

FOREWORD

This manual has been published to explain how to repair the swash plate type compressor (6E171) developed for medium vehicle.

When repairing the compressor, repairing should be carried out as described in this manual.

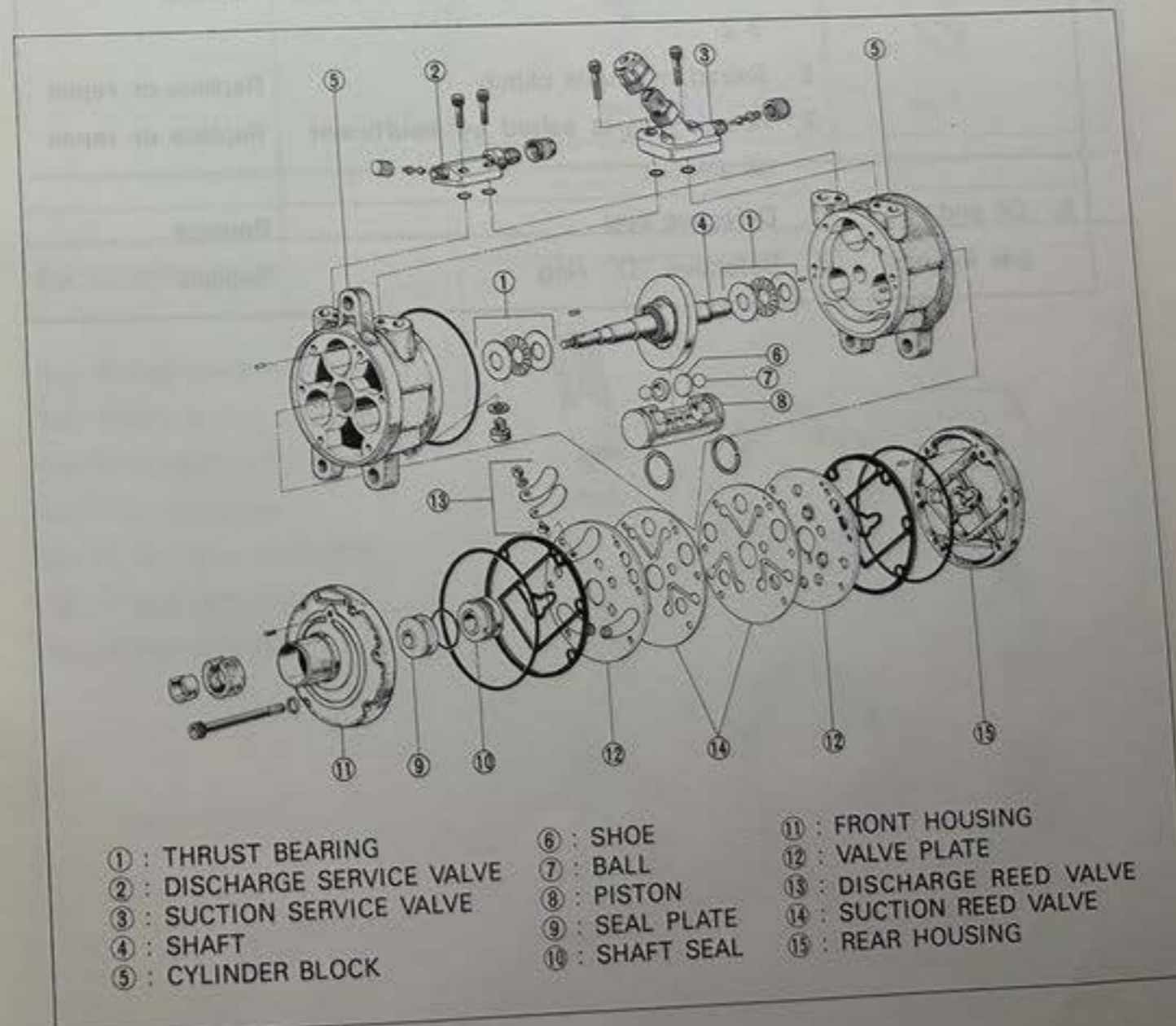
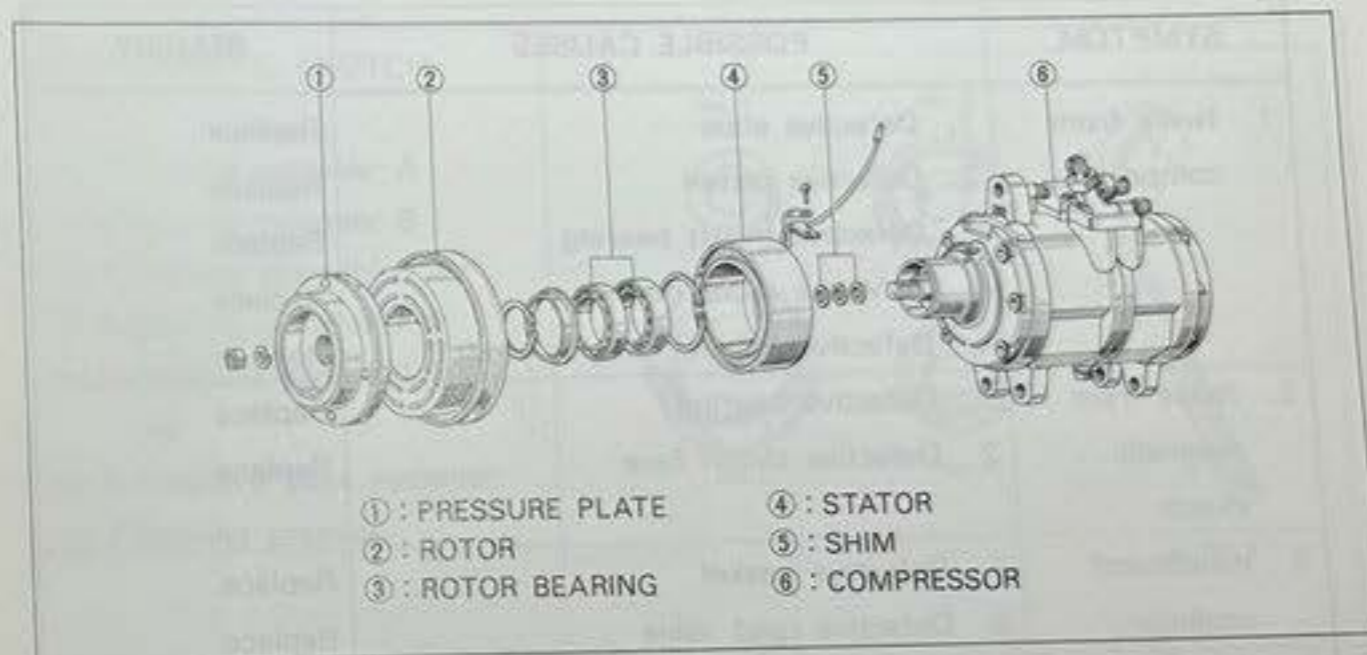
Please study this manual before repairing.

We reserve the right to make changes in this manual, at any time without notice.

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I. CONSTRUCTION



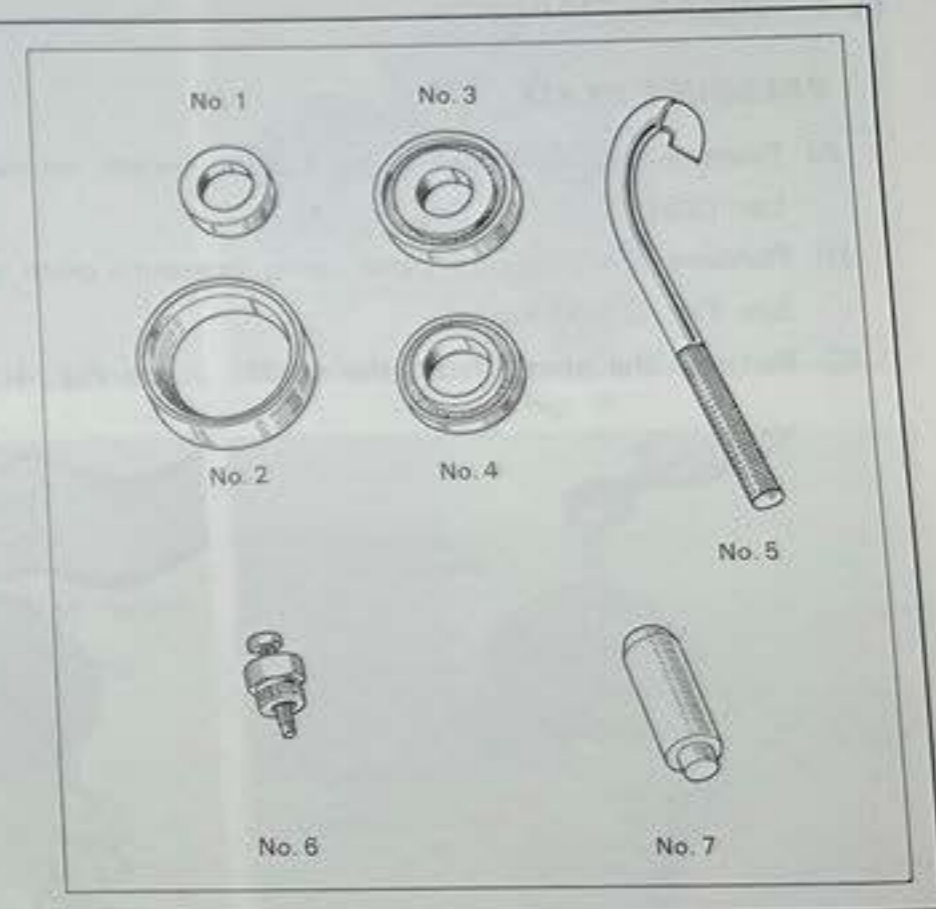
II. TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSES	REMEDY
1. Noise from compressor	1. Defective shoe	Replace
	2. Defective piston	Replace
	3. Defective thrust bearing	Replace
	4. Defective radial bearing	Replace
	5. Defective cylinder and/or shaft	Replace
2. Noise from magnetic clutch	1. Defective bearing	Replace
	2. Defective clutch face	Replace
3. Insufficient cooling	1. Defective gasket	Replace
	2. Defective reed valve	Replace
4. Not rotating	1. Locked by item 1-1, 2, 3, 4, 5 and 3-2.	Replace
	2. Seized magnetic clutch	Replace or repair
	3. Rotating parts seized by insufficient oil amount	Replace or repair
5. Oil and/or gas leakage	1. Defective seal	Replace
	2. Defective "O" ring	Replace

III. SPECIAL SERVICE TOOLS

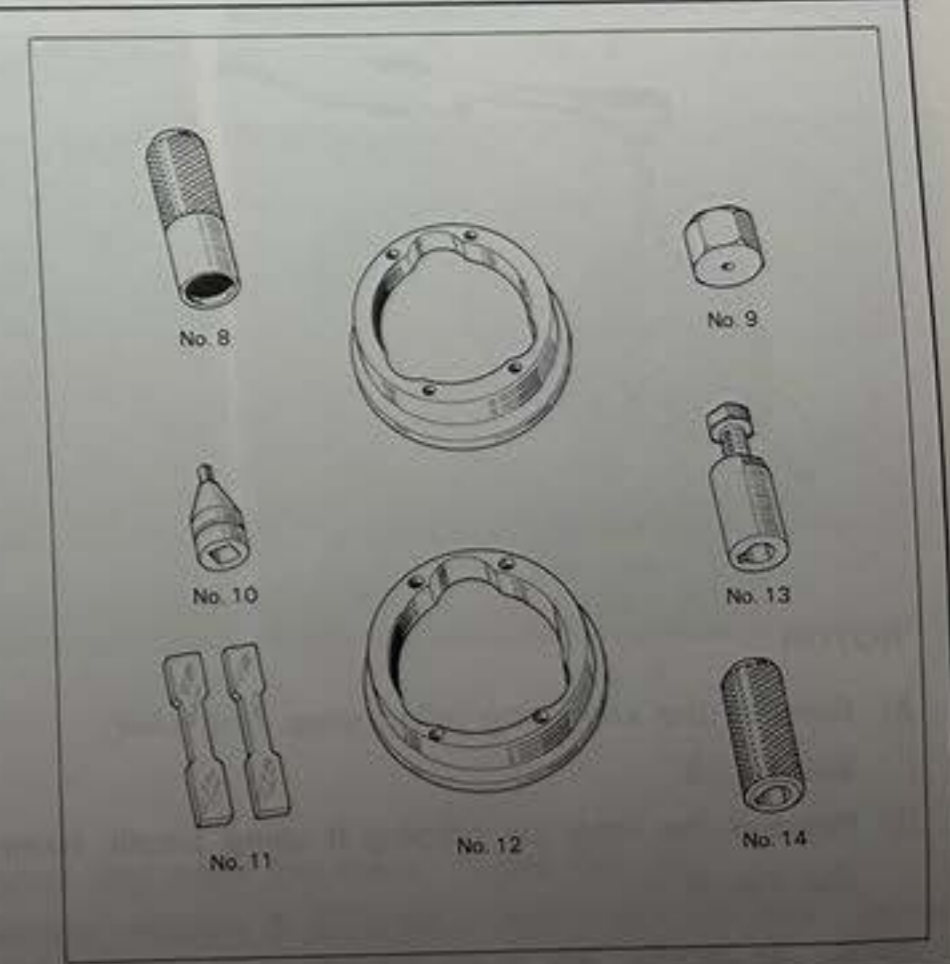
For MAGNETIC CLUTCH

- No.1: Bearing remover A
 No.2: Bearing remover B
 No.3: Bearing assembler A
 No.4: Bearing assembler B
 No.5: Pressure plate holding bar
 No.6: Pressure plate remover
 No.7: Bearing pressor



For COMPRESSOR

- No. 8: Seal plate pressor
 No. 9: Nozzle (for testing)
 No.10: Hexagon wrench
 No.11: Shoe gauge
 No.12: Cylinder assembler
 No.13: Key remover
 No.14: Key pressor



IV. REPAIRING OF MAGNETIC CLUTCH

IV-1 DISASSEMBLY

1. PRESSURE PLATE

- Remove the shaft nut using 12mm socket wrench and pressure plate holding bar (SST No.5). See Fig. 1.
- Remove the pressure plate using pressure plate remover (SST No.6). See Fig. 2 and Fig. 3.
- Remove the shims from the shaft. See Fig. 4.



Fig. 1



Fig. 2



Fig. 3



Fig. 4

2. ROTOR

- Remove the snap ring using snap ring plier. See Fig. 5.
- Remove the rotor by tapping it using plastic hammer. See Fig. 6.

Note: Be careful not to deform the pulley, when tapping the rotor.



Fig. 5



Fig. 6

3. STATOR

- Disconnect the stator lead wires from the compressor housing. See Fig. 7.
- Remove the snap ring for stator using snap ring plier. See Fig. 8.
- Detach the stator from the compressor housing. See Fig. 9.



Fig. 7



Fig. 8



Fig. 9

4. ROTOR BEARING

- Remove the bearing snap ring from the rotor. See Fig. 10.
- Place the rotor on bearing remover B (SST No.2) and press two bearings out. See Fig. 11.

Note: Press the bearings out only if it is to be replaced. Pressing the bearings on the inner race will damage it.



Fig. 10

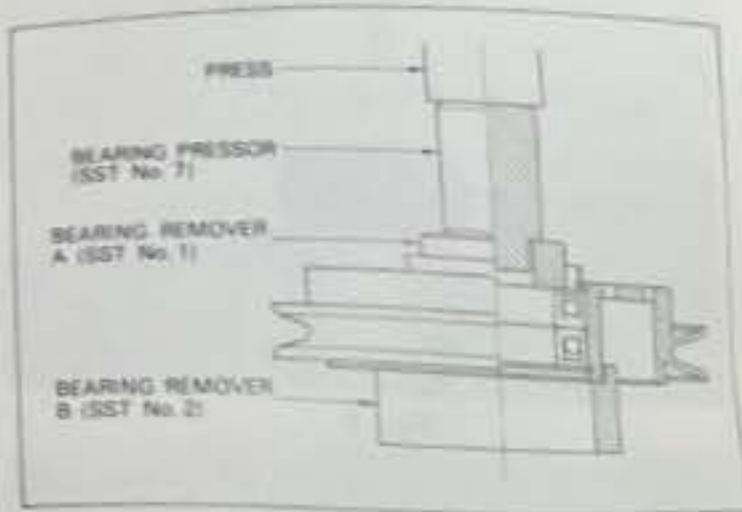


Fig. 11

IV-2 INSPECTION

1. PRESSURE PLATE AND ROTOR

- Inspect the pressure plate and rotor surfaces for wear and score. If the pressure plate and rotor surfaces are excessively worn or scored, replace them.
- Check the rotor bearings for wear and leakage of grease. Replace the bearings that prove to be defective.

2. STATOR

- Measure the resistance of stator coil using circuit tester.

Standard resistance at 20°C (68°F): $3.75 \pm 0.2 \Omega$

- Reading of less than 3.5 ohms indicates shorted field coil.
- Reading of infinity indicates open field coil.

If abnormal, replace it.

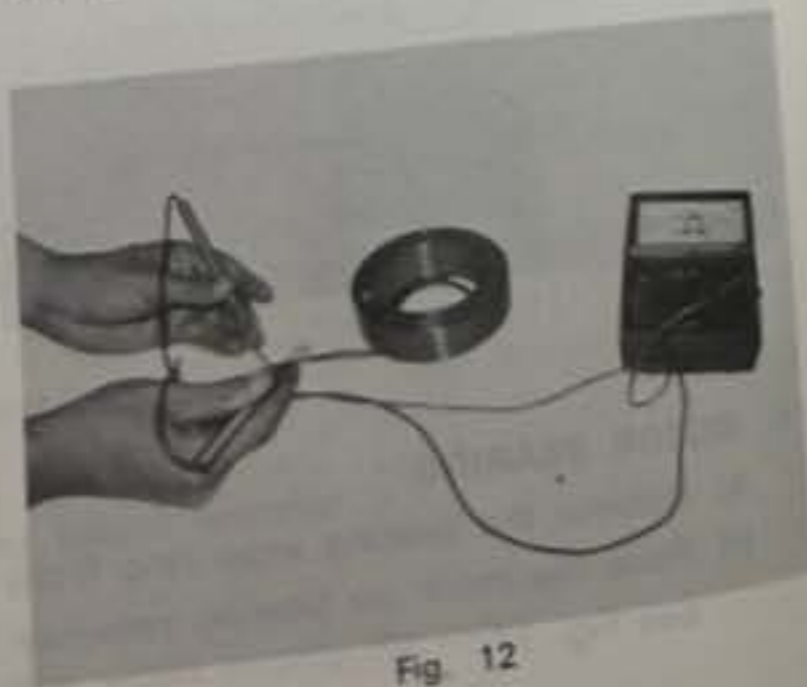


Fig. 12

IV-3 ASSEMBLY

1. ROTOR BEARING TO ROTOR

- Place the rotor on bearing assembler A (SST No.3) and insert a shield ring, two pieces of new bearing into the rotor boss till fully seated. See Fig. 13.
- Install the bearing snap ring into the rotor groove.

Note: New bearing must be installed every time when assembling.

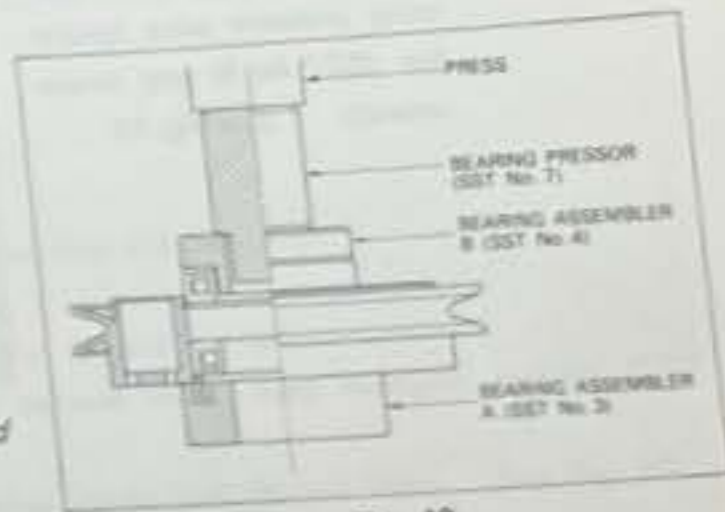


Fig. 13

2. STATOR, ROTOR AND PRESSURE PLATE

- Follow the disassembly procedure in reverse.

Note: 1) Pay special attention to direction of the snap rings for stator and rotor.

Tapered surface must be set upper side as shown in Fig. 14.

- Adjust the clearance between the pressure plate and rotor by putting the shims on the compressor shaft.

Standard clearance:

0.4–0.7 mm
(0.016–0.028 in.)

- If the clearance is less than 0.4 mm (0.016 in.), add the shims or replace the shim with thick one.
- If the clearance is over 0.7 mm (0.028 in.), reduce the shims or replace the shim with thin one.

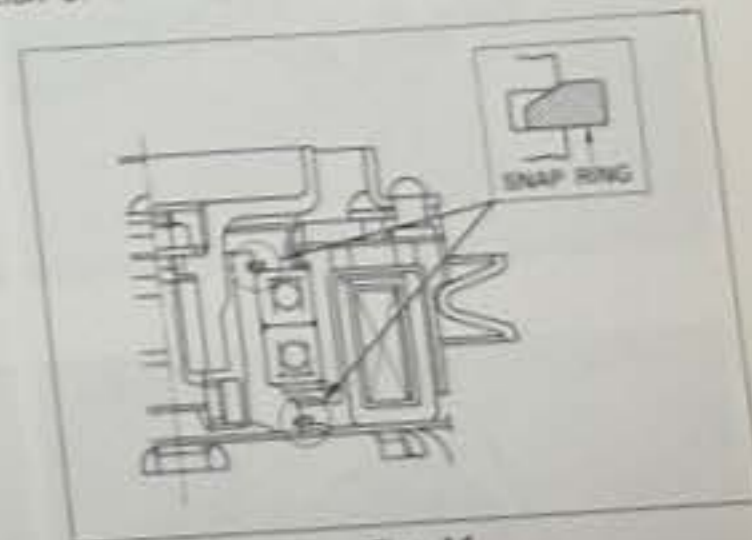


Fig. 14



Fig. 15

3) Tighten the shaft nut to 1.5
-1.75 kg-m (11-12.7 ft-lbs)
using pressure plate holding
bar (SST No.5) and torque
wrench. See Fig. 16.



Fig. 16

V. REPAIRING OF COMPRESSOR

When repairing the compressor, it must be removed from the car and placed on the clean workbench.

V-1 DISASSEMBLY

1. OIL PLUG AND SERVICE VALVES

- A) Remove the oil plug, and drain the oil into the container.
See Fig. 17 and Fig. 18.
- B) Note the quantity of oil removed, and discard the oil.
- C) Remove the suction and discharge service valve using hexagon wrench (SST No.10). See Fig. 19.
- D) Remove the O-rings from the service valves and discard them. See Fig. 20.



Fig. 17

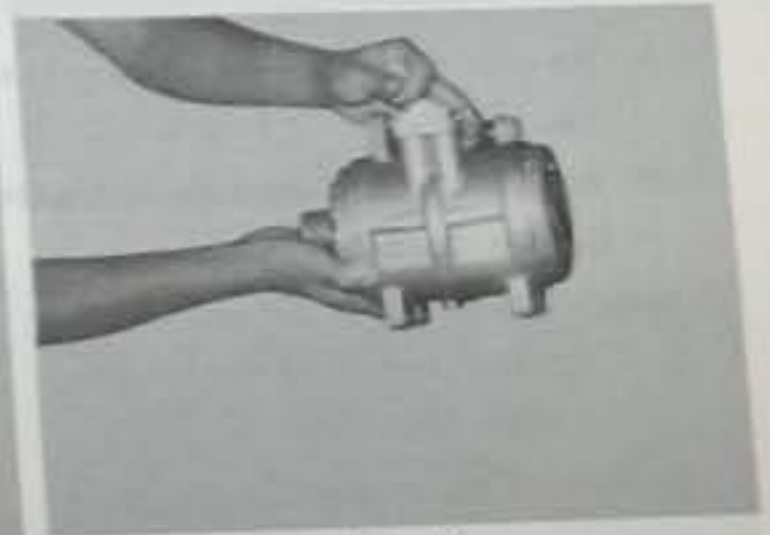


Fig. 18



Fig. 19



Fig. 20

2. KEY

- A) Put key remover (SST No.13) on the shaft, then turn its cylindrical body to catch the key. See Fig. 21.
- B) Turning the bolt clockwise, remove the key from the shaft. See Fig. 22.



Fig. 21

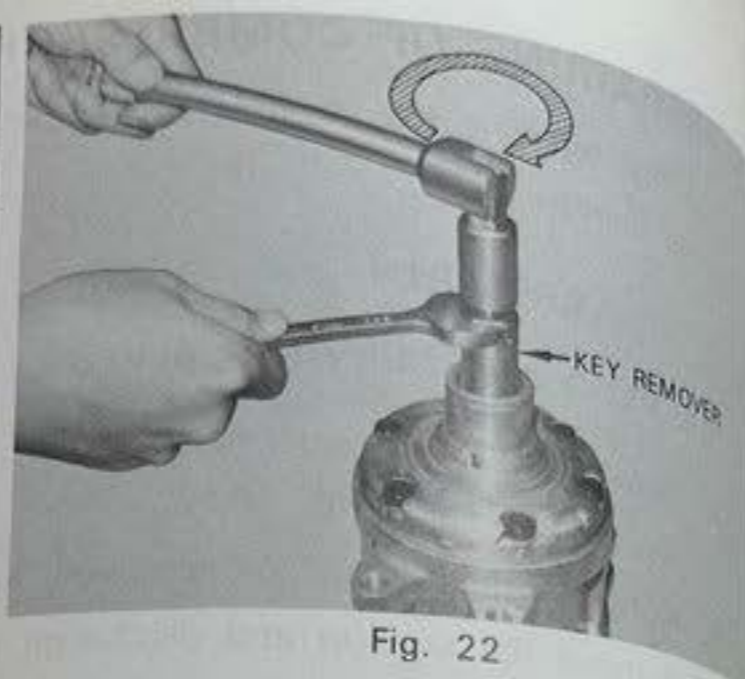


Fig. 22

3. FRONT HOUSING

- A) Remove six through bolts using hexagon wrench (SST No. 10). See Fig. 23.
- B) Remove the front housing by tapping the removing rips provided. See Fig. 24 and Fig. 25.

Note: Take care not to scratch the sealing surface of front housing when removing it.

- C) Remove the O-ring from the front housing and discard it. See Fig. 25.



Fig. 23

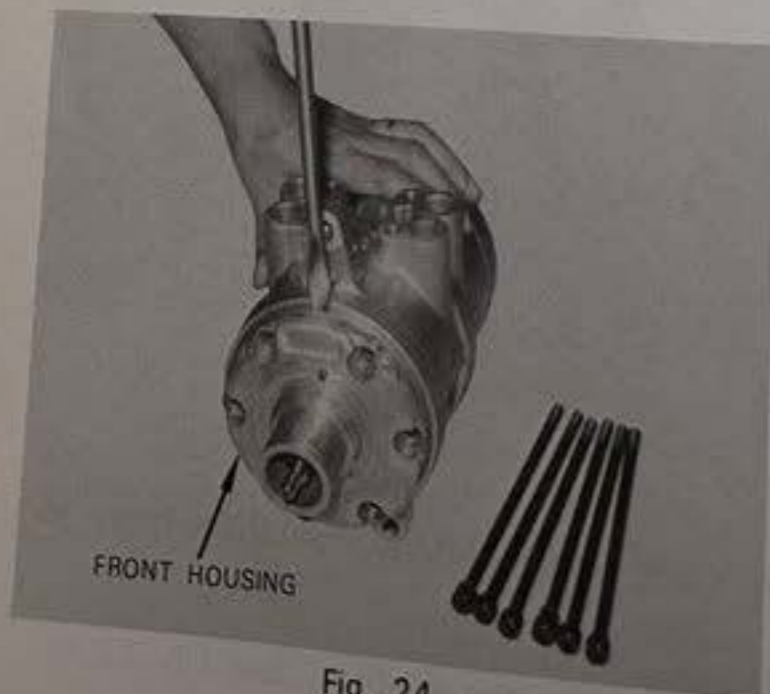


Fig. 24



Fig. 25

4. SEAL PLATE AND SHAFT SEAL

- A) Remove the felt. See Fig. 26.
- B) Push the seal plate out from the front housing. See Fig. 27 and Fig. 28.
- C) Remove the shaft seal from the compressor shaft. See Fig. 29.

Note: 1) Remove the seal plate only if it is to be replaced.

2) Be sure to handle the shaft seal carefully not to scratch the carbon seal.

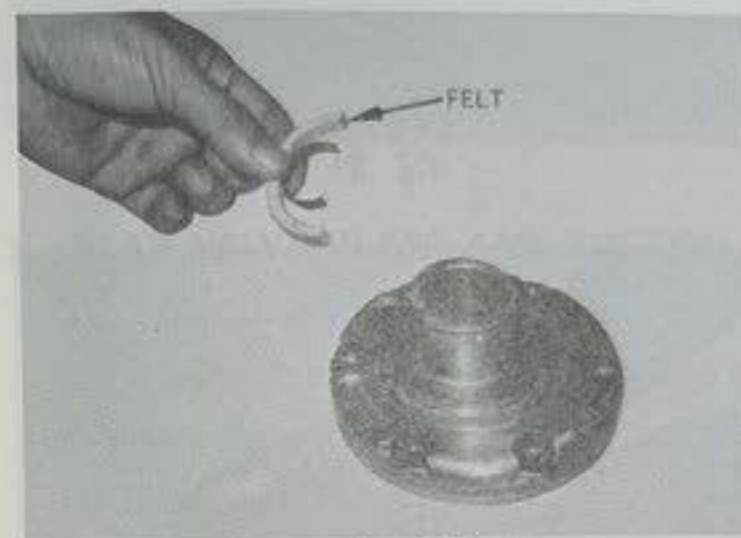


Fig. 26



Fig. 27

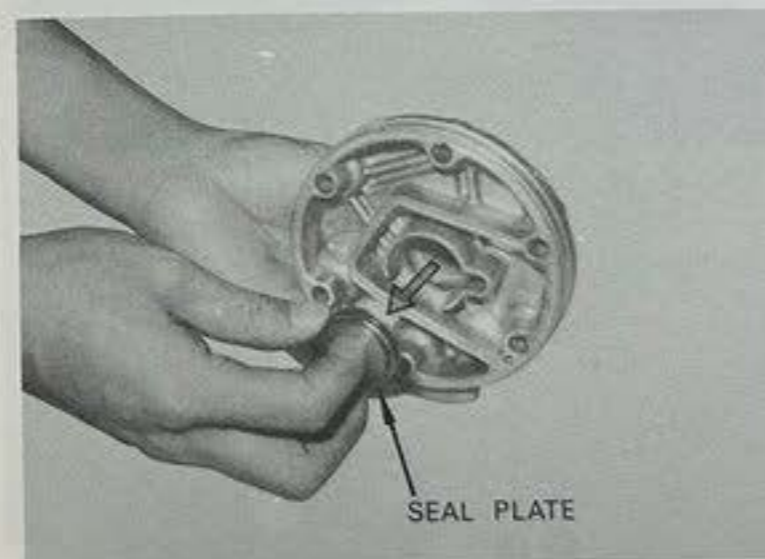


Fig. 28



Fig. 29

5. FRONT VALVE PLATE AND SUCTION REED VALVE

- A) Remove the dowel pin. See Fig. 30.
- B) Carefully lift out the valve plate. See Fig. 31.
- C) Carefully lift off the suction reed valve. See Fig. 32.
- D) Remove and discard the valve plate gasket.
- E) Remove the restrainers and discharge reed valves from the valve plate. See Fig. 33 and Fig. 34.

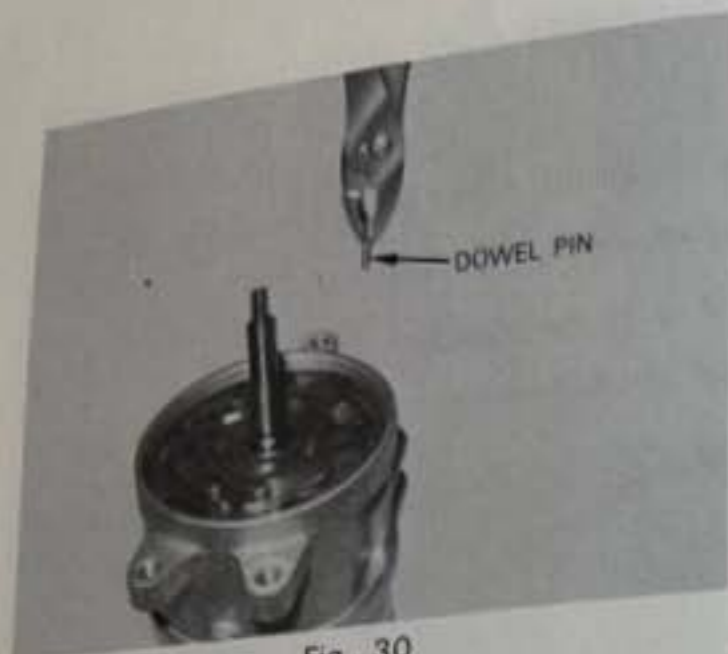


Fig. 30



Fig. 31



Fig. 35

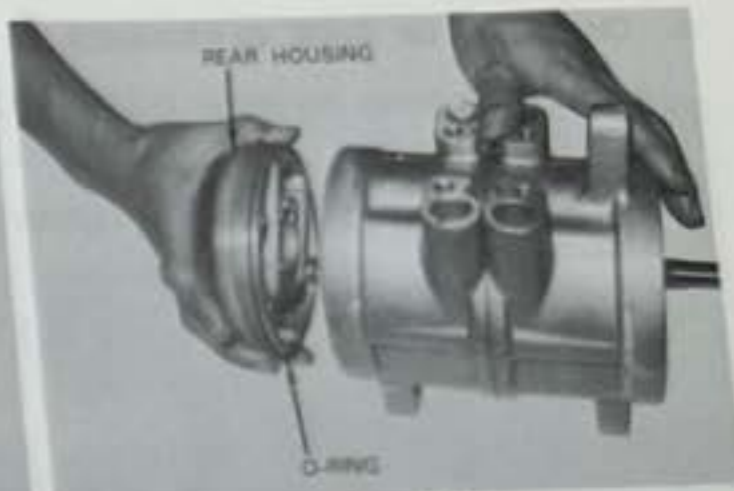


Fig. 36

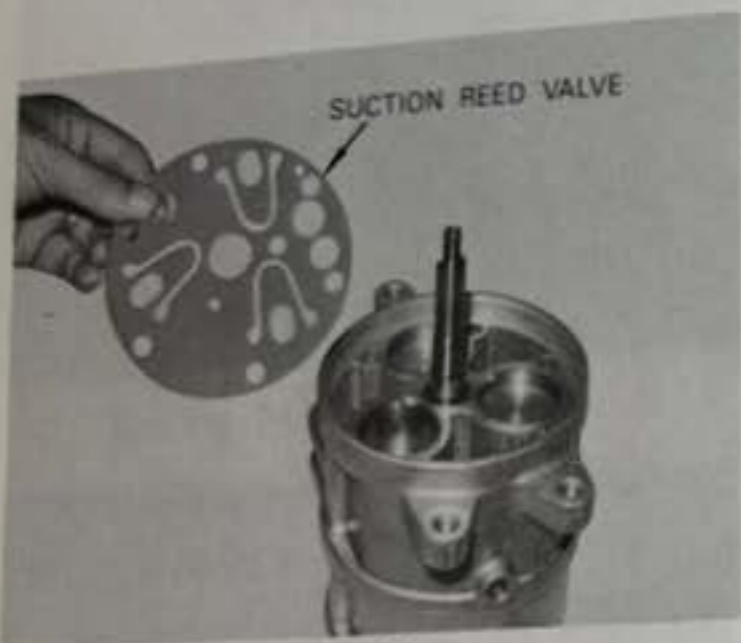


Fig. 32



Fig. 33

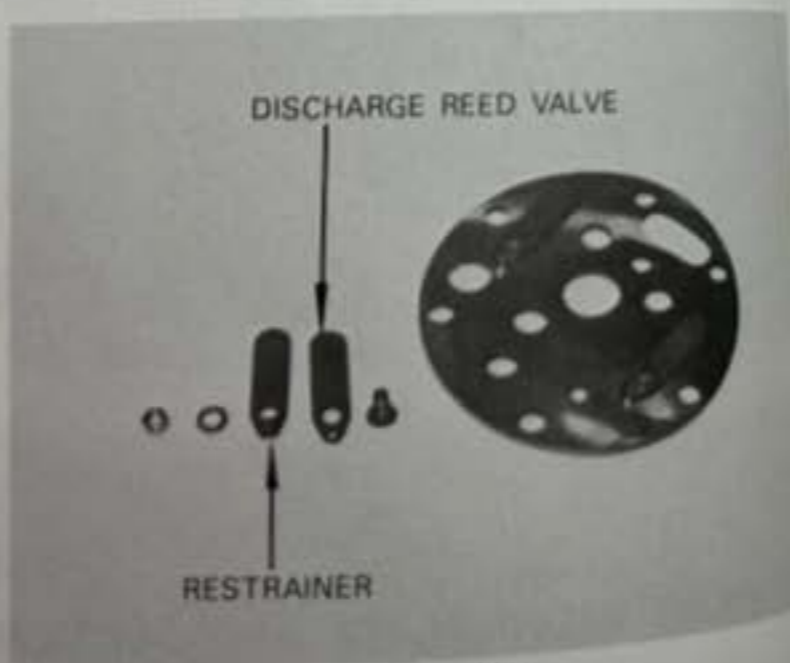


Fig. 34

7. REAR VALVE PLATE AND SUCTION REED VALVE

- After removing the dowel pin, carefully remove the valve plate. See Fig. 37.
- Carefully remove the suction reed valve. See Fig. 38.
- Remove and discard the valve plate gasket.
- Remove the restrainers and discharge reed valves from the valve plate. See Fig. 33 and Fig. 34.

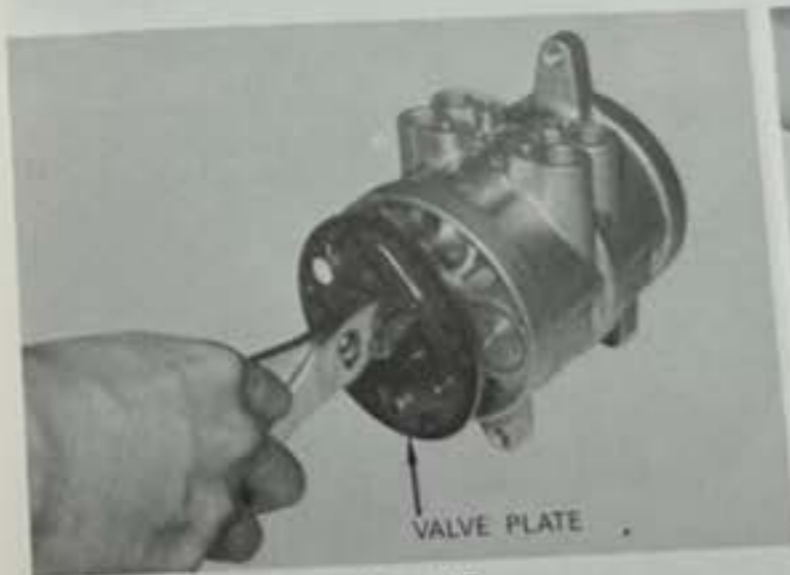


Fig. 37



Fig. 38

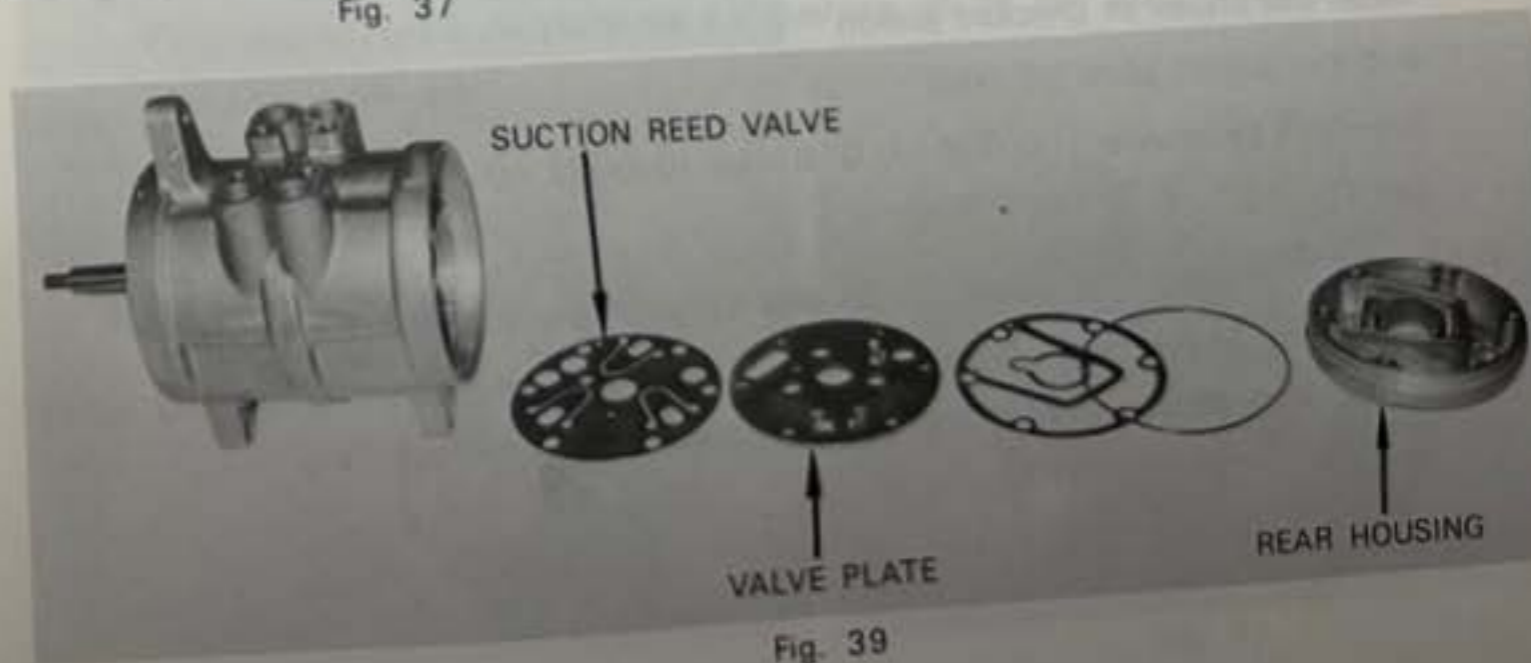


Fig. 39

6. REAR HOUSING

- Remove the rear housing by tapping the removing ribs provided. See Fig. 35 and Fig. 36.

Note: Take care not to scratch the sealing surface of rear housing when removing it.

8. CHECKING OF SHOE CLEARANCE

- A) Attach cylinder assembler (SST No. 12) to front and rear sides of cylinder
See Fig. 40.
- B) Install four through bolts and tighten to specified torque using hexagon wrench
(SST No. 10) and torque wrench.
Standard Torque: 250 kg-cm (18.1 ft-lbs)
See Fig. 41.



Fig. 40



Fig. 41

- C) Set one of the piston to top dead center.
- D) Set magnet stand w/ dial gauge on the ring of SST and its needle to the piston head positioned to top dead center.
- E) Move the piston up and down by hand to inspect the clearance between the shoes of checked piston and the swash plate of shaft.



Fig. 42

- F) Repeat this operation, steps C), D) and E), with the other two pistons.
Note: In case of the shoe clearance is out of the range, replace the shoes and adjust the shoe clearance according to the procedure described on "V-3".

9. CHECKING OF THRUST GAP

- A) Set the needle of dial gauge to rear end of shaft.
- B) Move the shaft along its axis to check the thrust bearings for worn thin.
Standard Gap: Zero
See Fig. 43.

Note: If there exists any gap, replace the thrust bearings.



Fig. 43

10. CYLINDER

- A) Carefully remove the rear half of cylinder by tapping it with plastic hammer.
See Fig. 44 and Fig. 45.



Fig. 44



Fig. 45

- B) Remove and discard the O-ring. See Fig. 46.
- C) Remove the shaft and pistons by pushing up on the shaft. See Fig. 47.

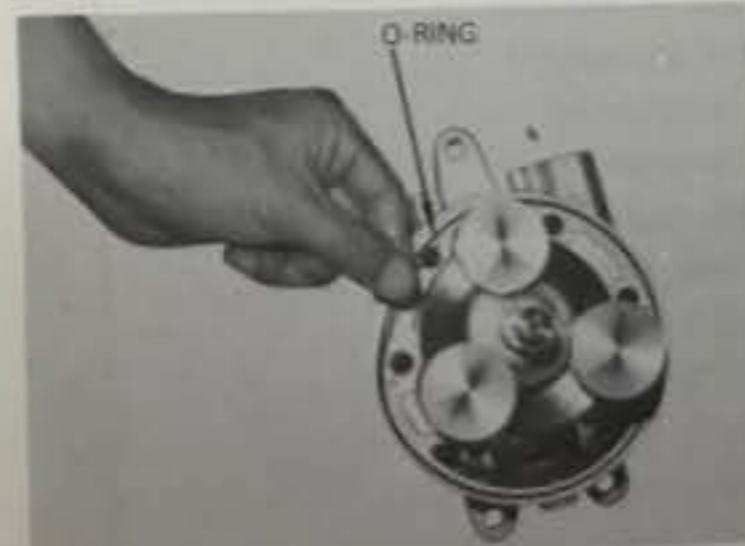


Fig. 46



Fig. 47

- D) Remove the pistons with balls and shoes. See Fig. 48.
Note: When removing the pistons from the shaft, be sure not to change the combination of piston, balls and shoes.
- E) Remove the thrust bearings from the shaft. See Fig. 49.



Fig. 48

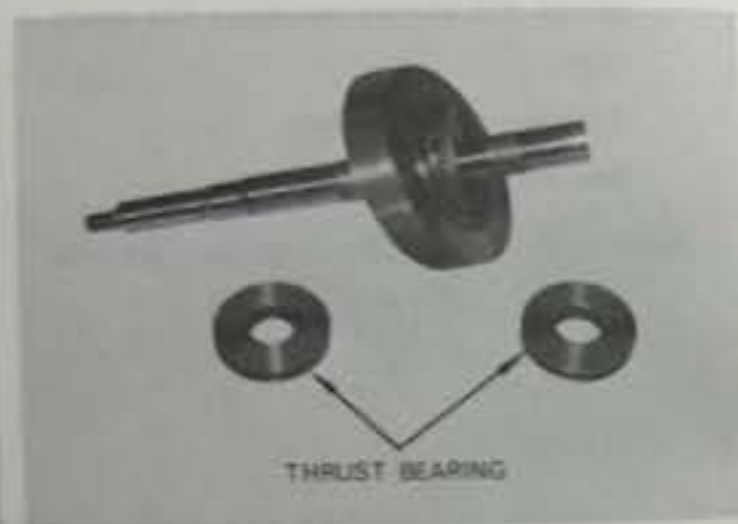


Fig. 49

V-2 INSPECTION

PART NAME	INSPECTION ITEMS	REMEDY (if defective)
SHAFT SEAL	A. Check the lapping surface of carbon disc for crack or scratch. B. Check the rubber seal for crack or hardening. C. Check the spring action.	A. Replace B. Replace C. Replace
SEAL PLATE	A. Check the sealing surfaces for scratch or corrosion.	A. Replace
VALVE PLATE	A. Check both surfaces for scratch or corrosion.	A. Polish with fine oil stone or replace
DISCHARGE REED VALVE	A. Check the reed for crack, scratch, deformation or corrosion. B. Check the restrainer for deformation or corrosion.	A. Replace B. Replace
SUCTION REED VALVE	A. Check the reed for crack, scratch, deformation or corrosion.	A. Replace
FRONT & REAR HOUSINGS	A. Check the sealing surfaces for crack, scratch or deformation.	A. Replace
CYLINDER BLOCK	A. Check the cylinder bore for scratch or corrosion. B. Check the piston clearance. Procedure : 1) Measure each cylinder bore with telescoping gauge and outside micrometer. 2) Measure each piston with outside micrometer. 3) Subtract the piston measurement from the cylinder bore measurement. This difference means piston clear-	A. Replace B. Replace cylinder or piston

PART NAME	INSPECTION ITEMS	REMEDY (If defective:)
	<p>Standard Piston Clearance : 0.026—0.036mm (0.001—0.0014 inch)</p> <p>C. Check the radial bearings for poor contact, worn-out needle, score or pit.</p> <p>D. Check the mating surfaces between front and rear cylinder blocks for crack or scratch.</p>	<p>C. Replace cylinder</p> <p>D. Replace</p>
THRUST BEARING	A. Check the races and rollers for pit, score or flaking.	A. Replace
SHAFT (※)	<p>A. Check the surface of swash plate for score, wear or signs of uneven shoe contact.</p> <p>B. Check the shaft for wear or deformation.</p>	<p>A. Repair or replace</p> <p>B. Repair or replace</p>
PISTON (※)	<p>A. Check the piston rings for wear.</p> <p>B. Check the piston clearance. (Refer to item "CYLINDER BLOCK-B")</p>	<p>A. Replace</p> <p>B. Replace piston or cylinder</p>
SHOE & BALL (※)	<p>A. Check the shoe for wear or crack.</p> <p>B. Check the ball for flaking or wear.</p>	<p>A. Replace</p> <p>B. Replace</p>
DISCHARGE & SUCTION SERVICE VALVES	<p>A. Check the flare portion for scratch or deformation.</p> <p>B. Check the groove for O-ring for crack or scratch.</p> <p>C. Check the schrader valve for gas leakage.</p>	<p>A. Replace</p> <p>B. Replace</p> <p>C. Replace</p>
<p>(※) When the shaft, pistons, shoes and/or balls are to be replaced, adjustment of shoe clearance should be performed according to the procedure described on "V-3".</p>		

V-3 ADJUSTMENT OF SHOE CLEARANCE

1. SELECTION OF SHOE GAUGE (SST No.11)

When adjusting the shoe clearance, select and use the suitable shoe gauge according to the following selection table.

16.565	CC6E	16.570	16.575	CC6E	16.580
No. 1		No. 2	No. 3		No. 4
16.565mm		16.570mm	16.575mm		16.580mm

SHOE GAUGE	APPLICATIONS
No. 1	When using the previous shaft of which swash plate is pretty worn.
No. 2	When assembling the previous shaft, pistons, balls and new shoes.
No. 3	When replacing the shaft, pistons, balls and shoes with new parts.
No. 4	If shaft rotating torque of compressor that is adjusted the shoe clearances with No.3 gauge is larger than standard.

2. ADJUSTING PROCEDURE OF SHOE CLEARANCE



Fig. 50

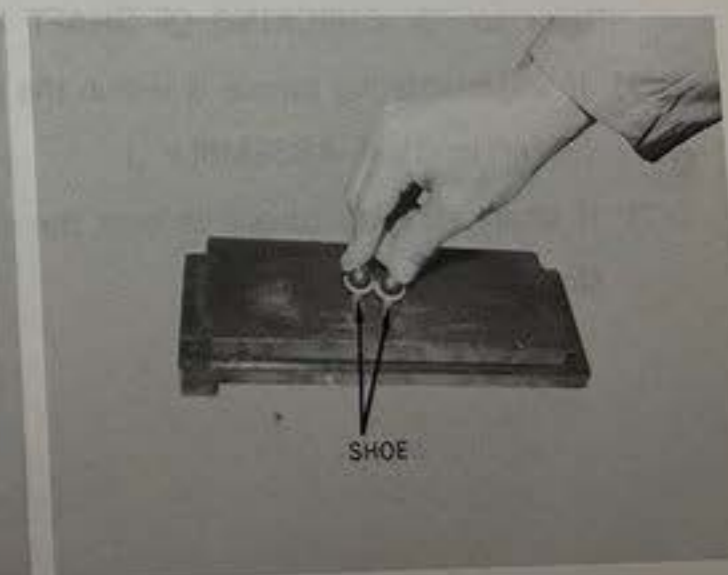


Fig. 51

- Note:* 1) When checking the shoe clearance using shoe gauge (SST No.11), coat the shoes and gauge with the compressor oil (DENSOIL 6, SUNISO No.5GS or equivalent)
- 2) When honing the shoe faces, lubricate the oil stone with the compressor oil.

2-1 When replacing the shaft, pistons, balls and shoes ;

- A) Using No.3 gauge, attempt to fit the gauge between the shoes on all pistons. See Fig. 50.
- B) If the gaps are smaller than No.3 gauge, adjust the gaps to fit by honing the shoe face until the gauge fits. See Fig. 51.
- C) Repeat this operation until all fits are equal.
- D) Temporarily assemble the cylinder, then check the shaft rotating torque. (Refer to "3. CHECKING OF SHAFT ROTATING TORQUE" on page 23.)
- D-1) If shaft rotating torque is within the specified range, assemble the compressor. (Refer to "V-4 ASSEMBLY".)
- D-2) If shaft rotating torque is over the specified range, repeat this operation using No.4 gauge.

2-2 When replacing all shoes and/or balls ;

- A) Using No.2 gauge, attempt to fit the gauge between the shoes on all pistons. See Fig. 50.
- B) If the gaps are smaller than No.2 gauge, adjust the gaps to fit by honing the shoe face until the gauge fits. See Fig. 51.
- C) Repeat this operation until all fits are equal.
- D) Temporarily assemble the cylinder, then check shaft rotating torque. (Refer to "3. CHECKING OF SHAFT ROTATING TORQUE" on page 23.)
- D-1) If shaft rotating torque is within the specified range, assemble the compressor. (Refer to "V-4 ASSEMBLY".)
- D-2) If shaft rotating torque is over the specified range, repeat this operation using No.3 or No.4 gauge.

2-3 When replacing shoes or balls partially ;

- A) After replacing the shoes or balls, measure the new gaps between the shoes. See Fig. 50.
- B) If the new gap is smaller than the other gaps, hone the shoes until all gaps are equal. See Fig. 51.

2-4 When using the previous shaft of which swash plate is pretty worn ;

- A) Using No.1 gauge, attempt to fit the gauge between the shoes on all pistons. See Fig. 50.
- B) If the gaps are smaller than No.1 gauge, adjust the gaps to fit by honing the shoe face until the gauge fits. See Fig. 51.
- C) Repeat this operation until all fits are equal.
- D) Temporarily assemble the cylinder, then check the shaft rotating torque. (Refer to "3. CHECKING OF SHAFT ROTATING TORQUE" on page 23.)
- D-1) If shaft rotating torque is within the specified range, assemble the compressor. (Refer to "V-4 ASSEMBLY".)
- D-2) If shaft rotating torque is over the specified range, repeat this operation using No.2 gauge.

V-4 ASSEMBLY

- Note:* 1) New gaskets and O-rings must be installed every time when assembling.
2) Before starting the assembly procedure, make sure all parts and workbench are clean.

1. CYLINDER

- Lubricate the swash plate of shaft, thrust bearings, pistons, balls, shoes and radial bearings of cylinder with clean compressor oil.
- Install the thrust bearings on the shaft. See Fig. 52.
- Insert the shaft and piston assemblies into their respective front cylinders. See Fig. 53.
- Lubricate and install the O-ring. See Fig. 54.
- Assemble the rear cylinder to the front cylinder. See Fig. 55.

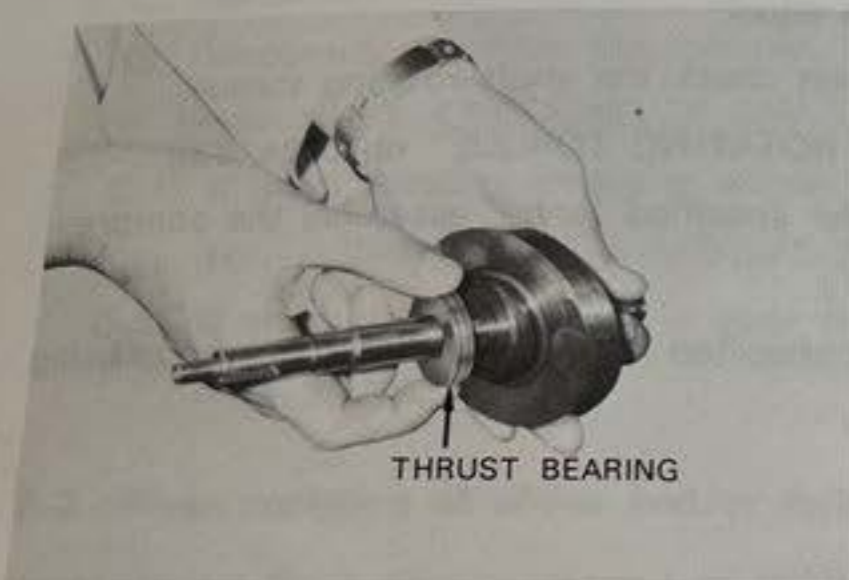


Fig. 52

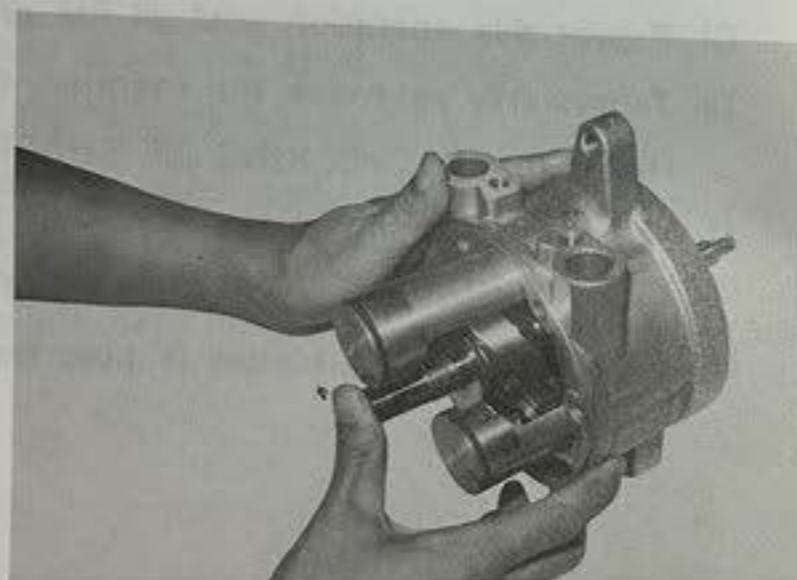


Fig. 53

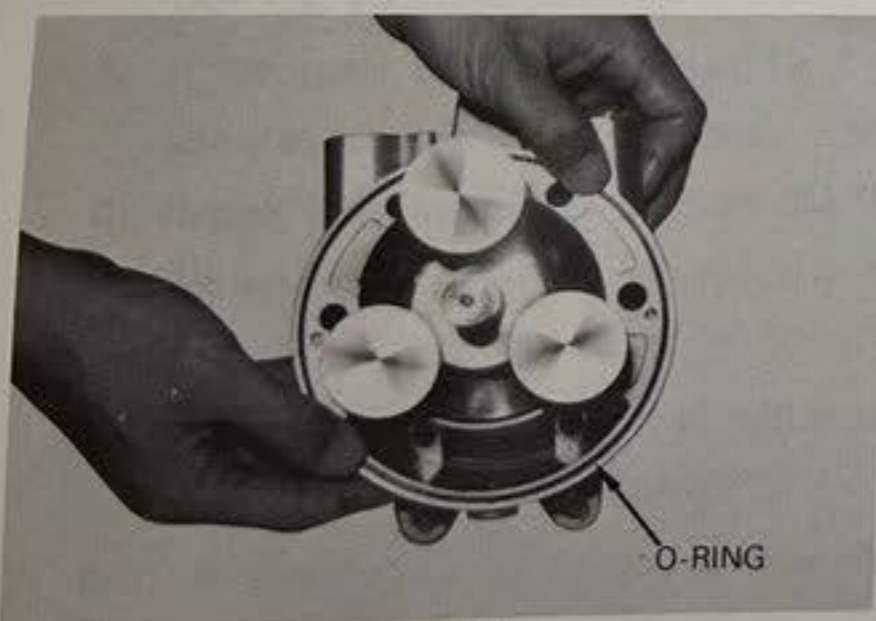


Fig. 54

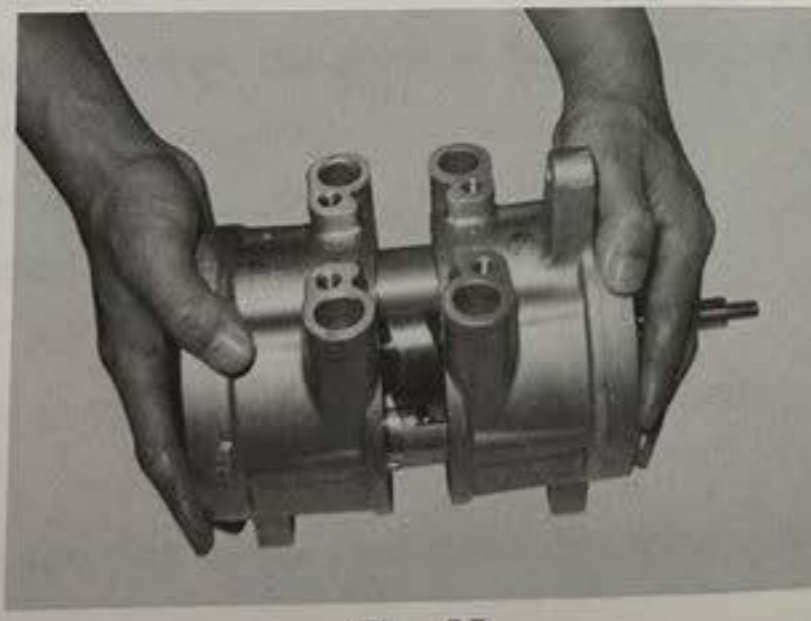


Fig. 55

2. CHECKING OF SHOE CLEARANCE AND THRUST GAP

- Follow the procedures written in V-1-8 and 9.
Standard Shoe Clearance : 0.005–0.015 mm (0.0002–0.0006 inch)
Standard Thrust Gap : Zero

3. CHECKING OF SHAFT ROTATING TORQUE

- Before removing cylinder assembler, measure the shaft rotating torque of the moment shaft began rotation with key pressor (SST No.14) and torque wrench. Standard Rotating Torque :
less than 120 kg-cm (8.7 ft-lbs)
See Fig. 56.

Note: If shaft rotating torque is larger than standard, disassemble the cylinder again, then adjust the shoe clearance by honing each shoe till it is satisfied within specified shoe clearance.

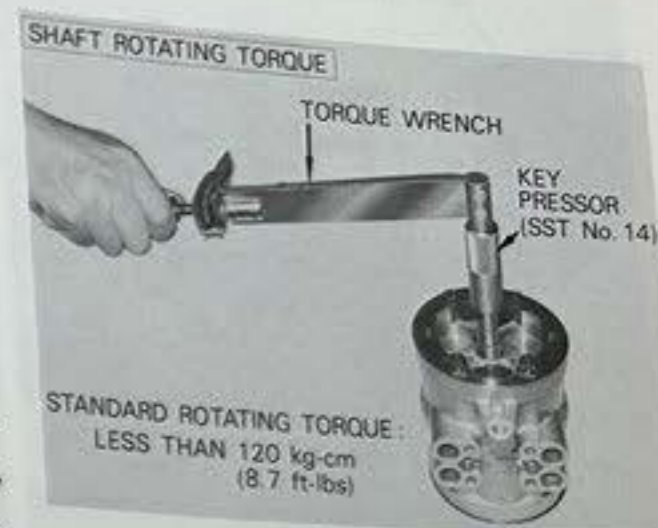


Fig. 56

4. VALVE PLATES AND HOUSINGS

- Soak all gaskets and O-rings in clean compressor oil.
- Assemble the front and rear valve plates and discharge reed valves. Fixing Torque of retaining bolts : 50–60 kg-cm (3.6–4.3 ft-lbs)
- Install the dowel pin, suction reed valve, rear valve plate and gasket. See Fig. 57 and Fig. 58.

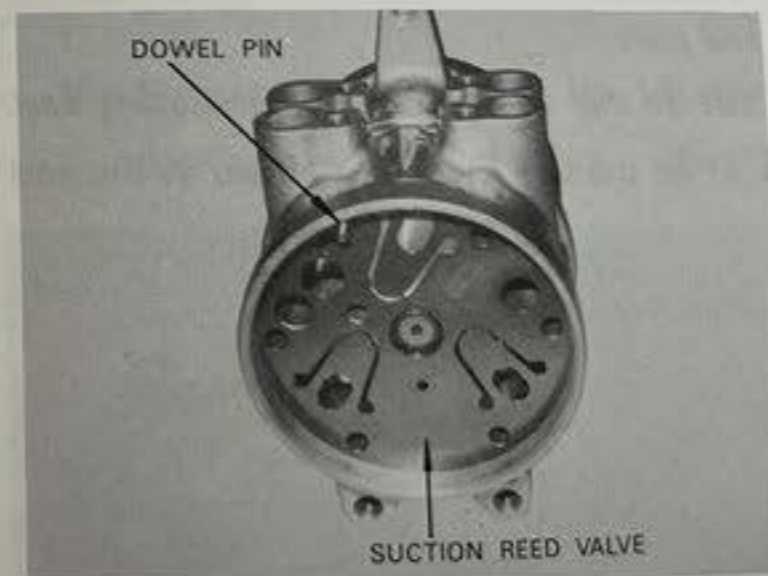


Fig. 57

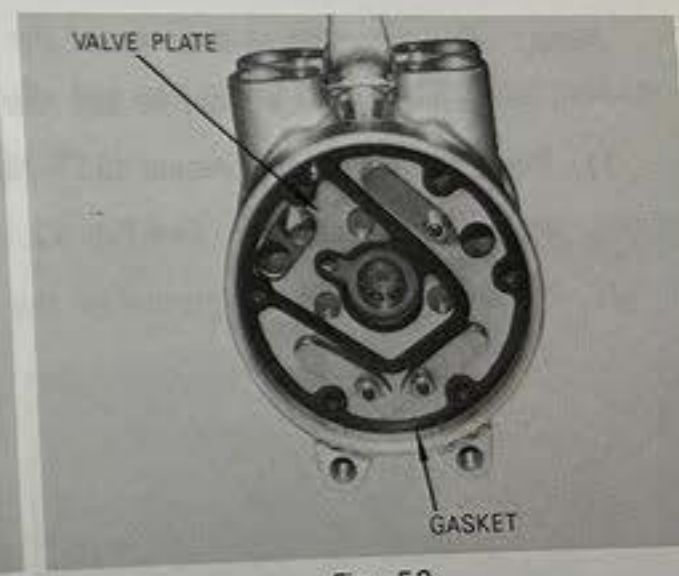


Fig. 58

- Put the O-ring in the groove of the rear housing.
- Install the rear housing. See Fig. 59.
- Install the dowel pin, suction reed valve, front valve plate, gasket and shaft seal. See Fig. 60, Fig. 61 and Fig. 62.
- Apply a few drops of compressor oil onto the shaft seal.

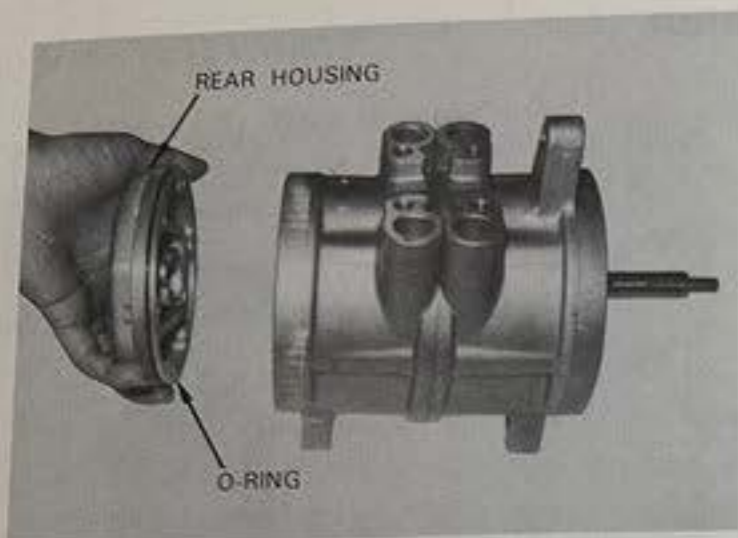


Fig. 59

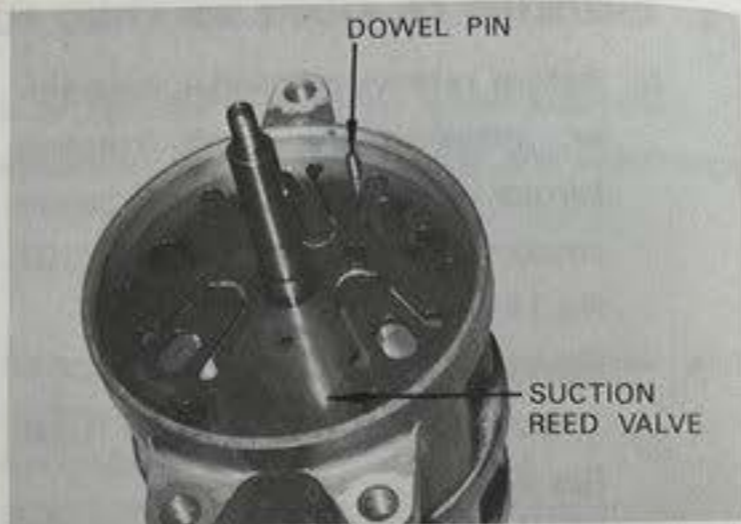


Fig. 60

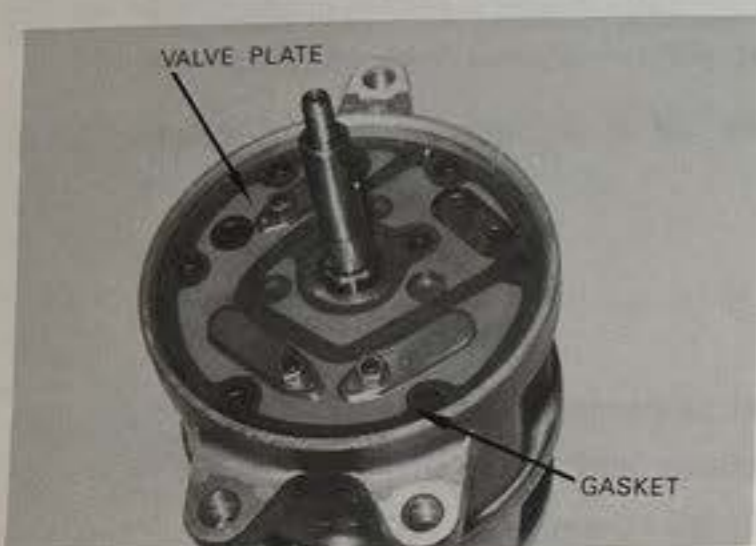


Fig. 61

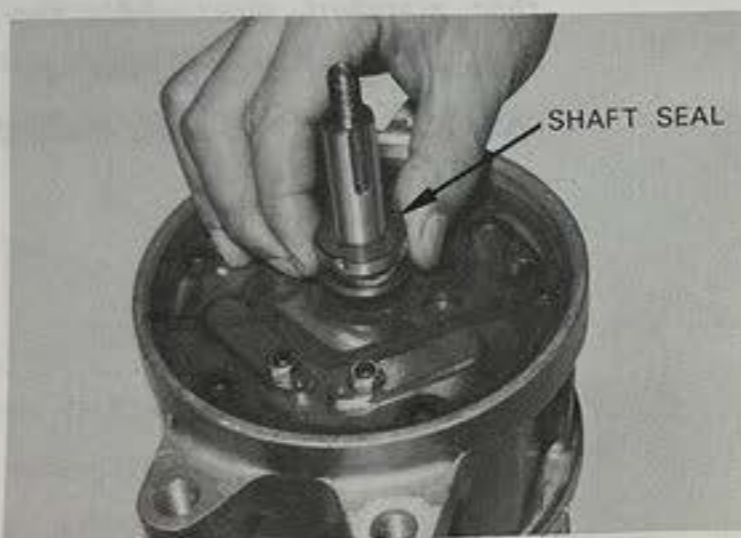


Fig. 62

H) Put the seal plate in the front housing boss.

Note: Pay attention to direction of the seal plate.

Lapped surface must be set rear side so that it contacts with the shaft seal.

I) Place the seal plate pressor (SST No. 8) on the seal plate, and press in the seal plate till fully seated. See Fig. 63.

J) Put the O-ring in the groove of the front housing.



Fig. 63

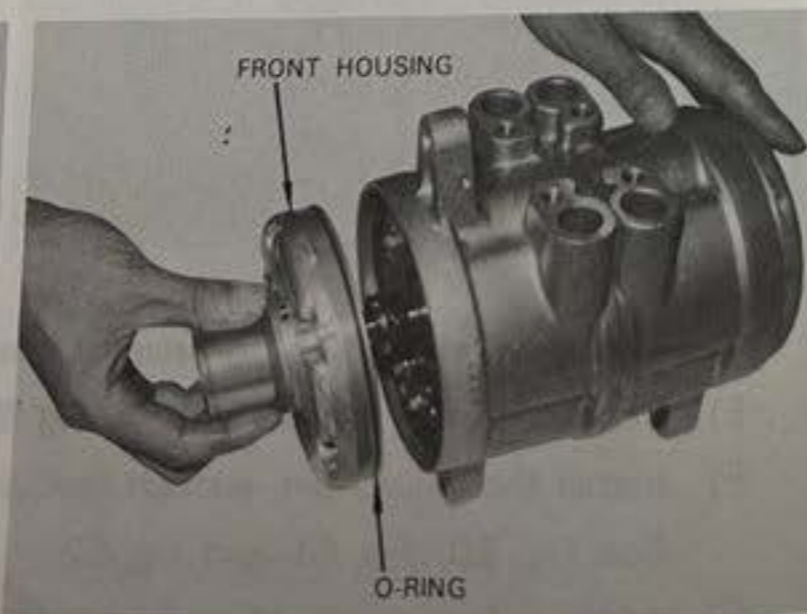


Fig. 64

K) Attach the front housing, and torque six through bolts using hexagon wrench (SST No. 10) and torque wrench.
Torque : 250 - 270 kg-cm (18.1 - 19.5 ft-lbs)
See Fig. 64 and Fig. 65.

L) Put the felt into the front housing boss. See Fig. 66.

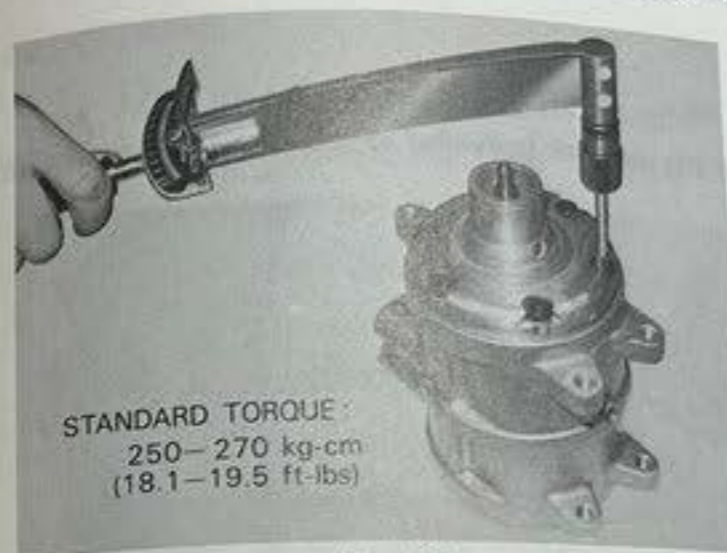


Fig. 65



Fig. 66

5. SERVICE VALVES AND KEY

A) Install the service valve O-rings, then install the discharge and suction service valves using hexagon wrench (SST No. 10) and torque wrench.

Torque : 250 - 270 kg-cm (18.1 - 19.5 ft-lbs)

See Fig. 67.

B) Place key pressor (SST No. 14) over the key and shaft, then tap the key pressor lightly to position the key. See Fig. 68.



Fig. 67

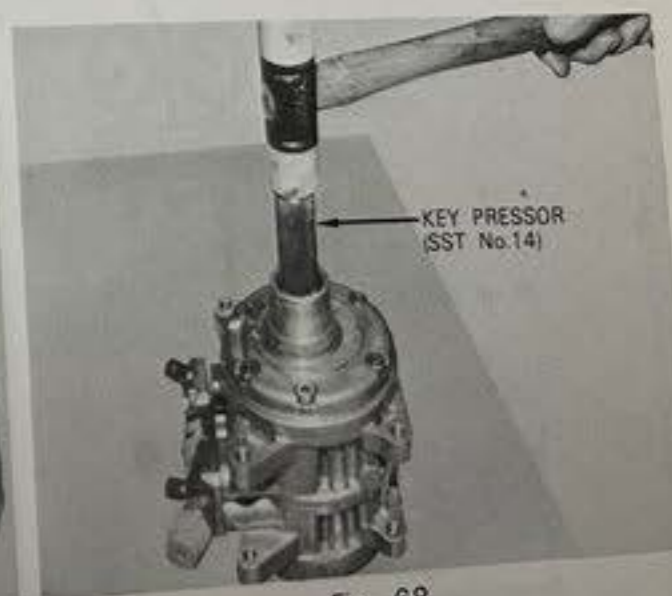


Fig. 68

- D) Remove the pistons with balls and shoes. See Fig. 48.
Note: When removing the pistons from the shaft, be sure not to change the combination of piston, balls and shoes.
- E) Remove the thrust bearings from the shaft. See Fig. 49.



Fig. 48

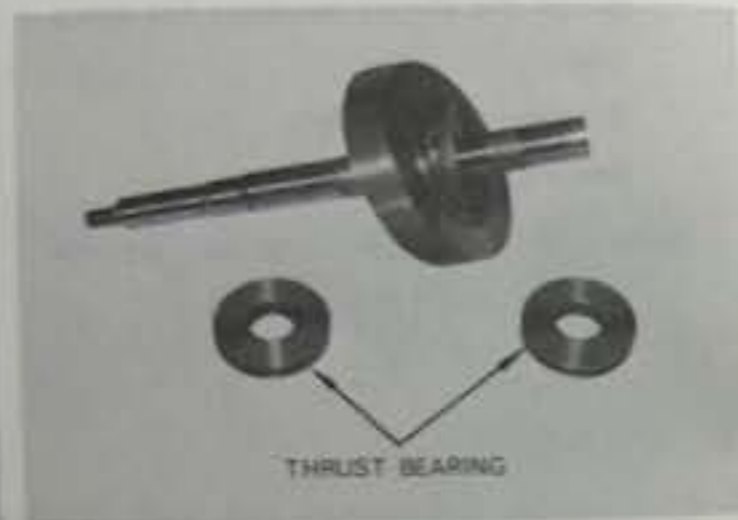


Fig. 49

V-2 INSPECTION

PART NAME	INSPECTION ITEMS	REMEDY (if defective)
SHAFT SEAL	A. Check the lapping surface of carbon disc for crack or scratch. B. Check the rubber seal for crack or hardening. C. Check the spring action.	A. Replace B. Replace C. Replace
SEAL PLATE	A. Check the sealing surfaces for scratch or corrosion.	A. Replace
VALVE PLATE	A. Check both surfaces for scratch or corrosion.	A. Polish with fine oil stone or replace
DISCHARGE REED VALVE	A. Check the reed for crack, scratch, deformation or corrosion. B. Check the restrainer for deformation or corrosion.	A. Replace B. Replace
SUCTION REED VALVE	A. Check the reed for crack, scratch, deformation or corrosion.	A. Replace
FRONT & REAR HOUSINGS	A. Check the sealing surfaces for crack, scratch or deformation.	A. Replace
CYLINDER BLOCK	A. Check the cylinder bore for scratch or corrosion. B. Check the piston clearance. Procedure : 1) Measure each cylinder bore with telescoping gauge and outside micrometer. 2) Measure each piston with outside micrometer. 3) Subtract the piston measurement from the cylinder bore measurement. This difference means piston clear-	A. Replace B. Replace cylinder or piston

- C) Start the compressor up to the revolution range shown in Fig. 73, and measure compressor rpm with tachometer.

INDICATION

- A) Lasting approx. 10 seconds after the compressor gets constant speed, the reading of high pressure gauge will be in the oblique lined zone shown in Fig. 73.
- B) If pressure does not come up to the specified range, disassemble and check the compressor. It will be caused by the defective valve plate, reed or gasket.
- C) On the contrary, if the pressure becomes high extremely, check the nozzle hole for small foreign particles.

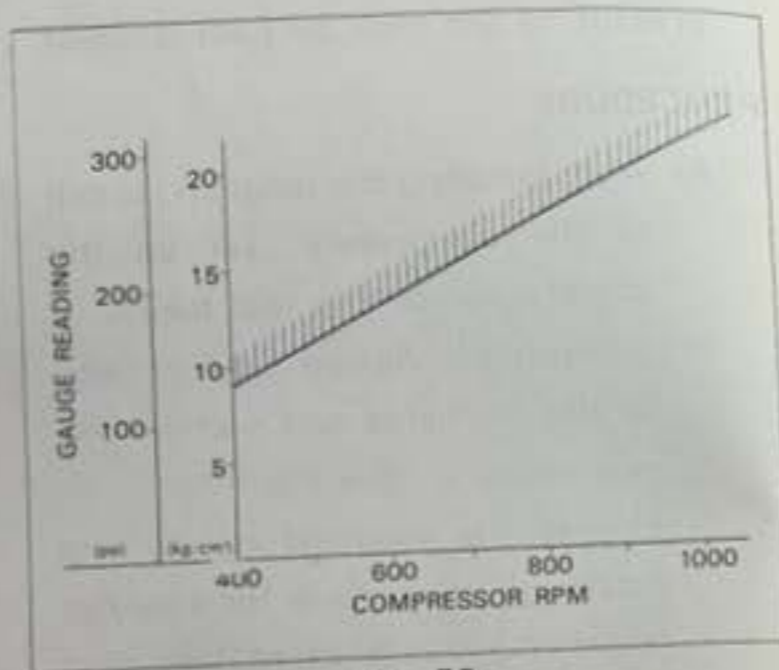


Fig. 73

VI-3 GAS LEAKAGE TEST

PROCEDURE

- A) Put the blind caps on the both service valves to close the service ports.
- B) Charge the refrigerant into the compressor through the charging valve till the pressure raises up to 3 kg/cm² (45 psi.). See Fig. 74.
- C) Check the compressor for gas leakage from the sealed portions using gas leak detector.

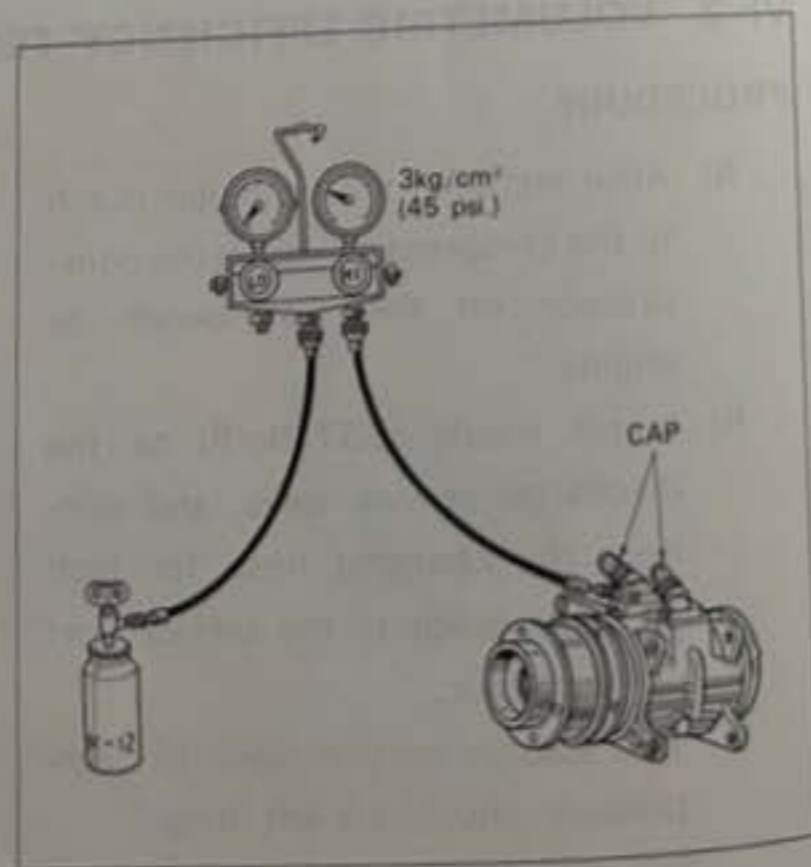


Fig. 74

INDICATION

- A) Finding out gas leakage from sealed portion, check and replace the

VI-4 FINISH

- A) Drain the previous compressor oil, and supply clean compressor oil.

Note: 1) Use only approved oil : DENSOIL 6, SUNISO No.5GS or Equivalent.
2) If using the compressor to new system, add the oil up to 265 - 295 cc (16.2 - 18.0 cu. in.)

- B) Evacuate the inside of compressor with vacuum pump for more than 30-minutes, then charge the refrigerant (R-12) into the compressor through the suction service valve.
- C) Make sure the caps are tight as free from moisture and contaminates when keeping the compressor.