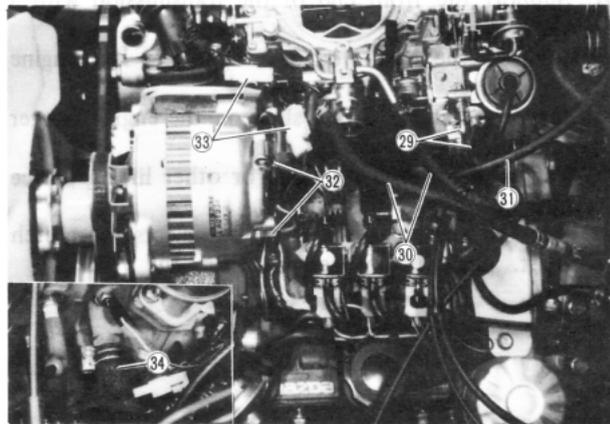


Fig. 1-7

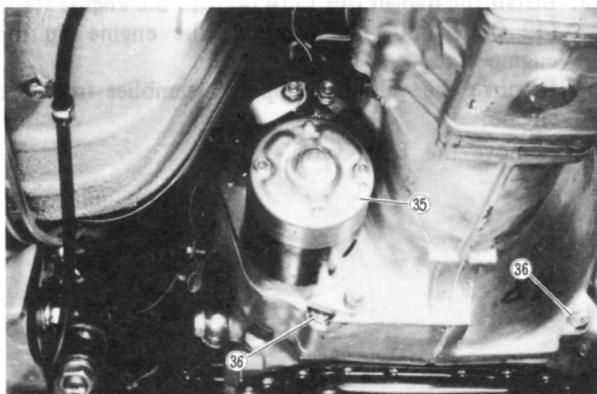


Fig. 1-8

16. Drain the cooling system by disconnecting the radiator lower hose from the radiator.
17. Disconnect the radiator upper hose from the radiator.
18. Disconnect the oil pipes from the radiator (automatic transmission only).
19. Remove the radiator and radiator shroud assembly.

20. Disconnect the vacuum hose for power brake assist.
21. Disconnect the heat exchanger pipe from the rear end of the inlet manifold.
22. Disconnect the coupler from the power valve solenoid (Except for Canada with manual transmission).
23. Disconnect the coasting richer connector (manual transmission).
24. Disconnect the couplers from the choke heater lead and anti-afterburn valve solenoid.
25. Disconnect the idle switch coupler (manual transmission).
26. Disconnect the coupler from the choke return solenoid valve (Except for Calif. and Canada).
27. Remove the bolts attaching the transmission to rear end of the engine.
28. Remove the thermal reactor rear cover.
29. Disconnect the accelerator cable, choke cable and hot start assist cable.
30. Disconnect the fuel main and return hoses.
31. Disconnect the sub-zero start assist fluid hose (Except for Calif.).
32. Disconnect the coupler and "B" terminal from the rear end of the alternator.
33. Disconnect the couplers from the No. 1 water temperature switch and air vent solenoid valve.
34. Disconnect the heater hose from the left side of the engine.

Jack up the vehicle and support it with stands.

35. Disconnect the wirings and remove the starting motor.
36. Remove the bolts attaching the transmission to rear end of the engine.

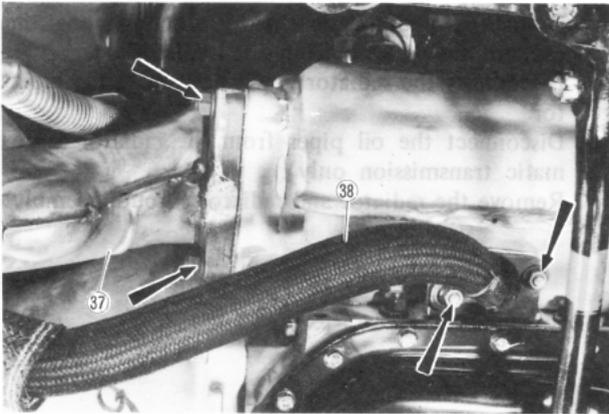


Fig. 1-9

- 37. Disconnect the air duct from the thermal reactor.
- 38. Remove the air pipe from the lower side of the thermal reactor.

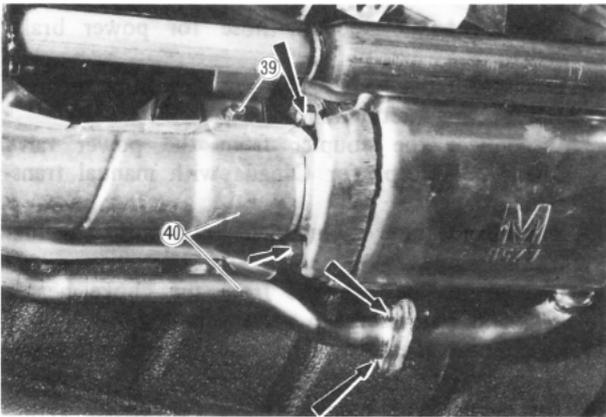


Fig. 1-10

- 39. Disconnect the air duct hanger.
- 40. Disconnect the air duct and heat exchanger pipe from the pre-silencer.

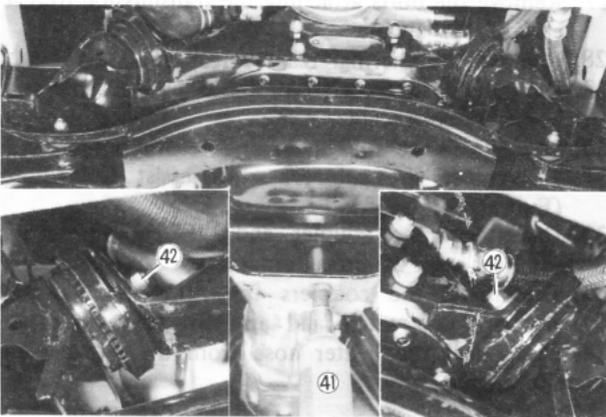


Fig. 1-11

- 41. Support the front end of the transmission with a suitable jack.
- 42. Remove the nuts from the right and left engine mountings.
- 43. Install a suitable lifting sling on the engine hanger brackets. Attach the sling to a hoist or other lifting device and take up all slack.
- 44. Pull the engine forward until it clears the clutch shaft. Then, lift the engine from the vehicle.

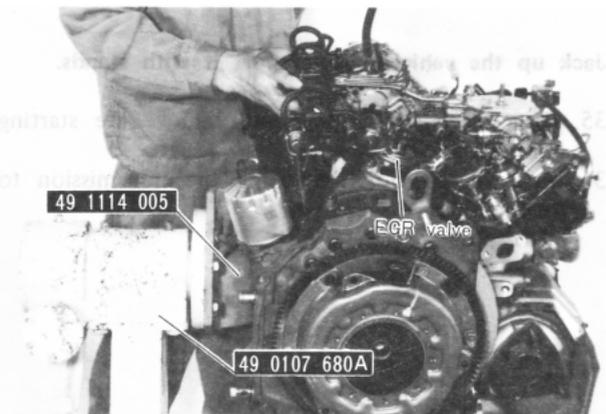


Fig. 1-12

- 45. Install the hanger (49 1114 005) to the engine stand (49 0107 680A) and mount the engine on the engine stand.
- 46. Remove the valve and piping assemblies from the engine.
- 47. Remove the EGR valve.

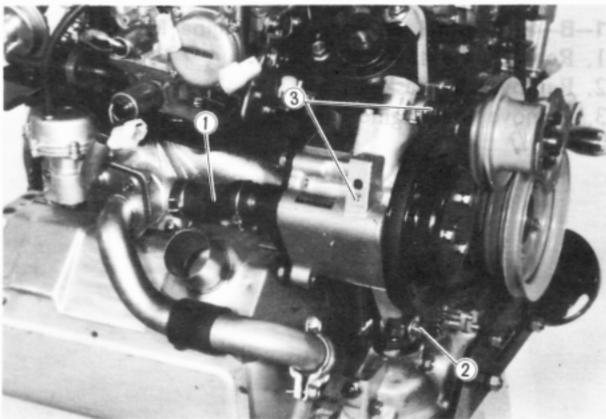


Fig. 1-13

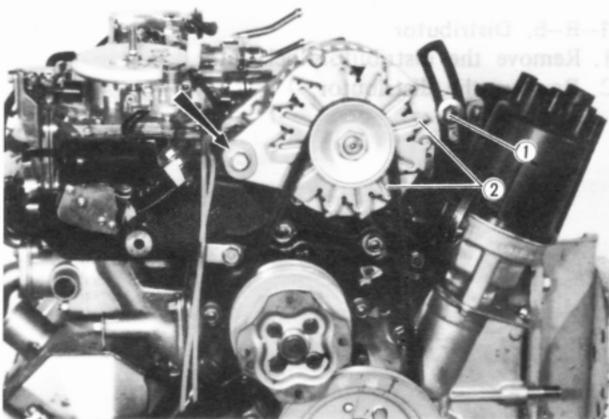


Fig. 1-14

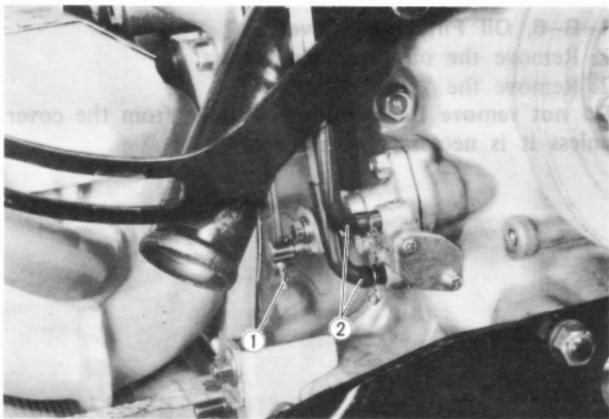


Fig. 1-15

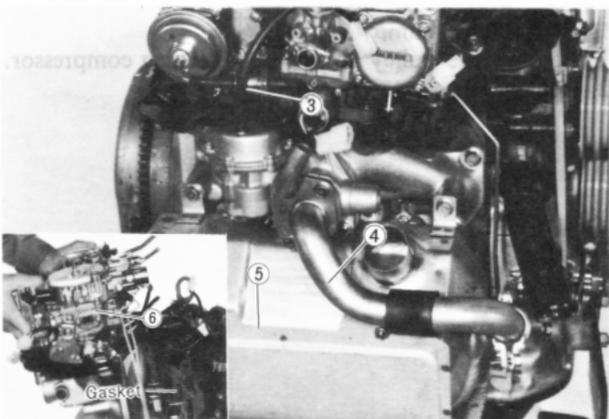


Fig. 1-16

1-B. ENGINE DISASSEMBLY

Remove the following component parts in sequences.

1-B-1. Air Pump and Drive Belt

1. Disconnect the air outlet hose.
2. Remove the air pump strap bolt.
3. Disengage the air pump drive belt and remove the air pump.

1-B-2. Alternator

1. Remove the alternator strap bolt.
2. Disengage the alternator drive belt and remove the alternator.

1-B-3. Inlet Manifold and Carburetor Assembly

1. Disconnect the connecting rod at the metering oil pump.
2. Disconnect the oil hoses at the metering oil pump outlets.

3. Disconnect the vacuum sensing tube.
4. Disconnect the air outlet pipe.
5. Remove the thermal reactor cover.
6. Remove the inlet manifold and carburetor assembly.
Remove the gasket and 'O' rings.

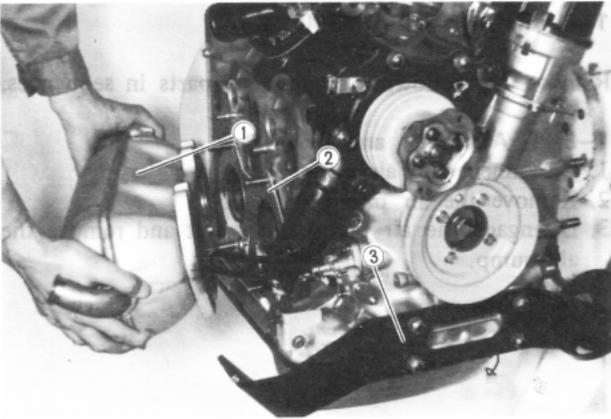


Fig. 1-17

1-B-4. Thermal Reactor and Engine Mount

1. Remove the thermal reactor.
2. Remove the gasket.
3. Remove the engine mount.

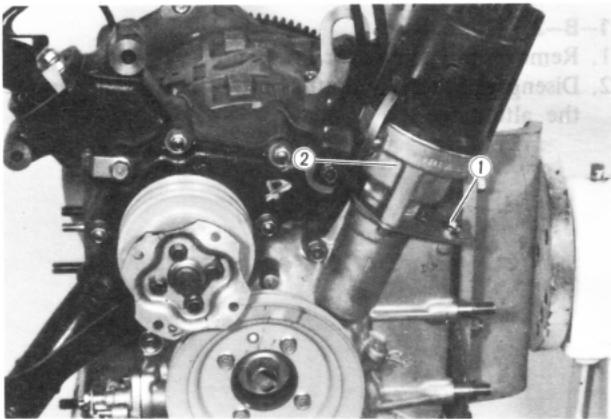


Fig. 1-18

1-B-5. Distributor

1. Remove the distributor lock nut.
2. Remove the distributor.

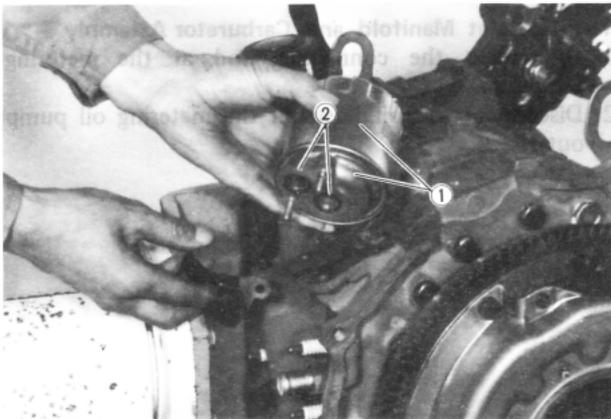


Fig. 1-19

1-B-6. Oil Filter and Cover

1. Remove the oil filter and cover.
 2. Remove the "O" rings.
- Do not remove** the oil filter cartridge from the cover unless it is necessary to replace.

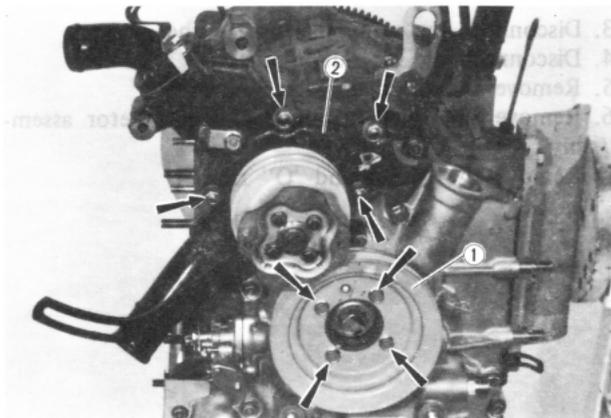


Fig. 1-20

1-B-7. Water Pump

1. Remove the pulley for air conditioning compressor.
2. Remove the water pump.



Fig. 1-21

1-B-8. Oil Pan and Oil Strainer

1. Remove the oil pan.
2. Remove the oil strainer and gasket.

To remove the oil pan, slowly drive the scraper of 30 mm (1.2 in) width and 1.5 ~ 2.0 mm (0.06 ~ 0.08 in) thickness with hammer, between the oil pan and rear housing.

Be careful not to damage the oil pan and housings.

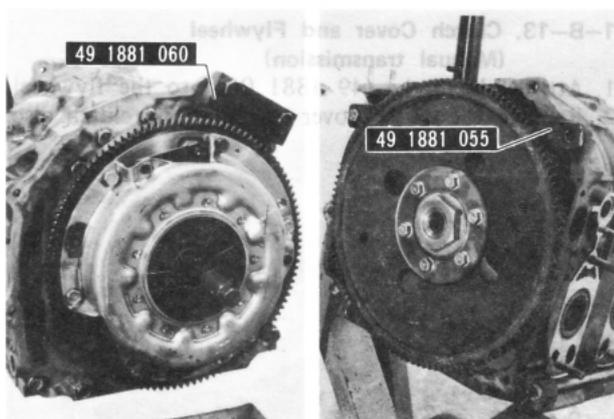


Fig. 1-22

1-B-9. Eccentric Shaft Pulley

1. On the engine equipped with manual transmission, attach the **brake** (49 1881 060) to the flywheel. On the engine equipped with automatic transmission, attach the **stopper** (49 1881 055) to the counter weight.
2. Remove the eccentric shaft pulley bolt and remove the pulley.

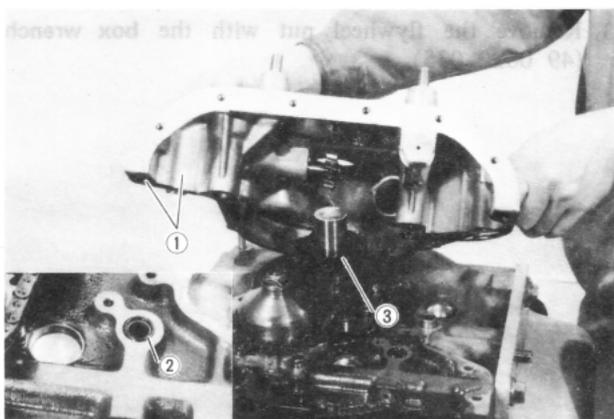


Fig. 1-23

1-B-10. Front Cover

1. Remove the front cover and gasket.
2. Remove the "O" ring on the oil passage.
3. Slide the distributor drive gear off the shaft.

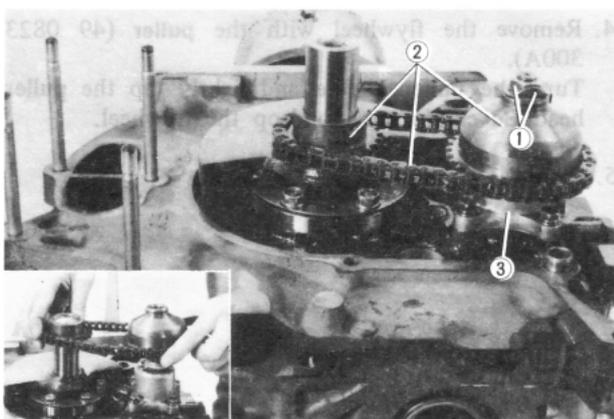


Fig. 1-24

1-B-11. Oil Pump Drive and Oil Pump

1. Straighten the lock washer tab and remove the nut and lock washer.
2. Slide the oil pump sprocket and eccentric shaft sprocket together with the drive chain off the eccentric shaft and oil pump shaft simultaneously.
3. Remove the oil pump.

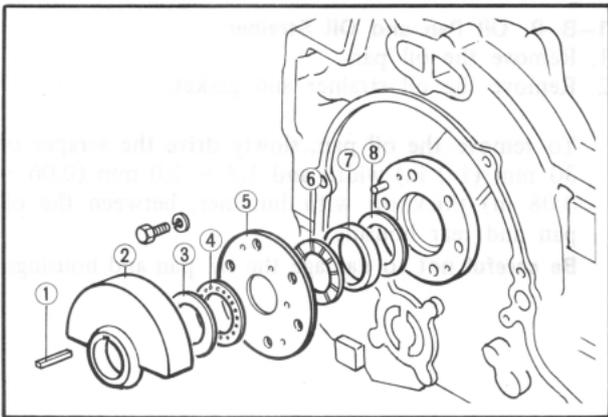


Fig. 1-25

1-B-12. Balance Weight and Bearing Housing

1. Remove the key, balance weight, thrust washer and needle bearing.
2. Remove the bearing housing, needle bearing, spacer and thrust plate.

- 1) Key
- 2) Balance weight
- 3) Thrust washer
- 4) Needle bearing
- 5) Bearing housing
- 6) Needle bearing
- 7) Spacer
- 8) Thrust plate

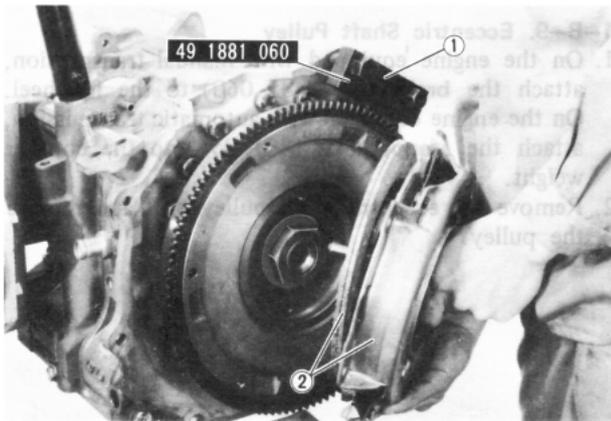


Fig. 1-26

1-B-13. Clutch Cover and Flywheel (Manual transmission)

1. Attach the **brake** (49 1881 060) to the flywheel.
2. Remove the clutch cover assembly and clutch disc.

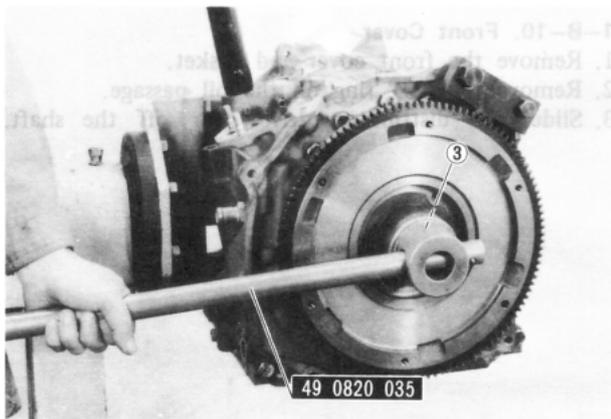


Fig. 1-27

3. Remove the flywheel nut with the **box wrench** (49 0820 035).



Fig. 1-28

4. Remove the flywheel with the **puller** (49 0823 300A).
Turn the puller handle and lightly tap the puller head. **Be careful** not to drop the flywheel.

5. Remove the key.

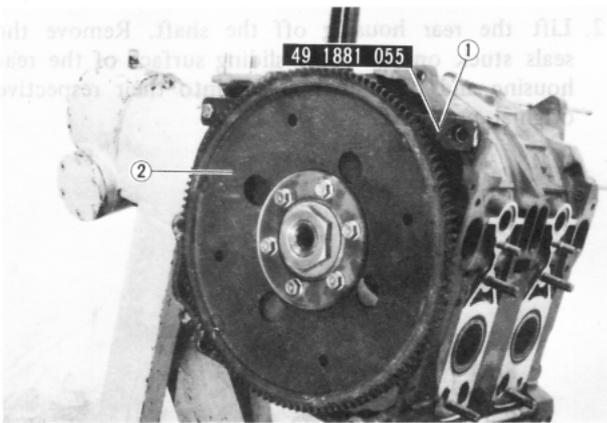


Fig. 1-29

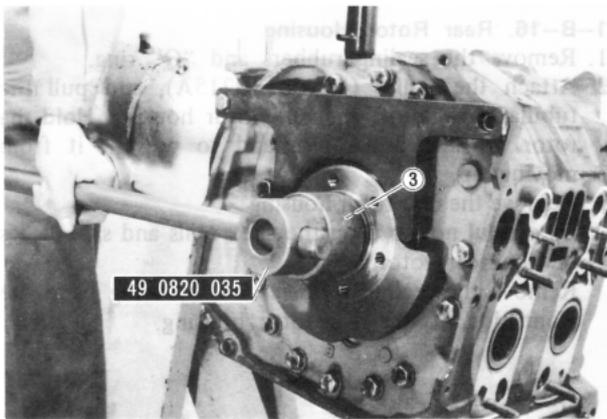


Fig. 1-30

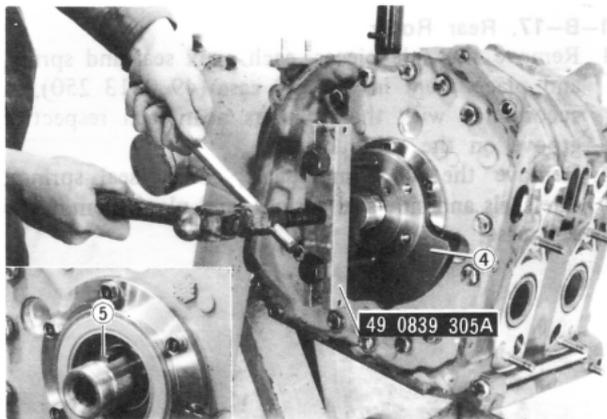


Fig. 1-31

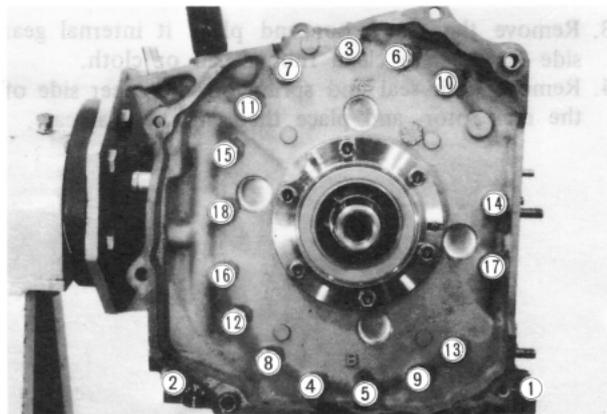


Fig. 1-32

**1-B-14. Drive Plate and Counter Weight
(Automatic transmission)**

1. Attach the **stopper** (49 1881 055) to the rear housing.
2. Remove the drive plate.

3. Remove the counter weight nut with the **box wrench** (49 0820 035).

4. Remove the counter weight by using the **puller** (49 0839 305A).
Turn the puller handle and lightly tap the puller head. **Be careful** not to drop the counter weight.

5. Remove the key.

1-B-15. Rear Housing

1. Remove the tension bolts.

Note :

- a) Loosen the tension bolts in the sequence shown in figure.
- b) Do not loosen the tension bolts at one time. Perform the removal in two or three procedures.

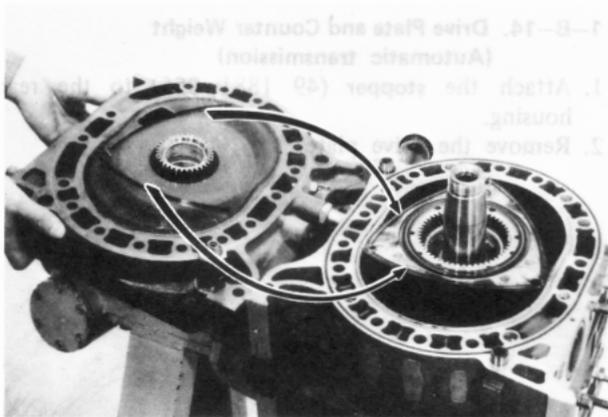


Fig. 1-33

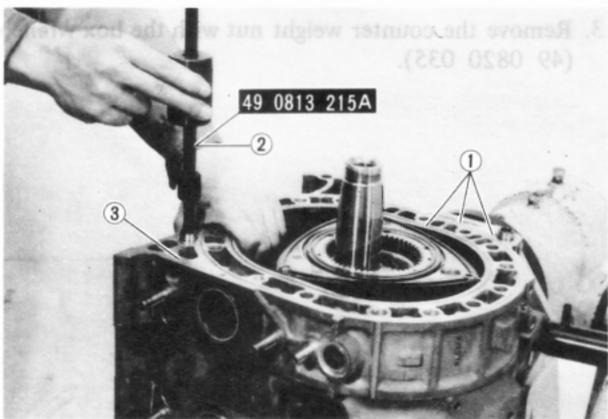


Fig. 1-34

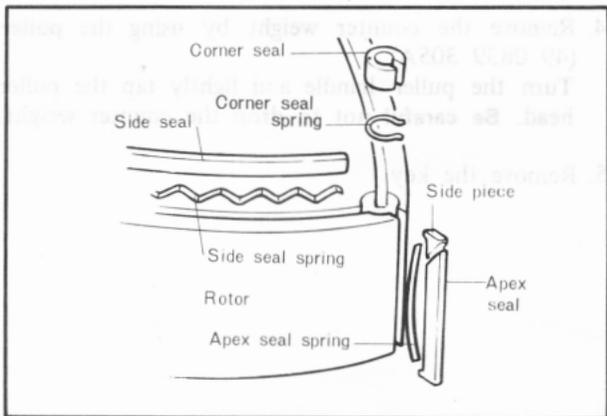


Fig. 1-35



Fig. 1-36

2. Lift the rear housing off the shaft. Remove the seals stuck on the rotor sliding surface of the rear housing and place them back into their respective original positions.

1-B-16. Rear Rotor Housing

1. Remove the sealing rubbers and "O" ring.
2. Attach the puller (49 0813 215A), and pull the tubular dowels off the rear rotor housing. **Hold the rotor housing down by hand to prevent it from moving up.**
3. Remove the rear rotor housing.
Be careful not to drop the apex seals and side pieces on the rear rotor.
Remove the sealing rubbers and "O" ring from the front side of the rear rotor housing.

1-B-17. Rear Rotor

1. Remove the side pieces, each apex seal and spring, and place them in the seal case (49 0813 250), in accordance with the numbers near each respective groove on the rotor face.
2. Remove the all corner seals, corner seal springs, side seals and side seal springs, and place them in the seal case.
3. Remove the rear rotor and place it internal gear side down on a clean rubber pad or cloth.
4. Remove each seal and spring on the other side of the rear rotor, and place them in the seal case.



Fig. 1-37

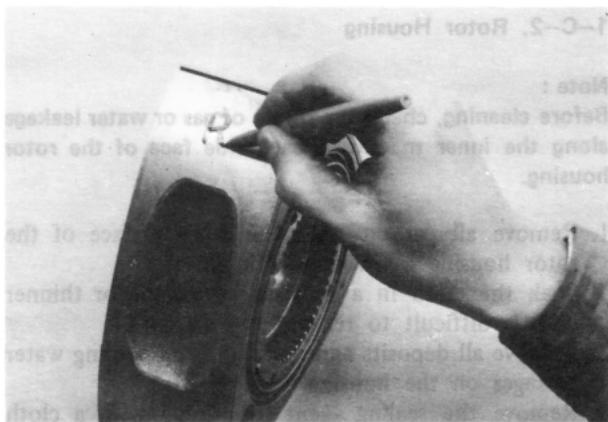


Fig. 1-38

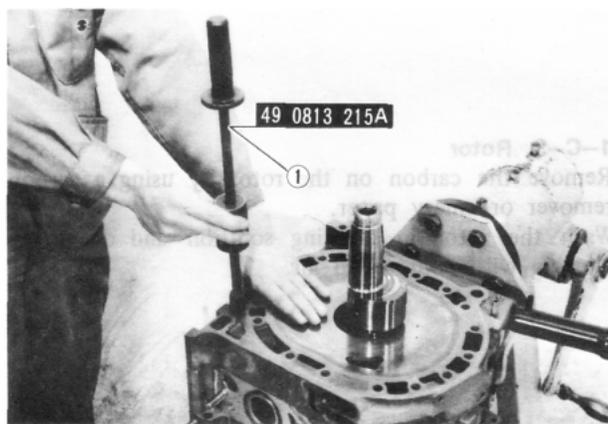


Fig. 1-39

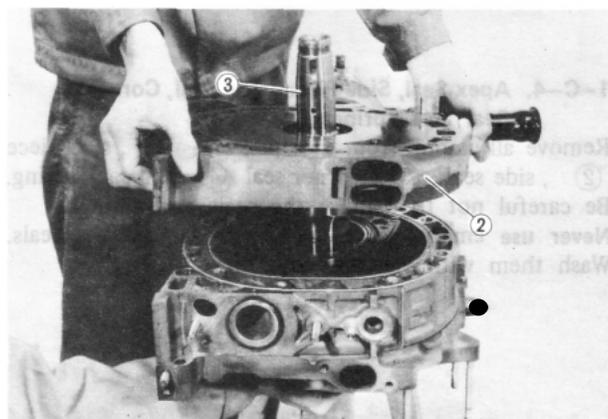


Fig. 1-40

5. Place a suitable protector onto the inner oil seal lip to protect the inner oil seal lip and remove the outer oil seal with **remover** (49 0813 225).

Do not exert strong pressure at only one place to prevent deformation of the oil seal.

6. Remove the inner oil seal with oil seal remover.
7. Remove the oil seal springs from the each respective groove.
8. Remove the oil seals and springs on the other side of the rear rotor.

9. Apply the identification mark onto the rear rotor so as to enable reinstalling to original location.

1-B-18. Intermediate Housing and Eccentric Shaft

1. Attach the **puller** (49 0813 215A), and pull the tubular dowels off the intermediate housing.

Hold the intermediate housing down by hand to prevent it from moving up.

2. Remove the intermediate housing.
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.
3. Remove the eccentric shaft.
Be careful not to damage the rotor bearing and the main bearing.

1-B-19. Front Rotor Housing and Front Rotor

Remove the front rotor housing and the front rotor assembly referring to Par. 1-B-16 and 1-B-17.

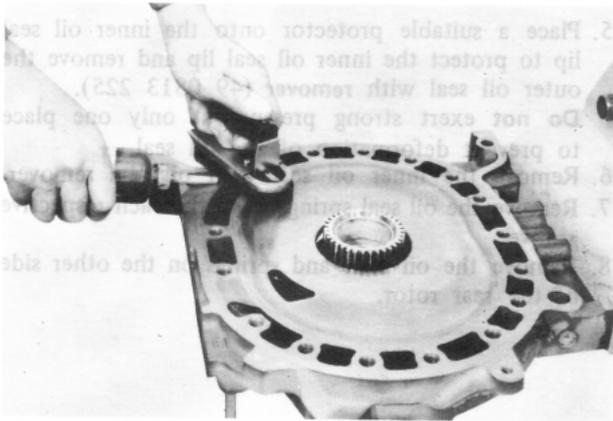


Fig. 1-41

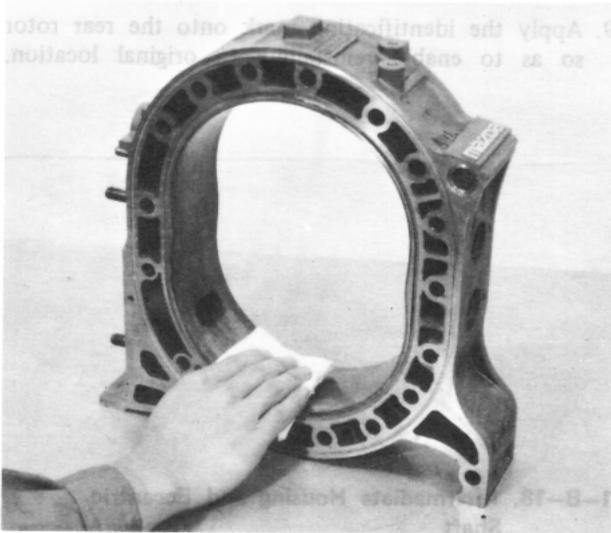


Fig. 1-42

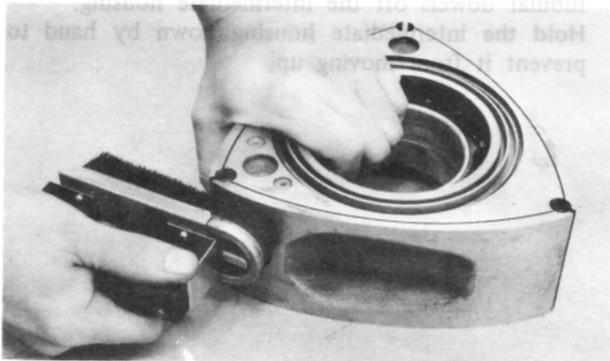


Fig. 1-43

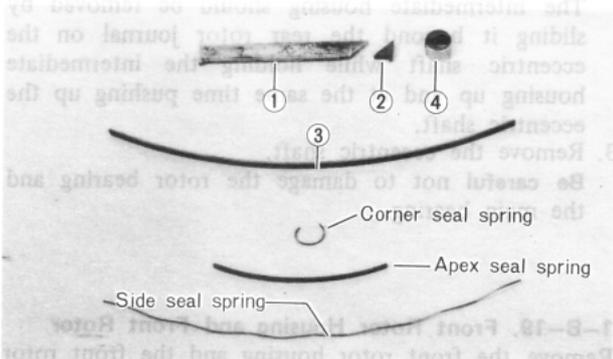


Fig. 1-44

1-C. CLEANING

1-C-1. Front, Intermediate and Rear Housings

1. Remove all carbon on the housings with an extra-fine emery paper.

If 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.

1-C-2. Rotor Housing

Note :

Before cleaning, check for traces of gas or water leakage along the inner margin of each side face of the rotor housing.

1. 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 it is difficult to remove the carbon.
2. Remove all deposits and rust from the cooling water passages on the housing.
3. Remove the sealing agent by wiping with a cloth or brush soaked in a solution of ketone or thinner.

1-C-3. Rotor

Remove the carbon on the rotor by using a carbon remover or emery paper.

Wash the rotor in cleaning solution and dry it by blowing with compressed air.

1-C-4. Apex Seal, Side Piece, Side Seal, Corner Seal and Springs

Remove all carbon from the apex seal ①, side piece ②, side seal ③, corner seal ④ and each spring. Be careful not to damage the seals and springs.

Never use emery paper as it will damage the seals. Wash them with cleaning solution.

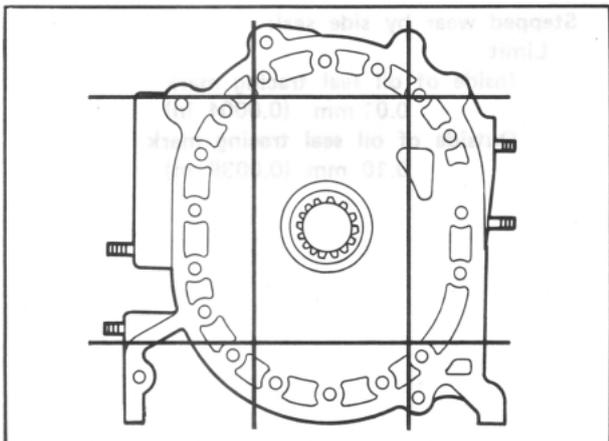


Fig. 1-45

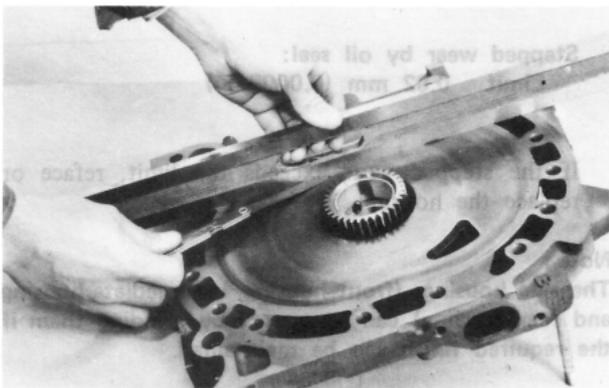


Fig. 1-46

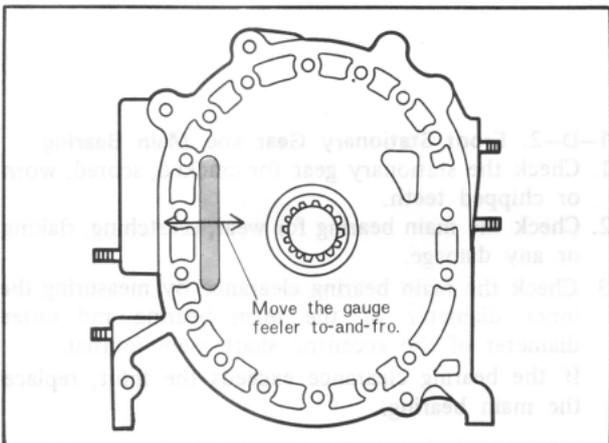


Fig. 1-47

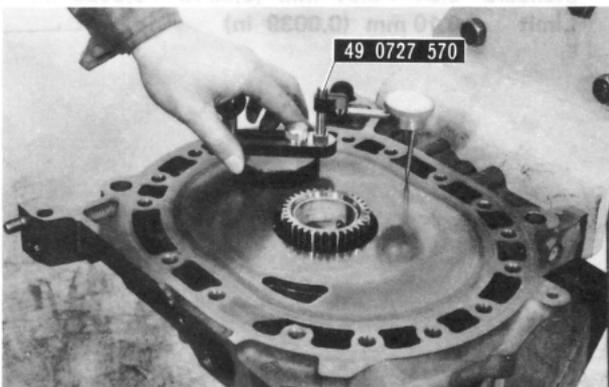


Fig. 1-48

1-D. INSPECTION AND REPAIR

Inspect the following parts in sequences.

1-D-1. Front, Intermediate and Rear Housings

1. Check for housing warpage by placing a straight edge on the housing surface.
If the warpage exceeds the limit, reface or replace the housing.

Warpage limit: 0.04 mm (0.0016 in)

2. Check for stepped wear on the rotor sliding surfaces of the housing.

To check, mount a dial indicator on the **gauge body** (49 0727 570) and slide the gauge body on the sliding surface of the housing.

**Stepped wear by side seal:
Limit 0.10 mm (0.0039 in)**

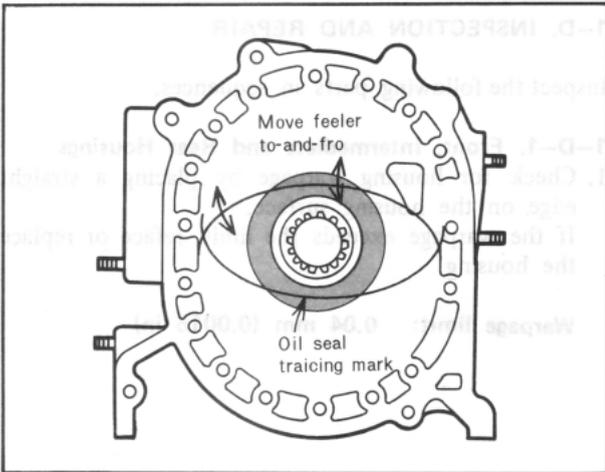


Fig. 1-49

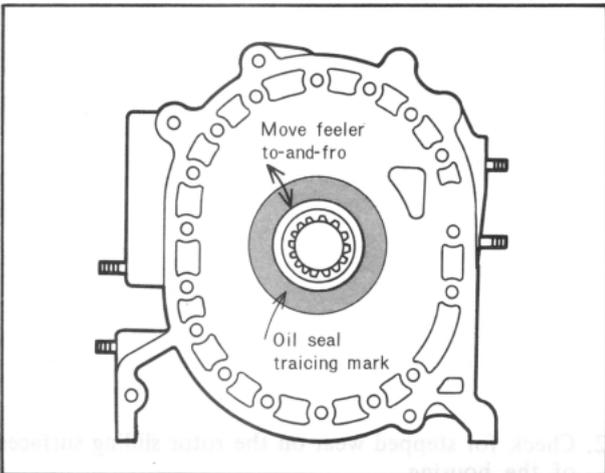


Fig. 1-50

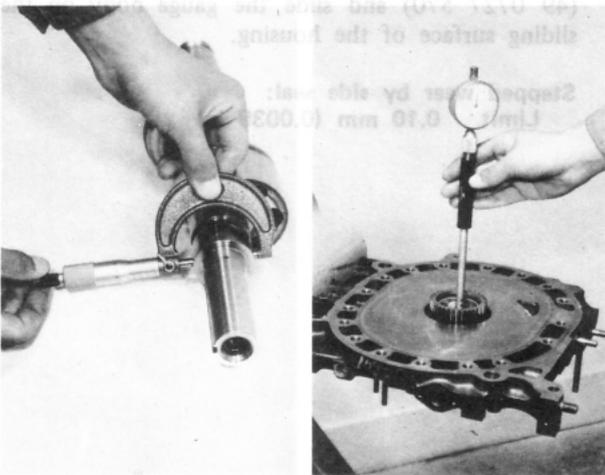


Fig. 1-51

Stepped wear by side seal:

Limit

Inside of oil seal tracing mark
0.01 mm (0.0004 in)

Outside of oil seal tracing mark
0.10 mm (0.0039 in)

Stepped wear by oil seal:

Limit 0.02 mm (0.0008 in)

If the stepped wear exceeds the limit, reface or replace the housing.

Note :

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

1-D-2. Front Stationary Gear and Main Bearing

1. Check the stationary gear for cracked, scored, worn or chipped teeth.
2. Check the main bearing for wear, scratching, flaking or any damage.
3. Check the main bearing clearance by measuring the inner diameter of the main bearing and outer diameter of the eccentric shaft main journal.
If the bearing clearance exceeds the limit, replace the main bearing.

Main bearing clearance:

Standard 0.04 ~ 0.07 mm (0.0016 ~ 0.0028 in)

Limit 0.10 mm (0.0039 in)

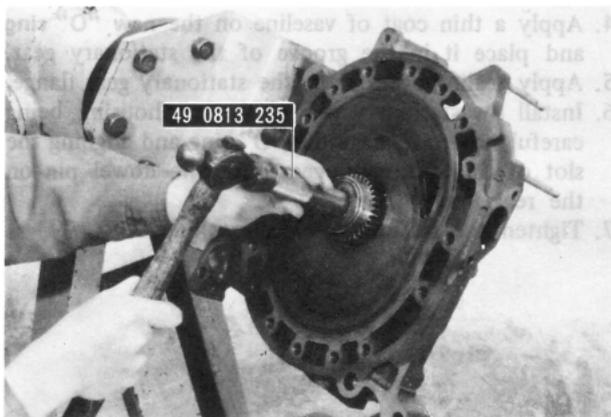


Fig. 1-52

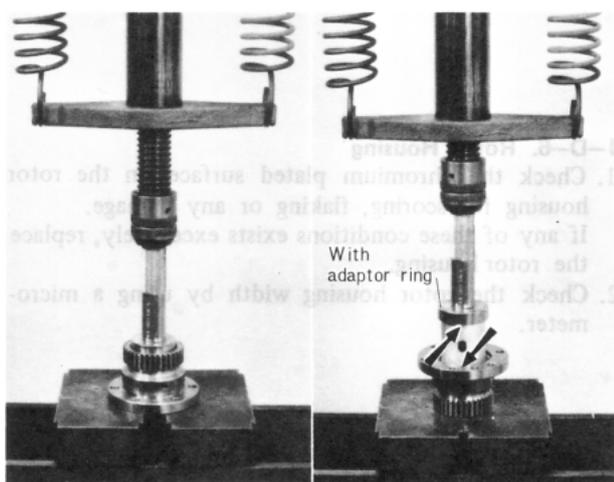


Fig. 1-53

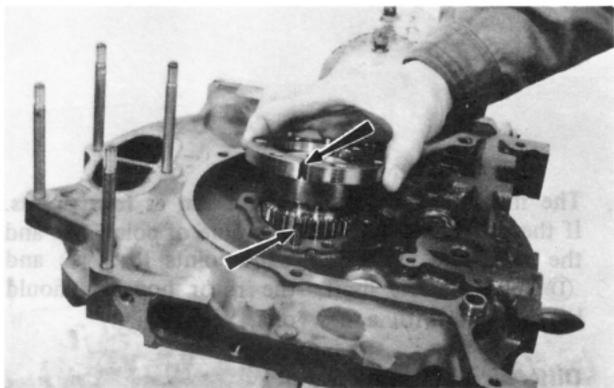


Fig. 1-54

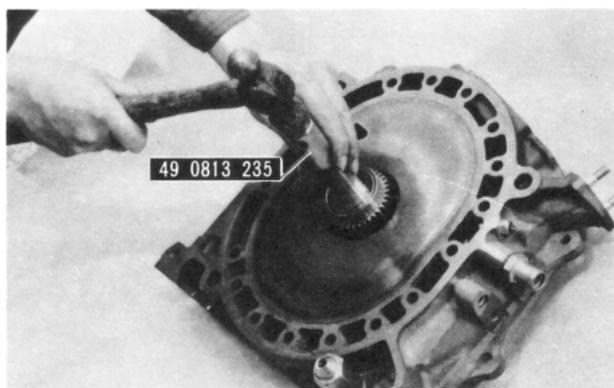


Fig. 1-55

1-D-3. Replacing Front Main Bearing

1. Remove the stationary gear and main bearing assembly, using the puller & installer (49 0813 235).

2. Using the puller & installer **without adaptor ring**, press out the main bearing.

3. Using the puller & installer **with adaptor ring**, and aligning the lug of the bearing and the slot of the stationary gear, press fit the main bearing into the stationary gear until the adaptor touches the stationary gear flange.

4. Install the stationary gear into the front housing, aligning the slot of the stationary gear flange and the dowel pin on the housing.

1-D-4. Rear Stationary Gear and Main Bearing

Check the rear stationary gear and main bearing as described in Par. 1-D-2.

1-D-5. Replacing Rear Main Bearing

1. Remove the stationary gear attaching bolts.

2. Using the puller & installer (49 0813 235), remove the stationary gear.

3. Replace the rear main bearing, referring to Steps 2 and 3 in Par. 1-D-3.

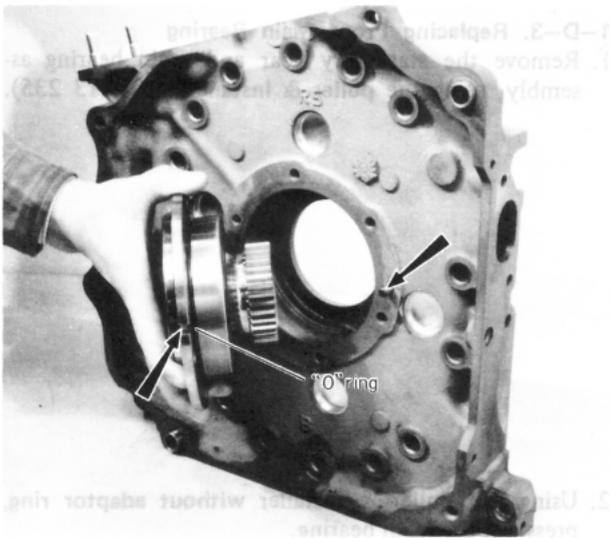


Fig. 1-56

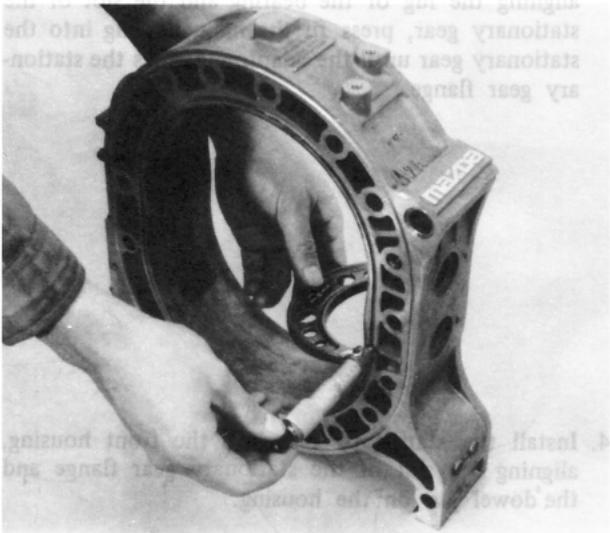


Fig. 1-57

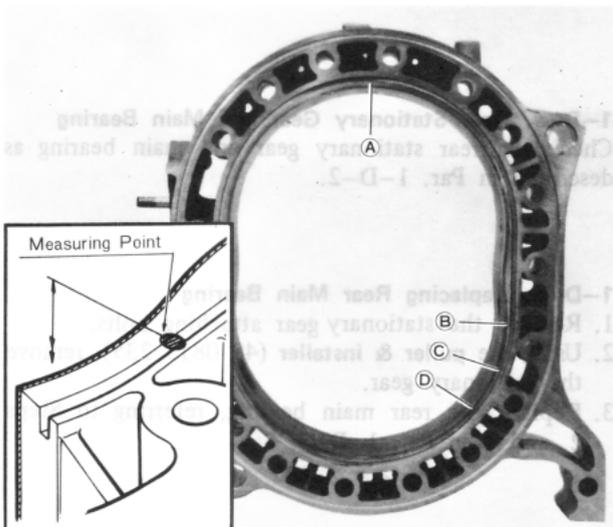


Fig. 1-58

4. Apply a thin coat of vaseline on the new "O" ring and place it in the groove of the 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 stationary gear attaching bolts.

1-D-6. Rotor Housing

1. Check the chromium plated surface on the rotor housing for scoring, flaking or any damage. If any of these conditions exists excessively, replace the rotor housing.
2. Check the rotor housing width by using a micrometer.

The measurements should be taken at four points. If the difference between the value of point A and the minimum value among the points B, C and D exceeds the limit, the rotor housing should be replaced with a new one.

Difference of rotor width:
Limit 0.06 mm (0.0024 in)

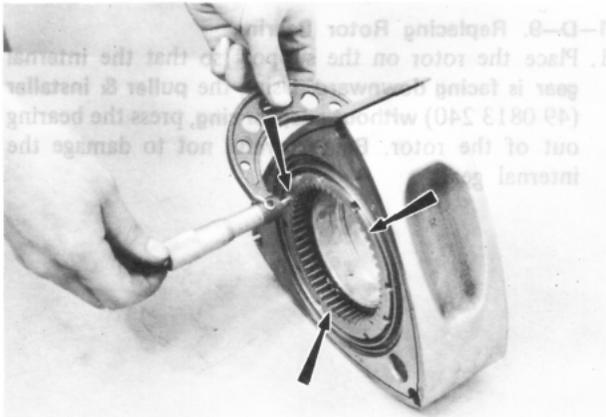


Fig. 1-59



Fig. 1-60

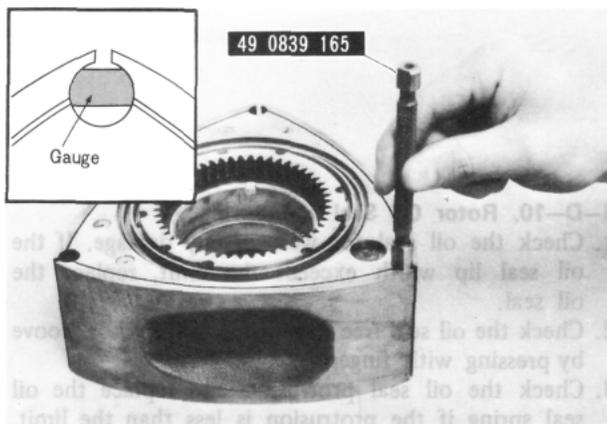


Fig. 1-61

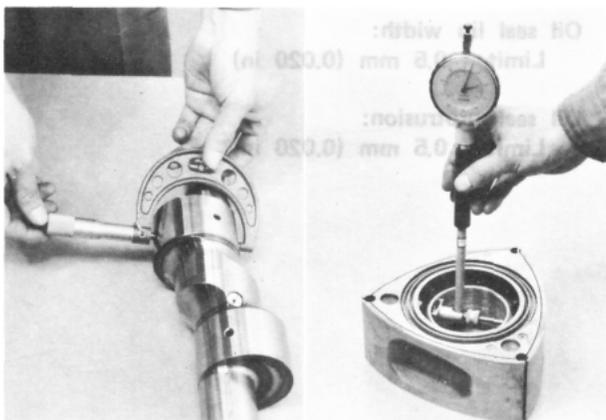


Fig. 1-62

1-D-7. Rotor

1. Carefully inspect the rotor and replace if it is severely worn or damaged.
2. Check the internal gear for cracked, scored, worn or chipped teeth.
3. Check the clearance between the side housing and rotor by measuring the rotor housing width \textcircled{A} (see Fig. 1-58) and the maximum rotor width. The rotor width should be measured at **three points**.

Clearance between the side housing and rotor:

Standard 0.12 ~ 0.18 mm (0.0047 ~ 0.0071 in)

Limit less than 0.10 mm (0.004 in)

If the clearance is more than the specification, replace the rotor assembly.

If the clearance is less than the specification, it indicates that the internal gear has come out, so strike the internal gear lightly with plastic hammer, being careful not to damage and recheck the clearance between the side housing and the rotor.

4. Check the corner seal bores for wear with the gauge (49 0839 165).
 - a) If neither end of the gauge go into the bore, use the original corner seal.
 - b) If the not-go-end of the gauge does not go into the bore while the go-end do, replace with a new corner seal.
 - c) If both ends of the gauge go into the bore, replace the rotor.

1-D-8. 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. If the bearing clearance exceeds the limit, replace the rotor bearing.

Rotor bearing clearance:

Standard 0.04 ~ 0.08 mm (0.0016 ~ 0.0031 in)

Limit 0.10 mm (0.0039 in)

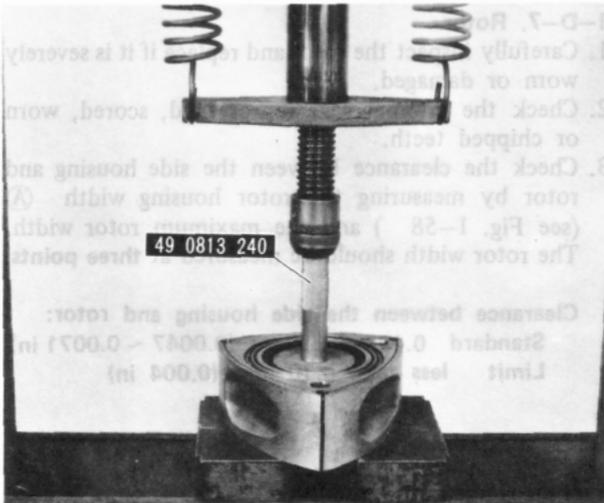


Fig. 1-63

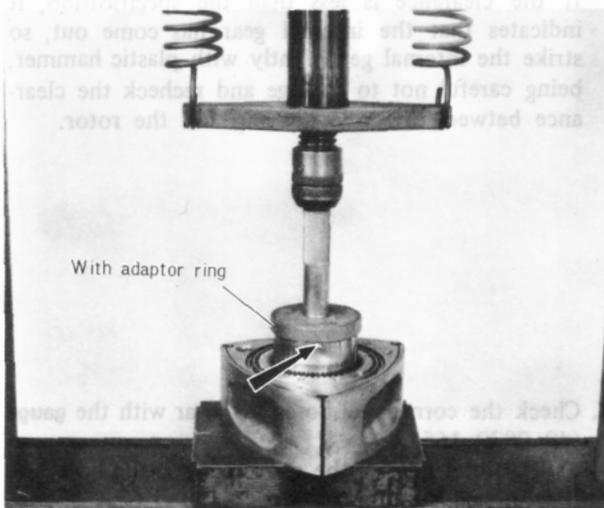


Fig. 1-64

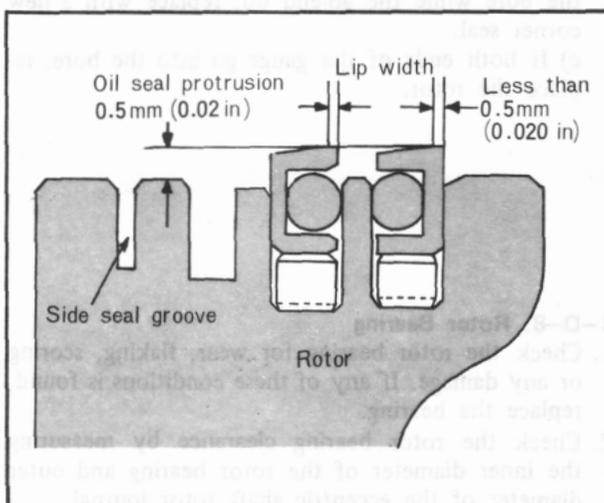


Fig. 1-65

1-D-9. Replacing Rotor Bearing

1. Place the rotor on the support so that the **internal gear is facing downward**. Using the **puller & installer (49 0813 240) without adaptor ring**, press the bearing out of the rotor. **Being careful not to damage the internal gear.**

2. Place the rotor on the support with **internal gear faced upward**.
3. Place the new rotor bearing on the rotor so that the bearing lug is in line with the slot of the rotor bore.
4. Remove the screws attaching the adaptor ring to the puller & installer. Using the puller & installer and adaptor ring, press fit the new bearing until the bearing is flush with the rotor boss.

1-D-10. Rotor Oil Seal and Spring

1. Check the oil seal for wear or any damage. If the oil seal lip width exceeds the limit, replace the oil seal.
2. Check the oil seal free movement in the rotor groove by pressing with finger.
3. Check the oil seal protrusion and replace the oil seal spring if the protrusion is less than the limit.

Oil seal lip width:
Limit 0.5 mm (0.020 in)

Oil seal protrusion:
Limit 0.5 mm (0.020 in)

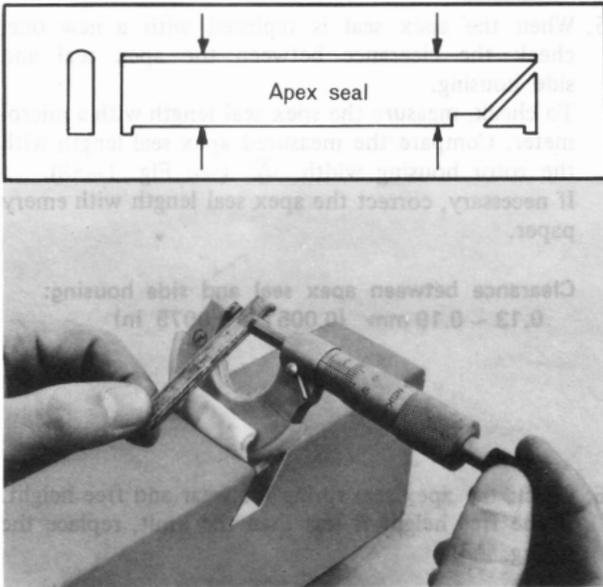


Fig. 1-66

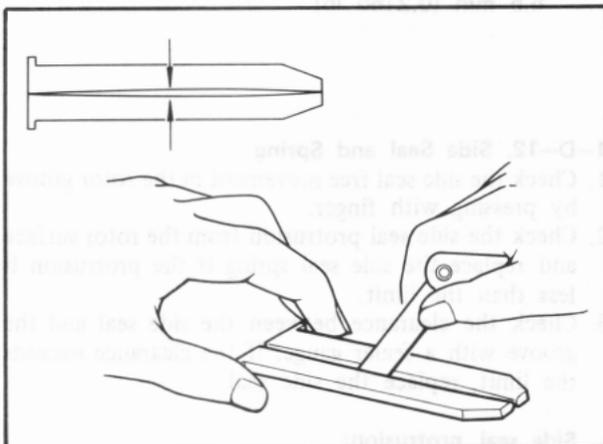


Fig. 1-67

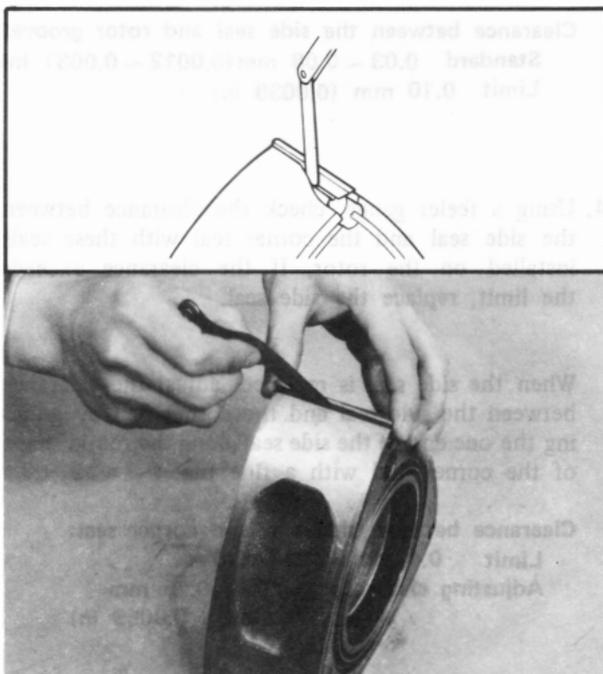


Fig. 1-68

1-D-11. Apex Seal, Side Piece and Spring

1. Check the apex seal and side piece for wear, crack or any damage.
If any of these conditions is found, replace the seal.
2. Measure the apex seal height with a micrometer at two positions and replace if the height is less than the limit.

Apex seal height:

Standard	8.5 mm (0.3347 in)
Limit	7.0 mm (0.2756 in)

3. Check the apex seal for warpage by measuring the clearance between the top surface of apex seals picked out from three seals on a rotor.
If the clearance exceeds the limit, replace all three apex seals on a rotor.

Apex seal warpage:

Limit	0.06 mm (0.0024 in)
--------------	----------------------------

4. Check the clearance between the apex seal and the groove. To check, place the apex seal in its respective groove on the rotor and measure the clearance 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.
If the clearance exceeds the limit, replace the apex seal.

Clearance between apex seal and rotor groove:

Standard	0.05 ~ 0.09 mm (0.002 ~ 0.0035 in)
Limit	0.15 mm (0.0059 in)

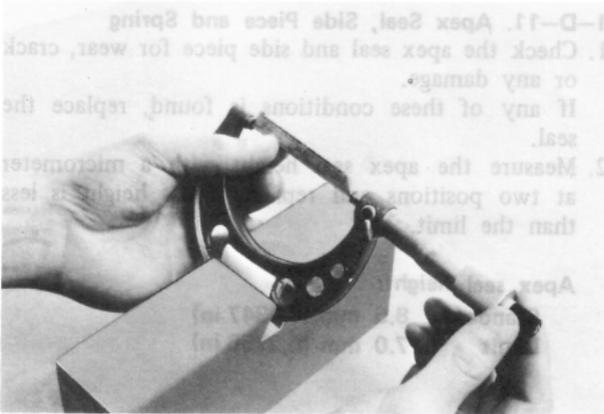


Fig. 1-69

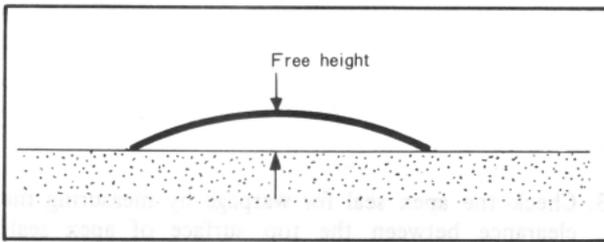


Fig. 1-70

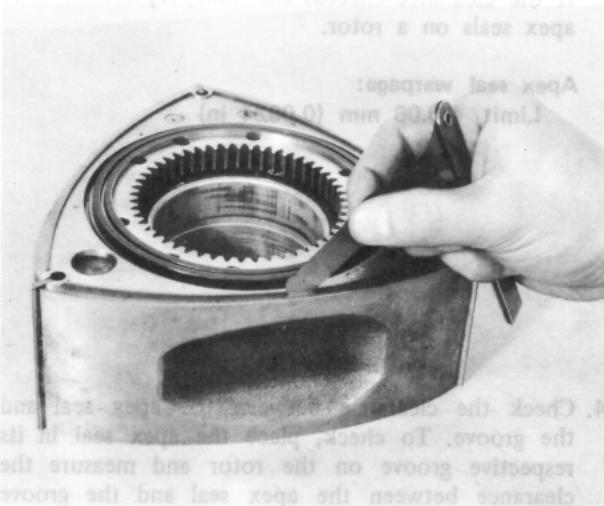


Fig. 1-71

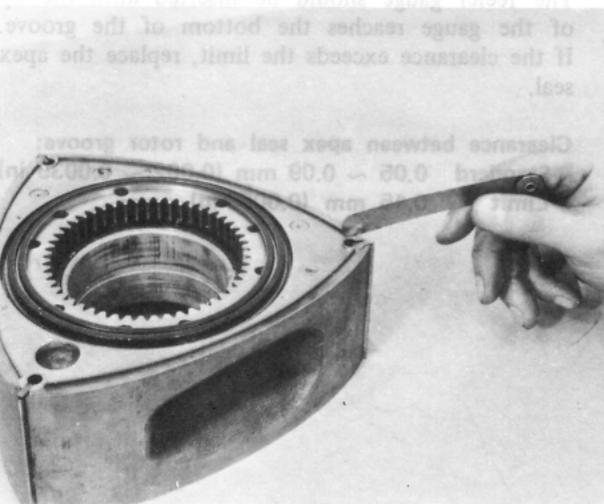


Fig. 1-72

- When the apex seal is replaced with a new one, check the clearance between the apex seal and side housing.

To check, measure the spex seal length with a micrometer. Compare the measured apex seal length with the rotor housing width $\text{\textcircled{A}}$ (see Fig. 1-58).

If necessary, correct the apex seal length with emery paper.

Clearance between apex seal and side housing:
 0.13 ~ 0.19 mm (0.0051 ~ 0.0075 in)

- Check the apex seal spring for wear and free height. If the free height is less than the limit, replace the spring.

Free height limit:
 5.5 mm (0.2165 in)

1-D-12. Side Seal and Spring

- Check the side seal free movement in the rotor groove by pressing with finger.
- Check the side seal protrusion from the rotor surface and replace the side seal spring if the protrusion is less than the limit.
- Check the clearance between the side seal and the groove with a feeler gauge. If the clearance exceeds the limit, replace the side seal.

Side seal protrusion:
 Limit 0.5 mm (0.02 in)

Clearance between the side seal and rotor groove:
 Standard 0.03 ~ 0.08 mm (0.0012 ~ 0.0031 in)
 Limit 0.10 mm (0.0039 in)

- Using a feeler gauge, check the clearance between the side seal and the corner seal with these seals installed on the rotor. If the clearance exceeds the limit, replace the side seal.

When the side seal is replaced, adjust the clearance 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.

Clearance between side seal and corner seal:
 Limit 0.4 mm (0.0157 in)
 Adjusting clearance 0.05 ~ 0.15 mm
 (0.002 ~ 0.0059 in)

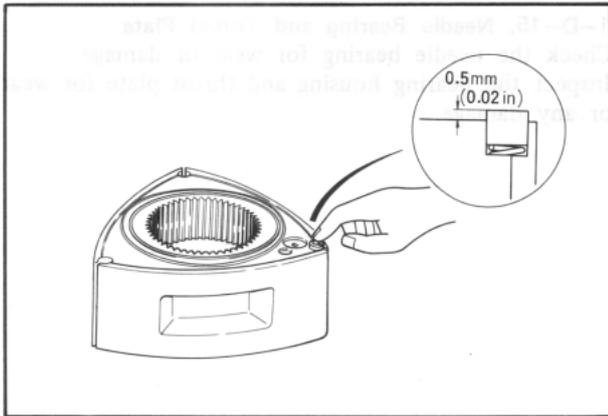


Fig. 1-73

1-D-13. Corner Seal and Spring

1. Check the corner seal for wear, crack or any damage. If any of these conditions is found, replace the seal.
2. Check the corner seal free movement in the rotor groove by pressing with finger.
3. Check the corner seal protrusion from the rotor surface. Replace the corner seal spring if the protrusion is less than the limit.
4. Check the corner seal spring for wear.

Corner seal protrusion:
Limit 0.5 mm (0.02 in)

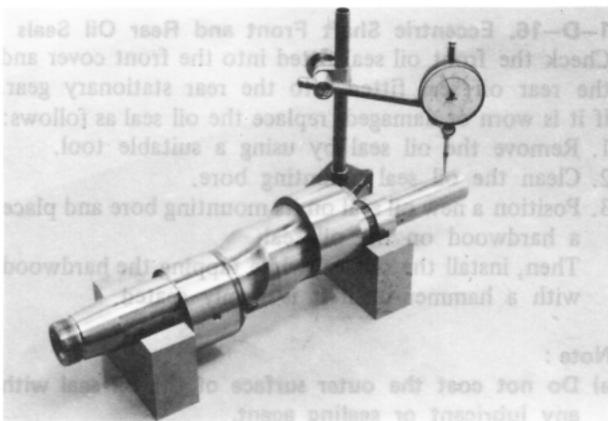


Fig. 1-74

1-D-14. Eccentric Shaft

1. Check the shaft for cracks, scratches, wear or any damage. Be sure that the oil passages are open.
2. Check the shaft for run-out. To check, use a dial indicator and turn the eccentric shaft, and take one-half of the largest difference shown by the dial indicator. If the run-out is more than the limit, replace the shaft with a new one.

Eccentric shaft run-out:
Limit 0.06 mm (0.0024 in)

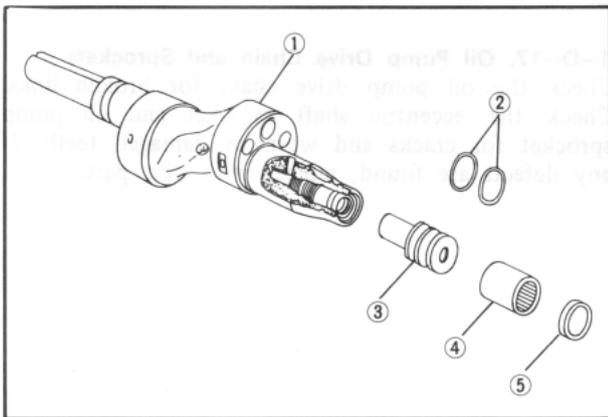


Fig. 1-75

3. 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.

- 1) Eccentric shaft
- 2) "O" ring
- 3) Blind plug
- 4) Bearing
- 5) Oil seal

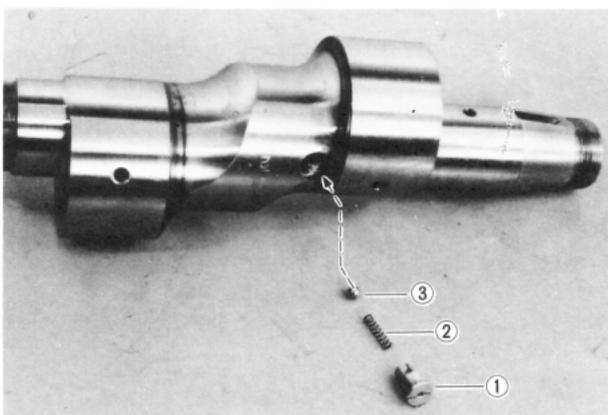


Fig. 1-76

4. Check the oil jet for spring weakness, stick or damage of the steel ball.

- 1) Plug
- 2) Spring
- 3) Steel ball

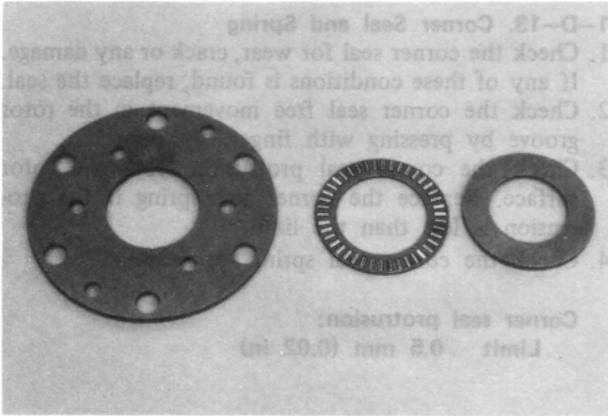


Fig. 1-77

1-D-15. Needle Bearing and Thrust Plate

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

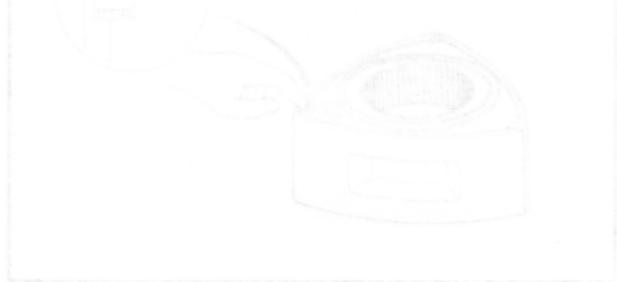


Fig. 1-73

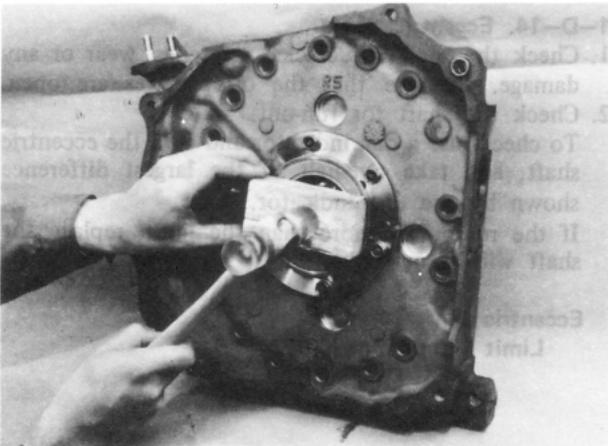


Fig. 1-78

1-D-16. Eccentric Shaft Front and Rear Oil Seals

Check the front oil seal fitted into the front cover and the rear oil seal fitted into the rear stationary gear. If it is worn or damaged, replace the oil seal as follows:

1. Remove the oil seal by using a suitable tool.
2. Clean the oil seal mounting bore.
3. Position a new oil seal on its mounting bore and place a hardwood on the oil seal. Then, install the oil seal while tapping the hardwood with a hammer until it is firmly seated.

Note :

- a) Do not coat the outer surface of the oil seal with any lubricant or sealing agent.
- b) Do not tap the oil seal directly with a hammer.

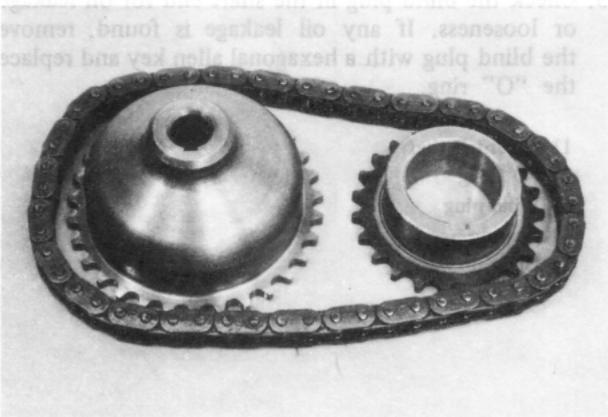


Fig. 1-79

1-D-17. Oil Pump Drive Chain and Sprockets

Check the oil pump drive chain for broken links. Check the eccentric shaft sprocket and oil pump sprocket for cracks and worn or damaged teeth. If any defects are found, replace with new parts.

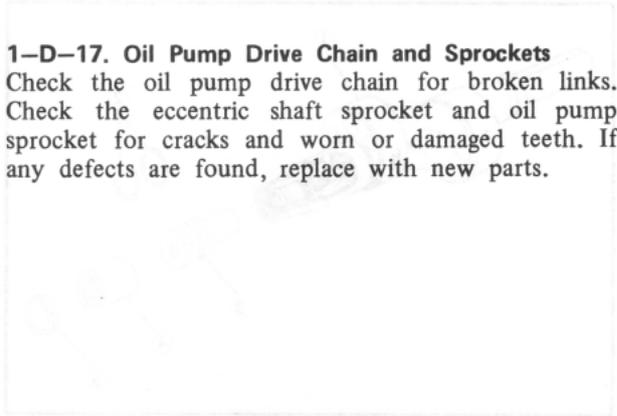


Fig. 1-75



Fig. 1-80

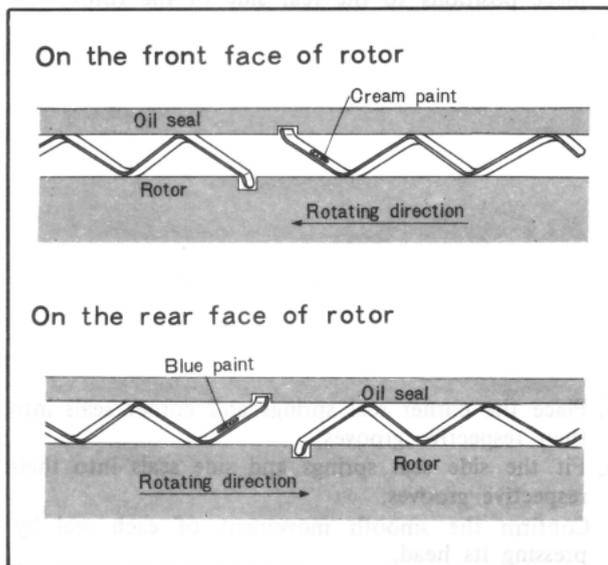


Fig. 1-81

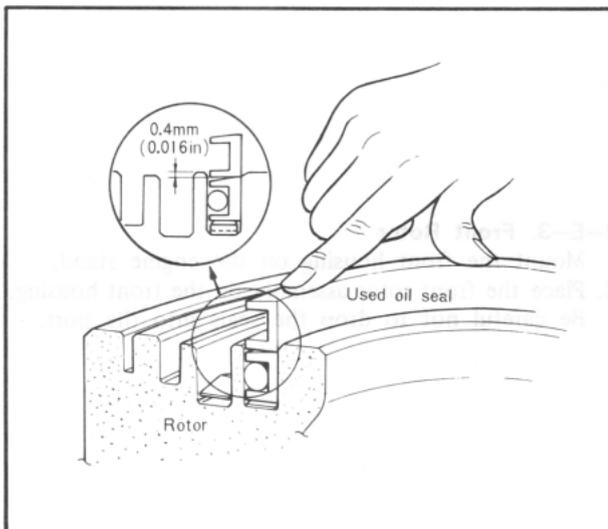


Fig. 1-82

1-E. ENGINE ASSEMBLY

Assemble the following component parts in sequences.

Note :

The "O" rings, rubber seals, and gaskets should be replaced with new ones.

1-E-1. Oil Seal

1. Place the rotor on a clean 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 in the oil seal grooves.

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

3. Install a **new "O" ring** in each oil seal.
4. Place the inner oil seal to the oil seal groove so that the square edge of the spring fits in the stopper notch of the oil seal.

5. Press the inner oil seal by using a used inner oil seal so that the lip surface of the oil seal sinks into a position approximately **0.4 mm (0.016 in)** below the surface of the rotor.
6. Place the outer oil seal to the oil seal groove so that the square edge of the spring fits in the stopper notch of the oil seal.
7. Push the oil seal slowly with fingers. Confirm the smooth movement of each oil seal by pressing the oil seal.
8. Install the oil seal springs and oil seals on the other side of the rotor.

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.

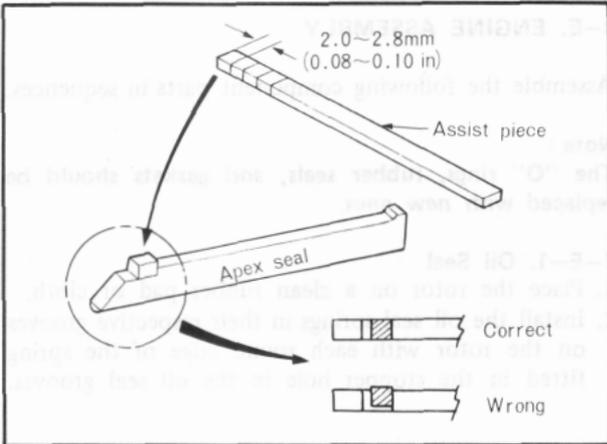


Fig. 1-83

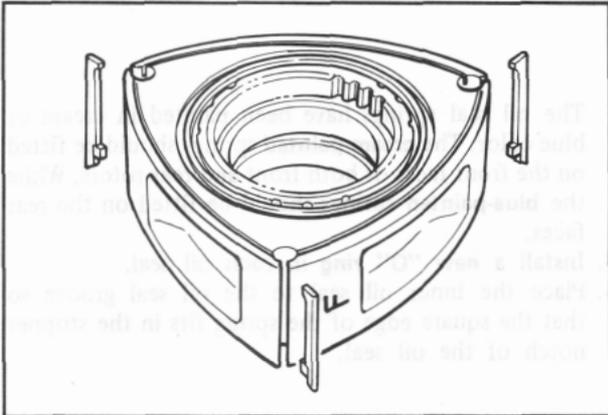


Fig. 1-84

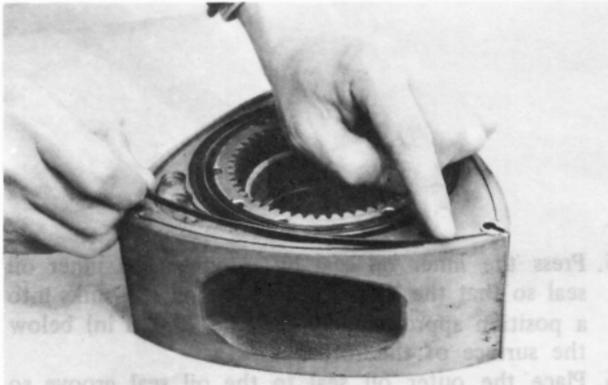


Fig. 1-85



Fig. 1-86

1-E-2. Seals (Front side of rotor)

1. Place the front rotor on a clean rubber pad or cloth with the internal gear upward.
2. Cut the assist piece with a knife so that its length becomes to **2.0 ~ 2.8 mm (0.08 ~ 0.10 in)**.
3. Peel the paper stuck on the assist piece and stick the assist piece on the apex seal.

4. Install the apex seals without the spring and side piece into their respective grooves so that the side piece positions to the rear side of the rotor.

5. Place the corner seal springs and corner seals into their respective grooves.
6. Fit the side seal springs and side seals into their respective grooves.
Confirm the smooth movement of each seal by pressing its head.

1-E-3. Front Rotor

1. Mount the front housing on the engine stand.
2. Place the front rotor assembly on the front housing.
Be careful not to drop the seals into the port.

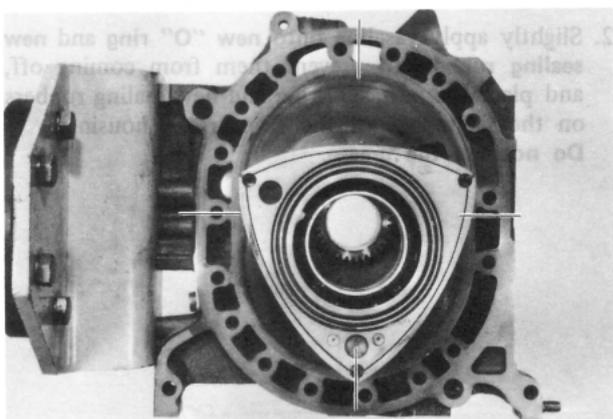


Fig. 1-87



Fig. 1-88

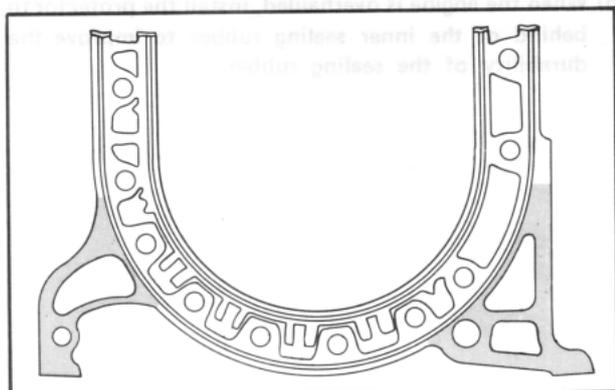


Fig. 1-89

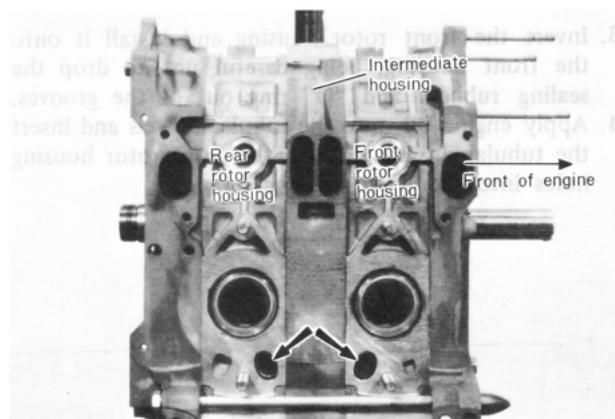


Fig. 1-90

3. Mesh the internal gear and stationary gear so that one of the rotor apexes is set to any one of the four places.



1-E-4. Eccentric Shaft

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



1-E-5. Front Rotor Housing

1. Apply sealing agent onto the front side of the front rotor housing.



Note :

The front and rear rotor housings are not interchangeable.

Install the rotor housing so that the each air injection hole goes toward the intermediate housing.

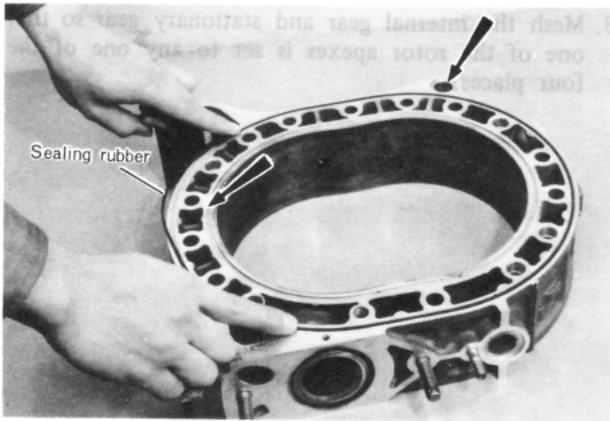


Fig. 1-91

2. Slightly apply vaseline onto **new "O" ring and new sealing rubbers** to prevent them from coming off, and place the new "O" ring and new sealing rubbers on the front side of the front rotor housing. **Do not use the grease.**

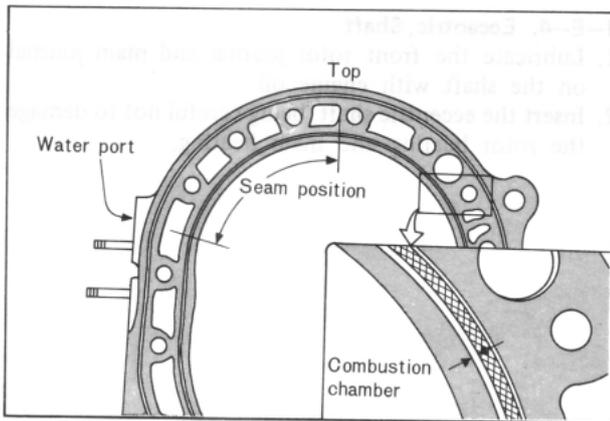


Fig. 1-92

Note :

- a) The wider white line of the inner sealing rubber should face to combustion chamber and the seam of the sealing rubber should be placed at the position as shown in figure. **Do not stretch the sealing rubbers.**

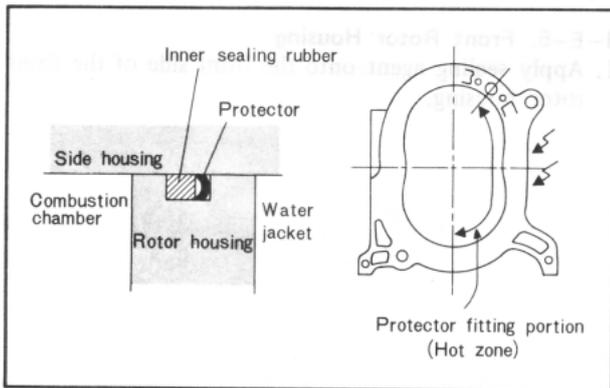


Fig. 1-93

- b) When the engine is overhauled, install the protector to behind of the inner sealing rubber to improve the durability of the sealing rubber.

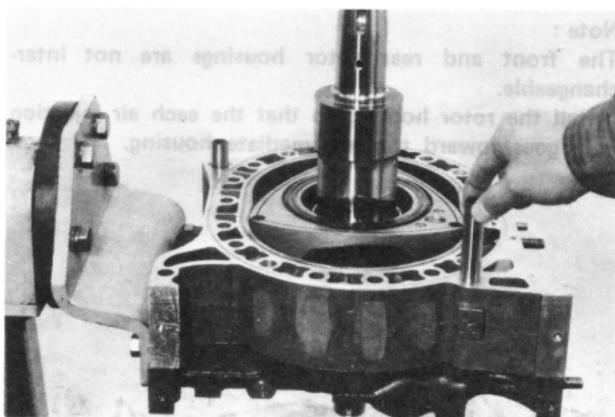


Fig. 1-94

3. Invert the front rotor housing and install it onto the front housing, being careful not to drop the sealing rubbers and "O" ring out of the grooves.
4. Apply engine oil onto the tubular dowels and insert the tubular dowels through the front rotor housing holes into the front housing holes.

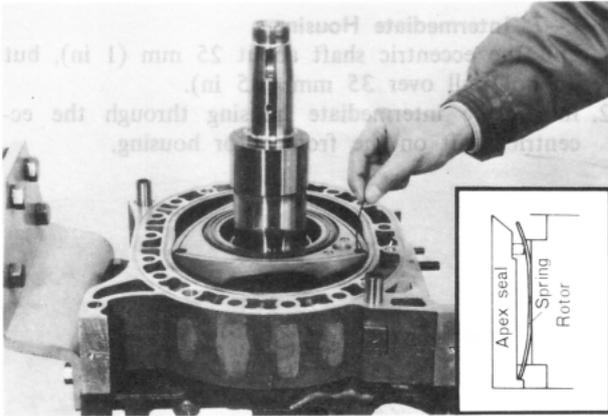


Fig. 1-95

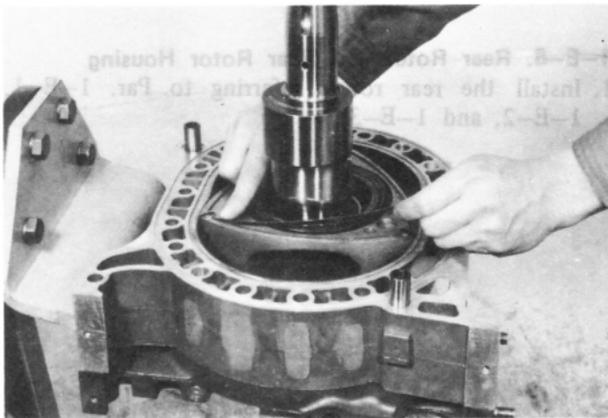


Fig. 1-96

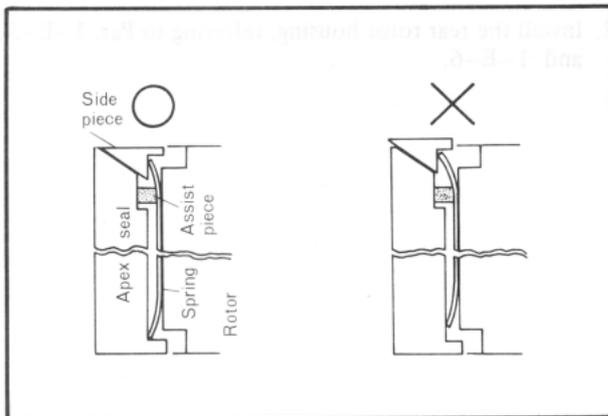


Fig. 1-97

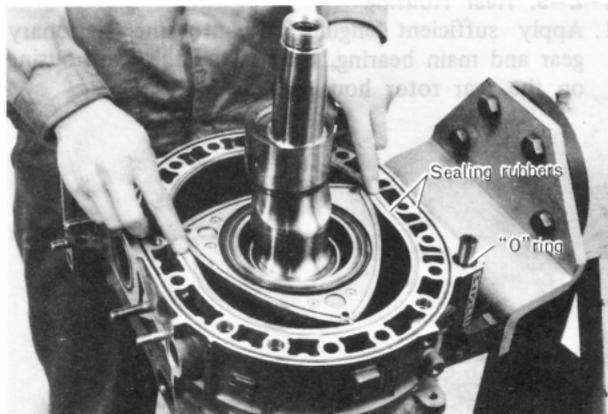


Fig. 1-98

1-E-6. Seals (Rear side of rotor)

1. Insert the each apex seal spring so that the both ends of the spring may support the back side of the apex seal.

2. Install the corner seal springs and corner seals into their respective grooves.
 3. Install the side seal springs and side seals into their respective grooves.

4. Fit the each side piece to its original position. And confirm that the spring should be set correctly on the side piece.
 5. Confirm the smooth movement of each seal by pressing its head.

6. Apply the sealing agent on the rear side of the front rotor housing and then, place the **new "O" ring, new sealing rubbers** and protector on the rear side of the front rotor housing, as instructed in Par. 1-E-5.
 7. Apply engine oil onto the each seal and sliding surface of the front rotor housing. Make sure that the front rotor housing is free from any foreign matter.



Fig. 1-99

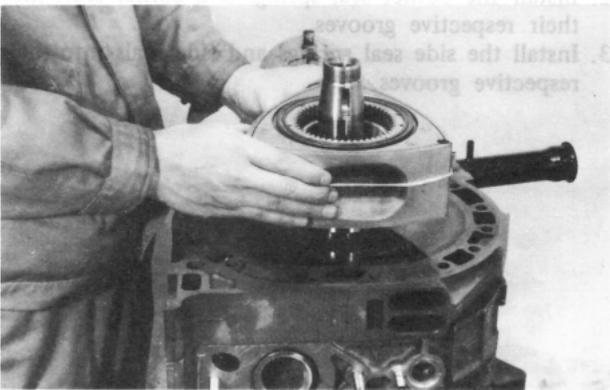


Fig. 1-100

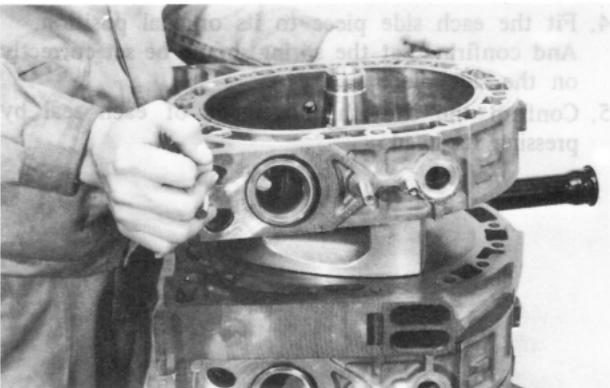


Fig. 1-101

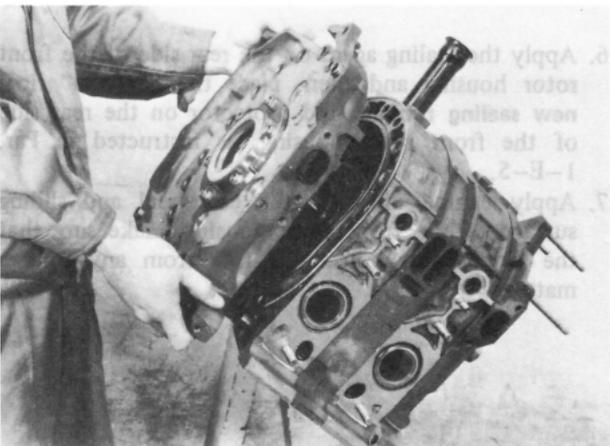


Fig. 1-102

1-E-7. Intermediate Housing

1. 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.



Fig. 1-98

1-E-8. Rear Rotor and Rear Rotor Housing

1. Install the rear rotor, referring to Par. 1-E-1, 1-E-2, and 1-E-3.



Fig. 1-99

2. Install the rear rotor housing, referring to Par. 1-E-5 and 1-E-6.



Fig. 1-97

1-E-9. Rear Housing

1. Apply sufficient engine oil onto the stationary gear and main bearing, then install the rear housing on the rear rotor housing.



Fig. 1-98

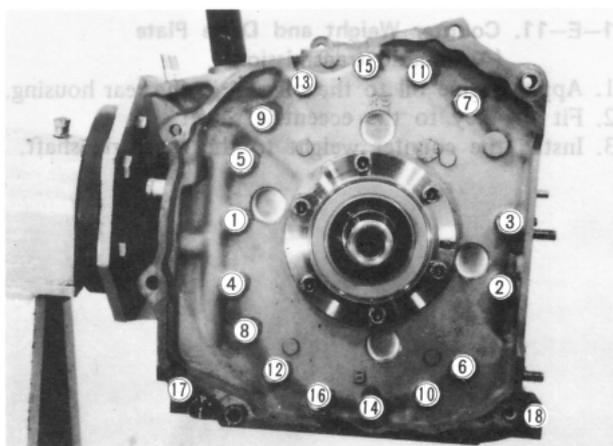


Fig. 1-103

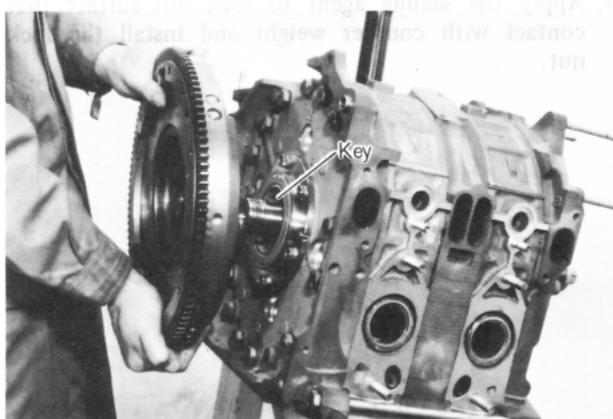


Fig. 1-104

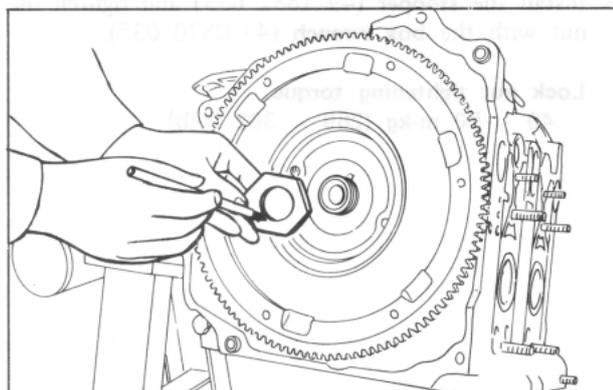


Fig. 1-105

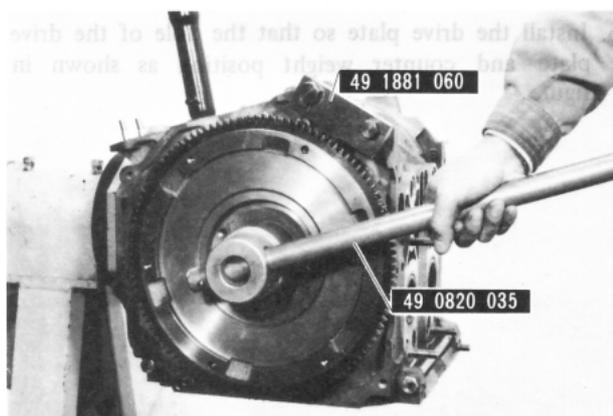


Fig. 1-106

2. Apply engine oil onto the thread of the bolt.
3. Fit the tension bolts and tighten the bolts in the order shown in figure.

Tension bolt tightening torque:
3.2 ~ 3.8 m-k g (23 ~ 27 ft-lb)

Note :

- a) Replace the sealing washer in the tension bolt when the engine is overhauled.
 - b) Do not tighten the tension bolts at one time.
4. Turn the eccentric shaft and make sure that the rotation is light and smooth.

1-E-10. Flywheel (Manual transmission)

1. Apply engine oil to the oil seal in the rear housing.
2. Fit the key to the eccentric shaft.
3. Install the flywheel to the eccentric shaft.

4. Apply the sealing agent to lock nut surface that contact with flywheel and install the lock nut.

5. Install the **brake** (49 1881 060) and tighten the nut with the **box wrench** (49 0820 035).

Lock nut tightening torque:
40 ~ 50 m-k g (289 ~ 362 ft-lb)

6. Install the clutch disc and clutch cover assembly as described in Par. 6-C.

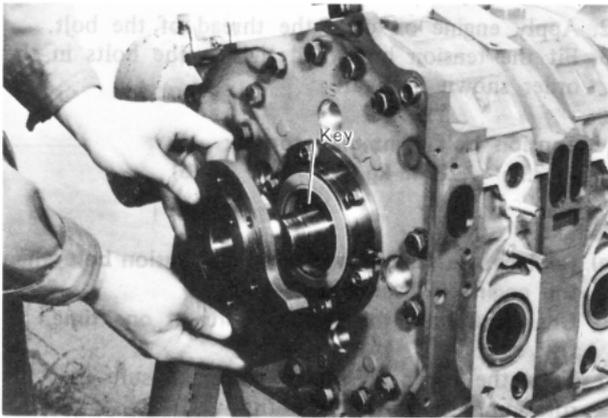


Fig. 1-107

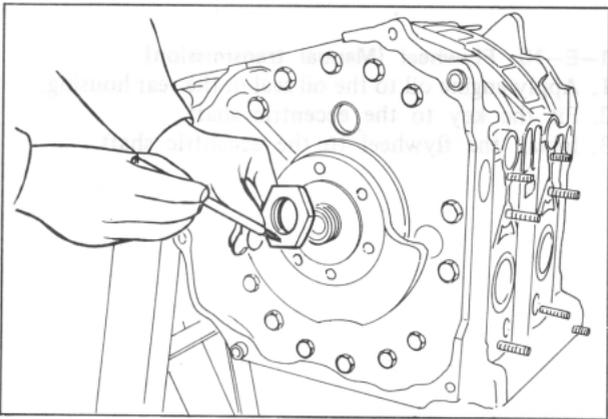


Fig. 1-108

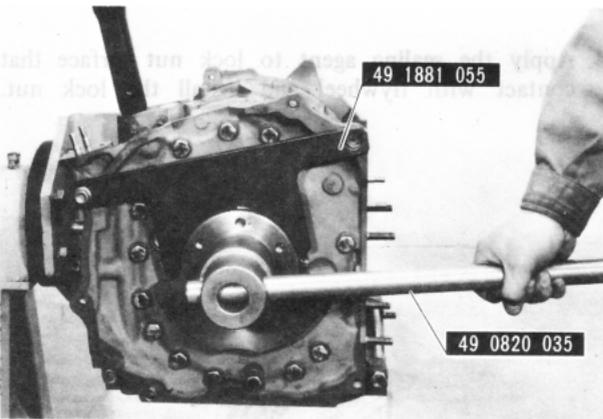


Fig. 1-109

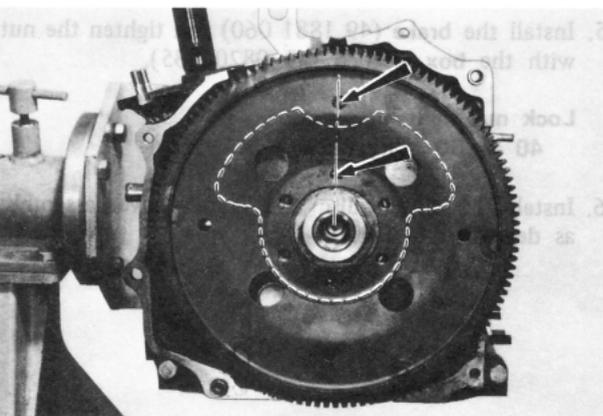


Fig. 1-110

1-E-11. Counter Weight and Drive Plate (Automatic transmission)

1. Apply engine oil to the oil seal in the rear housing.
2. Fit the key to the eccentric shaft.
3. Install the counter weight to the eccentric shaft.

4. Apply the sealing agent to lock nut surface that contact with counter weight and install the lock nut.

5. Install the **stopper** (49 1881 055) and tighten the nut with the **box wrench** (49 0820 035).

Lock nut tightening torque:
40 ~ 50 m-k \ddot{g} (289 ~ 362 ft-lb)

6. Install the drive plate so that the hole of the drive plate and counter weight position as shown in figure.

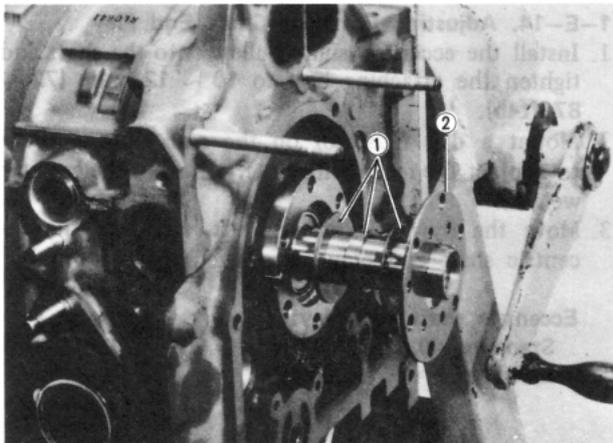


Fig. 1-111

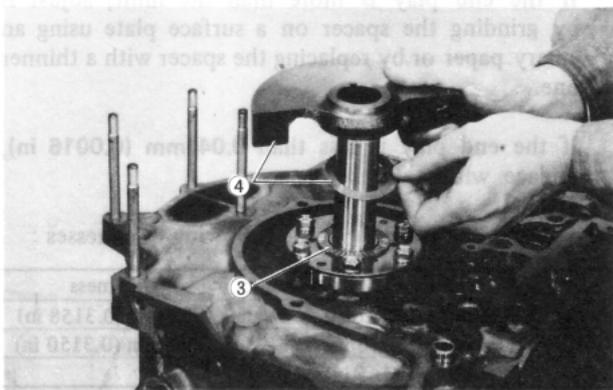


Fig. 1-112

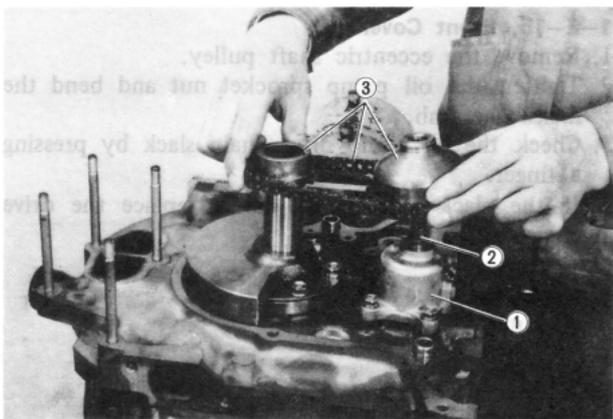


Fig. 1-113

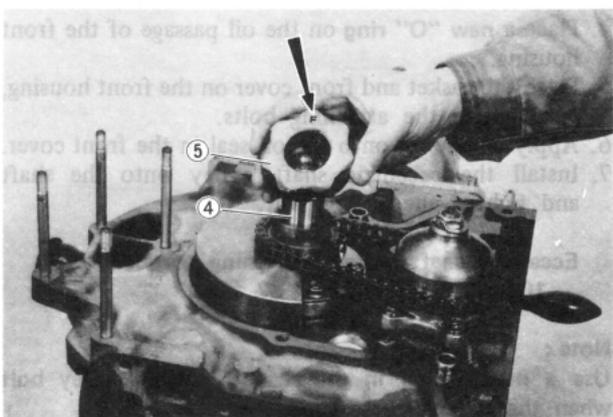


Fig. 1-114

1-E-12. Bearing Housing and Balance Weight

1. Place the thrust plate with the chamfer downward, and slide the spacer and needle bearing onto the eccentric shaft. Then apply sufficient engine oil onto them.
2. Place the bearing housing on the front housing, and tighten the attaching bolts.

Note :

If the bearing housing has not been removed from the front housing, special care should be taken, when installing 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.

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

1-E-13. Oil Pump and Oil Pump Drive

1. Install the oil pump assembly on the front housing.
2. Fit the key onto the oil pump shaft.
3. Fit the oil pump drive chain onto the oil pump sprocket and eccentric shaft sprocket, and install them to the eccentric shaft and oil pump shaft, aligning the key and keyway.



4. Aligning the keyways of the eccentric shaft sprocket and balance weight, and install the key.
5. Slide the distributor drive gear onto the eccentric shaft with "F" mark toward the front of engine.



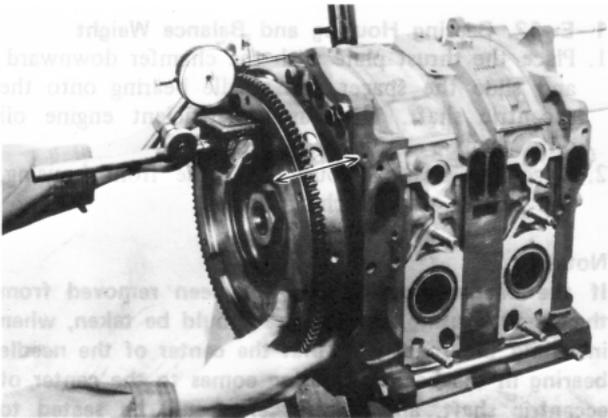


Fig. 1-115

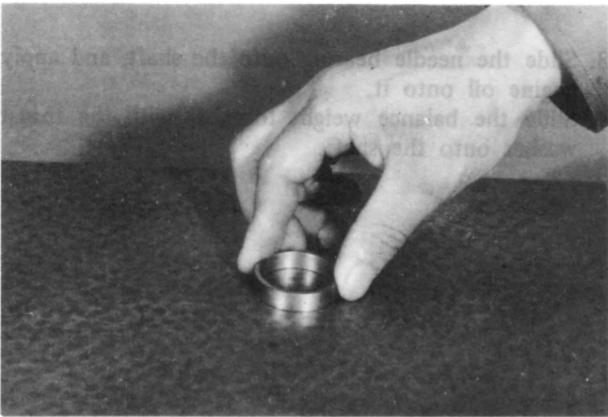


Fig. 1-116

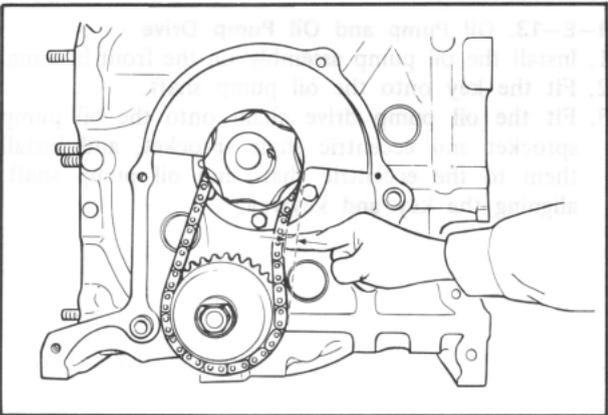


Fig. 1-117

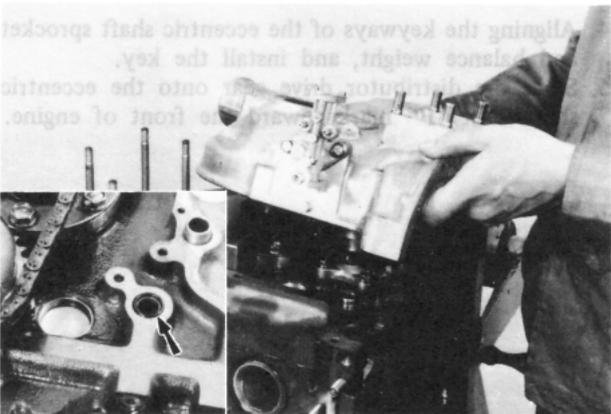


Fig. 1-118

1-E-14. Adjusting Eccentric Shaft End Play

1. Install the eccentric shaft pulley onto the shaft and tighten the attaching bolt to **10 ~ 12 m-kg (72 ~ 87 ft-lb)**.
2. Mount a dial indicator on the rear housing so as to contact the feeler with the flywheel or the counter weight.
3. Move the flywheel fore and aft, and read the eccentric shaft end play.

Eccentric shaft end play:

Standard 0.04 ~ 0.07 mm (0.0016 ~ 0.0028 in)
Limit 0.09 mm (0.0035 in)

If the end play is more than the limit, adjust it by grinding the spacer on a surface plate using an emery paper or by replacing the spacer with a thinner one.

If the end play is less than **0.04 mm (0.0016 in)**, replace with a thicker spacer.

The spacers are available in the following thicknesses :

Mark	Thickness	Mark	Thickness
X	8.08 mm (0.3181 in)	V	8.02 mm (0.3158 in)
K	8.06 mm (0.3173 in)	Z	8.00 mm (0.3150 in)
Y	8.04 mm (0.3165 in)		

1-E-15. Front Cover

1. Remove the eccentric shaft pulley.
2. Tighten the oil pump sprocket nut and bend the lockwasher tab.
3. Check the oil pump drive chain slack by pressing a finger.
If the slack exceeds the limit, replace the drive chain with a new one.

Oil pump drive chain slack:
Limit 12 mm (0.47 in)

4. Place a new "O" ring on the oil passage of the front housing.
5. Place the gasket and front cover on the front housing, and tighten the attaching bolts.
6. Apply engine oil onto the oil seal in the front cover.
7. Install the eccentric shaft pulley onto the shaft and tighten the pulley bolt.

Eccentric shaft pulley tightening torque:
10 ~ 12 m-kg (72 ~ 87 ft-lb)

Note :

Use a new washer in the eccentric shaft pulley bolt when the pulley is removed.

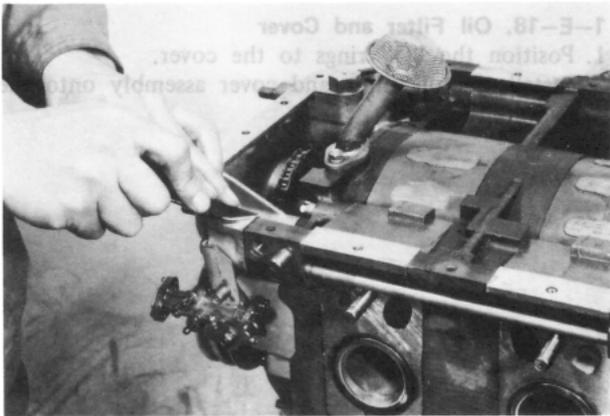


Fig. 1-119

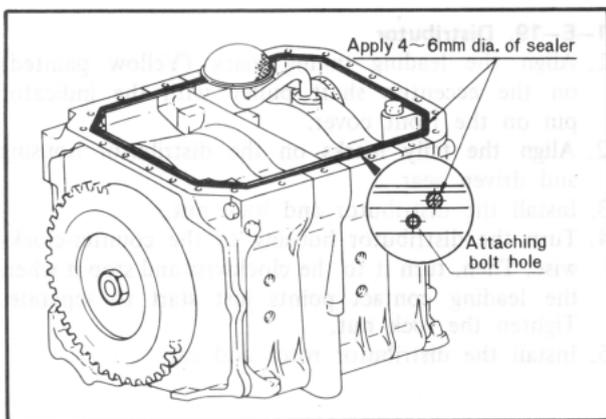


Fig. 1-120

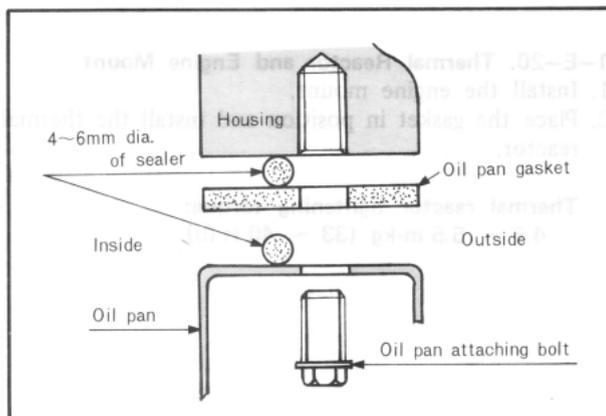


Fig. 1-121

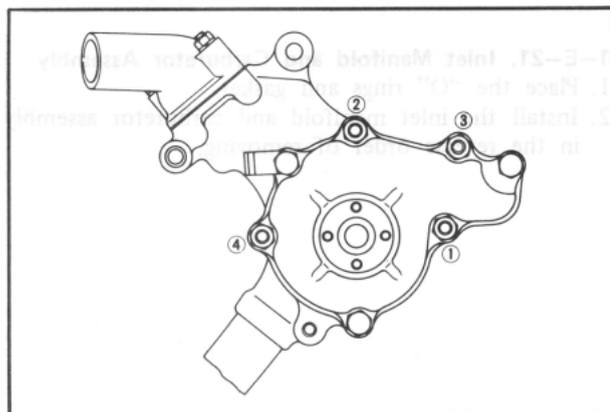


Fig. 1-122

1-E-16. Oil Strainer and Oil Pan

1. Install the oil strainer and gasket on the front housing.
2. Cut off the excess gaskets along the mounting surface of the oil pan.

3. Apply the **4 ~ 6 mm (0.16 ~ 0.24 in)** diameter continuous bead of sealer (Part No. 8527 77 739) on mounting surface of oil pan and place the gasket on it. The both ends of the sealer bead should be overlapped.

4. Apply the sealer onto the gasket and install the oil pan.

Oil pan tightening torque:
0.8 ~ 1.1 m-kg (6 ~ 8 ft-lb)

1-E-17. Water Pump

Install the water pump and tighten the nuts in sequence as shown in figure.

Water pump tightening torque:
1.8 ~ 2.7 m-kg (13 ~ 20 ft-lb)



Fig. 1-123

1-E-18. Oil Filter and Cover

1. Position the "O" rings to the cover.
2. Install the oil filter and cover assembly onto the rear housing.

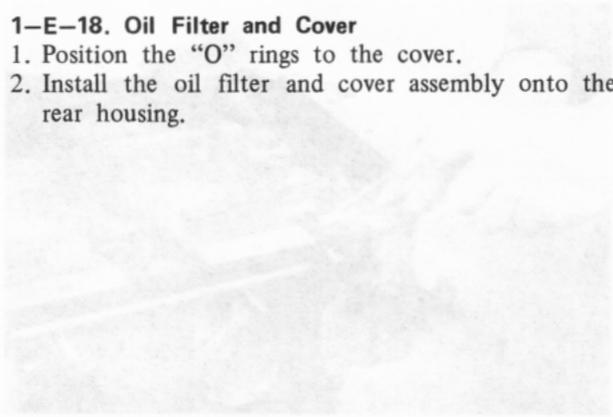


Fig. 1-124

1-E-19. Distributor

1. Align the leading timing mark (Yellow painted) on the eccentric shaft pulley with the indicator pin on the front cover.
2. Align the tally marks on the distributor housing and driven gear.
3. Install the distributor and lock nut.
4. Turn the distributor housing to the counter-clockwise. Then, turn it to the clockwise and stop it when the leading contact points just start to separate. Tighten the lock nut.
5. Install the distributor rotor and cap.

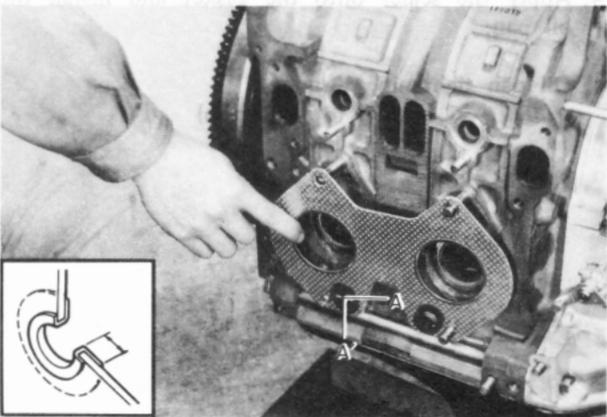
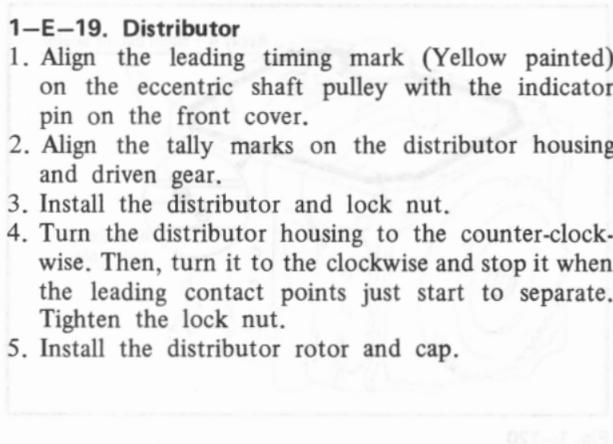


Fig. 1-125

1-E-20. Thermal Reactor and Engine Mount

1. Install the engine mount.
2. Place the gasket in position and install the thermal reactor.

Thermal reactor tightening torque:
4.5 ~ 5.5 m·kg (33 ~ 40 ft·lb)

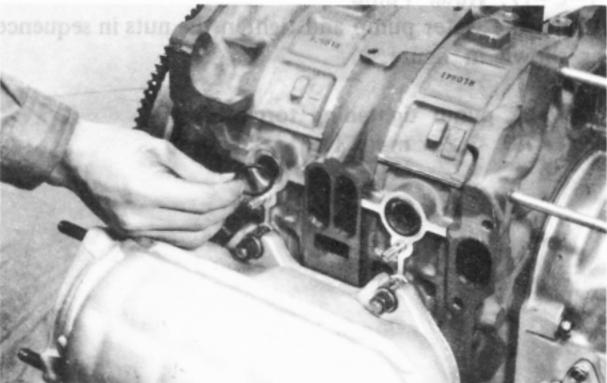
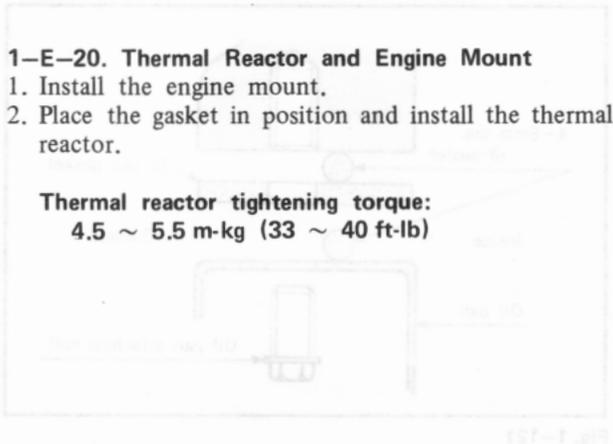
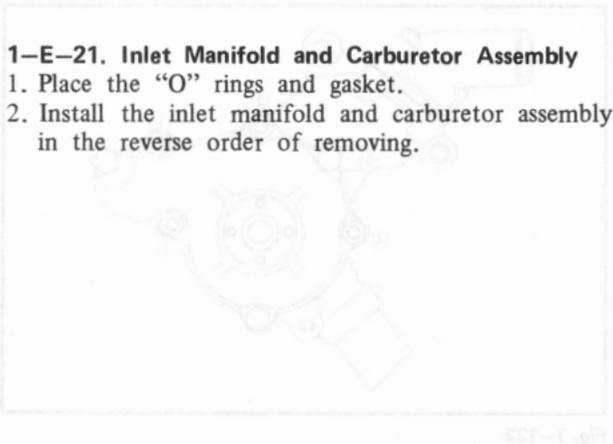


Fig. 1-126

1-E-21. Inlet Manifold and Carburetor Assembly

1. Place the "O" rings and gasket.
2. Install the inlet manifold and carburetor assembly in the reverse order of removing.



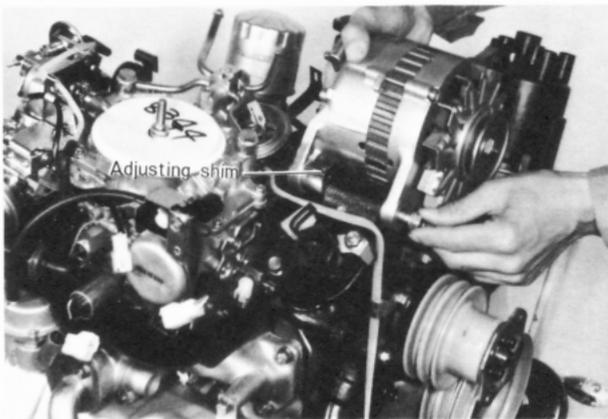


Fig. 1-127

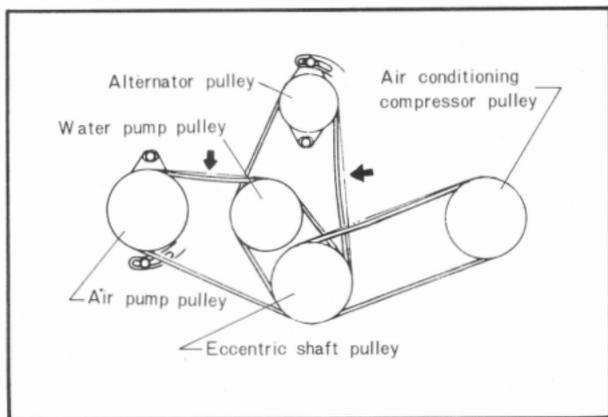


Fig. 1-128

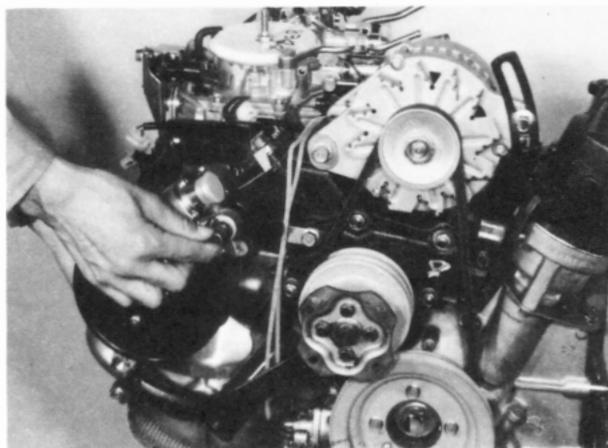


Fig. 1-129

1-E-22. Alternator and Drive Belt

1. Install the alternator to the bracket and check the clearance between the alternator support and bracket. If the clearance is more than the limit, adjust it by inserting the following adjust shim.

Clearance:
Limit 0.15 mm (0.0059 in)

Available adjusting shims

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

2. Install the drive belt and adjust the belt tension.

Alternator drive belt tension:

15 ± 2 mm (0.59 ± 0.08 in) When pressed at **10kg (22 lb)** between the alternator pulley and eccentric shaft pulley.

1-E-23. Air Pump and Drive Belt

- Install the air pump and drive belt, and then, adjust the drive belt tension.

Air pump drive belt tension:

12 ± 1 mm (0.47 ± 0.04 in) when pressed at **10 kg (22 lb)** between the air pump pulley and water pump pulley.

1-F. ENGINE INSTALLATION

Carry out the removal operation in the reverse order.

After installing the engine, perform the following operations.

1. Refill the engine with coolant, and lubricant.
2. Tune up the engine.
3. Check and adjust the bonnet for proper closing.