

MODEL LS-4300  
SERIES C SERIES II  
BOOK NO. WEL4305-0E (778)  
SERIAL NO. Shop Manual

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### 3 Handling of the Interchangeable (Common) Parts

#### 3.1 Packings

- 1) As a rule, replace packings, gaskets, and copper packings with new ones.
- 2) Coat the gasket for particular area with liquid packing
  - \* Use cautions when applying liquid packing.
- 3) Remove flaw, dust, paint, oil, or previously used liquid gasket completely.
- 4) Evenly coat with specified liquid gasket and let it dry for few minutes
- 5) When it is dried to touch, mate the gaskets
- 6) Leather packing should be assembled after dipping in oil

#### 3.2 "O"-Ring

- 1) If "O"-ring has been hardened after long storage, discard even if it is unused
- 2) Use only "O"-rings specified in detailed parts list For the lubricated area in engine in particular, "O"-rings of special material like silicon rubber are being used for the purpose of heat resistance as well as prevention of deterioration Therefore do not use substitute parts
- 3) Periphery of "O"-ring is marked with either blue or green dot for following identifications

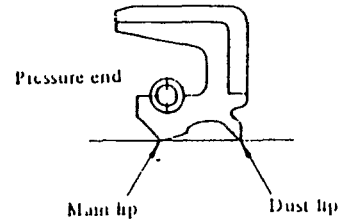
| ID              | Type      | Symbol | Hardness | Purpose                                 | Type of rubber  |
|-----------------|-----------|--------|----------|---|-----------------|
| Blue<br>1 dot   | JIS B2401 | 1A     | 70±5     | Mineral oil resistant for low pressure  | NBR             |
| Blue<br>2 dots  | JIS B2401 | 1B     | 90±5     | Mineral oil resistant for high pressure | NBR             |
| Red<br>1 dot    | JIS B2401 | 2      | 70±5     | Gasoline resistant                      | NBR             |
| Yellow<br>1 dot | JIS B2401 | 3      | 70±5     | Vegetable oil resistant                 | CR              |
| No dot          | JIS B2401 | 4C     | 70±5     | Heat and cold resistant                 | Silicon rubber  |
| Green<br>1 dot  | JIS B2401 | 4D     | 70±5     | Heat and oil resistant                  | Fluorine rubber |

- 4) Coat "O"-rings with oil before installation to avoid flaws.

Silicon rubber is easily torn

#### 3.3 Oil Seal

- 1) Pay attention to the direction of oil seal lips



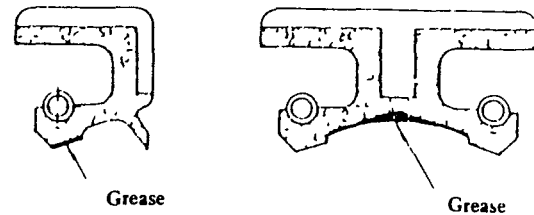
- 2) Take care that dust does not get on oil seals, and make sure there is no rust or flaw (especially on lip surface).
- 3) For assembling oil seal, apply grease in the following manner in order to prevent early dry friction

##### a) Single lip type oil seal

Apply to entire periphery on the opposite side of lip's seal end uniformly with finger to the extent that it does not build up

##### b) Double lip type oil seal

Apply to entire periphery of lip's space with finger to 40 - 60% of the space



- 4) Make sure that there is neither dust, flaw, nor rust on the contact surface (shaft area) of the oil seal, and apply grease or lubrication oil for smooth installation.

- 5) For checking a flaw on lip surface, lightly sweep with wire If it catches, replace the oil seal.

 **DANGER**

- Release all hydraulic oil pressure according to the procedures outlined below before installing or removing a hydraulic pressure gauge. Use extreme care when working with circuit with accumulator. Make sure the pressure is relieved.

- 1 Position the attachment on the ground
- 2 Stop the engine
- 3 Place the starter key in the ON position, and put the control switch at ON  
Note NEVER perform this operation with the starter key and the control switch at their OFF positions.
- 4 Move the right and left operation levers ten times each in all four directions—right, left, backwards and forwards (Move the travel levers back and forth about ten times each )
- 5 Slowly loosen the air breather on hydraulic oil tank to bleed the air from the hydraulic oil tank  
Note Do not loosen the air breather rapidly
- 6 Turn the starter key and the control switch back to OFF.

- Maintain the predetermined pressure setting when adjusting the pressure

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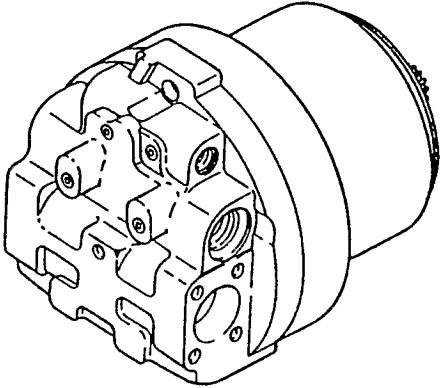
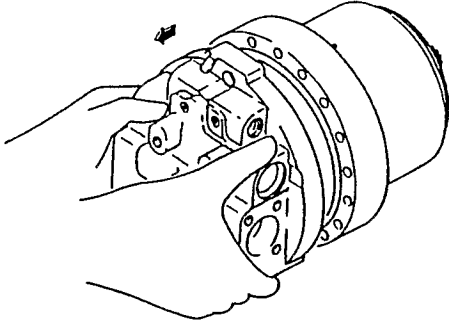
| Ref No | Part Name        | Q'ty |
|--------|------------------|------|
| 202    | Holder B, S/A    | 1    |
| -1     |                  | 1    |
| -2     | Planetary gear B | 3    |
| -3     | Needle roller    | 45   |
| -4     | Gear shaft B     | 3    |
| -5     | Thrust washer    | 6    |
| -6     | Spring pin       | 3    |
| 203    |                  | 1    |
| -1     |                  | 1    |
| -2     |                  | 4    |
| -3     |                  | 72   |
| -4     |                  | 4    |
| -5     | Floating bush    | 4    |
| -7     |                  | 8    |
| -8     |                  | 4    |
| 204    | Drive gear       | 1    |
| 205    | Thrust plate     | 1    |
| 206    | Sun gear B       | 1    |
| 207    | Snap ring        | 1    |
| 208    |                  | 1    |
| 209    |                  | 1    |
| 210    | Flange           | 1    |
| 211    | Floating seal    | 1    |
| 212    | Angular bearing  | 2    |
| 213    | Housing          | 1    |
| 214    | Shim             | 1    |
| 214    |                  | 1    |
| 214    |                  | 1    |
| 214    |                  | 1    |
| 214    |                  | 1    |
| 215    | Pin              | 4    |
| 216    | Socket head bolt | 4    |
| 217    |                  | 16   |
| 218    | Plate            | 4    |
| 219    | Ring gear        | 1    |
| 220    | O-ring           | 1    |
| 221    |                  | 24   |
| 222    |                  | 3    |
| 223    | Thrust plate     | 1    |
| 223    |                  | 1    |
| 223    |                  | 1    |
| 223    |                  | 1    |
| 223    |                  | 1    |
| 224    | Cover            | 1    |
| 225    |                  | 16   |
| 226    | Plug             | 2    |
| 227    |                  | 2    |
| 229    |                  | 1    |
| 230    |                  | 1    |
| 231    |                  | 3    |
|        |                  |      |
|        |                  |      |
|        |                  |      |
|        |                  |      |
| 300    |                  | 3    |
| 400    | Name plate       | 1    |
| 500    | Drive screw      | 2    |
| 600    | Coupling         | 1    |
| 601    | Spring pin       | 1    |

| Ref No | Part Name        | Q'ty |
|--------|------------------|------|
|        |                  |      |
|        |                  |      |
| 103    | Shaft            | 1    |
| 104    | Cylinder block   | 1    |
| 105    | Valve plate      | 1    |
| 106    | Piston assembly  | 9    |
| -1     |                  | 1    |
| -2     | Shoe S/A         | 1    |
| 107    | Retainer plate   | 1    |
| 108    | Retainer holder  | 1    |
| 109    | Bellows          | 1    |
| 110    | Screw ball       | 2    |
| 111    |                  | 2    |
| -1     |                  | 1    |
| -2     | Shoe assembly    | 1    |
| 112    | Roller bearing   | 1    |
| 113    |                  | 1    |
| 114    | Snap ring        | 1    |
| 115    |                  | 1    |
| 116    | Spring           | 1    |
| 117    | Collar           | 1    |
| 118    | Pin              | 1    |
| 119    |                  | 3    |
| 120    | Socket head bolt | 14   |
| 121    | Oil seal         | 1    |
| 122    | O-ring           | 1    |
| 123    |                  | 1    |
| 124    |                  | 1    |
| 125    | Brake piston     | 1    |
| 126    | Collar           | 1    |
| 127    | Friction plate   | 3    |
| 128    | Disk             | 2    |
| 129    | Pin              | 2    |
| 130    | Spring           | 8    |
| 131    |                  | 1    |
| 132    |                  | 1    |
| 133    | Take-up ring     | 1    |
| 134    |                  | 1    |
| 135    |                  | 3    |
| 136    | Plug             | 2    |
| 137    |                  | 4    |
| 139    | Orifice          | 1    |
| 140    |                  | 2    |
| 141    |                  | 2    |
| 142    | Spring           | 2    |
| 143    | Shim             | 3    |
| 144    |                  | 3    |
| 145    |                  | 3    |
|        |                  |      |
| 200    |                  | 1    |
| 201    | Holder S/A       | 1    |
| -1     |                  | 1    |
| -2     | Planetary gear A | 3    |
| -3     | Needle bearing   | 3    |
| -4     | Gear shaft B     | 3    |
| -5     | Thrust washer    | 6    |
| -6     | Spring pin       | 3    |

| Ref No | Part Name               | Q'ty |
|--------|-------------------------|------|
| 100    | Piston motor            | 1    |
| 101    | Case                    | 1    |
| 102    | Base plate assembly     | 1    |
| -1     |                         | 1    |
| -2     | Plunger assembly        | 1    |
| -2-1   |                         | 1    |
| -2-2   | Check valve             | 2    |
| -2-3   | Spring                  | 2    |
| -2-4   | Plug                    | 2    |
| -2-5   | O-ring                  | 2    |
| -3     | Spring seat             | 2    |
| -4     | Spring                  | 2    |
| -5     | Spring seat             | 2    |
| -6     | Cap assembly            | 2    |
| -6-1   |                         | 1    |
| -6-2   |                         | 1    |
| -6-4   | Socket head bolt        | 4    |
| -6-5   | Steel ball              | 1    |
| -6-6   | Spring                  | 1    |
| -6-7   | Plug                    | 1    |
| -6-8   |                         | 1    |
| -7     | Relief valve assembly   | 2    |
| -7-1   | Relief housing assembly | 1    |
| -7-2   | Poppet                  | 1    |
| -7-3   | Poppet seat             | 1    |
| -7-4   | Spring seat             | 1    |
| -7-5   | Spring                  | 1    |
| -7-6   | Plug                    | 1    |
| -7-7   | Set screw               | 1    |
| -7-8   | Nut                     | 1    |
| -7-9   | O-ring                  | 1    |
| -7-10  |                         | 1    |
| -7-11  | Back-up ring            | 2    |
| -7-12  | Spring guide            | 1    |
| -7-13  |                         | 1    |
| -7-14  | Back-up ring            | 1    |
| -7-15  | Free piston             | 1    |
| -7-16  |                         | 1    |
| -7-17  |                         | 2    |
| -8     | Plug                    | 6    |
| -9     |                         | 2    |
| -12    | Valve                   | 1    |
| -13    |                         | 1    |
| -14    |                         | 1    |
| -15    |                         | 1    |
| -16    |                         | 1    |
| -17    | Spring                  | 1    |
| -18    |                         | 2    |

## 6 4 Troubleshooting table for double counterbalance

| Abnormality   | Possible cause   | Countermeasure or remedy   |
|---|--|--|
| I The motor does not revolve, or the revolution speed is slow | 1. The plunger is not switched.<br>1) Pressurized fluid is not supplied to the pilot<br>2) Foreign material is caught between the plunger and the body.<br>3) The orifice is clogged | Inspect the pipe for damage<br>Completely remove foreign materials, repair the damaged area, and reassemble after washing. Here, replace if damage is so severe that there is much leakage Reassemble after washing  |
| II The motor does not stop, or the stopping is slow.          | 1. The plunger does not return<br>1) Foreign materials have entered and become caught.<br>2) The spring is broken<br>3) The spring is not assembled<br>4) The orifice is clogged     | Completely remove foreign materials, repair the damaged area, and reassemble after washing Here, replace if damage is so severe that there is much leakage Reassemble after washing. Replace the spring. Then, completely remove the foreign materials, repair the damaged area, and reassemble after washing Here, replace if damage is so severe as to cause much leakage Reassemble after washing Assemble the spring in the specified position.<br>Reassemble after washing. |
| III The revolution varies                                     | 1 The plunger does not move smoothly<br>1) Foreign materials have entered and become caught<br>2) The orifice is clogged.  | Completely remove foreign materials, repair the damaged area, and reassemble after washing. Here, replace if damage is so severe that there is much leakage Reassemble after washing.  |
| IV Abnormal noise is heard                                    | 1. The plunger is not damaged<br>1) Foreign materials have entered and become caught<br>2) The spring is damaged<br>3) The orifice is clogged.                                       | Completely remove foreign materials, repair the damaged area, and reassemble after washing. Here, replace if damage is so deep that leakage is much Reassemble after washing Replace the spring Then, completely remove the foreign materials, repair the damaged area, and reassemble after washing Here, replace if damage is so severe that there is much leakage. Reassemble after washing   |

| Disassembling procedure   | Cautionary points during assembling  |
|---|--|
| <p data-bbox="244 310 809 401">b Remove the motor from the vise, horizontally place the motor on the working bench and fix the motor</p>  <p data-bbox="244 1073 809 1163">c Remove the socket head bolt ②, and using a screw-driver or similar, remove the base plate ②</p>  | <p data-bbox="834 1073 1379 1129">Don't forcibly pry off the base with the driver<br/>Applicable tool</p> <p data-bbox="863 1136 1141 1163">No 18      Screwdriver</p> |

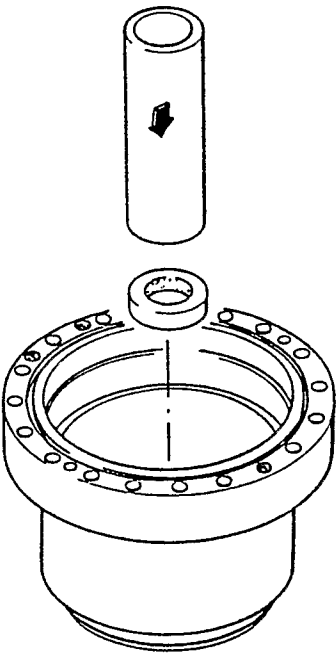
7.5 Assembling procedure

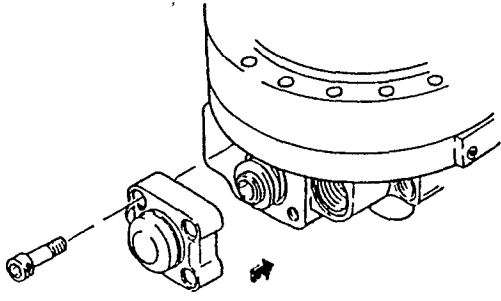
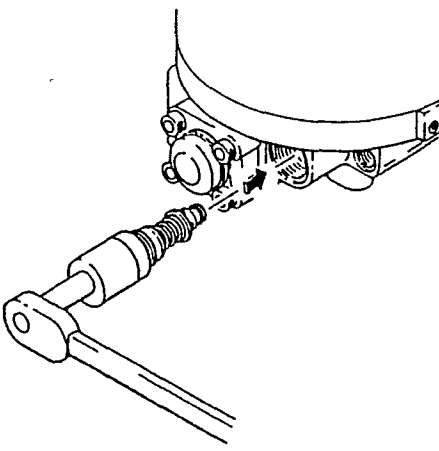
7.5.1 Cautionary points before assembling

- a) Wash each part with clean washing oil, and apply air.
- b) When handling cleaned part, take sufficient care to keep it free from sticking dust, hit marks and damage
- c) Previously coat grease on the oil seal and O-ring. (Particularly on the oil seal lip section)
- d) Before assembling, coat clean hydraulic oil on the sliding area and bearing area
- e) Tighten each fastening area to the specified torque
- f) Replace the seals, bearings and pins with new ones

7.5.2 Assembling

Proceed with the following for assembling.

| Assembling procedure  | Cautionary points during assembling  |
|---|--|
| <p>1. Oil seal assembling<br/>Press-fit the oil seal to the case ①</p>  | <p>Don't mistake the press-fitting direction. Verify that the oil seal is completely press-fit<br/>Applicable tools<br/>No.36 Oil seal press-fitting jig</p> |

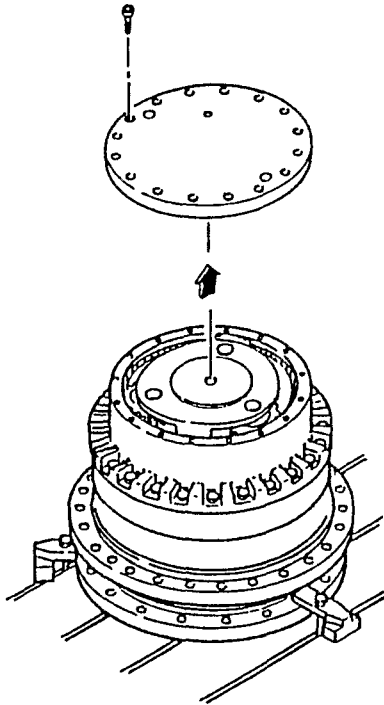
| Assembling procedure  | Cautionary points during assembling   |
|---|---|
| <p>b) Assemble the cap S/A (26) on the base plate (21), and fasten it with the socket head bolts (264).</p>                | <p>Since it is pressed by the spring (24), tighten the socket head bolts (264) half-way, supporting the sub-assembly by hand.</p> <p>Tightening torque 10 to 11 kg-m (72.3 to 79.6 ft lb)</p> <p>Applicable tool</p> <ul style="list-style-type: none"> <li>No.3 Preset type torque wrench</li> <li>No.5 Ratchet handle for socket wrench</li> <li>No.11 Hex. bit for socket wrench</li> <li>No.14 Hex. bar wrench</li> </ul> |
| <p>c) Assemble the relief valve S/A (27) on the base plate (21), and tighten the plug (276) to the specified torque</p>  | <p>Tightening torque 27 to 30 kg-m (195.3 to 217.0 ft lb)</p> <p>Applicable tools</p> <ul style="list-style-type: none"> <li>No 4 Preset type torque wrench</li> <li>No.5 Ratchet handle for socket wrench</li> <li>No 9 Socket for socket wrench</li> </ul>  |

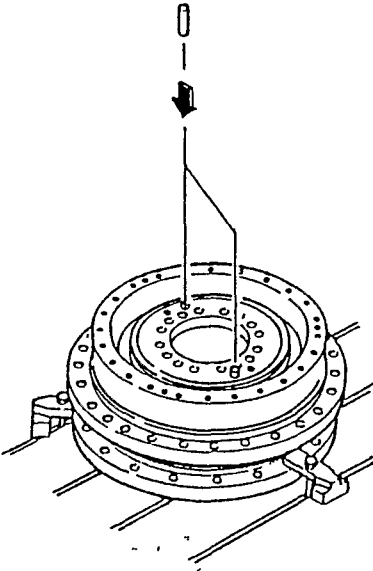
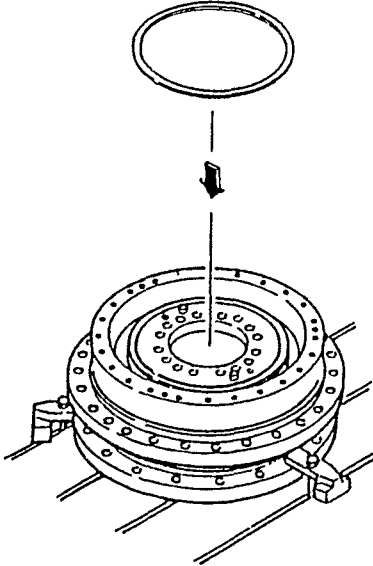
9.3 Disassembling procedure

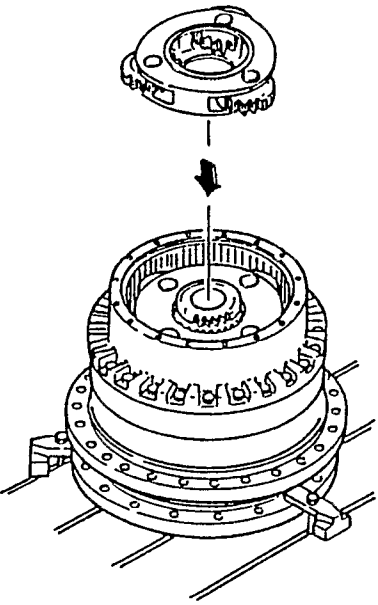
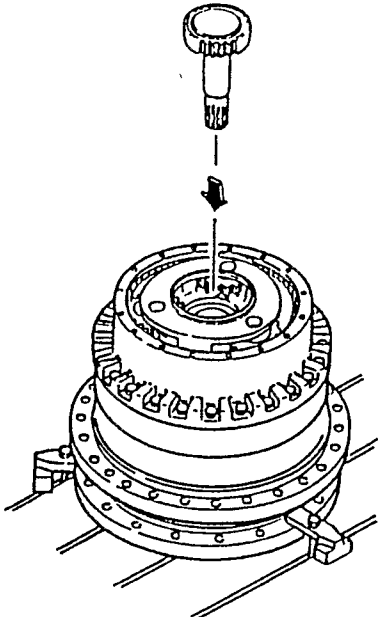
9.3.1 Cautionary points before disassembly

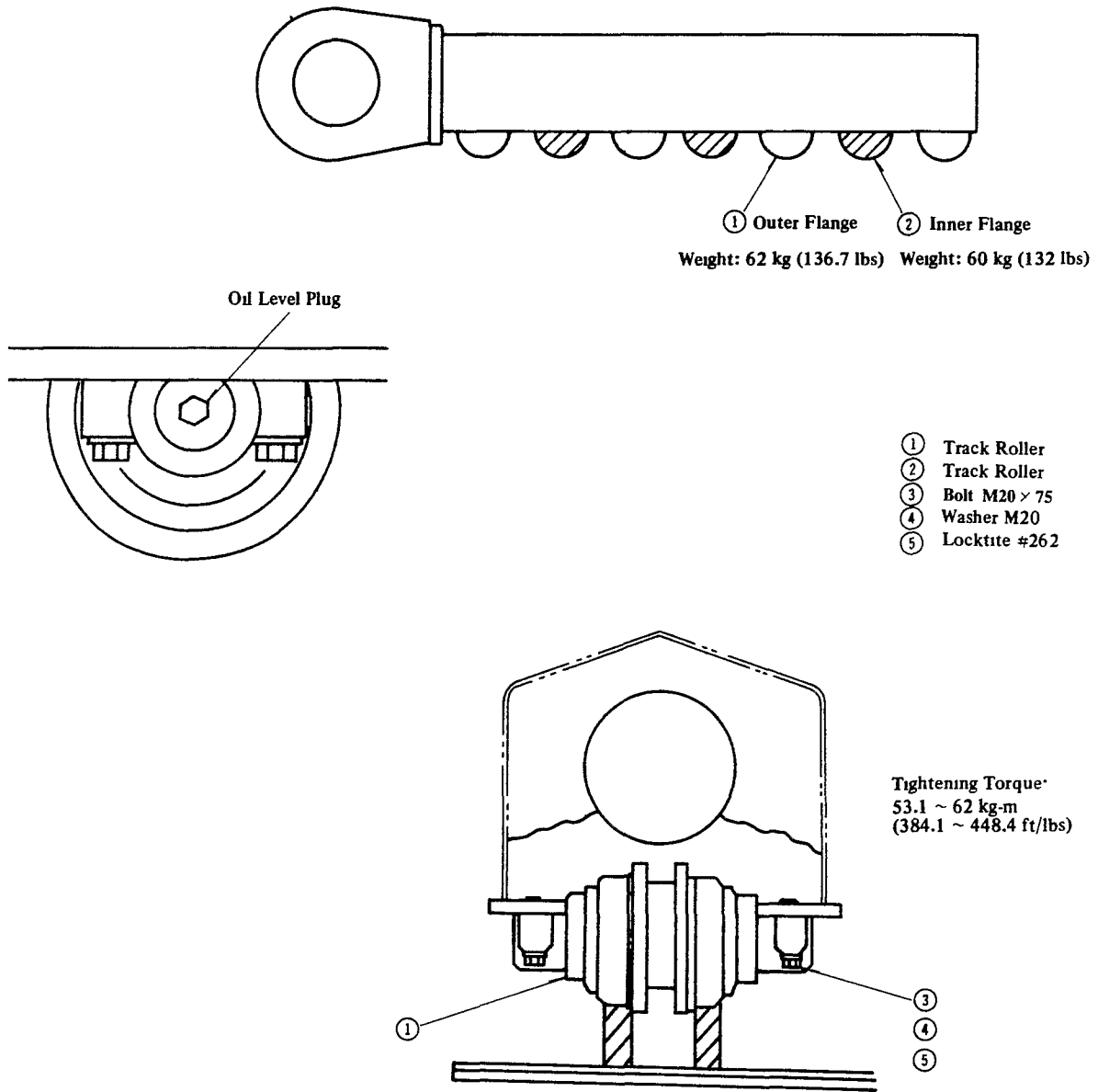
- a) Completely remove mud, dirt, etc which sticks to the outer surface (Sufficiently wash the outside)
- b) Scribe matchmarks to allow for accurate regeneration of the original assembly
- c) Drain the lubricant from the case.
- d) Select a dust-free working site, and be careful to prevent mud, dirt, etc from sticking to the parts
- e) Take sufficient care to prevent scratch marks and damage when a part falls or bumps into another object

9.3.2 Disassembly

| Disassembling procedure  | Cautionary points during disassembling   |
|--|--|
| <p>1. Cover disassembling<br/>                     Facing the motor mounting surface downward, fix the Reduction gear<br/>                     Loosen the socket head bolt (25), and remove the cover (24).</p>  | <p>Applicable tools</p> <ul style="list-style-type: none"> <li>No.2           Preset type torque wrench</li> <li>No.5           Ratchet handle for socket wrench</li> <li>No.7, 10       Hex. bit for socket wrench</li> <li>No.12, 15      Hex. bar wrench</li> <li>No 17, 21, 22 Hanger</li> </ul> |

| Assembling procedure   | Cautionary points during assembling                 |
|--|---|
| <p>f) Press-fit the pin ⑮ to the flange ⑩. At this time, adjust the pin ⑮ to protrude 21.5 to 22.2mm beyond the flange ⑩</p>  <p>2 Holder C ⑭ assembling</p> <p>a) Assemble the same number of shims ⑭ as in the disassembling procedure</p>  | <p>Applicable tools</p> <p>No.25 Plastic hammer</p> |

| Assembling procedure  | Cautionary points during assembling |
|---|-------------------------------------|
| <p data-bbox="224 310 586 344">10 Assemble holder A S/A ①</p>  <p data-bbox="224 1066 594 1100">11 Assemble the drive gear ④</p>  |                                     |



[Note]

- 1 Each bolt shall be coated with Loctite #262
- 2 Oil level plug must be positioned toward the outside of the machine

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5) The slip rate of the hydraulic motor is much.

Check the drain rate of the hydraulic motor. If the rate is 500cc/min or less, it is produced that the motor is not abnormal.

| Problems   | Cause  | Remedy  |
|--|--|---|
| The slip rate is high when the torque driving the hydraulic motor from the outside operates. | <ol style="list-style-type: none"> <li>1. The relief valve operates improperly.</li> <li>2. The seat of the plunger is defective.</li> </ol> | <ol style="list-style-type: none"> <li>1. Same as in Item 1).</li> <li>2. Replace.</li> </ol> |

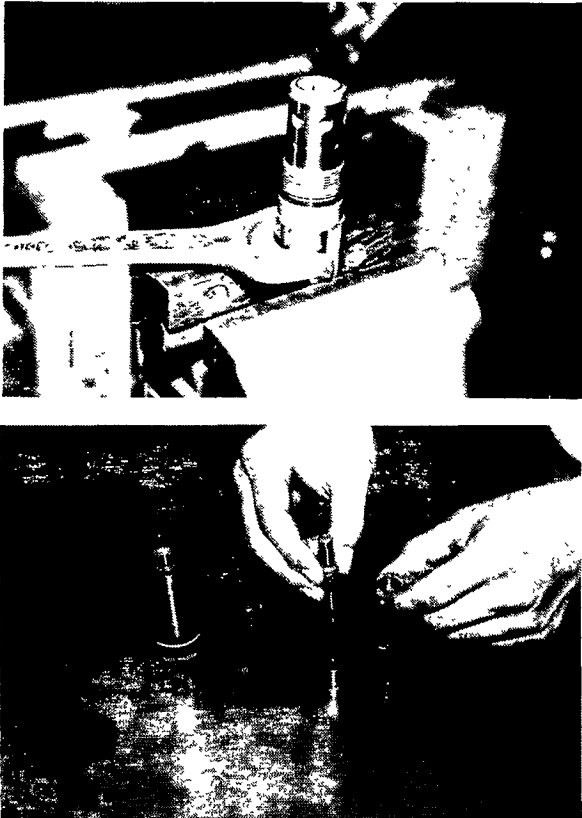
6) Fluid leakage

i) Fluid leaks at the oil seal

| Problems                     | Cause  | Remedy   |
|------------------------------|--|--|
| Fluid leaks at the oil seal. | <ol style="list-style-type: none"> <li>1. Dust is caught by the lip, and it is damaged.</li> <li>2. The shaft is damaged or worn.</li> <li>3. Since the pressure in the casing is abnormally high, the lip of the oil seal is turned over.</li> <li>4. The shaft is rusted.</li> </ol> | <ol style="list-style-type: none"> <li>1. Replace the oil seal.</li> <li>2. Dislocate the lip or the shaft, and replace if necessary.</li> <li>3. Repair the drain pipe if clogged.</li> <li>4. Disassemble and recondition</li> </ol> |

ii) Fluid leaks at the joining surface.

| Problems                            | Cause   | Remedy  |
|-------------------------------------|---|---|
| Fluid leaks at the joining surface. | <ol style="list-style-type: none"> <li>1. Forget installing O-ring.</li> <li>2. O-ring is scored.</li> <li>3. The seal surface is scored.</li> <li>4. The bolt is loose or broken.</li> </ol> | <ol style="list-style-type: none"> <li>1. Install O-ring properly and assemble.</li> <li>2. Replace.</li> <li>3. Disassemble and recondition.</li> <li>4. Retighten to the specified torque, or replace.</li> </ol> |

|    | Disassembling procedure   | Cautionary points   |
|----|---|---|
| 15 | <p>④ Relief valve disassembling</p> <p>Hold the plug (201) and the body (101) respectively, and pressing them against each other, bend them. The C-ring will be removed for disassembly.</p> <p>The piston (302), plunger (301) and seat (341) can be removed from the body side.</p> <p>The springs (321 and 322) can be pulled out from the plug side.</p> <p>Face the plug downward and lightly hit it, and the piston (303), spring (323) and spring seat (333) will be ready for pulling out.</p>  | <p>If they are bent with the cut end of the C-ring facing upwards, it will facilitate removal.</p> <p>If any damage is found on the parts, remove them as an assembly unit.</p> |

The above completes the disassembling procedure. Sufficiently check the parts for abnormalities.

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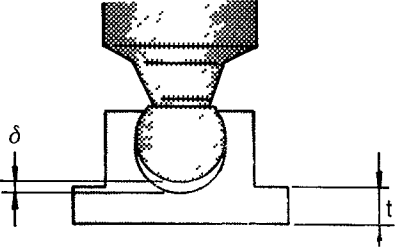
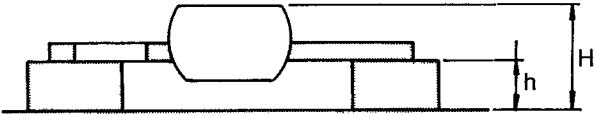
## 5 Maintenance procedure

## 5-1 Replacement criteria for worn parts

If any part is worn more than the following limits, replace or readjust the part.

However, if any excessive damage is apparently observed, it should be corrected regardless of the limits.

Table 4 Part replacement criteria

| Item  | Standard dimensions (mm) | Recommended value (mm)   | Remedy  |
|---|--------------------------|--|---|
| Clearance (D-d) between piston and cylinder bore  | 0.032 (0.001")           | 0.062 (0.002")   | Replace the piston or cylinder.                                 |
| Play of staked area between the piston and shoe   | 0                        | 0.3 (0.012")   | Replace the piston assembly.                                    |
| Shoe thickness (t)  | 6 (0.24")                | 5.8 (0.23")  |   |
| Assembly height (H-h) of retaining plate and spheric bushing  | 7 (0.28")                | 6.5 (0.256")   | Replace the retaining plate and spheric bushing as an assembly. |
| Thickness of friction plate   | 4.0 (0.16")              | 3.6 (0.142")   | Replace.  |
|  <p>Play Between The Piston And Shoe (<math>\delta</math>)<br/>Shoe Thickness (t)</p> |                          |  <p>Assembly Height (H-h) Of Retaining Plate<br/>And Spheric Bushing</p> |   |

## 5-2 Reconditioning criteria for sliding surfaces

If any sliding surface is rougher than the following limits, recondition or readjust the surface.

Table 5 Reconditioning criteria for sliding surfaces

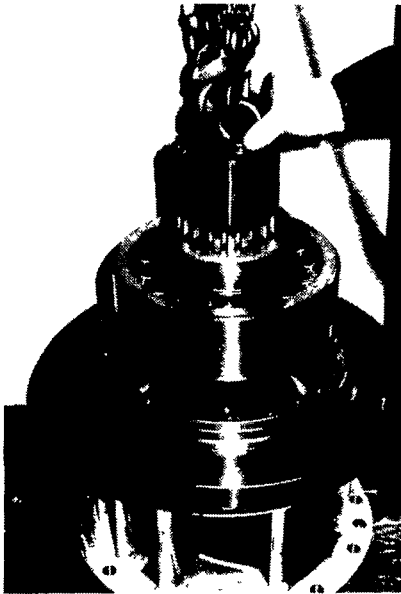
| Part name   | Standard surface roughness | Surface roughness which requires reconditioning |
|-------------|----------------------------|---|
| Shoe        | 0.8-Z (Ra=0.2) (Lapping)   | 3-Z (Ra=0.8)                                    |
| Shoe plate  | 0.4-Z (Ra=0.1) (Lapping)   | 3-Z (Ra=0.8)                                    |
| Cylinder    | 1.6-Z (Ra=0.4) (Lapping)   | 12.5-Z (Ra=3.2)                                 |
| Valve plate | 0.8-Z (Ra=0.2) (Lapping)   | 6.3-Z (Ra=1.6)                                  |

## Note:

1. Lap each sliding surface to the standard surface roughness or finer.
2. If the spheric sliding area between the retaining plate and the spheric bushing is damaged, replace them as an assembly.

6-6 [Assembling]

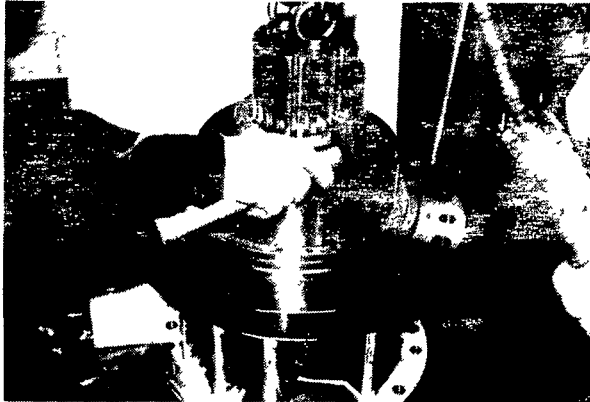
1



Turn over the shaft assembly, and slowly enter it into the turned-over casing assembly.

Tool: Eyebolt

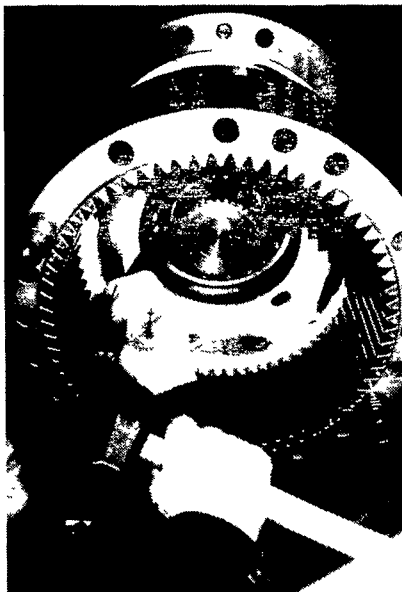
2



Apply light hits of hammer.

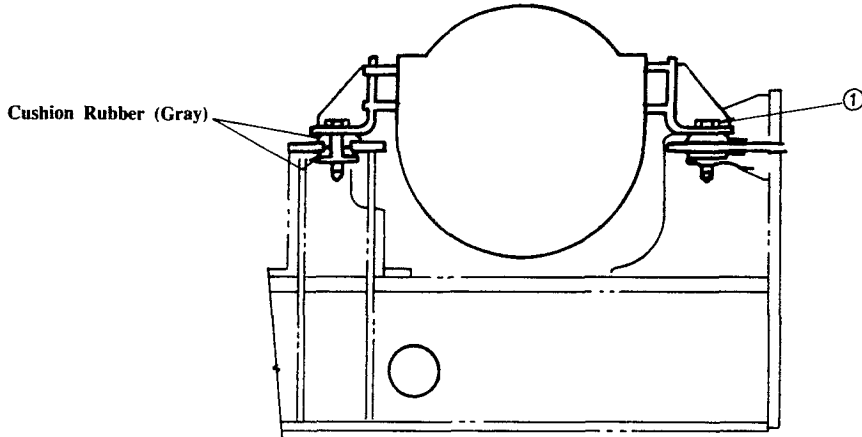
Tool: Hammer

3



Suspend the casing assembly, and lightly hit the shaft assembly from the bottom side to correct the inclination of the shaft assembly. Then, assemble them.

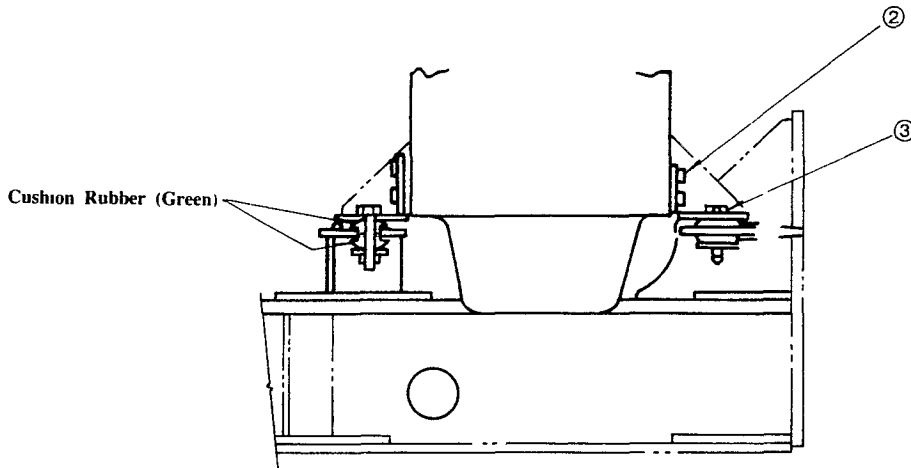
Tools: Hammer  
Chisel



Hydraulic Pump Side

Tightening Torque.

① 29.5 ~ 34.4 kg-m (213 ~ 249 ft lbs)



Fan Side

② 11.1 ~ 12.9 kg-m (80 ~ 93 ft lbs)

③ 29.5 ~ 34.4 (213 ~ 249 ft. lbs)

① Bolt M20 × 260

② Bolt M12 × 35

③ Bolt M12 × 130

[Note]

1 Cushion rubber for front and rear have different color

2 Each bolt shall be coated with Loctite #262

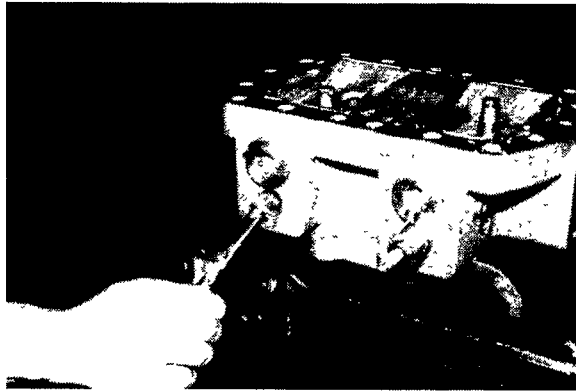
## 3.2 Table of tools and jigs

The following tools and jigs are required to carry out the disassembly and reassembly of the hydraulic pump

| Tool/Jig                   | Q'ty         | Comments                                    |
|----------------------------|--------------|---|
| Allen key                  | 1 each       | Nominal 3, 4, 5, 8, 10, 17                  |
| Spanner (or monkey wrench) | 1 each       | Nominal 10, 13, 17, 22, 24, 27 and 29       |
| Round nose pliers          | 1            | Nominal 125                                 |
| Plastic hammer             | 1            | Medium                                      |
| Ring pliers                | 1            | 110 size                                    |
| Phillip's screwdriver      | 1            |   |
| Heater                     | 1 each       | For input shaft and subsidiary shaft        |
| Burner                     | 1            |   |
| Rubber disk assembly       | 2            | Fig 1<br>To prevent dropping cylinder block |
| Round bar or pipe          | 1            | Fig 2                                       |
| L-shaped bar               | 1            | Fig 3                                       |
| Washing fluid              | Small amount | Spray type is recommended                   |
| Liquid packing             | Small amount | Three Bond #1215                            |
| Adhesive                   | Small amount | Loctite #572                                |
| Adhesive                   | Small amount | Three Bond #1305                            |
| Grease                     | Small amount |   |
| Vernier calipers           | 1            | Approx 200mm                                |

Control all tightening torques with a torque wrench when assembling the pump in a workshop  
Use a torque wrench, when working on the pump on site.

Remove the spring seats



No 2-18

Remove the spools

⚠ Take care not to scratch any surfaces

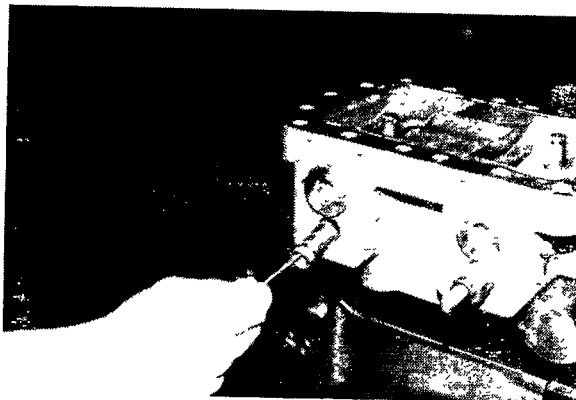


No 2-19

Remove the bushings.

[Use a 2~3mm diameter rod, bent at the end, to remove the bushings]

⚠ Take care not to scratch any surfaces



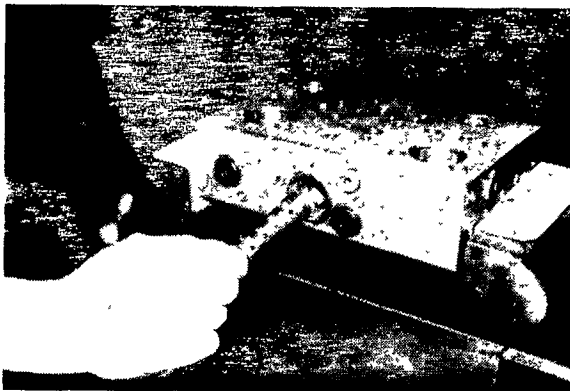
No 2-20

Remove the distance piece and the spool



No 3-7

Remove the bushings.  
[Use a 2~3mm diameter rod, bent at the end, to remove the bushings ]  
▲ Take care not to scratch any surfaces

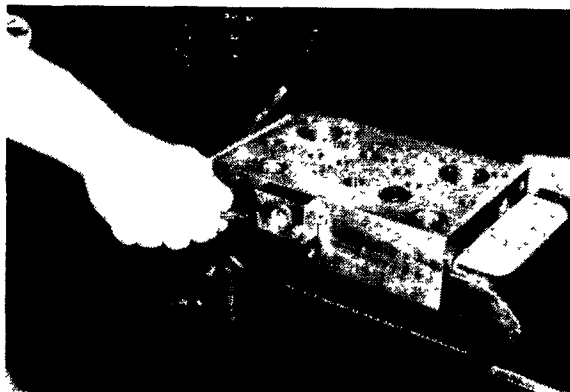


No.3-8

[Disassembly of the selector spool]

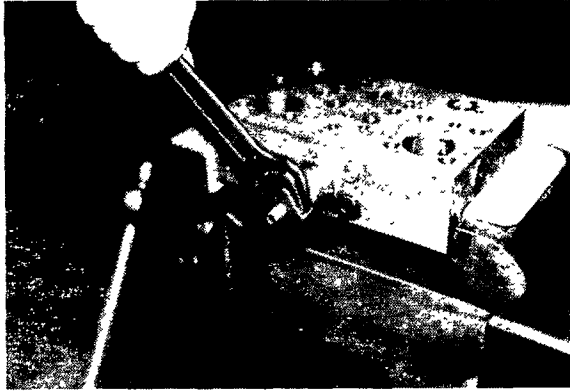
Remove the two hexagonal socket head cap bolts (M6 × 25) and remove the cover

[5mm A/F Allen key]



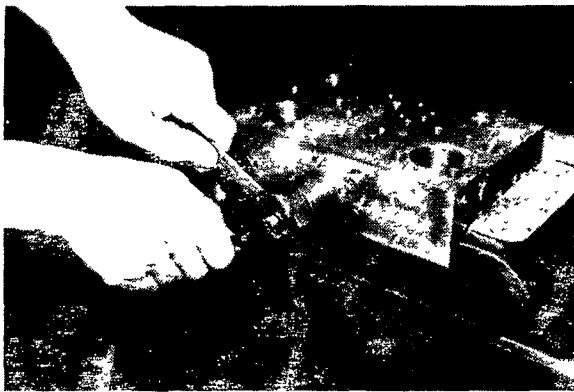
No 3-9

Mount the guide  
 [27 mm A/F spanner  
 Tightening torque. ]



No 3-5

Tighten the nut to fasten the guide in place while preventing the adjusting screw from turning with an Allen key  
 [Adjusting screw  
 5 mm A/F Allen key]  
 [Nut 17 mm A/F spanner]

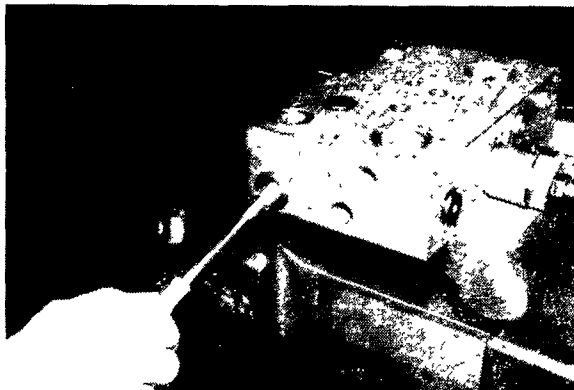


No 3-4

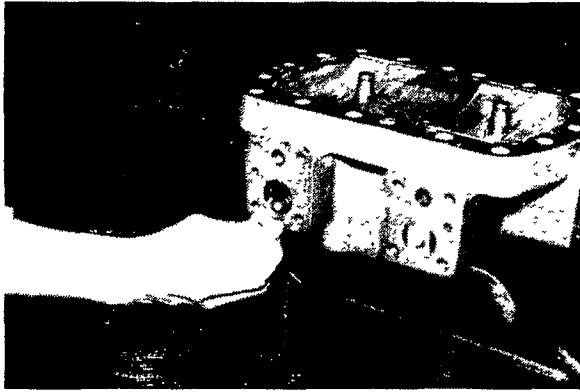
[Mounting the nipple]

Insert the filter into the bottom of the hole with a straight-headed screwdriver

[Tightening torque. 1 kgf m  
 (7.2 ft lb)]



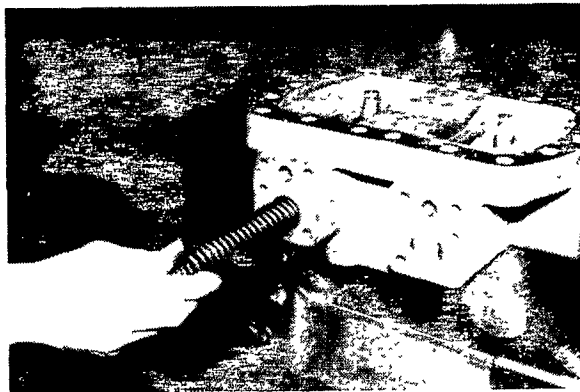
No 4-25



No 2-10

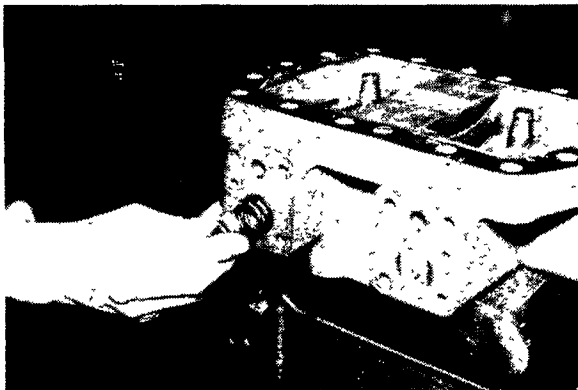
Put the shims on the rods  
Make sure that the total shim thickness is the same as it was on assembly  
The high-pressure setting will differ if the thickness is different

Insert the large springs

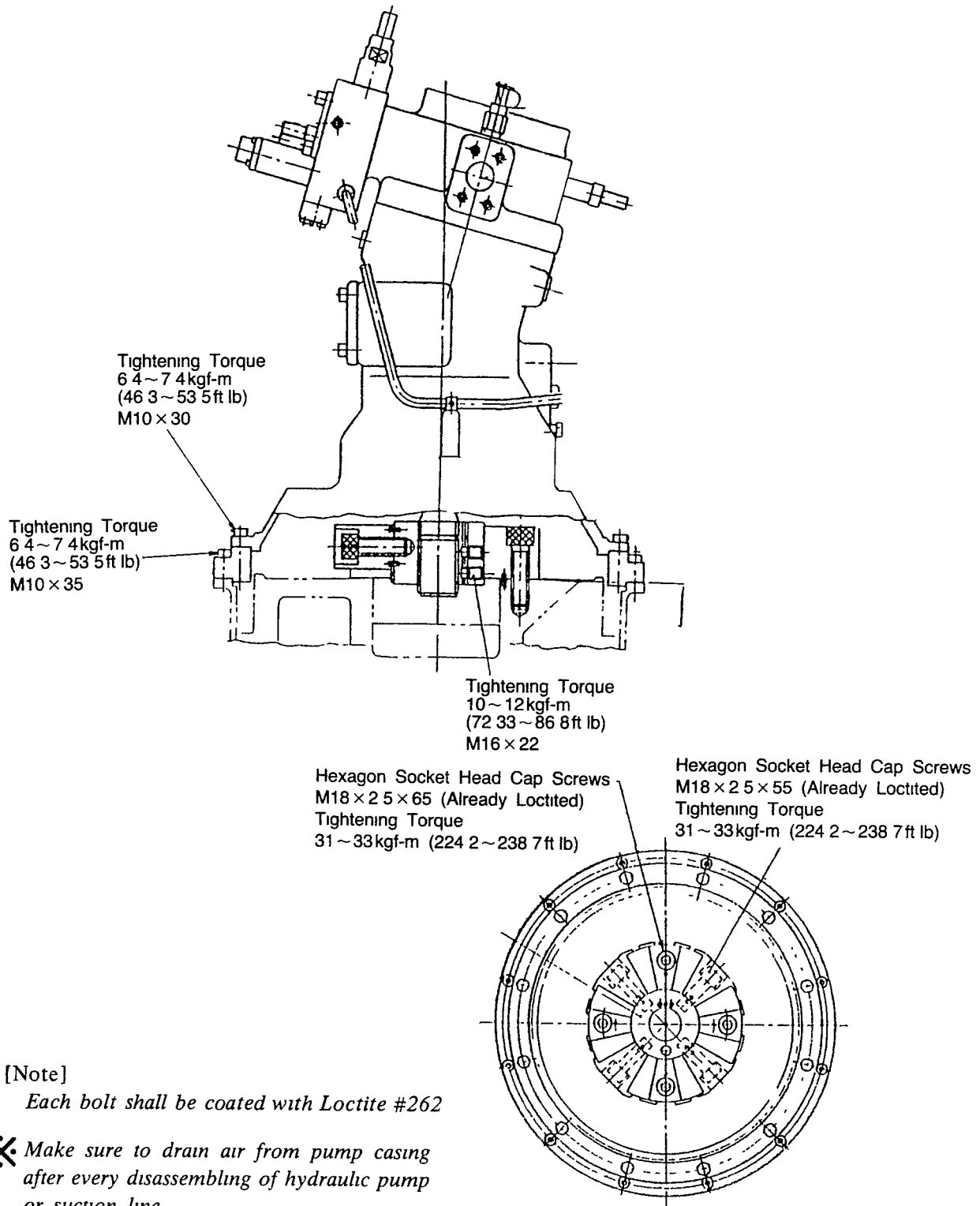


No 2-9

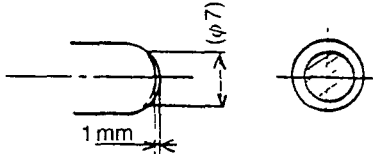
Insert the spring seats



No 2-8


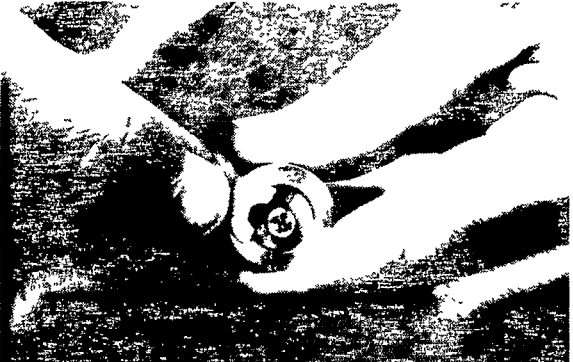



## 7.2 Maintenance Standards

| Item                           | Standard  | Comments  |
|--------------------------------|---|---|
| Leakage                        | Replace if the leakage exceeds 1000 cc/min with the handle in the neutral position or 2000 cc/min during operation  | Conditions<br>Primary pressure 30 kgf/cm <sup>2</sup><br>Oil viscosity 23 CSt |
| Spool                          | Replace when the sliding contact faces are worn 10 μm or more than the non-sliding contact faces  | The conditions are approximately the same as for the leakage, above           |
| Push rod                       |  <p>Replace if the tip is worn 1 mm or more</p>  |   |
| Play in the operating controls | Replace the parts if the wear in the pin, shaft and joint lead to play of more than 2 mm  | Tighten all parts if the play is due to looseness of the bolts etc            |
| Safety of operation            | Refer to "Troubleshooting" later in these procedures if abnormal noises, hunting or drops in primary pressure are experienced during operation. Replace the valve if the problem cannot be solved |   |

Note 1) It is recommended that all O-rings and other seals be replaced whenever the valve is disassembled. However, they may be used again if they are undamaged.

2) The seal washer (12) must be replaced each time the hexagonal socket head bolt (13) is loosened.

| No | Operation  | Cautions  |
|----|--|---|
| 4  | <p>Mount the washers (217), springs (241) and spring seats (216) in order onto the spools (201)</p>   |   |
| 5  | <p>Stand each spool (201) on a level work bench, push the spring seat (216) up and insert the two semicircular washers (215) into the top of the spring seat such that they do not overlap</p>  | <p>Do not pull down the spring seat by more than 6 mm</p>   |
| 6  | <p>Mount the return springs (241) into the casing<br/>Mount the pressure reduction assembly into the casing</p>   | <p>Assemble in the same positions as before disassembly</p> |

---

## CONTROL VALVE CONTENTS

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---

## Parts list (Swing side valve section)

| Item | Part Name       | Q'ty | Item | Part Name        | Q'ty | Item | Part Name                 | Q'ty |
|------|-----------------|------|------|------------------|------|------|---------------------------|------|
| 1    | Valve housing   | 1    | 20   | Cap (L)          | 1    | 39   | Plug                      | 2    |
| 2    | Spool           | 1    | 21   | Cap (S)          | 1    | 40   | Sleeve                    | 1    |
| 3    | Spool (Travel)  | 1    | 22   | Spring           | 1    | 41   | Plug                      | 1    |
| 4    | Spool (Boom II) | 1    | 23   | Socket head bolt | 14   | 42   | O-ring                    | 5    |
| 5    | Spool (Swing)   | 1    | 24   | Poppet           | 1    | 43   | Poppet                    | 2    |
| 6    | Spool (Arm I)   | 1    | 25   | Blank            |      | 44   | Spring                    | 2    |
| 7    | Poppet          | 1    | 26   | Plug             | 1    | 45   | Plug                      | 3    |
| 8    | Poppet          | 1    | 27   | O-ring           | 1    | 46   | Plug                      | 1    |
| 9    | O-ring          | 1    | 28   | Plug             | 1    | 47   | O-ring                    | 1    |
| 10   | Back-up ring    | 1    | 29   | O-ring           | 1    | 48   | Plug assembly             | 2    |
| 11   | Plug            | 1    | 30   | Poppet           | 1    | 49   | O-ring                    | 1    |
| 12   | Spring          | 1    | 31   | Spring           | 1    | 50   | Relief valve              | 3    |
| 13   | Piston          | 1    | 32   | Spacer           | 1    | 51   | Relief valve              | 2    |
| 14   | Piston          | 1    | 33   | O-ring           | 1    | 52   | Low pressure relief valve | 1    |
| 15   | Plug assembly   | 1    | 34   | Plug             | 1    | 53   | Plug                      | 6    |
| 16   | Spring seat     | 8    | 35   | Plug             | 1    |      |                           |      |
| 17   | Spring          | 3    | 36   | Spring           | 1    |      |                           |      |
| 18   | Spool end       | 4    | 37   | Cap              | 1    |      |                           |      |
| 19   | O-ring          | 9    | 38   | Cap              | 1    |      |                           |      |

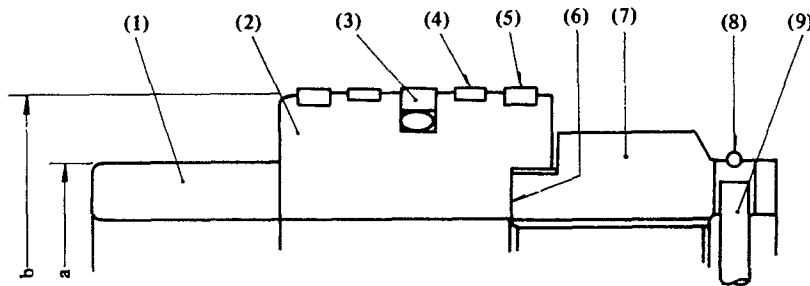
Table 1 (use with figure 3)

## 5 Troubleshooting

## 5.1 Control valve overall

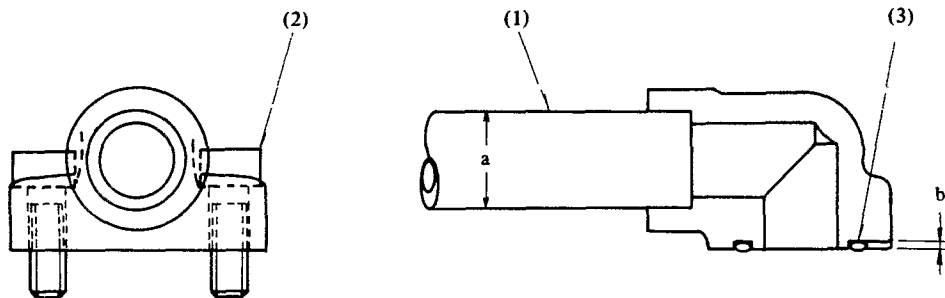
| Symptoms   | Possible causes  | Remedial measures   |
|--|--|---|
| A spool is sticking  | 1 The oil temperature is abnormally high                   | Remove the portion of the piping where resistance is restricting the flow of oil                          |
|  | 2 The hydraulic oil is dirty                               | Clean out the circuit when the hydraulic oil is replaced  |
|  | 3. The pipe port joint is overtightened.                   | Check the tightening torque   |
|  | 4 The valve housing is strained due to faulty installation | Loosen the installation bolts and check it  |
|  | 5 Pressure is too high                                     | Install a pressure gauge on the inlet and cylinder circuit and check the pressure                         |
|  | 6 The spool is bent  | Replace the valve assembly parts  |
|  | 7 The return spring is broken                              | Replace the damaged parts   |
|  | 8 The spring or the cap is out of alignment                | Loosen the cap and center it, then tighten it again   |
|  | 9 Temperature distribution inside the valve is not uniform | Warm up the entire circuit  |
| Spool doesn't move properly  | 1 Dirt is clogging up the inside of the valve              | Remove the dirt (flush out the valve)   |
| A negative load cannot be held   | 1 Oil is leaking from the cylinder                         | Check the cylinder  |
|  | 2 Oil is bypassing from the valve spool                    | Replace the valve   |
|  | 3 Oil is leaking from the port relief valve.               | Take the port relief valve out of the valve housing and clean the housing seat and port relief valve seat |
| The negative load drops when the spool is switched to a position higher than neutral | 1 Dirt is digging into the load check valve                | Disassemble and clean the check valve   |
|  | 2 The check valve's poppet or seat is scratched            | Replace the poppet or smooth the poppet and seat by rubbing with polishing powder                         |

**3.4 Piston Complete**



| No  | Name               | Dimension | Replacement standard   |
|-----|--------------------|-----------|--|
| (1) | Cushion ring       | a         | <ul style="list-style-type: none"> <li>• When local wear exceeding 0.2 mm (0.008") arises</li> </ul> |
| (2) | Piston             | b         | <ul style="list-style-type: none"> <li>• ditto</li> </ul>  |
| (3) | Seal ring assembly |           | <ul style="list-style-type: none"> <li>• To be replaced whenever cylinder is disassembled</li> </ul> |
| (4) | Slide ring         |           | <ul style="list-style-type: none"> <li>• ditto</li> </ul>  |
| (5) | Slide ring         |           | <ul style="list-style-type: none"> <li>• ditto</li> </ul>  |
| (6) | Shim               |           | <ul style="list-style-type: none"> <li>• ditto</li> </ul>  |
| (7) | Piston nut         |           | <ul style="list-style-type: none"> <li>• ditto</li> </ul>  |
| (8) | Snap ring          |           | <ul style="list-style-type: none"> <li>• ditto</li> </ul>  |
| (9) | Pin                |           | <ul style="list-style-type: none"> <li>• ditto</li> </ul>  |

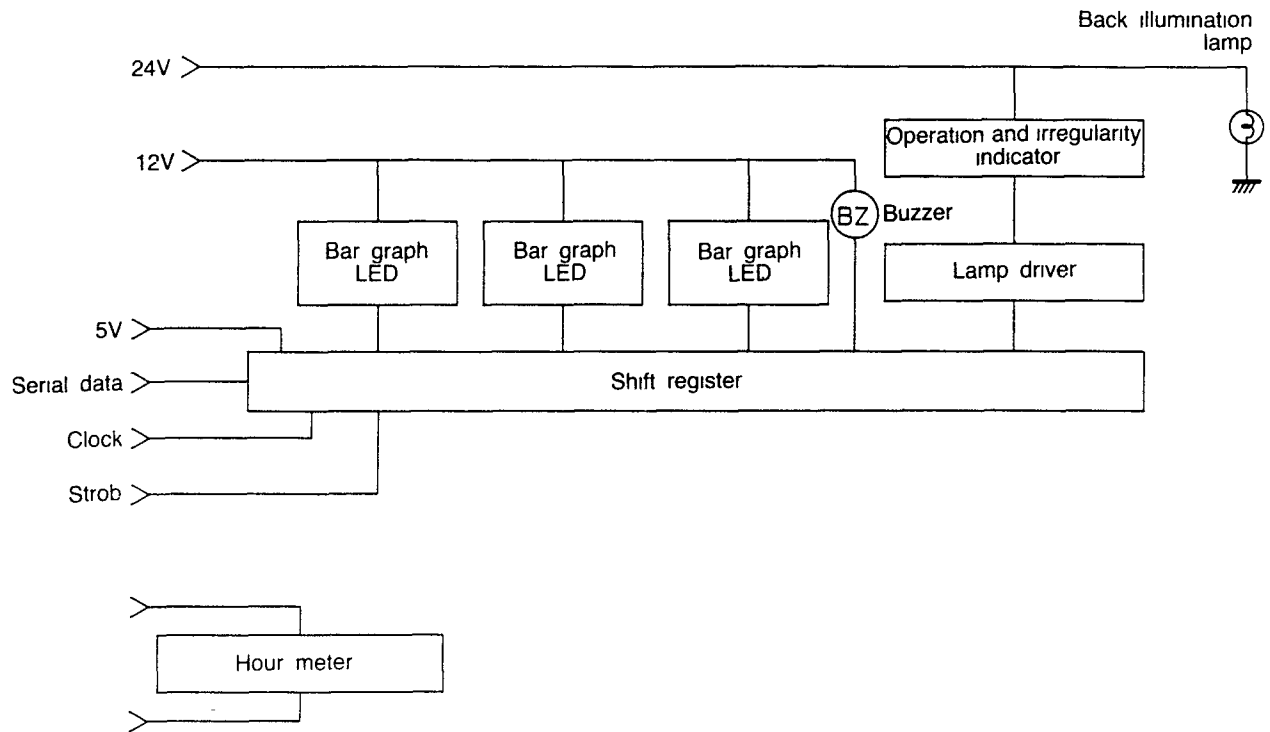
**3.5 Piping Complete**



| No  | Name   | Dimension | Replacement standard   |
|-----|--------|-----------|--|
| (1) | Pipe   | a         | <ul style="list-style-type: none"> <li>• When local hollow exceeding 1 arises</li> </ul>                   |
|     |        | b         | <ul style="list-style-type: none"> <li>• When corrosion or scratches arise in the O-ring groove</li> </ul> |
| (2) | Bolt   |           | <ul style="list-style-type: none"> <li>• When corrosion arises on threaded portion</li> </ul>              |
| (3) | O-ring |           | <ul style="list-style-type: none"> <li>• To be replaced whenever removed</li> </ul>                        |

Note Corrosion may arise inside the pipe  
Remove rust and apply flushing

Monitor display block diagram





4.3 Procedure for installing the monitor

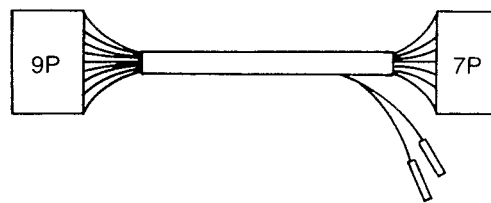
1) The place where the monitor is to be mounted is right-hand front of the cab



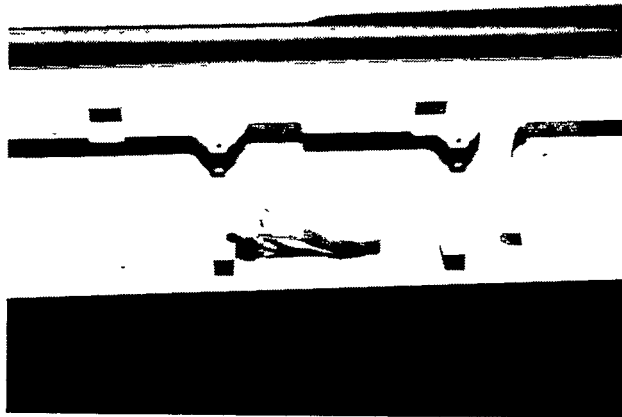
2) Connect the monitor with the controller with the wiring

① A hole is provided in the backward place where the monitor is to be installed as shown in the right-hand photo. Remove the rubber cap from there and have the wiring passed through the hole.

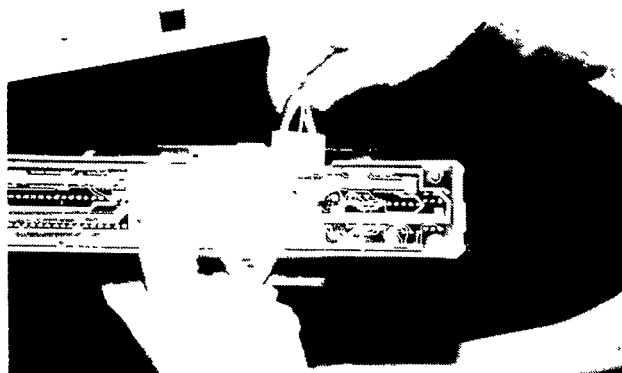
(Monitor) (Controller)



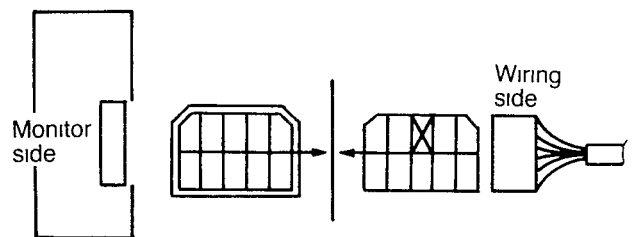
See the above figure for wiring facing



3) Bring the connector to the monitor installation place



4) Connect the monitor with the wiring connector, watching for the direction (only one direction works)



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