CASE CONSTRUCTION

SERVICE MANUAL

CRAWLER EXCAVATOR

CX75SR
CX80
TIER 3

87676026A NA

Issued 01Aug 08

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WARNING: *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message which follows. Your safety depends on it.*

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Cooling system

Fan type ..... Ø 650 mm (25.59 in), suction type - 7 blades, intake
Radiator
- Capacity ..... 5.1L (1.3 gal)
- Fin type ..... wavy
- Fin pitch ..... 2 mm (0.079 in)

Oil cooler
- Capacity ..... 4.4 L (1.2 gal)
- Fin type ..... wavy
- Fin pitch ..... 1.75 mm (0.069 in)

Inter-cooler
- Capacity ..... 4.1 L (1.1 gal)
- Fin type ..... wavy
- Fin pitch ..... 1.75 mm (0.069 in)

Capacity of coolant and lubricants

Coolant ..... 10.2 L (2.70 gal)
Fuel ..... 100 L (26.42 gal)
Lubricant for engine ..... 9 L (2.38 gal)
Lubricant for travel reduction gear (one side) ..... 1.1 L (0.29 gal)
Hydraulic oil ..... 97.3 L (25.70 gal)
Capacity of hydraulic oil tank ..... 50 L (13.21 gal)

Air conditioning

R134 gas load ..... 1Kg (2.20 lbs)

Hydraulic oil filter

Suction filter (inside tank) ..... 150 mesh
Return filter (inside tank) ..... 6 µm
Pilot line filter (inside housing) ..... 8 µm

Fuel filter

Main filter ..... 4 µm
Pre-filter ..... 10 µm

Operating devices

Operator's seat
- Location: left side
- Structure: Adjustable forward and back and up and down, reclining mechanism, with seat suspension.

Cab
- Sealed steel type, all reinforced glass.

Levers and pedals
- For travel use: Lever and pedal type (hydraulic pilot type) (x2)
- For operating machine use: Lever type (hydraulic pilot type) (x2)
- For blade use: Lever type (hydraulic pilot type) (x1)
- For offset-boom operating use (CX75SR) ..... Pedal type (hydraulic pilot type) (x1)

Instruments and switches
- Work mode select switch: 2 modes (N/Standard operating mode, E/Economy operating mode)
- Travel mode select switch: Low-speed/high-speed switch type
- One-touch idle: Knob switch type
- Engine emergency stop: Switch type

Monitor device
- Machine status display (full-dot liquid crystal)
- Work mode selection status: N/E

Instruments (full-dot liquid crystal, except for hour meter)
- Fuel gauge: Analog
- Engine coolant temperature gauge: Analog
- Hour meter: digital type
- Machine Status and Warning Alarms *Items have a warning alarm

Over heat*	Battery charge*	Check engine*
Refill fuel*	Engine oil pressure*	Engine preheat

Work Unit

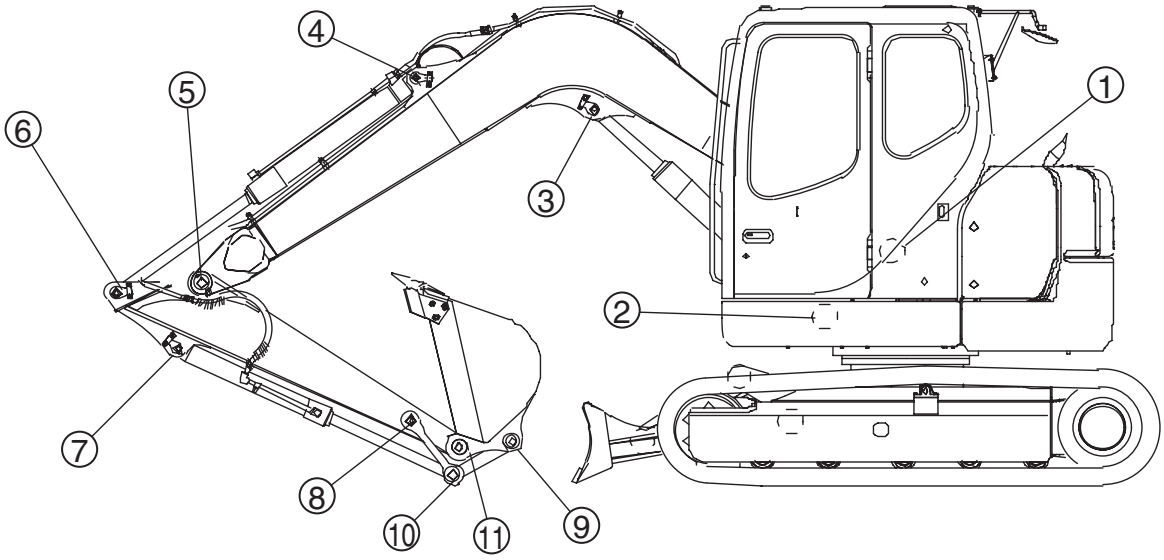
Model.....Backhoe attachment
Components / dimensions / working dimensions

CX75SR

Model	MONO BOOM	OFFSET BOOM

Boom length	3870 mm (152.36 in)		
Arm type	Standard 1.710 mm (67.32 in)	Long 2.120 mm (83.46 in)	Standard 1.750 mm (68.90 in)
Arm (dipper) length	1710 mm (67.32 in)	2120 mm (83.46 in)	1740 mm (68.50 in)
Bucket capacity	Heaped 0.28 m^3 (Leveled 0.20 m^3)	Heaped 0.22 m^3 (Leveled 0.16 m^3)	Heaped 0.28 m^3 (Leveled 0.20 m^3)
Bucket width	730 mm (28.74 in)	600 mm (23.62 in)	730 mm (28.74 in)
Bucket width with side cutter	804 mm (31.65 in)	673 mm (26.50 in)	804 mm (31.65 in)
Bucket weight with side cutter	204 kg (449.74 lb)	178 kg (392.42 lb)	204 kg (449.74 lb)
Bucket radius	1450 mm (57.08 in)	1050 mm (41.34 in)	1450 mm (57.08 in)
Bucket wrist action	177°		
Maximum digging radius	6520 mm (256.69 in)	6900 mm (271.65 in)	6080 mm (239.40 in)
Maximum digging radius at ground line	6390 mm (251.57 in)	6770 mm (266.53 in)	6360 mm (250.39 in)
Maximum digging depth	4140 mm (162.99 in)	4540 mm (178.74 in)	4190 mm (164.96 in)
Maximum vertical straight wall digging radius	3640 mm (143.31 in)	4100 mm (161.42 in)	4580 mm (180.31 in)
Maximum digging height	7330 mm (288.58 in)	7620 mm (300 in)	7195 mm (283.27 in)
Maximum dump height	5250 mm (206.69 in)	5540 mm (218.10 in)	5150 mm (202.75 in)
Minimum swing radius at front	1785 mm (70.27 in)	2085 mm (82.08 in)	2230 mm (87.79 in)
Height for minimum swing radius at front	5620 mm (221.26 in)	5650 mm (222.44 in)	5700 mm (224.41 in)

DIMENSIONS AND WEAR LIMITS OF ATTACHMENT LINKAGES (MONO BOOM)



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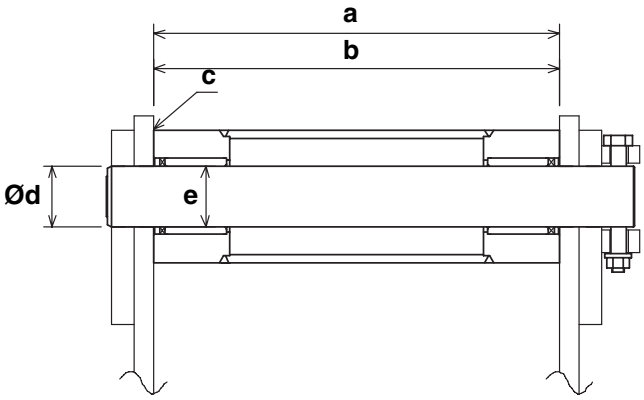
1. Boom foot/Frame



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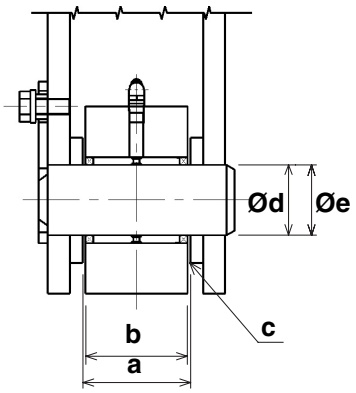
Mark		Dimension (mm)
a (frame)	Standard	400
	Limit	410
b (boom)	Standard	399
	Limit	397
c (a - b)	Standard	1.0 to 3.5
	Limit	Shims
Ø d (shaft)	Standard	60
	Limit	59
Ø d (bushing)	Standard	60
	Limit	61.5

12. Lower frame/Blade



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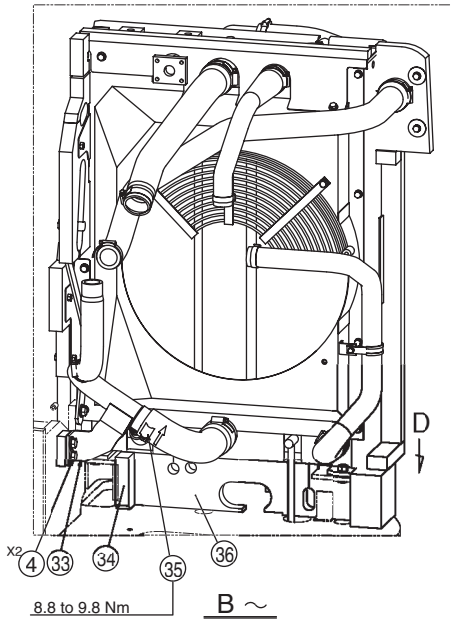
Mark		Dimension (mm)
a (frame)	Standard	69
	Limit	75
b (blade)	Standard	65
	Limit	63
c (play)	Standard	3.0 to 5.0
	Limit	Shims
d (shaft)	Standard	45
	Limit	44
e (bushing)	Standard	45
	Limit	46.5

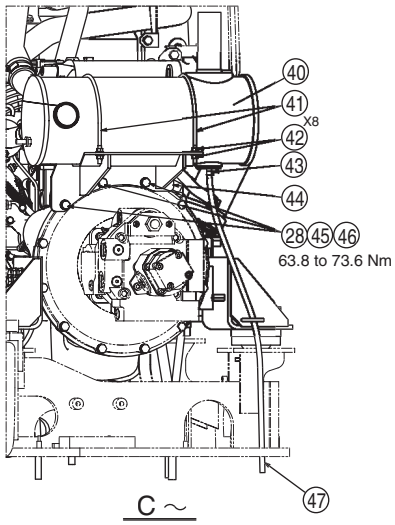
SPECIAL TORQUE SETTINGS CX80

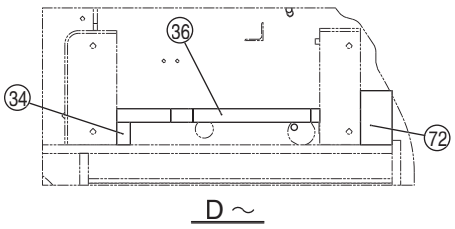
No.	Component	Screw	Wrench (mm)	Torque setting
1 *	Travel motor and reduction gear assembly	M16	24	267-312 Nm (197-230 lb-ft)
2 *	Drive sprocket	M14	22	173-202 Nm (127-149 lb-ft)
3 *	Idler wheel	M10	17	63-73 Nm (46-54 lb-ft)
4 *	Upper roller	M16	24	267-312 Nm (197-230 lb-ft)
5 *	Lower roller	M20	30	521-608 Nm (384-448 lb-ft)
6 *	Front guard	M16	24	267-312 Nm (197-230 lb-ft)
7	Shoe bolt	M14	22	220-270 Nm (162-199 lb-ft)
8	Counterweight	M24	36	850-992 Nm (627-658 lb-ft)
9	Turntable (swing frame)	M16	24	252-283 Nm (186-209 lb-ft)
10 *	Swing unit	M16	24	273-317 Nm (201-234 lb-ft)
11 *	Engine (engine mount)	M16	24	265-313 Nm (196-231 lb-ft)
12 *	Engine bracket	M10	17	64-74 Nm (47-54 lb-ft)
13	Radiator	M10	17	36-44 Nm (26-32 lb-ft)
14 *	Hydraulic pump	M10	17 Hexagon socket head	63-73 Nm (47-54 lb-ft)
15 *		M12		109-126 Nm (80-93 lb-ft)
16 *	Hydraulic reservoir	M12	19	69-78 Nm (51-57 lb-ft)
17 *	Fuel reservoir	M12	19	98-108 Nm (72-80 lb-ft)
18 *	Control valve	M12	19	53-64 Nm (39-47 lb-ft)
19 *	Hydraulic swivel	M10	17	63-73 Nm (46-54 lb-ft)

NOTE: *Use Loctite 262 or an equivalent on retaining screws of those components marked with an asterisk (*).*

1. Air inlet pipe (1)
2. Hose clamp (2)
3. Radiator stay (1)
4. Bolt (6)
5. Air hose (1)
6. Vacuum indicateur (1)
7. Cushion seal (1)
8. Radiator (standard) assy (1)
9. Label (1)
10. Rubber hose (L = 800) (1)
11. Corrugated tube 13 x 8 00 (1)
12. Hose band (3)
13. Jubilee clip 50 - 65 (1)
14. Hose clamp (1)
15. Air hose (1)
16. High strength nut M8 (3)
17. Spring washer 8 (3)
18. Exhaust pipe (1)
19. Clamp (1)
20. Diesel engine dom (1)
23. Elastic rubber (8)
24. High strength bolt M16 x 130 (4)
25. High strength washer 16 (4)
26. Plate (4)
27. Nut (4)
28. Bond 262 (-)
29. Engine supt (1)
30. Bolt M10 x 25 (10)
31. Engine supt (1)
32. Bolt M10 x 30 (8)
33. Bracket (1)
34. Cushion seal (1)
35. Hose clamp (1)
36. Cushion seal (1)
37. Reserve tank (1)
38. Harness band L = 250 (1)
39. Rubber hose (L = 900) (1)
40. Muffler (1)
41. U bolt M8 (2)
42. Franged nut M8 (8)
43. Hose band (1)
44. Muffler bracket (1)
45. High strength bolt M10 x 35 (3)
46. High strength washer 10 (3)
47. Tube L = 700
48. Bolt M8 x 25 (1)
49. Clamp M8 (1)
50. Liquid packing (-)
51. Hose clamp 38 - 50 (2)
52. Jubilee clip 58 - 75 (1)
53. High strength bolt M8 x 45 (2)
54. Plain washer 8 (2)
55. Seal retainer (2)
56. Cushion seal (1)
57. Bolt M10 x 20 (2)
58. Bracket (1)
59. Jubilee clip 68 - 85 (3)
60. Air hose (1)
61. Air hose (1)
62. Bracket (1)
63. Bolt M8 x 20 (2)
64. Air cleaner (1)
65. Bolt M6 x 16 (2)
66. Holder (1)
67. Engine supt (1)
68. Hose band (1)
69. Rubber hose L = 600
70. Engine supt rf (1)
71. Cushion seal (1)
72. Acoustic insulation (1)
73. Blot M12 x 30 (4)
74. Radiator (standard) assy (1)







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Engine Control

1. Engine start-up control

[1] Power supply (key switch at ON position)

1) Battery relay is energized.
2) Power is supplied to the initial excitation port (IG) in the alternator. (The alternator does not generate electricity until the input signal is recognized).
3) Power is supplied to the monitor to initiate operation.

[2] Cranking (key switch at Start)

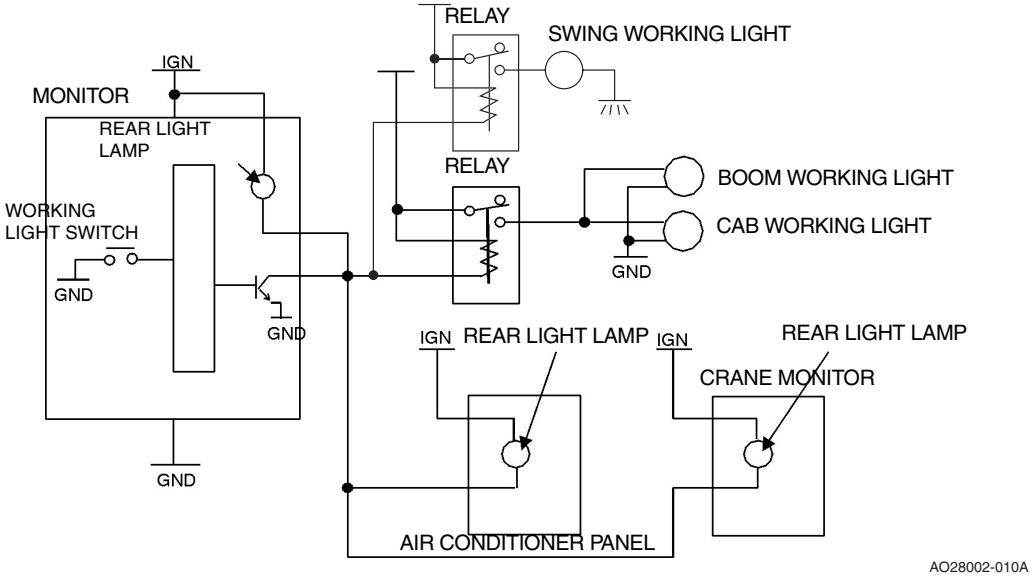
1) Energizing the safety relay will initiate the power to be supplied to the starter relay integrated in the starter motor, thus activating the starter motor.
2) When the engine is started through the starter motor, signals will be output from the alternator to the safety relay.
3) When the engine reaches to the required rotational speed, the signals from the alternator to the safety relay will be activated then the power supply to the starter motor stops.
   As a result the starter motor stops its operation (if the cranking continues).
4) When the engine starts, the power generation begins at the alternator B terminal and the supply of power is supplied to each load while batteries are also recharged. The terminal L on the alternator starts its output at the same time, activating the battery charging warning and the hour meter.
   (See Monitor Display for details.)

[3] Low-temperature start-up feature / preheat (key switch at HEAT or at ST)

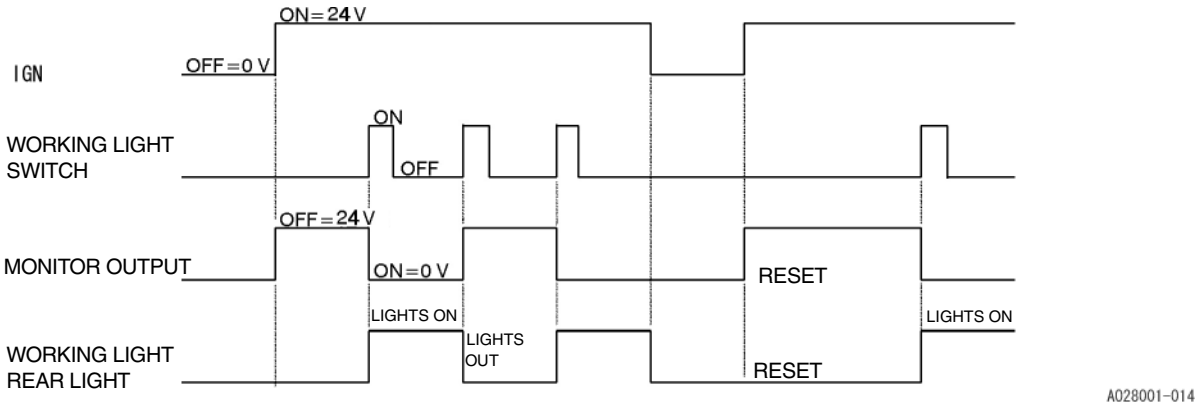
1) The heat relay is also energized during cranking (key switch at ST) to supply power to the air heater.
   This is to maintain the temperature achieved through manual preheating.

[4] Working light

1) Configuration



2) Operation

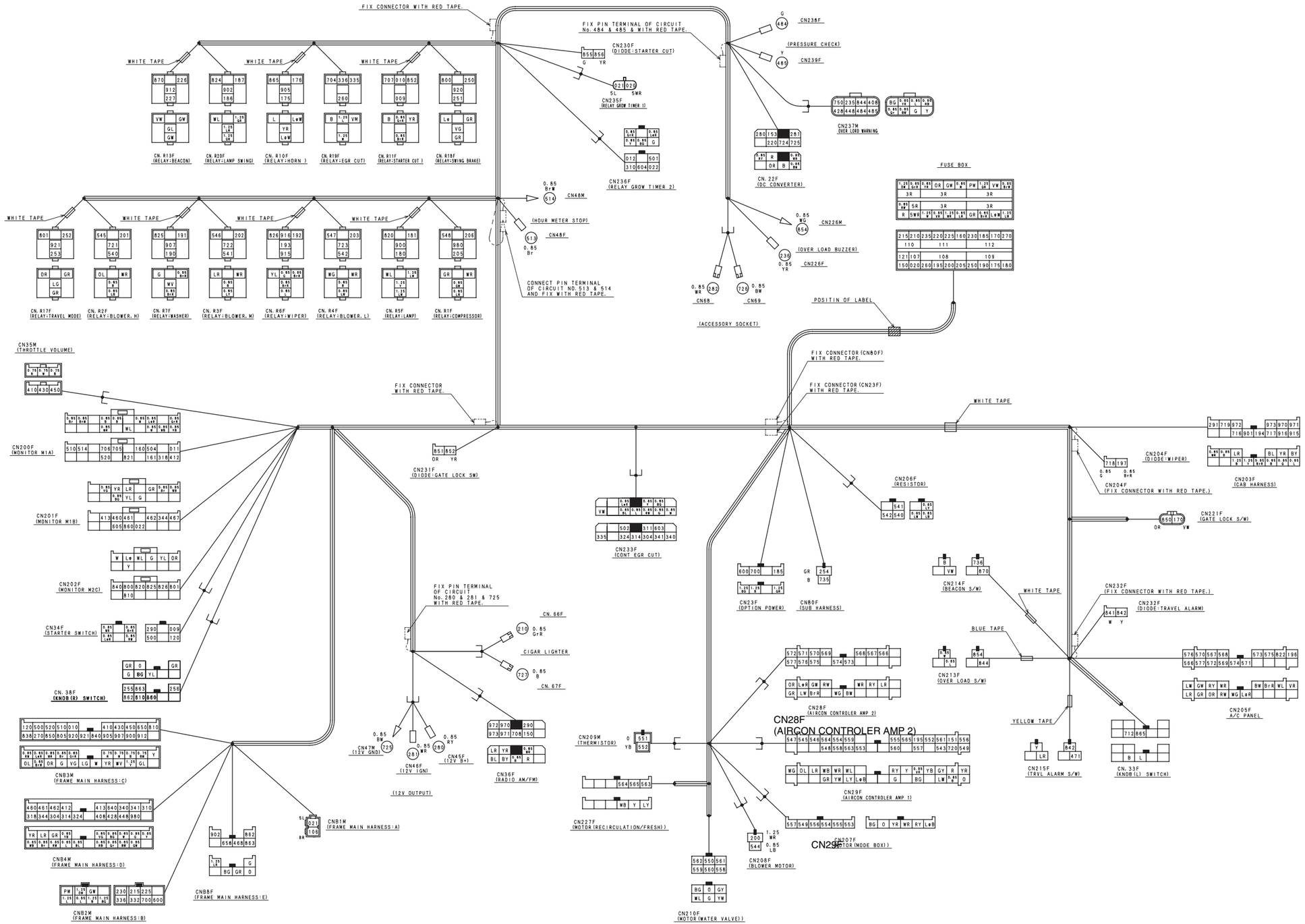


- If the key switch is turned ON again after it was turned OFF, the working lights and the rear lights will be reset.

NOTES

NOTES

Cab Main Harness (inside cab)

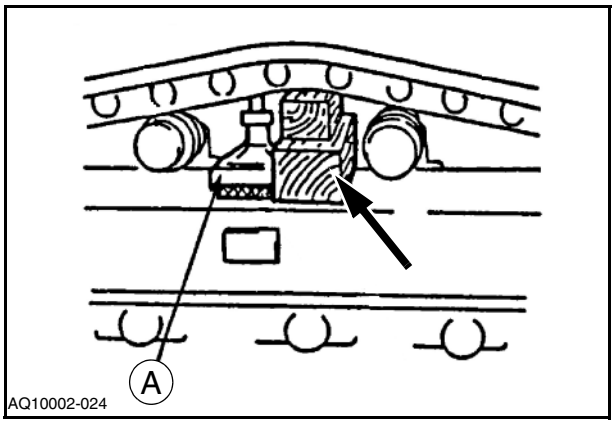


KAR10710-E00

1 Removal

[1] Loosen track shoe. See “Track shoe, removal”.

[2] Place the hydraulic jack (A) as shown in the drawing to the left.



[3] Using the hydraulic jack (A), lift the track shoe high enough that the upper roller can be removed.

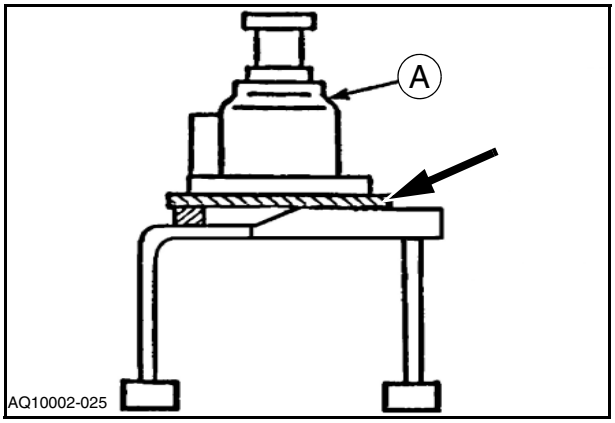
[4] Place blocks between the track shoe and side frame and secure them.

[5] Loosen the upper roller mounting bolt (2) slightly (so that the bolt head comes off 2 to 4 mm).

[6] Hit the upper roller gently with a copper hammer and detach it from the side frame.

[7] Attach lifting tools on the upper roller.

[8] Remove the upper roller by removing mounting bolts (2) completely while lifting the upper roller using the lifting tools.



NOTE: *Be careful to keep fingers and hands clear.*

2 Installation

[1] Apply Loctite No. 262 to the upper roller mounting bolts (2).

[2] Finger tighten all upper roller mounting bolts (2) while lifting the upper roller.

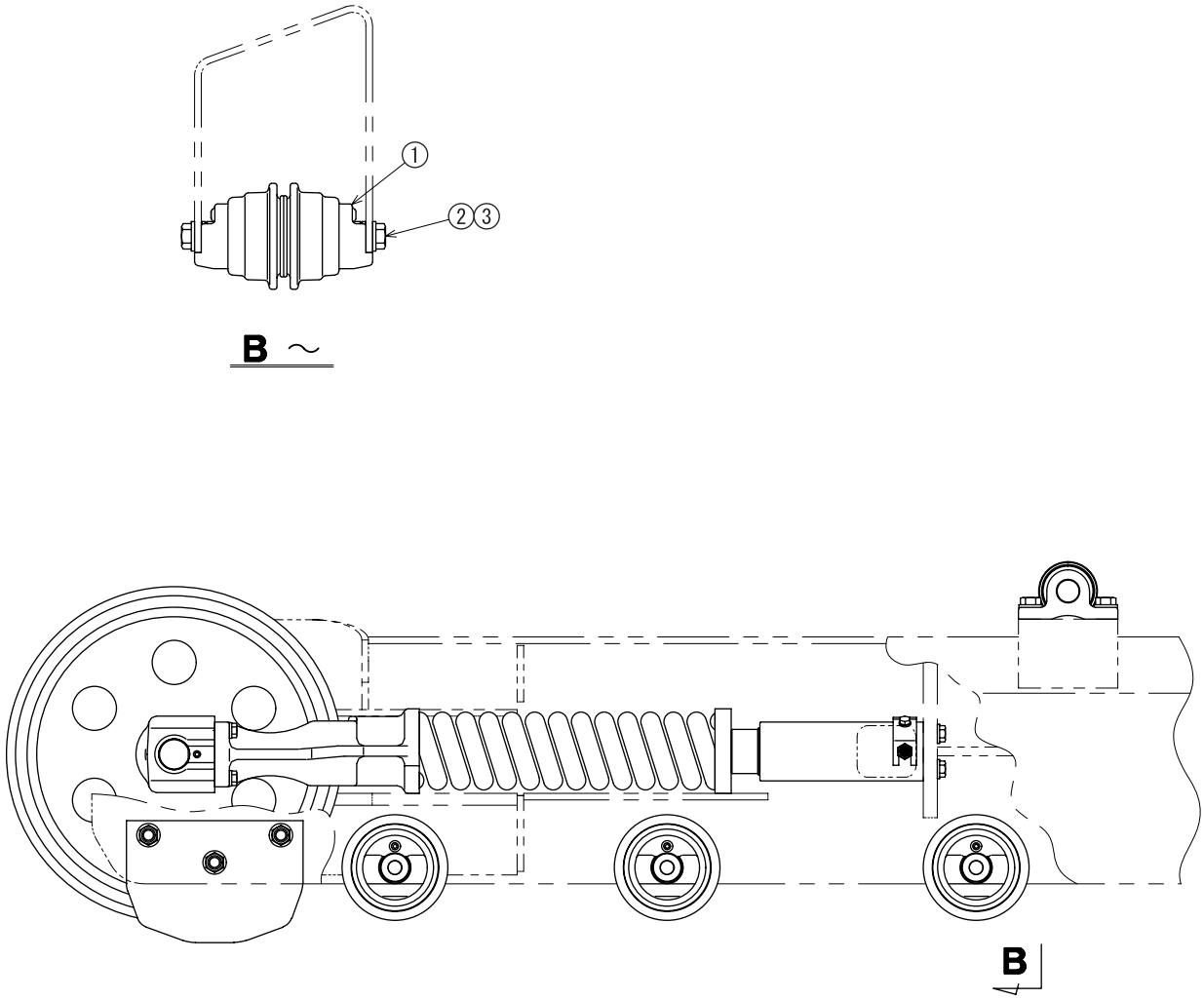
NOTE: *Adjust the position of the upper roller if necessary, using shims (4) so that the track links are evenly supported.*

[3] Tighten the upper roller mounting bolts (2) to the specified torque.

[4] Remove the blocks and jack.

[5] Fill grease into the grease cylinder and give the track shoe the specified tension.
(See Track shoe, installation).

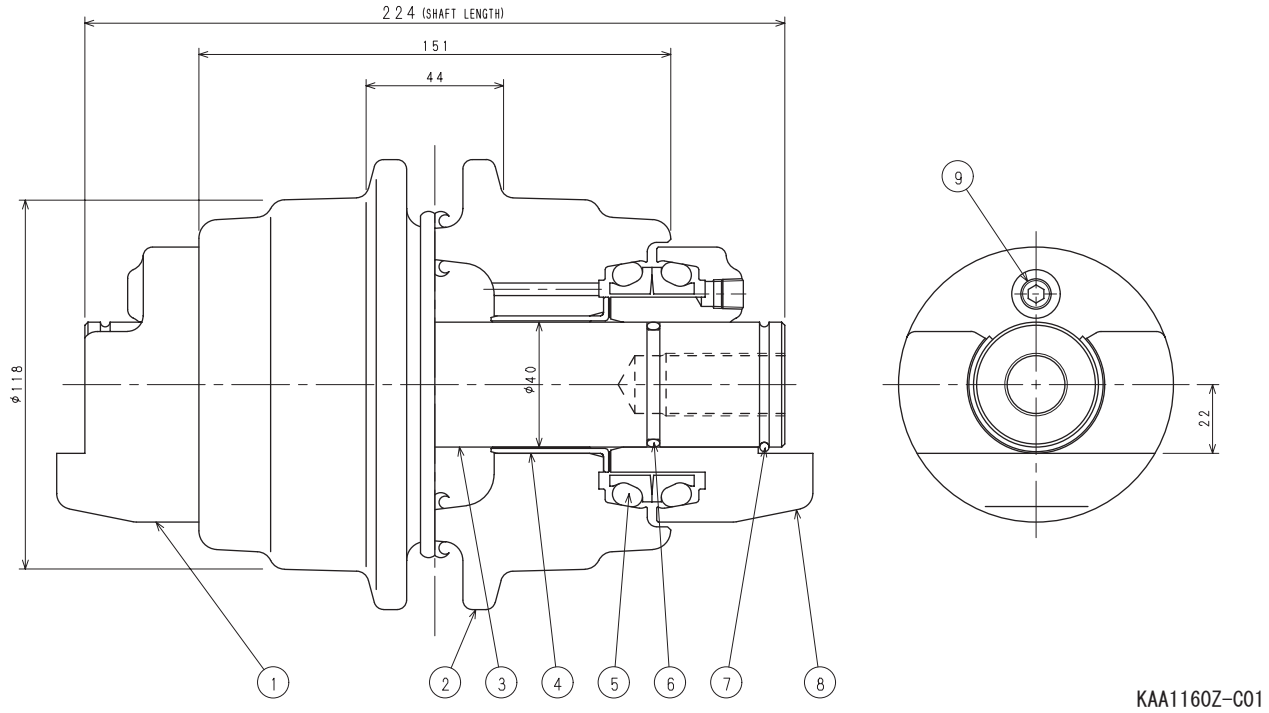
2 Lower roller



AQ10002-026

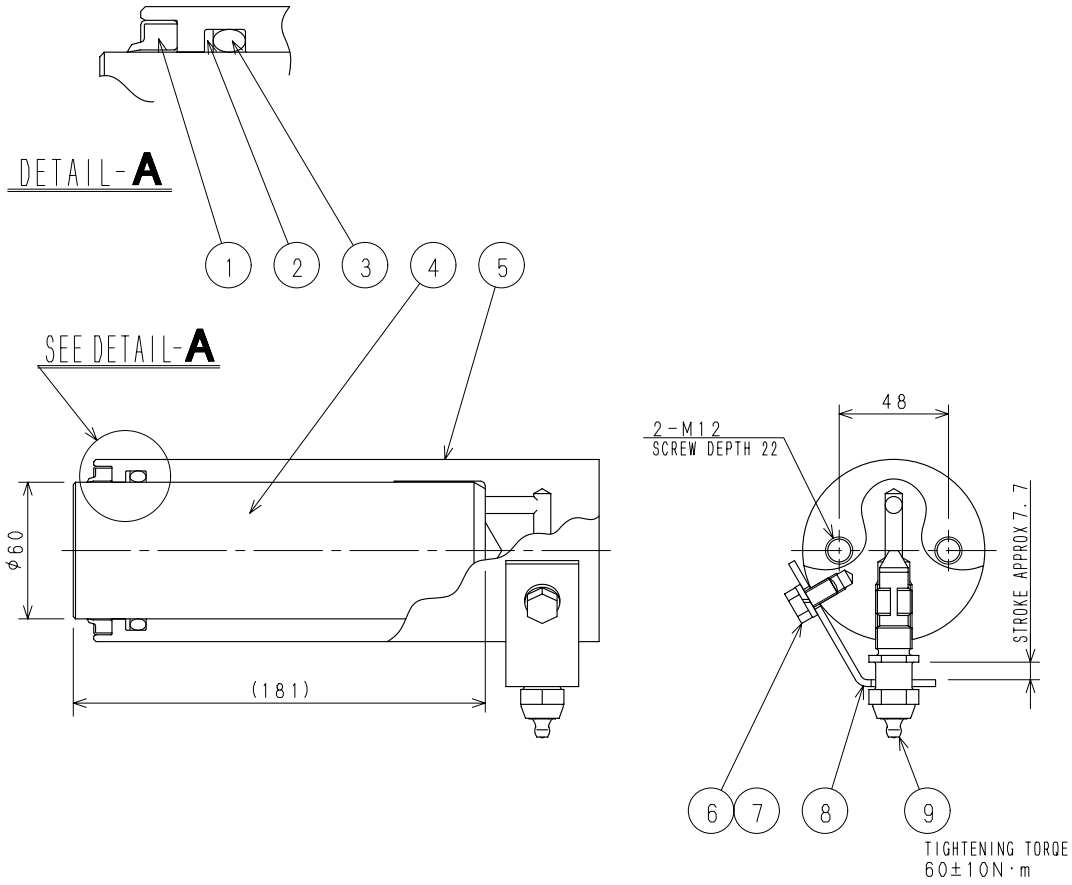
1. Lower roller
2. Bolt
3. Loctite 262

7 Assembly drawings



1. Collar (without plug) (1)
2. Track roller (1)
3. Roller shaft (1)
4. Bushing (2)
5. Floating seal (2)
6. O-ring 1B-G35 (2)
7. Wire clip (2)
8. Collar (with plug) (1)
9. Plug 1/8 (1)

5 Assembly drawings



NOTES

1) BE CAREFUL OF BACKUP-RING ② & O-RING ③ POSITION, AND APPLY GREASE ON O-RING BEFORE ASSEMBLY.

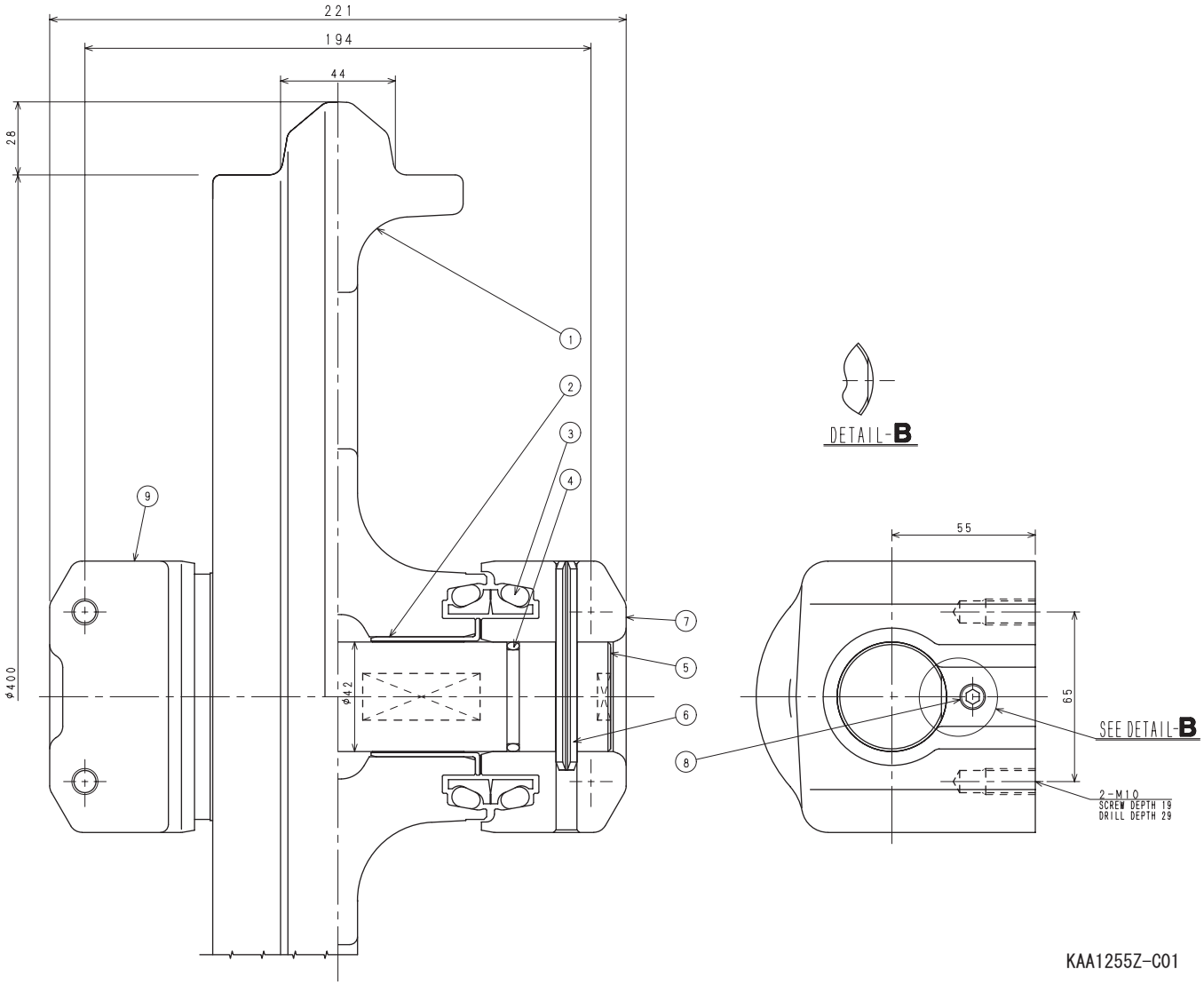
2) THE C1 MACHINING SURFACE OF ROD:PISTON ④ IS ON SEAL:DUST ① SIDE.

3) ASSEMBLE BRACKET ⑧ AS SHOWN IN THE DRAWING, AFTER ASSEMBLING VALVE:CHECK ⑨.

KAA1219Z-B01

1. Dust seal (1)
2. Back-up ring T-P60 (1)
3. O-ring 1B-P60 (1)
4. Piston rod (1)
5. Grease cylinder (1)
6. High strength bolt M8 x 16 (2)
7. Spring washer 8 (2)
8. Bracket (1)
9. Check valve (1)

5 Assembly drawings



1. Track-up roller (1)
2. Bushing (2)
3. Floating seal (2)
4. O-ring 1B P36 (2)
5. Roller shaft (1)
6. Spring pin (2)
7. Hub (with plug) (1)
8. Plug 1/8 (1)
9. Hub (without plug) (1)

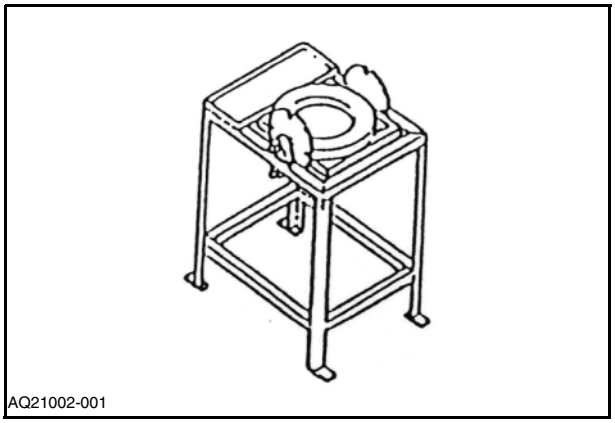
3) Equipment and materials

Applicable parts (Usage method or parts No.)	Name	Description and remarks	Q'ty
For disassembling and reassembling works	General work bench		1
For washing motor and parts	Washing tank		1
104, 149	Press machine	Press capacity: 1960 N or more	1
149	Heating tank	Heating capacity: over 100°C Volume: 500 x 500 x 500 mm	1
For drying washed parts	Compressed air supply	Pressure: 0.29 - 0.49 MPa	

4) Manufacturing tools

Name: Travel motor workbenchp

• Workbench for easily and safely disassembling and assembling the travel motor.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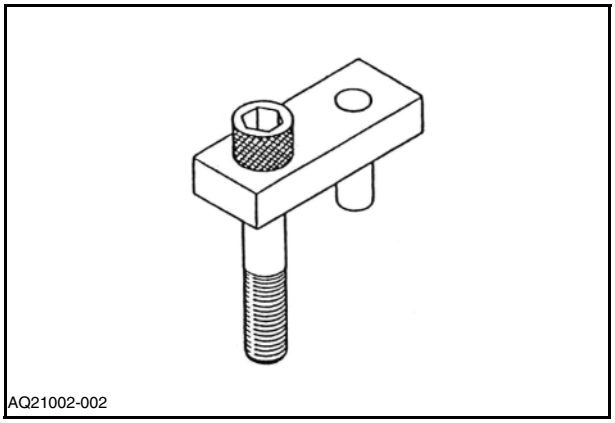
Name: Fixture

• For connecting spindle (2) and hub (1).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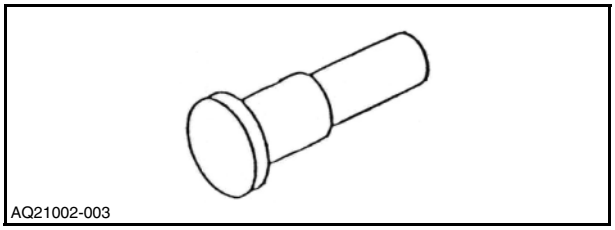
Name: Holder (I)

• For inserting spring (114), washer (110) and snap ring (145) into cylinder block (104).

• For removing spring (114) from cylinder block (104).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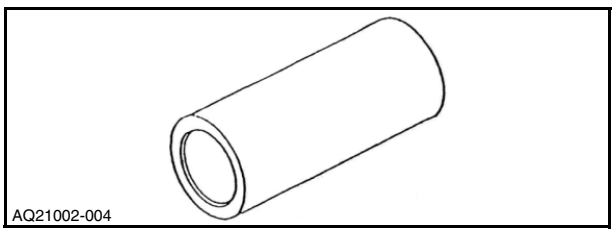
Name: Holder (II)

• For removing ball bearing (149) from or insertingit onto shaft (102).


AQ21002-004

8) Pull out parallel pin (42) (2 pcs) from spindle (2).

9) Remove O-ring (43) (2 pcs), (44) from spindle (2)

NOTE: *Do not reuse O-ring (43), (44) which have been removed.*

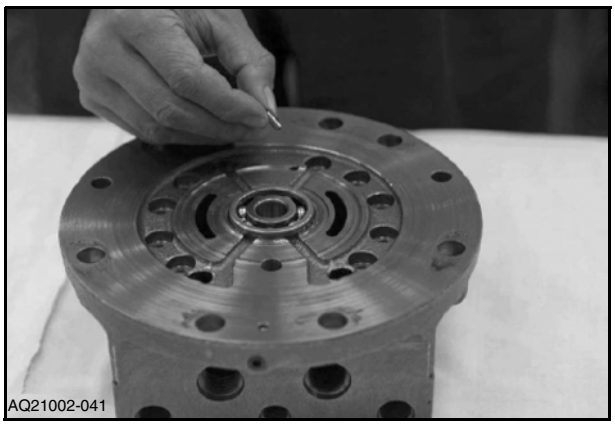
[9] Disassembly of the rear flange mounting the parts

1) Lay removed rear flange (301) on the workbench. (Face up the mating face with spindle (2)).

2) Remove timing plate (109) from rear flange (301).

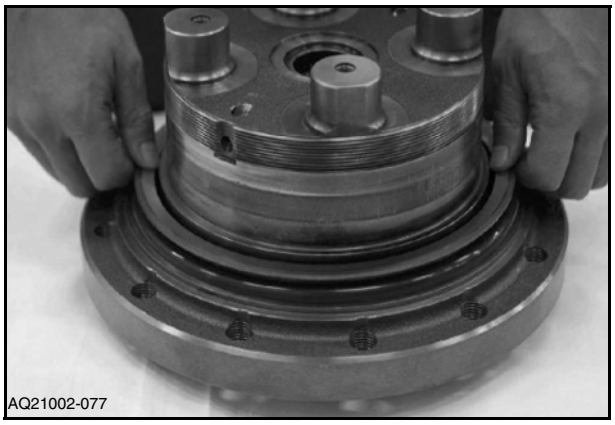
NOTE: *The timing plate might be found stuck to the mating face of the rear flange. To separate timing plate, insert a flat bar into the groove of the rear flange and raise the timing plate slowly. Never try to ply the timing plate off with a sharp or pointed tool or the precision finished mating faces will suffer costly damage.*

3) Pull out parallel pin (342) from rear flange (301).



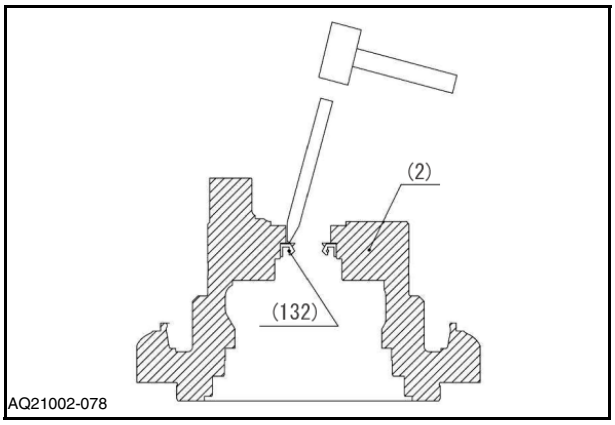
[21] Removal of the spindle fittings

1) Remove floating seal (31) from spindle (2).



2) Remove oil seal (132) from spindle (2).

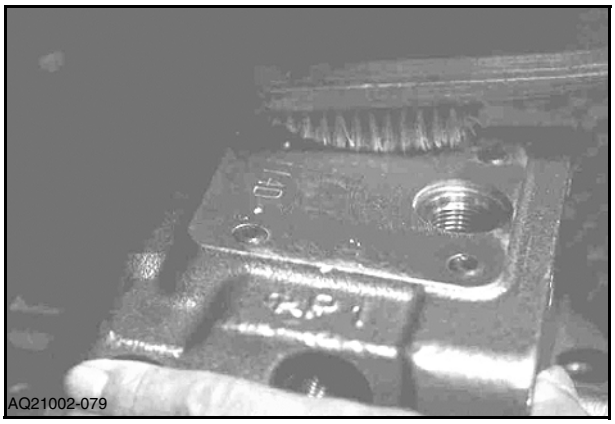
NOTE: *Do not reuse floating seal (31) and oil seal (132) which have been removed.*



[22] Washing

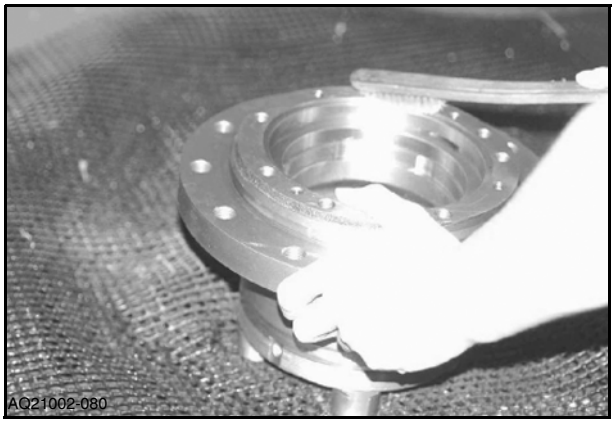
1) Separate hub (1), spindle (2), cover (13) and rear flange (301) from other parts. (hereafter called the built-in parts).
2) Wash the built-in parts in a wash tank.

NOTE: *Carefully wash to remove any darts from the external surfaces.*



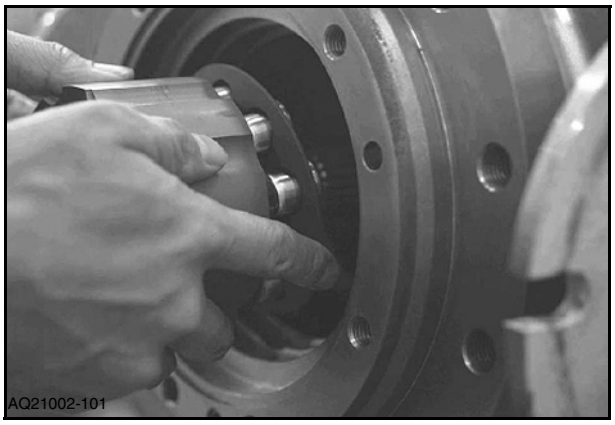
WARNING: Wash all parts carefully with kerosene. Take notice of a possibility of due to combustibility. To prevent the built-in parts from being marred by dirt during washing, immerse the parts in kerosene long enough for any dirt or oil to become loose and surface before washing them,

3) Full a primary washing vessel with kerosene. Put the built-in parts in it and wash them.



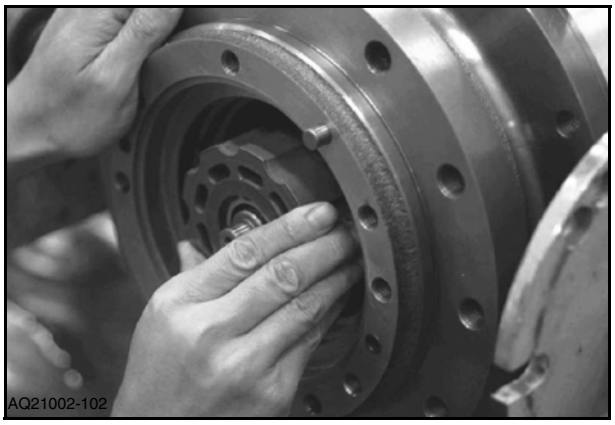
4) Install cylinder block (104) to shaft (102).

NOTE: *Install cylinder block (104) into the spline of shaft (102) by aligning the spline hole with the spline of the shaft.*



5) After installing the cylinder block (102), turn it by hand and make sure that it fits properly. If not, inspect it.

NOTE: *After installing the cylinder block (104), do not raise it. If it raises, thrust ball (108) separates and cylinder block do not rotates.*



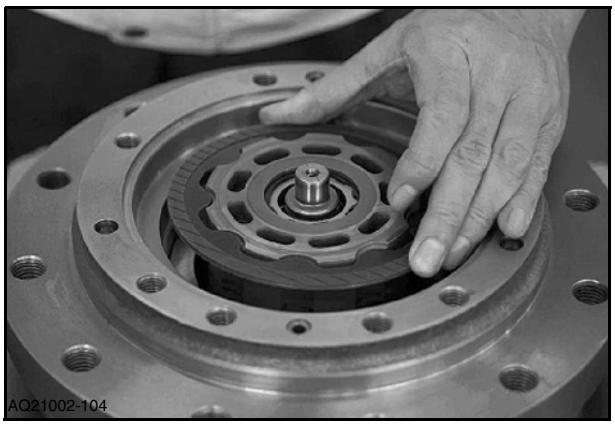
[7] Assembly of parking brake section

NOTE: *Install the friction plate to the cylinder block after immerse the friction plate (115) in hydraulic fluid.*

1) Turn the workbench 90 degrees.
2) Install mating plate (116).

3) Friction plate (115) into the groove outside of cylinder block (104) alternately.
   Then install mating plate (116), friction plate (115) and mating plate (116).
4) Fit O-ring (135), (139) to the O-ring groove of piston (112).
   At this time, apply a thin coat of grease to the O-rings.
5) Install piston (112) into spindle (2).

NOTE: *If the piston (112) doesnÕt fit into the spindle (2) because of the resistance of the O-rings, tap the edge of the piston (112) lightly and equally with a plastic hammer.*
Be careful not to damage the O-rings at this time



5 Performance confirmation test

After servicing the GM motor, perform the following tests by the following procedure.

1 Required measuring devices

1	Pressure gauge for 3.43 MPa	2 pieces
2	Measuring cylinder (for 5 liters)	1 piece
3	Stop watch	1 piece

2 Test procedure

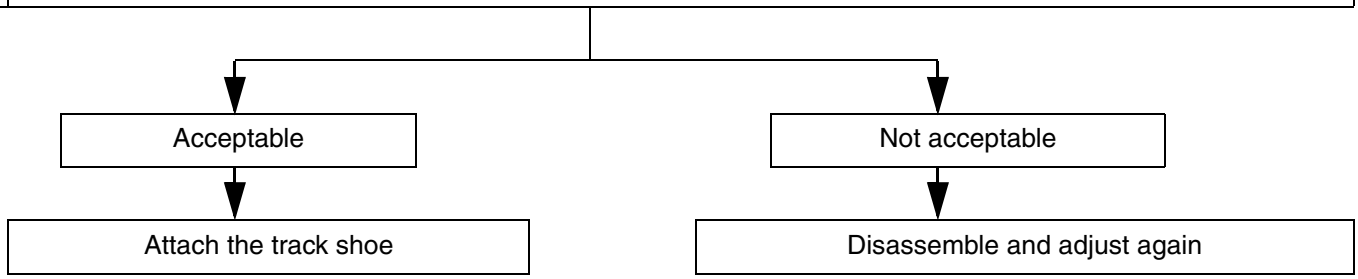
1	Installation and connection of travel motor	Install and connect the travel motor to the machine body (frame section). However, do not attach the track shoe. This is to perform the travel motor performance test (no-load operation)

Note : • When connecting, connect the travel motor so that the pressure gauge (main circuit) can be installed and the drain amount of the hydraulic motor can be measured.
• Whem installing GM motors, do not strike them with a hammer or other instrument. Use the bolt holes to gently install the motor.

2	Travel motor breaking-in operation	Switching	Travel motor speed	Pressure	Rotation direction	Operation time
		Low speed rotation	10 min^{-1}	No load	Left or right	Each 1 min. or longer
		High speed rotation	20 min^{-1}			

3	Travel motor performance confirmation test

1	Pre-test preparation operation • Perform preparation operation until the temperatures indicated below are reached. • Hydraulic oil temperature: 45~55°C • Reduction gear hub external temperature: 40~80°C
2	Confirmation test • Measure the items below at low speed to determine whether travel motor is acceptable. **Criteria for acceptability** Travel motor drive pressure difference: 1.57 MPa or less at 10 min^{-1} Hydraulic motor drain amount: 0.6 L/min at 10 min^{-1}



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WARNING: *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message which follows. Your safety depends on it.*

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MEASURING PRESSURE

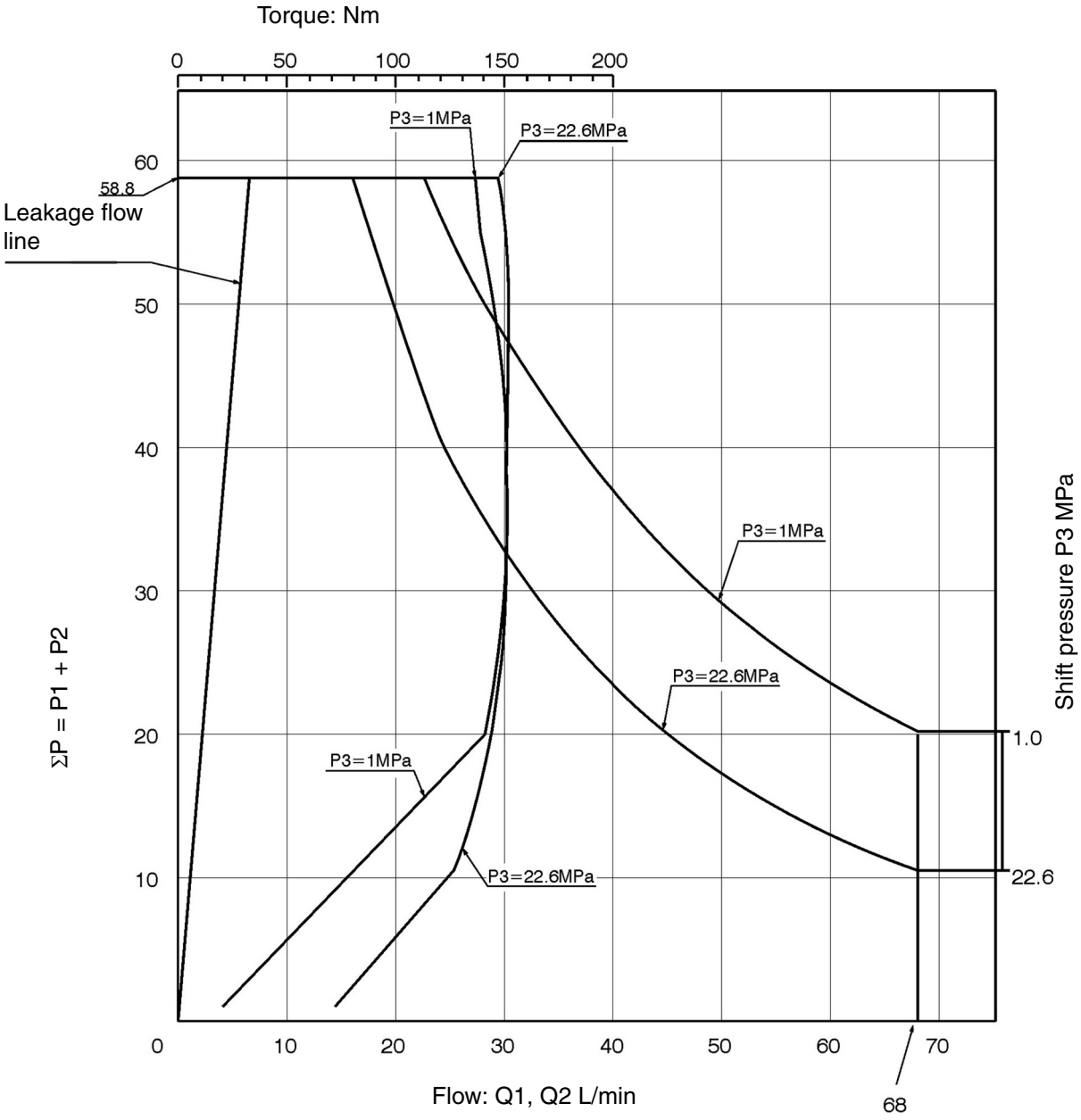
1) Basic Conditions

Oil temperature	45 - 55 °C {113 - 131°F}
Engine revolutions at no load	2200 rpm {2200 min^{-1}}

2) Pressure Settings

			Relief valve Individual pressure settings	Actual readings measured on machines (reference)	Method of measurement
Main relief pressure			29.4 MPa at 44 L/min {4264 psi at 11.6 gpm}	29.7 MPa {4307 psi}	Arm relief
Boom overload relief		Up	31.9 MPa at 20 L/min {4626 psi at 5.3 gpm}	33.5 MPa {4858 psi}	Fasten main relief 180° + Boom-up relief
		Down	31.9 MPa at 20 L/min {4626 psi at 5.3 gpm}	33.2 MPa {4815 psi}	Fasten main relief 180° + Boom-down relief
Arm overload relief		Out	31.9 MPa at 20 L/min {4626 psi at 5.3 gpm}	32.7 MPa {4742 psi}	Fasten main relief 180° + Arm-out relief
		In	31.9 MPa at 20 L/min {4626 psi at 5.3 gpm}	33.0 MPa {4786 psi}	Fasten main relief 180° + Arm-in relief
Bucket overload relief		Open	31.9 MPa at 20 L/min {4626 psi at 5.3 gpm}	33.1 MPa {4800 psi}	Fasten main relief 180° + Bucket-open relief
		Close	31.9 MPa at 20 L/min {4626 psi at 5.3 gpm}	33.1 MPa {4800 psi}	Fasten main relief 180° + Bucket-closed relief
Swing relief		Right	22.6 MPa at 57.5 L/min {3277 psi at 15.2 gpm}	25.0 MPa {3625 psi}	Swing relief
		Left	22.6 MPa at 57.5 L/min {3277 psi at 15.2 gpm}	25.0 MPa {3625 psi}	Swing relief
Boom Swing port relief (CX80)		Right	33.3 MPa at 20 L/min {4830 psi at 5.3 gpm}	33.7 MPa {4888 psi}	Fasten main relief 180° + Boom swing-right relief
		Left	31.9 MPa at 20 L/min {4626 psi at 5.3 gpm}	32.9 MPa {4772 psi}	Fasten main relief 180° + Boom swing-left relief
Blade	Main		22.6 MPa at 24 L/min {3277 psi at 6.3 gpm}	23.3 MPa {3379 psi}	Blade-up relief
	Over-load relief	Up	25.5 MPa at 20 L/min {3698 psi at 5.3 gpm}	26.5 MPa {3843 psi}	Fasten blade main relief 180° + Blade-up relief
		Down	25.5 MPa at 20 L/min {3698 psi at 5.3 gpm}	26.5 MPa {3843 psi}	Fasten blade main relief 180° + Blade-down relief
Pilot relief			4.2 MPa {609 psi}	3.8 MPa {551 psi}	Lever neutral

FLOW CURVE



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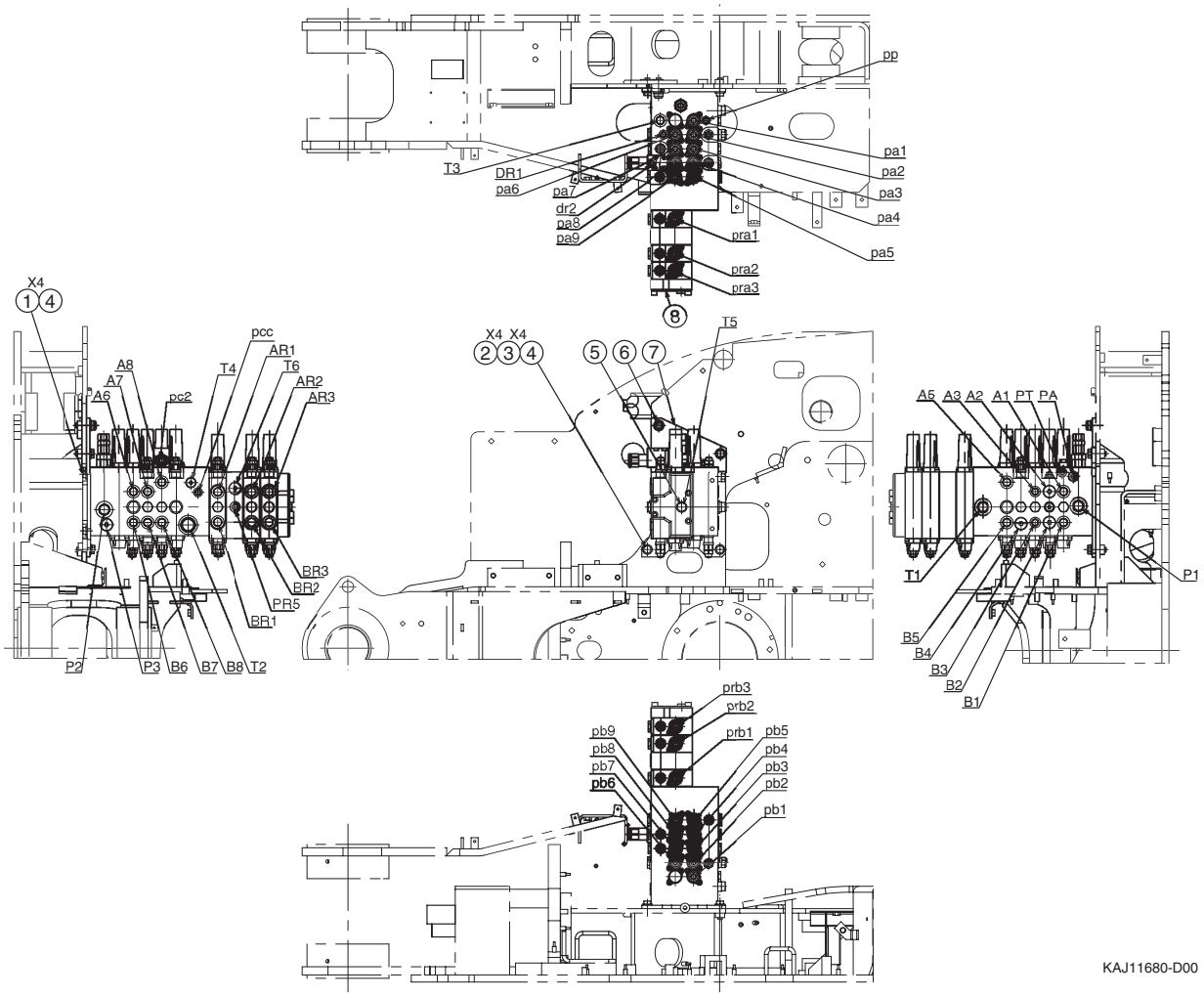
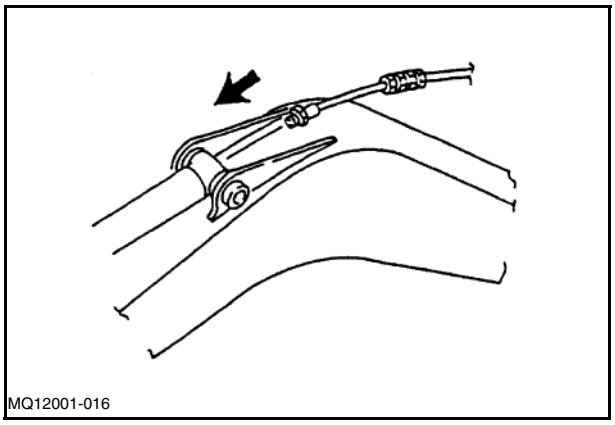
CONTROL VALVE



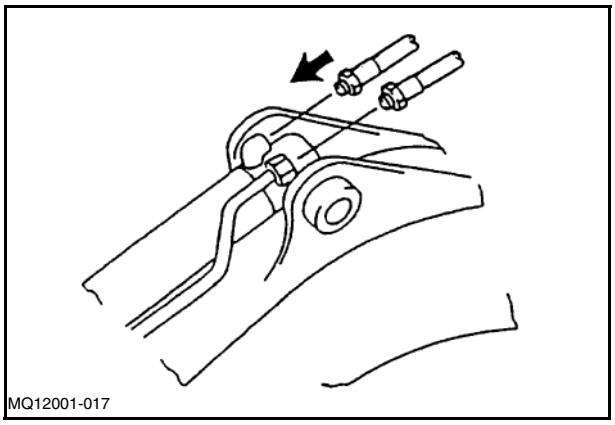
1. Sems bolt M12 x 30 (4)
2. High strength M12 x 40 (4)
3. High strength washer 12 (4)
4. Bond 262 (-)
5. Plug (1)
6. Protection cap (1)
7. Plate (1)
8. Control valve (1)

Main line	Pilot port	Line name	Main line	Pilot port	Line name
P1, P2	-	Pressure line	A8	pa8, pa4	Boom line up
T1, T2	-	Low pressure line	B8	pb8, pc2	Boom line down
A1	pa1	Traction line left backward	T3	-	Swing line
B1	pb1	Traction line left forward	AR1	pra1	Swing right
A2	pa2	Option 1	BR1	prb1	Swing left
B2	pb2	Option 1	AR2	pra2	Blade line up
A3	pa3	Swing line right	BR2	prb2	Blade line down
B3	pb3	Swing line left	AR3	pra3	Option 2
B4	-	Plug (boom 2)	BR3	prb3	Option 2
A5	pa5, pa9	Arm line out	PR5	-	Blade line pressure
B5	pb5, pb9	Arm line in	T5	-	Plug
A6	pa6	Traction line right backward	P3, T4	-	Plug
B6	pb6	Traction line right forward	-	PP	Pilot pressure line
A7	pa7	Bucket line close	-	PT, PA	Pressure detection
B7	pb7	Bucket line open	-	DR1, pcc, dr2, pb4	Drain line

3) Install the grease hose to the dipper cylinder.


MQ12001-016

4) Connect the hoses to the dipper cylinder.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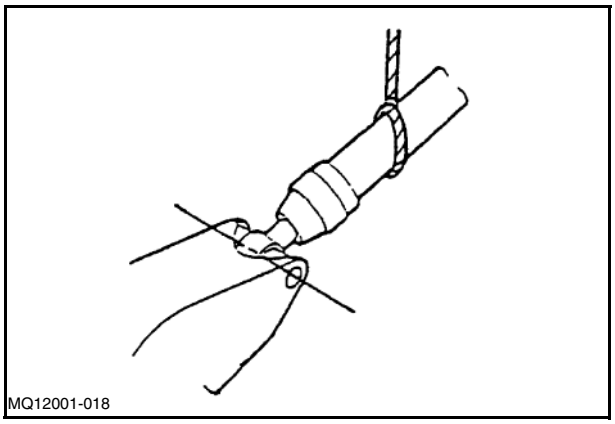
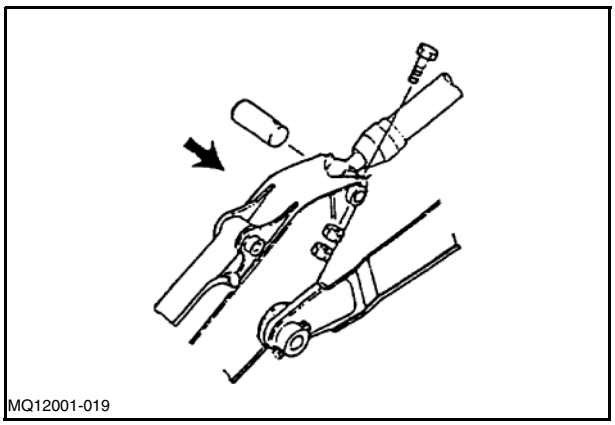
5) Position the cylinder head so that it is aligned for installation in the arm.


MQ12001-018

6) Install the pin and fasten it with a bolt and spacer. When putting in a pin, it unites with the circle boss of a dipper.

NOTE: *Cycle the cylinder to bleed air from the cylinder. After bleeding air, check for oil leakage.*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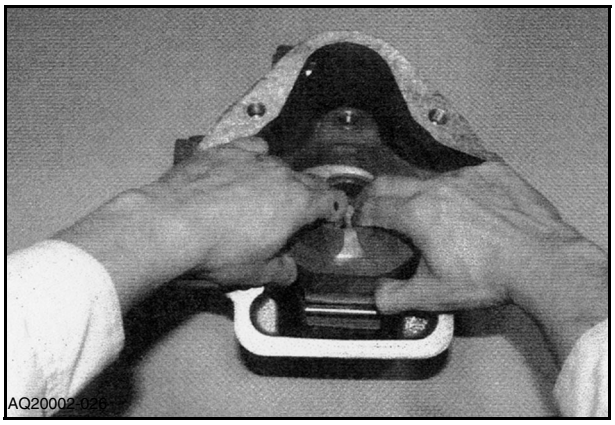
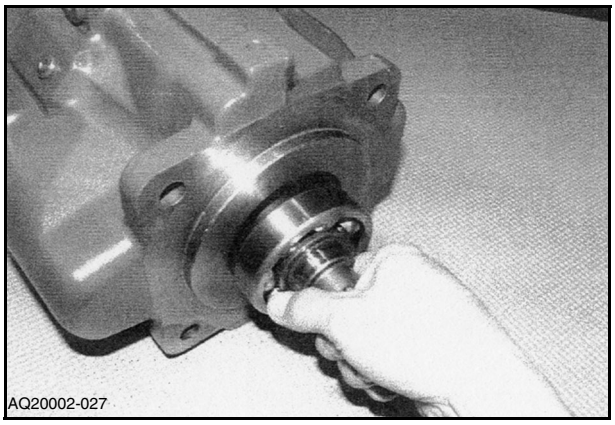
2) Install the swash plate.
To keep the swash plate from falling off, apply grease to the area (spherical) in contact with the guide.

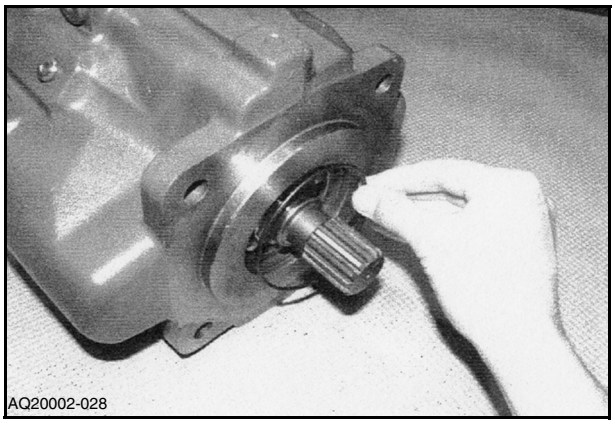


3) Install the shaft.
Do this with the housing on its side.

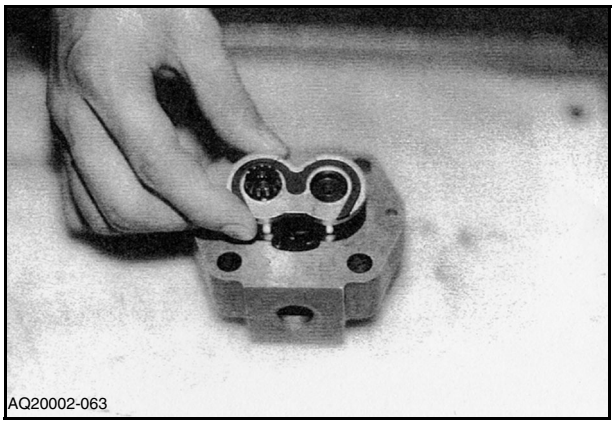
NOTE: *Be careful that the swash plate does not fall off.*



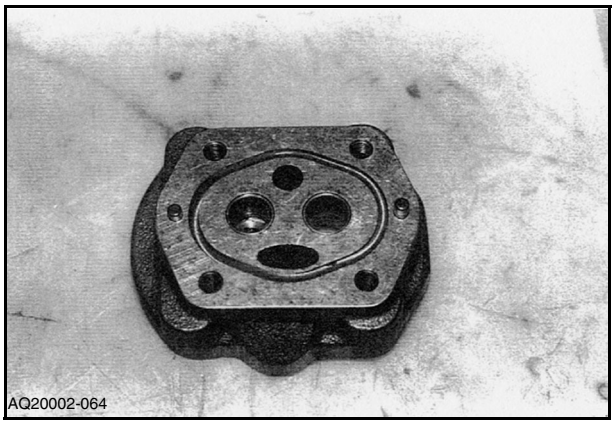
4) Apply grease to the O-ring and install.



4) Install side plate assembled in (3.) on the housing.


AQ20002-063

5) Assemble the 2 parallel pins into the intermediate frame.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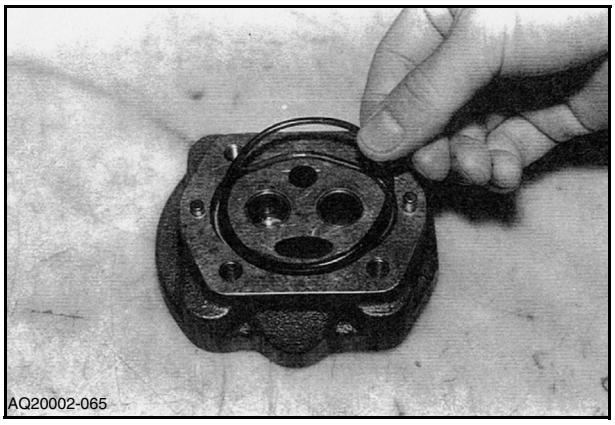
6) Install the O-ring on the intermediate frame.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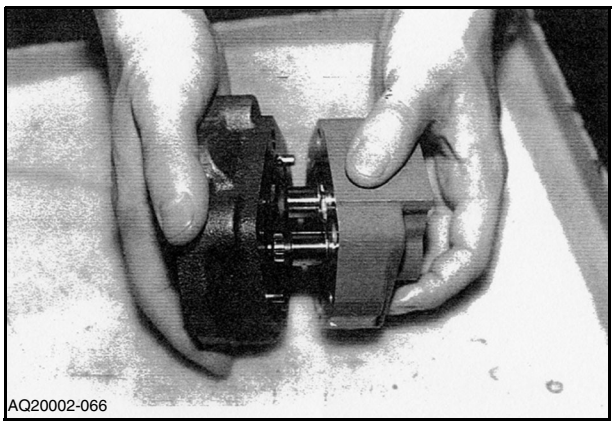
7) Install the intermediate frame.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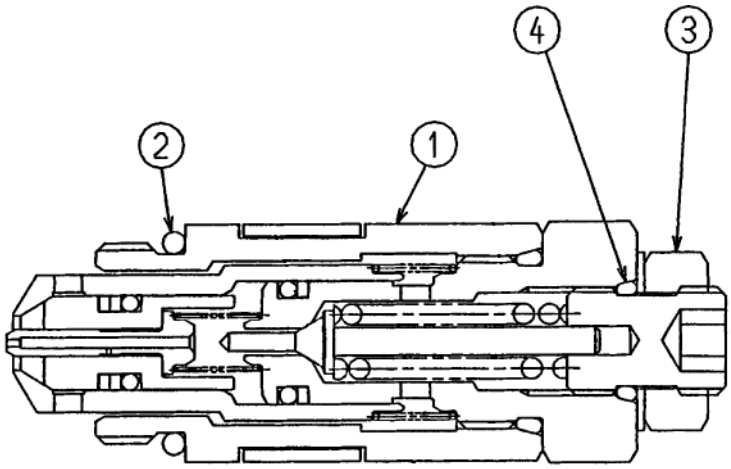
2 Instructions for Disassembling and Assembling the Overload Relief Valves



AQ23002-002

[1] Disassembling

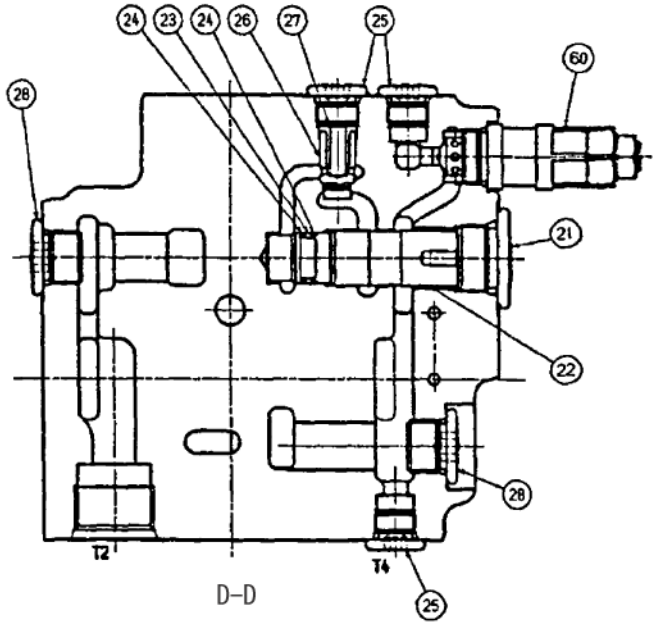
This component must be replaced as an assembly.
When disassembling, loosen cap (1) (WAF: 24) with a wrench, etc. and remove O-ring (2).
If there is a leak from the adjuster kit section (3), loosen the adjuster kit and replace the O-rings (4).

WARNING: When disassembling the adjuster kit, be careful that parts do not fly out due to the spring, and be careful not to lose the poppet.

[2] Assembling

Make sure there is no dirt or paint chips around the threaded section of cap (1) and install a new O-ring (2). Thoroughly clean the area where the relief valve is to be installed on the valve housing as well. Install the relief valve and fasten cap (1).
Tightening torque: 59 to 69 Nm
If the adjuster kit has been disassembled, thoroughly clean around the threaded part, and adjust the pressure according to 3. Adjusting the Relief Valves (page 14).

WARNING: All the above tightening torque values are for under wet conditions (with hydraulic oil applied).



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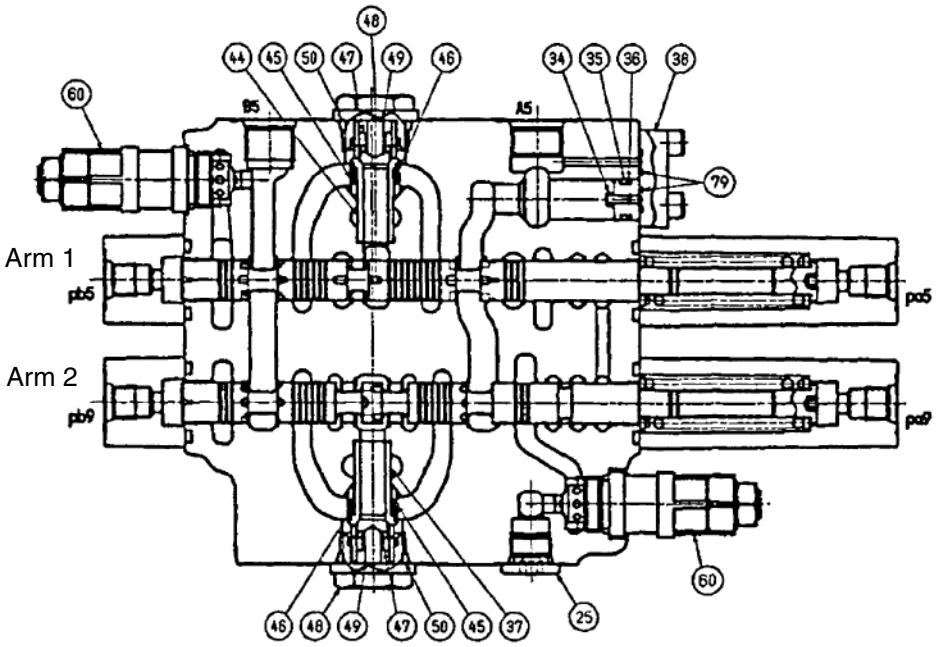

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12 Assembling the main spools (2 through 10) (80-2)

1) Install O-ring (12) (80-4) on the valve housing (1) (80-1).
2) Install short cap (14) on Travel Straight spool (10). Install short caps (13) (80-5) on all the other spools. Pass socket head bolts (65) (80-12) through the caps and fasten.
   Tightening torque: 20 to 25 Nm
3) Install spools (2 through 10) (80-2), assembled as a subassemblies, into spool holes in the same locations as before disassembly.
4) Install long cap (15) on Travel Straight spool (10). Install long caps (11) (80-3) on all the other spools. Pass socket head bolt (65) through the long caps and fasten.
   Tightening torque: 20 to 25 Nm.

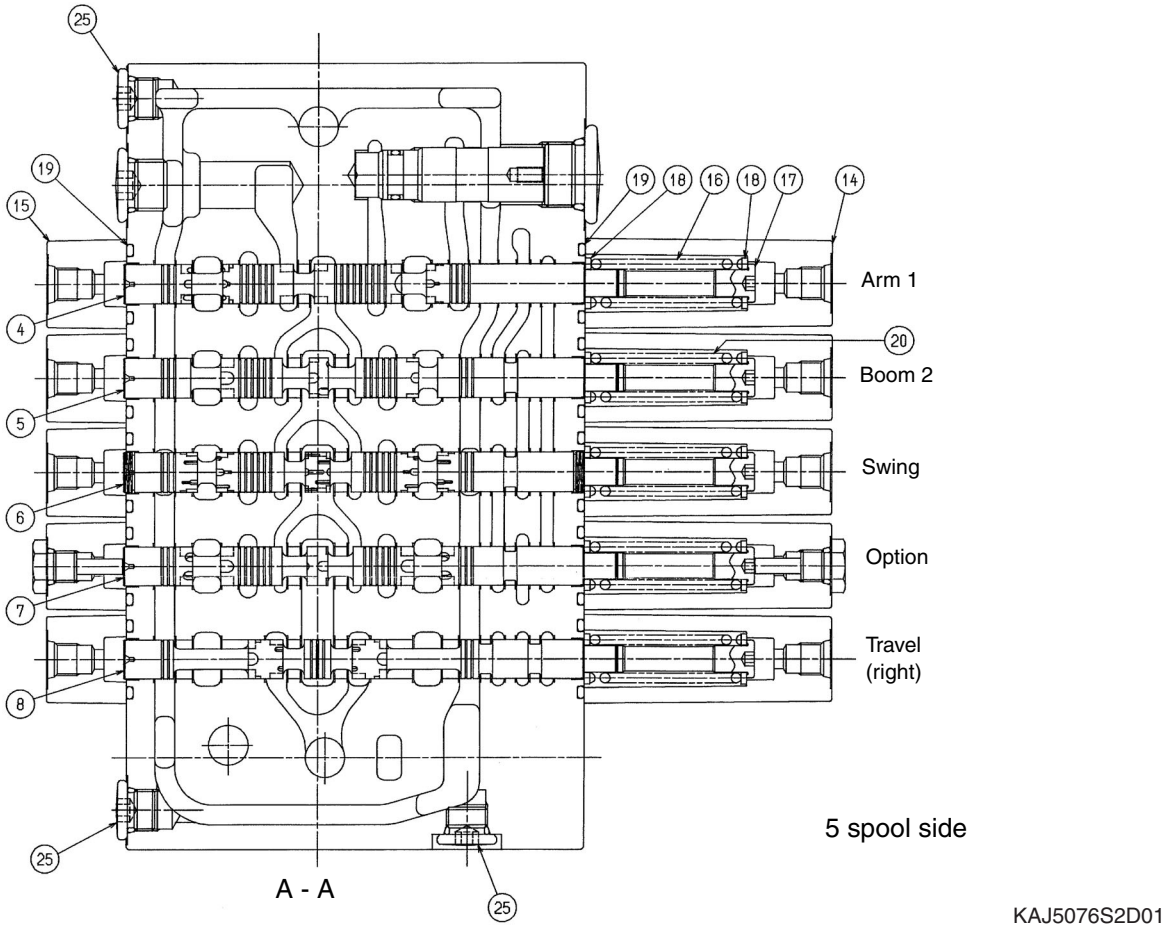
⚠ **WARNING:** Be careful that the mating surface O-rings do not fall off when installing the caps.

13 Assembling the other plugs

1) Install an O-ring on plug assembly (90) and fasten the assembly.
   Tightening torque: 205 to 227 Nm
2) Install O-rings on plug assemblies (32) (61-2) and fasten the assemblies.
   Tightening torque: 73 to 79 Nm
3) Install an O-ring on plug assembly (21) and fasten the assembly.
   Tightening torque: 13.5 to 16.5 Nm
4) Install an O-ring on plug assembly (22) and fasten the assembly.
   Tightening torque: 103 to 113 Nm
5) Install O-rings on plug assemblies (69) (78-2) and fasten the assemblies.
   Tightening torque: 116 to 128 Nm
6) Install an O-ring on plug assembly (20) and fasten the assembly.
   Tightening torque: 49 to 59 Nm
7) Install an O-ring on plug assembly (89) and fasten the assembly.
   Tightening torque: 19 to 22 Nm

⚠ **WARNING:** After completing the assembly, check for parts that may have been forgotten or not tightened. Forgetting to tighten parts will cause oil leakage from loose parts.
All tightening torque values are for under wet conditions (with hydraulic oil applied).

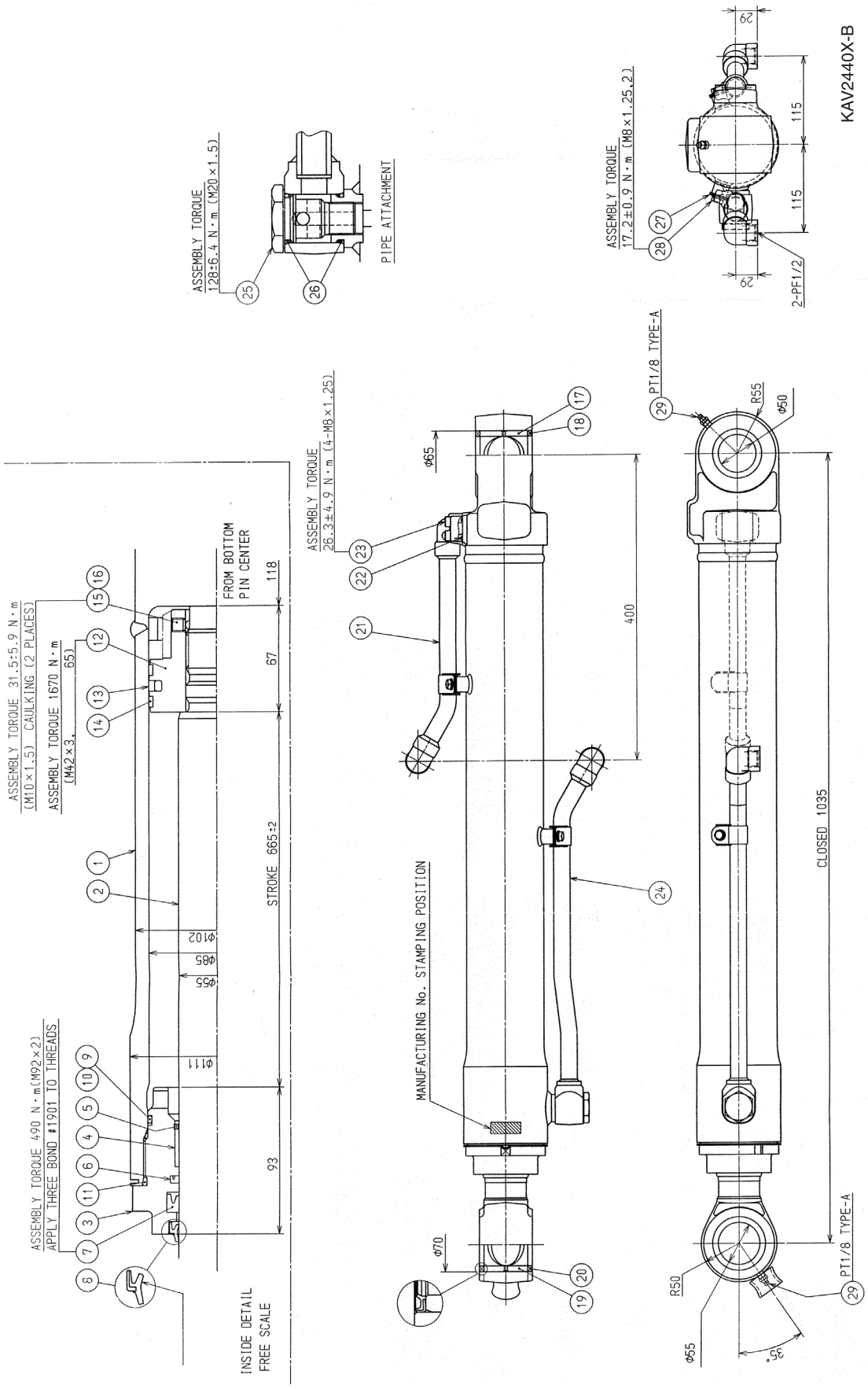
3 Overall View 2/3



NOTES

4 Bucket cylinder (mono boom spec.)

CX75SR - CX80



2 Maintenance instructions

1 Description of functions

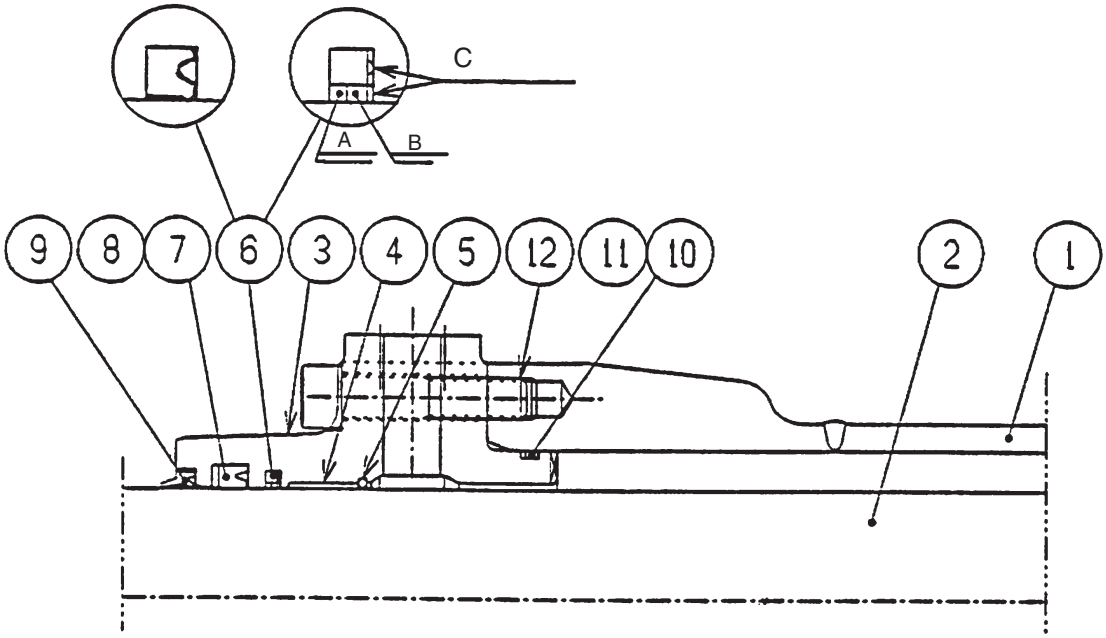
1) Basic functions

The hydraulic piston system is a kind of hydraulic actuator which converts hydraulic energy supplied from the hydraulic pump into a larger force for linear movement via a piston. In addition, it switches its operational direction between extension and retraction by way of lever operation on the hydraulic oil direction switch-over valve.
This larger force, linear movement, and operational direction switching over are the basic functions.

2) Function by section

1) Cylinder head assembly

The piston assembly has a bearing function for the piston rod (2) provided by means of bushing (4) press fitted into the inside surface of cylinder head (3). It prevents external oil leakage by means of a buffer ring (6), U-ring (7) and backup ring (8) inserted into the inside surface of cylinder head. It also prevents dust from the outside by means of a wiper ring (9) press fitted into the inside surface of the cylinder head.
Engaging with the cushion bearing (13) at the cylinder's most extended position, it generates high pressure in the cushion chamber and this softens the cylinderÕs impact at the most extended position.
In addition, it also supplies and drains high-pressure oil from the inside of cylinder tube to the ports.



AQ24002-001

A: Black, B: Green, C: Split

Bushing (4)
The bushing is press fitted into the inner face of the cylinder head and is in contact with the piston rod. It reduces eccentricity, which adversely affects the seal performance, by sharing lateral load applied on the cylinder together with the slide ring located on the outer circumference of the piston, performing high-bearing linear motion against the piston rod, as well as supporting one end of the piston rod.

5 Instructions for disassembling and assembling

1) Preparation

Before starting the disassembly, prepare the following items:

1) Prepare a workbench

2) Choose and prepare a stable and strongly built workbench large enough to arrange and keep parts and perform jobs.

2) General precautions for work

1) Before disassembly, fully rinse soil and dust attached to the cylinder outside walls.

2) As each part is a precision component, handle parts carefully and do not drop them or allow them to hit each other.

3) Do not attempt to hit or pry parts forcedly because they are tightly fitted. Take time and carry out the operation carefully in order to avoid causing burrs or damage resulting in inability to reassemble a part, oil leakage or lower efficiency.

4) If components are left disassembled or half-disassembled, the parts may rust because of moisture and dirt. Rust prevention and dirt-proofing should be considered if the operation is suspended for unavoidable reasons.

3) Maintenance reference

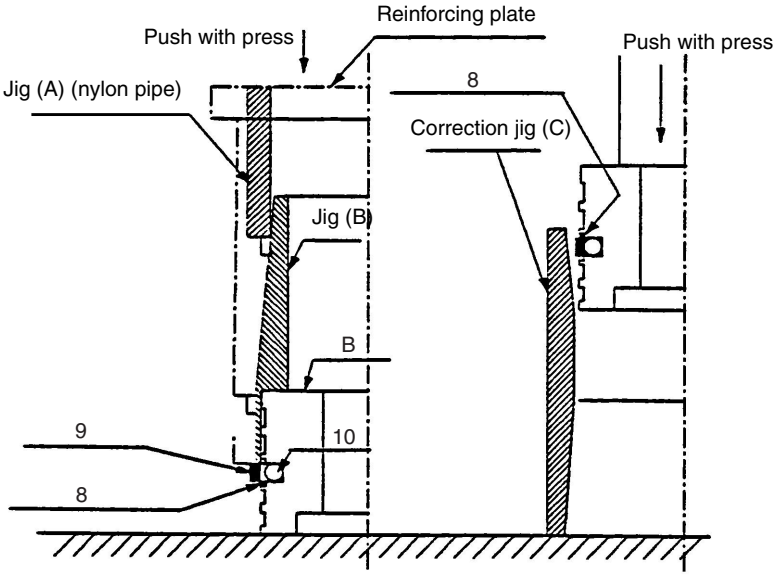
For sliding parts and sealing parts, replace them following the items below:

1) Bushing	When a whole quarter of the circumference has worn and turned reddish copper color
2) Seals and slide rings	Replace with new ones when disassembling cylinders
3) Pin bushing	When serious scuffing has occurred

4) Piston

1. Place the piston (B) on the press and install a seal ring (9) using a jig as shown in the figure to the right. (Pre-fit O-ring (10) and back up ring (9) to one side.)

2. Immediately after fitting seal ring and backup ring on the other side, correct the seal ring using a correction jig so that it does not remain expanded.
(This must be strictly observed.)

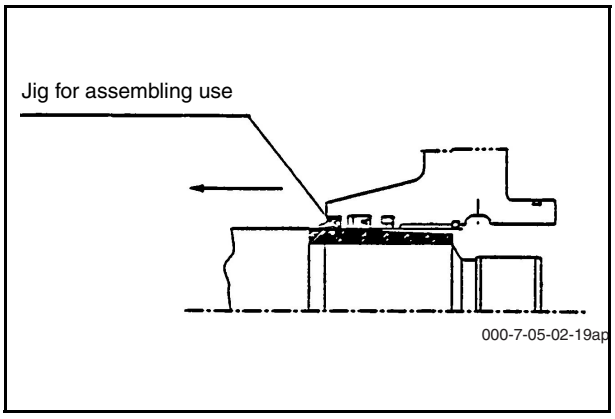


AQ24002-053

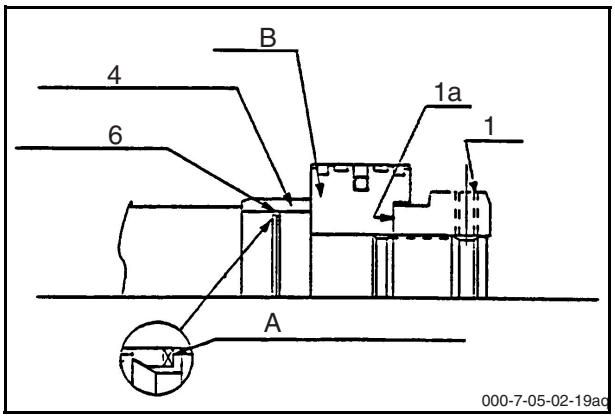
5) Assembling piston rod

1. Secure the piston rod.

2. Engage the cylinder head.
Care must be taken to confirm that the lips of the wiper ring and the U-ring are not engaged with the stepped part.

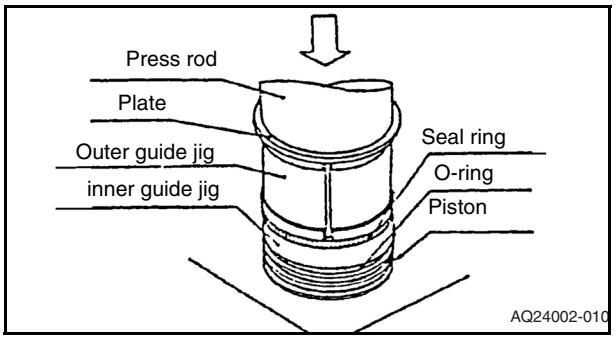


3. Engage cushion seal (6), cushion bearing (4) and piston (B). (Cushion seals are not required for bucket cylinders)
Then, fit shim and fasten the piston nut. (Direct the “slit” (A) on the cushion seal toward the piston side.)



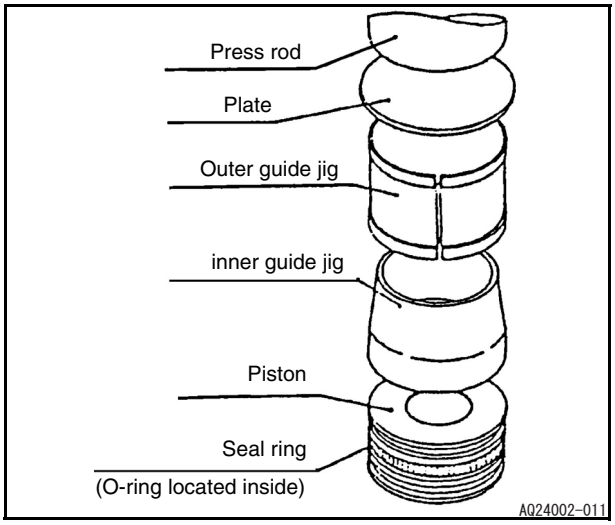
5) Press fitting
Use a press and push down the seal ring until it fits in the groove of the piston.

CAUTION: Use caution while pushing down the seal ring because it may not be properly fit in the groove if it is at an angle in the inner guide jig.
Installation of the ring must be carried out swiftly.



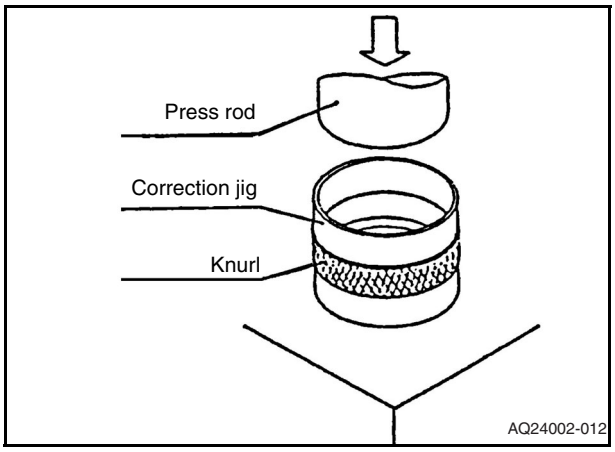
6) Removing the jigs
Remove the jigs in the following order, once confirmed that the seal ring has been completely installed in the groove of the piston.
1. Remove the press rod.
2. Remove the plate.
3. Remove the outer guide jig.
4. Remove the inner guide jig.

The installation of a seal ring is now complete.
The instructions for aligning a seal ring using a correction jig will be given next.



7) Preparing a correction jig
Place a correction jig under a press.

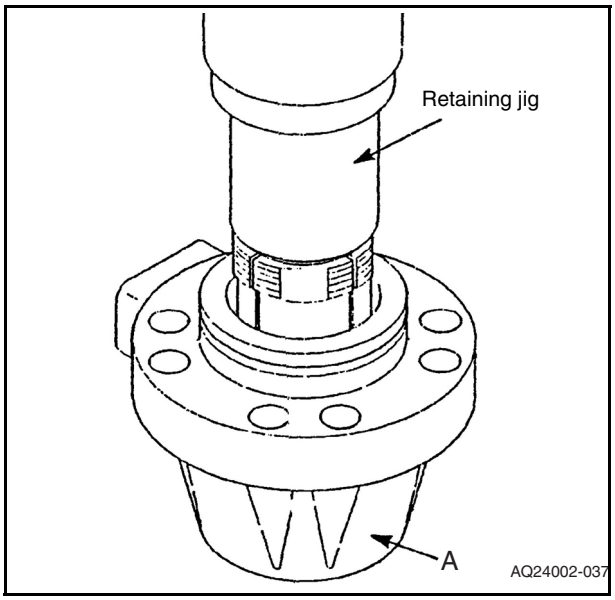
CAUTION: Apply a light coat of oil to the tapered area of the correction jig and place the jig with the tapered side up.
Use caution to keep foreign substances such as dirt, particles and lint off the jig.



6) Press fitting the bushing
Use a press to push down the bolt head of the adjuster until the bushing reaches the proper position in the cylinder head (A).

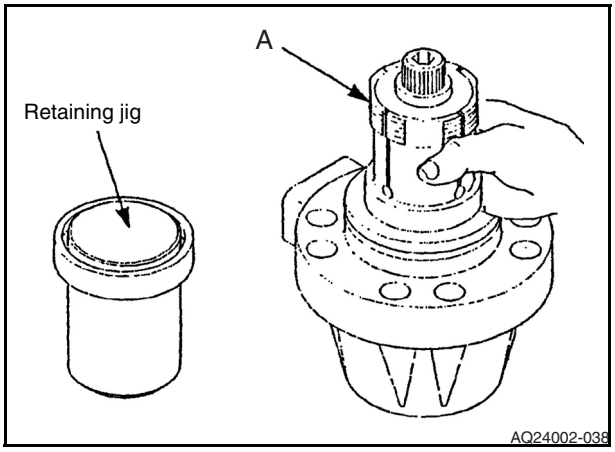
Keep the press load below 5 tons.

CAUTION: Check to see if the bushing edge sits at the back of the snap ring grooves. Press fit again if not.



7) Removing the retainer (jig) and the chuck assembly (A) (jig)
Once the press fitting of the bushing is complete, remove the retainer and the chuck assembly from the cylinder head. Then, attach the seals and press fit the wiper ring.

CAUTION: Examine to see if the bushing is press fit properly.



Other precautions

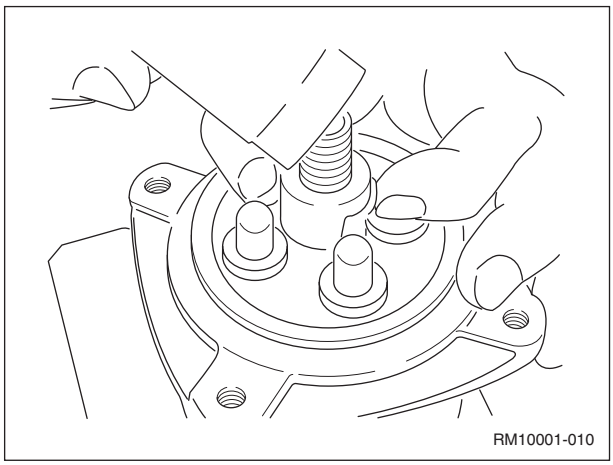
1. A specific piston rod diameter requires a specific jig. Refer to the applicable table to choose the correct jig for a specific diameter size.

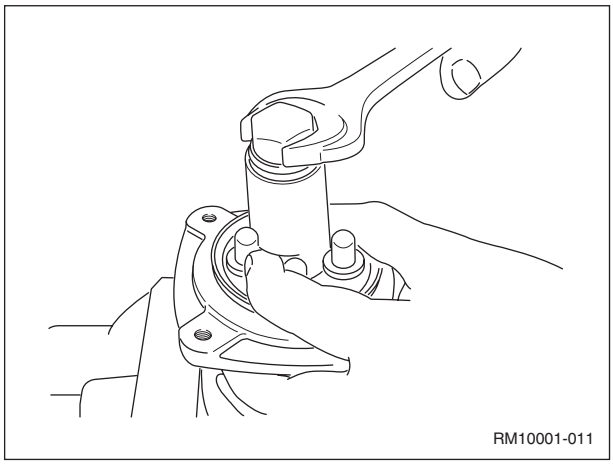
2. The blade section of the chuck assembly is a vital portion and must be handled and stored with extreme care.

[5] Use a jig to rotate the joint (301) to the left and loosen it.

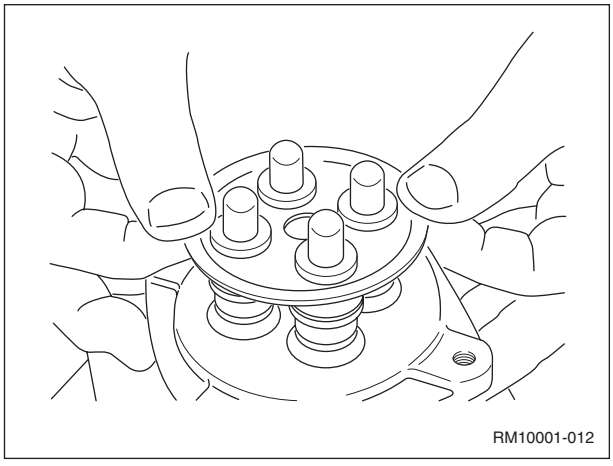
• The diagram shows the valve with the jig installed.

• If the return springs (221) are strong, the plate (151), plugs (211), and push rods (212) will rise at the same time the joint is loosened, so be careful of parts flying off when removing the joint.


RM10001-010


RM10001-011

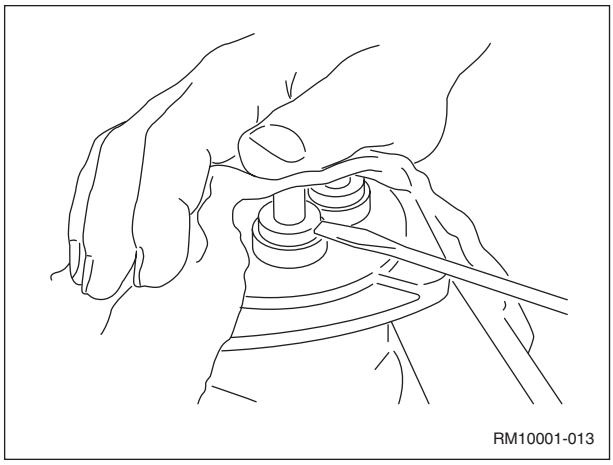
[6] Remove the plate (151).


RM10001-012

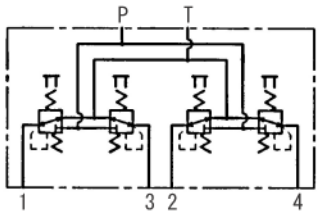
[7] If the return springs (221) are weak, the plugs (211) will remain in the casing (101) due to the sliding resistance of the O-rings (214), so use a flathead screwdriver to remove them.

• Use the groove in the outer circumference of the plugs and remove them while making sure they are not damaged by an unbalanced load.

• Use caution as plugs may fly off when they are being removed due to the return springs.

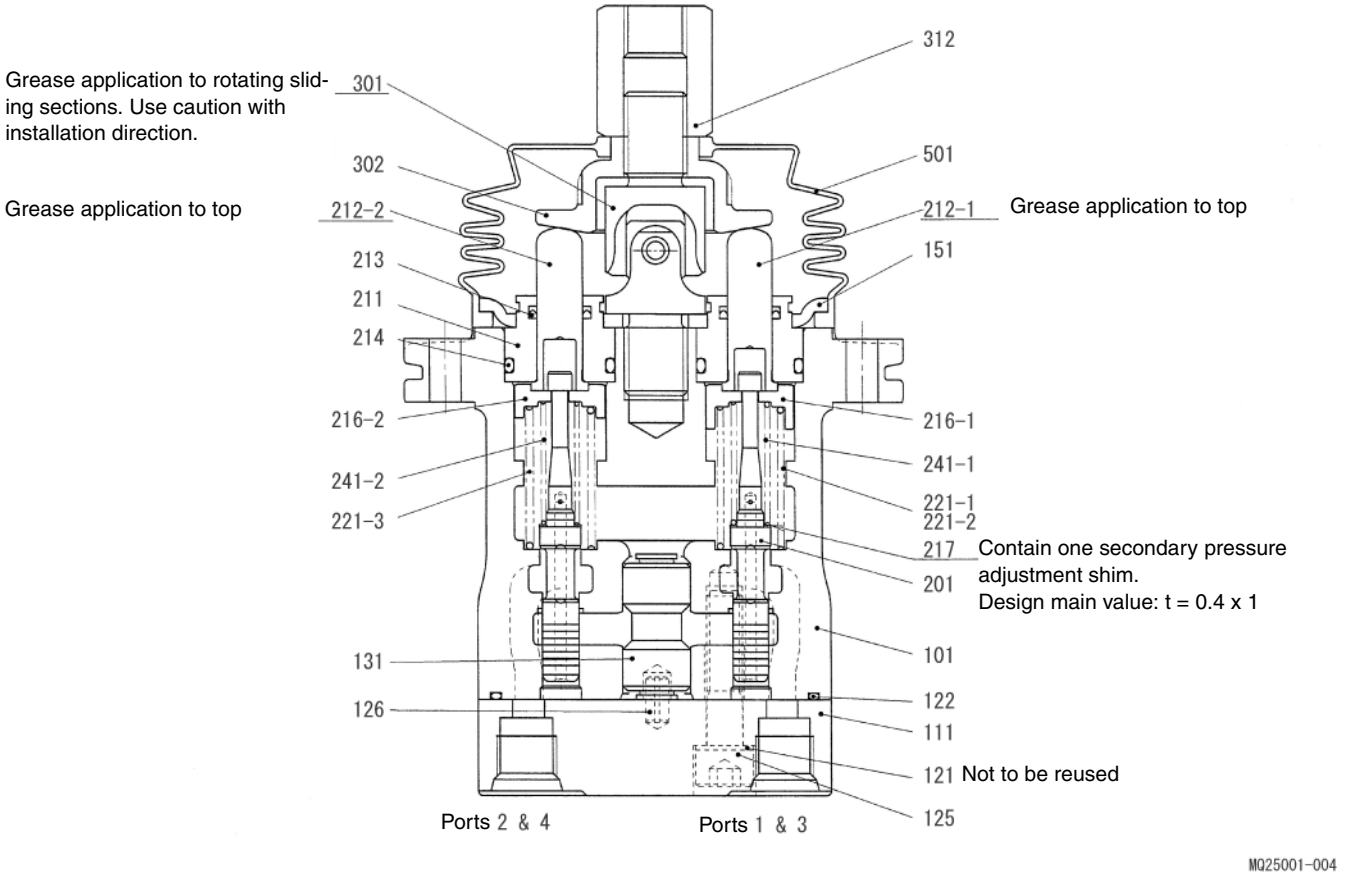

RM10001-013

5 Attached diagram 1. Remote control valve assembly cross-section diagram



Tightening torque list

No.	Screw size	Tightening torque
125	M8	20.6 ± 1.5 Nm
301	M14	47.1 ± 2.9 Nm
312	M14	68.6 ± 4.9 Nm



Code	Part name	Qty	Code	Part name	Qty
101	Casing	1	214	O-ring	4
111	Port plate	1	216-1	Spring seating (port 1, 3)	2
121	Seal washer	2	216-2	Spring seating (port 2, 4)	2
122	O-ring	1	217	Washer	4
125	Hexagon socket head bolt	2	221-1	Return spring (port 1)	1
126	Spring pin	1	221-2	Return spring (port 3)	1
131	Bushing	1	221-3	Return spring (port 2, 4)	2
151	Plate	1	241-1	Secondary pressure spring (port 1, 3)	2
201	Spool	4	241-2	Secondary pressure spring (port 2, 4)	2
211	Plug	4	301	Joint	1
212-1	Push rod (port 1, 3)	2	302	Disk	1
212-2	Push rod (port 2, 4)	2	312	Adjusting nut	1
213	Seal	4	501	Bellows	1

Disassembly and Assembly

General precautions

- Because all the parts in hydraulic valves are precision components, perform valve disassembly and assembly in a clean and dust-free area. Use clean tools and cleaning solvent.
- Clean disassembled parts and apply a corrosion inhibitor.
- Number parts when disassembling so that they can be put back in their original locations when assembling.
- Clean each part thoroughly, remove foreign substances, and make sure that there are no burrs or dents. If burrs or dents are found, remove them with an oilstone.
- Replace seals with new ones each time the valves are disassembled.
- When assembling, apply a thin coat of hydraulic oil to sliding surfaces and grease to seals.
- During the operation, if a part does not move smoothly, never hit or pry it.

Disassembling procedure

(Assembly should be done in the reverse order of disassembly).

Precautions

When disassembling, make note of where each part was assembled, using tags and the like, and be sure to assemble each part into its original location when reassembling.

[1] See figure 7.

- Remove boots (18). (x 2)
- Remove Hexagon socket set screws. (x 2)
- Withdraw pins (5). (x 2)
- Remove cams (7). (x 2)
- Remove Hexagon socket head bolts. (x 4)
- Remove covers (17). (x 2)
- Remove pushers (11). (x 4)
- Remove steel balls (31) and holders (20). (4 each)
- Remove shims (2 and 4).
- Remove U packings. (x 4)

Tightening torque:

Hexagon socket head bolt: 9.8 ± 1.0 Nm

Hexagon socket set screw: 9.8 ± 1.0 Nm

Disassembly may not be possible if hexagon socket set screws are secured with loctite. In this case, remove the hexagon socket head bolt together with cam (7), pin (5) and cover (10).

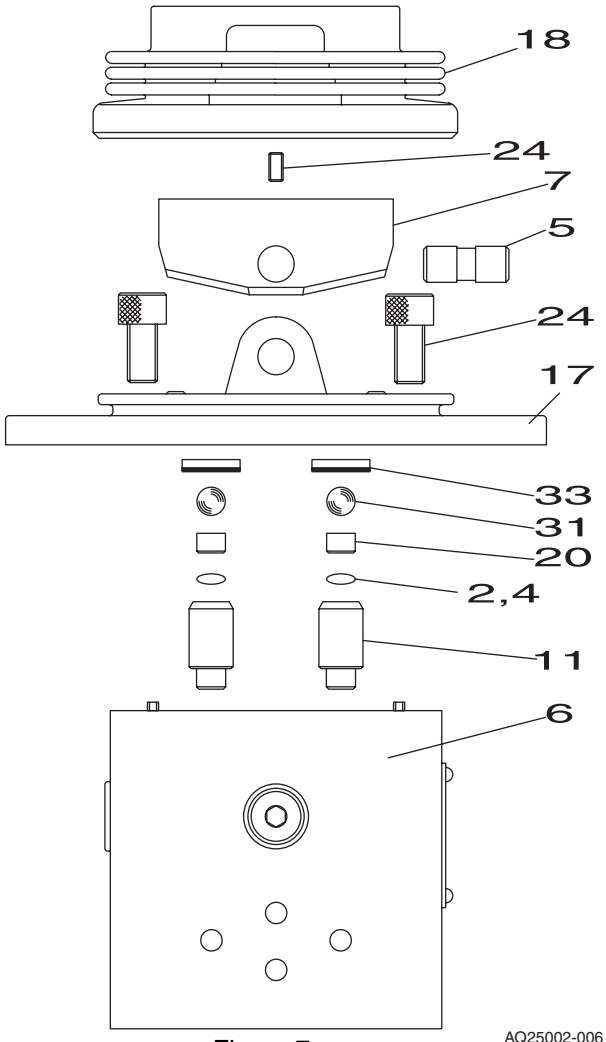


Figure 7

2 Theory of operation

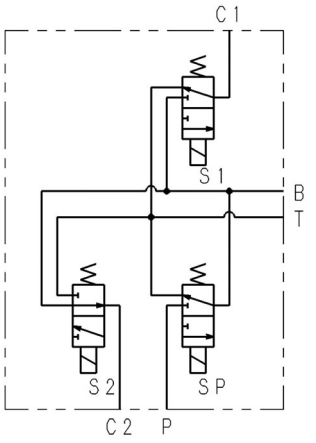
The hydraulic fluid supplied from the port P is fed to the solenoid operated directional valves S1 @ when the valve SP is energized. The hydraulic fluid is then fed to the ports C1 depending on whether or not the valves S1 is energized.

Electromagnetic selector valves S1:

Oil passes through when energized

Electromagnetic selector valves S2:

Oil passes through when not energized



NN16001-002

3 Maintenance

1 Assembling and disassembling precautions

[1] Disassemble the valve with due attention not to damage the O-ring and other parts, and store the parts in a safe place.

[2] If there is any flaw on the O-ring, replace it with a new one.

[3] Be careful to assemble the parts in the correct orientation and without forgetting any of the parts.

[4] When assembling, reverse the order of disassembling and pay attention not to allow any foreign matters such as dirt to get into the valve.

2 Assembling and Disassembling a Solenoid Operated Directional Valve

[1] Remove the mounting bolts from the solenoid (C) and remove the coil part. (Tool: 3 mm Hexagon wrench)

[2] Remove the tube, while paying attention not to damage the edges of the flat portion of the core. However, if the core is removed, replace the O-ring (A) with a new one. (Tool: 23 mm spanner)

[3] Take out the spools (2) and (3) and the springs (4) and (5).

[4] Pry the snap ring (7) off by inserting a flat head screwdriver or the like in the notch, and remove the adapter (6).

[5] Assemble the valve by reversing the order of disassembling. When tightening the core, pay attention not to damage the edges of the flat portion of the core.
When mounting the adaptor, apply grease or other appropriate lubricant to the O-ring (B) and pay attention not to damage the O-ring.

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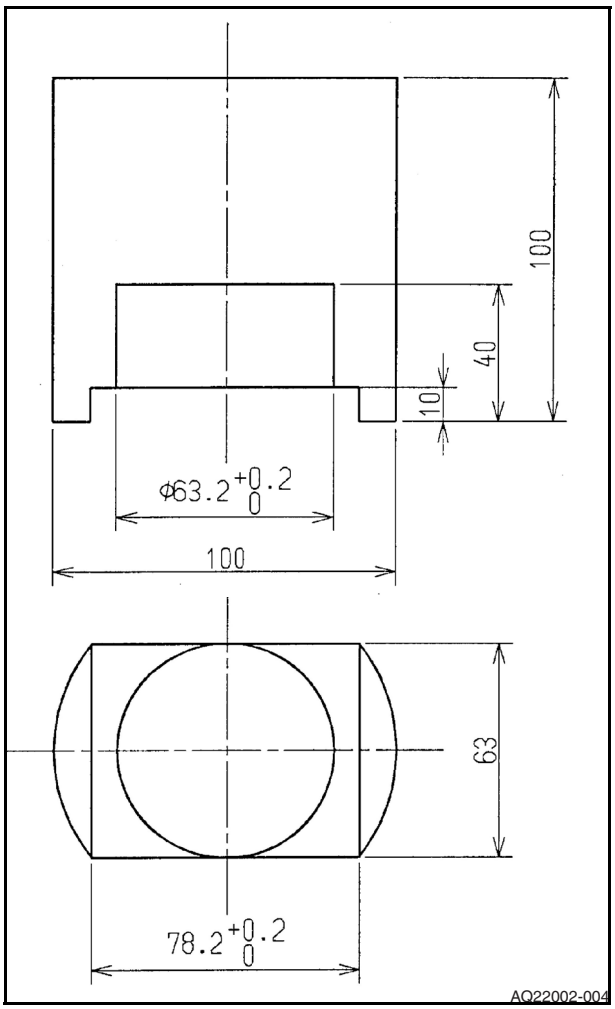
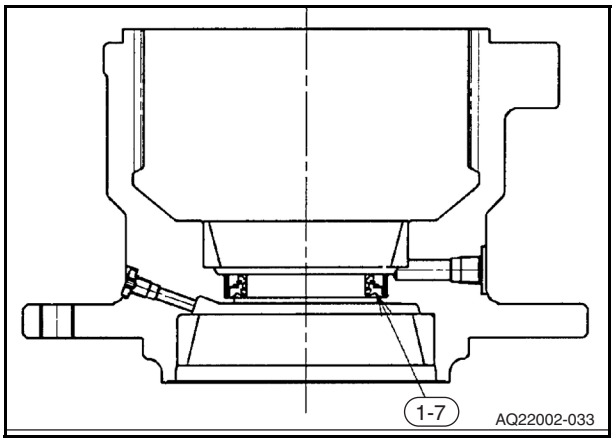
Tool name ..... Configurations for reference

4. Collar press fitting jigs (1-10).

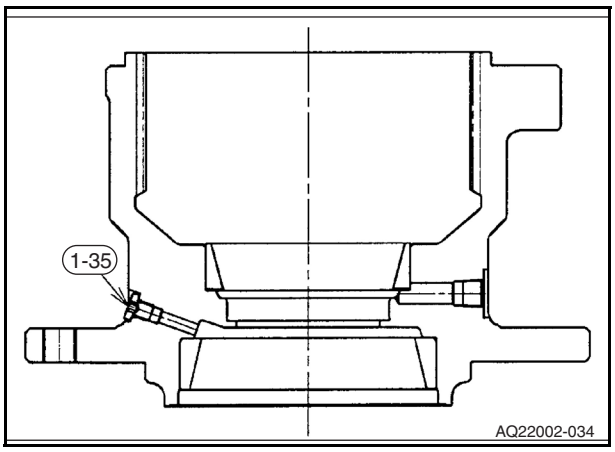


9) Break oil seal (1-7) and remove.

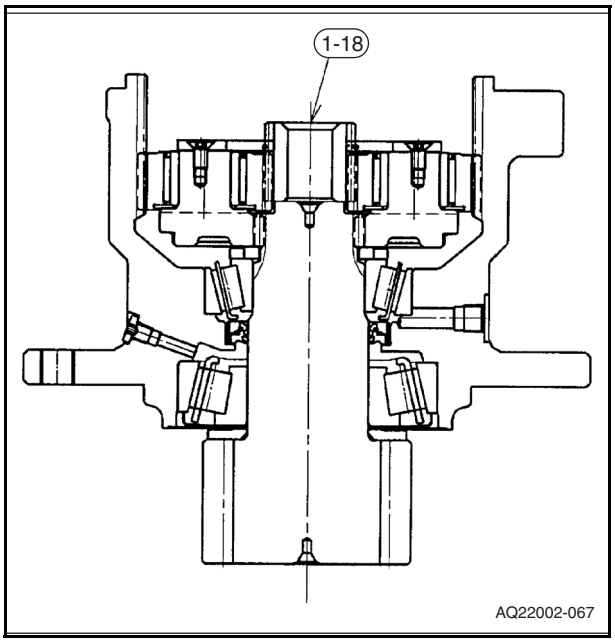
NOTE: *Oil seals that have been removed cannot be reused. Be careful not to damage the outer races of tapered roller bearings (1-6, 1-8) during removal.*



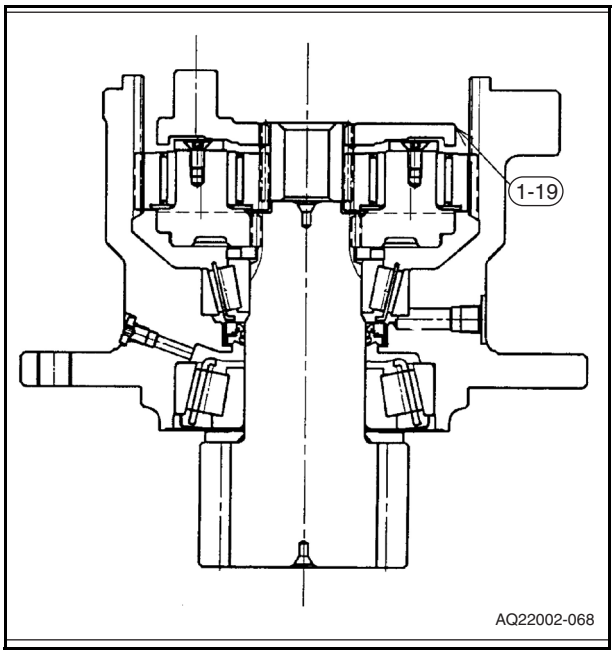
10) Remove plug (1-35).



9 Install sun gear (1-18).



10 Install holder (1-19).



2 Anti-reverse valve

1 Troubleshooting

If any problems occur during operation, refer to the troubleshooting table shown below to determine the cause of the problem and measures for remedying it.

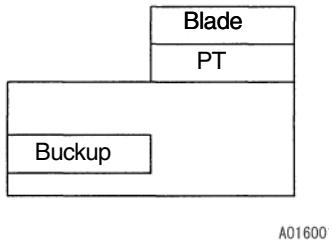
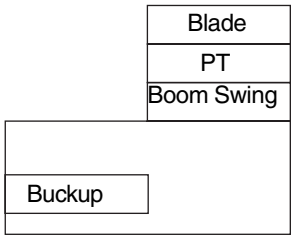
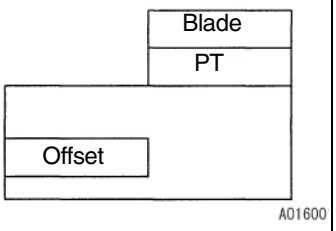
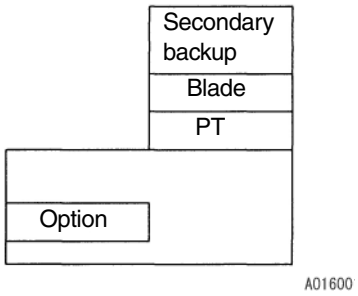
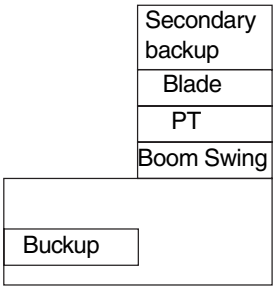
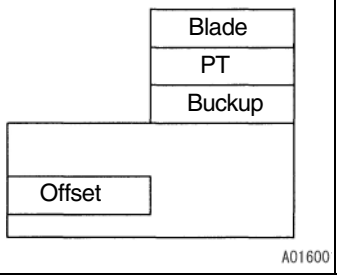
Troubleshooting table

Problem	Cause	Remedy
1. Motor does not rotate or rotates slowly.	1. Malfunction in something other than the piston motor, valve unit or anti-reverse valve.	Check to see if the oil pressure at the entry side of the valve is correct. Then inspect/repair each device.
	2. Faulty seat in check valve assembly. 1) Foreign substances present.	Remove foreign substances completely and repair where damaged. Clean and reassemble. Replace if scratches are deep and leak is large.
	2) Excessive torque on anti-reverse valve bolts.	Fasten bolts to specified torque.
	3. Faulty sleeve 1) Foreign substances present.	Remove foreign substances completely and repair where damaged. Clean and reassemble. Replace if scratches are deep and leak is large.
2. Motor does not stop, or takes a while to stop.	1. Faulty seat in check valve assembly. 1) Foreign substances present.	Remove foreign substances completely and repair where damaged. Clean and reassemble. Replace if scratches are deep and leak is large.
	2) Excessive torque on anti-reverse valve bolts.	Fasten bolts to specified torque.
	2. Faulty valve inside check valve assembly. 1) Foreign substances present.	Remove foreign substances completely and repair where damaged. Clean and reassemble. Replace if sliding section is scratched
	2) Valve orifice is blocked with dirt or dust.	Remove dirt or dust completely. Clean and reassemble.
	3. Faulty sleeve 1) Foreign substances present.	Remove foreign substances completely and repair where damaged. Clean and reassemble. Replace if scratches are deep and leak is large.
3. Greater than usual shock at swing stops	1. Faulty valve inside check valve assembly. 1) Foreign substances present.	Remove foreign substances completely. Clean and reassemble. Replace if sliding section is scratched
	2) Valve orifice is blocked with dirt or dust.	Remove dirt or dust completely. Clean and reassemble.
	2. Orifice is blocked with dirt or dust. 1) Orifice section of anti-reverse valve is blocked with dirt or dust.	Remove all dirt or dust. Clean and reassemble.
	2) Orifice on valve unit side is blocked with dirt or dust.	Remove all dirt or dust. Clean and reassemble.

CONTROL VALVE CONFIGURATION TABLE

Overview

Control valves are configured as follows according to model and specification.

	MONO BOOM with BLADE (CX75SR)	MONO BOOM with BLADE (CX80)	OFFSET BOOM with BLADE (CX75SR) (Specification for Europe)
Standard			
Optional			

Swing Override Throttle Circuit

Providing an override throttle on the parallel circuit enables the pressure to rise at combined operation of arm and swing, thus securing the swing force for press digging operation.

1 HYDRAULIC RESERVOIR
10. MAIN HYDRAULIC PUMP
15. MAIN CONTROL VALVE
22. SWING MOTOR
27. DIPPER CYLINDER
51. ACCUMULATOR
60. PILOT SYSTEM MANIFOLD
96. SWING PILOT CIRCUIT CUSHION VALVE
102. 3 ELECTROVALVE BLOCK

Legend

- Pressure Line
- Tank line
- Pilot pressure line
- Pilot tank line
- Electric Line

Blade Circuits (CX80)

Blade Circuits

As the blade remote control valve is switched over, the pilot oil enters Port prb2 or pra2.

The oil at PR5 from the gear pump then flows into the blade cylinder through the Parallel passage.

The returning oil flows into the tank through Port AR2 or BR2.

1	HYDRAULIC RESERVOIR
10.	MAIN HYDRAULIC PUMP
15.	MAIN CONTROL VALVE
51.	ACCUMULATOR
99.	DOZER BLADE HAND CONTROL
100.	DOZER BLADE CYLINDER
102.	3 ELECTROVALVE BLOCK

Legend

- Pressure Line
- Tank line
- Pilot pressure line
- Pilot tank line
- Electric Line

Backup Reciprocating Circuit (ultra small swing hydraulic excavator)

As the back up remote control valve is switched over, the pilot oil enters Port pra1 or Port prb1. The oil at P2 then flows into the backup valve AR1 or Port BR1 through the parallel passage.

The returning oil flows into the tank through Port BR1 or Port AR1.

1 HYDRAULIC RESERVOIR
10. MAIN HYDRAULIC PUMP
15. MAIN CONTROL VALVE
51. ACCUMULATOR
60. PILOT SYSTEM MANIFOLD
83. SHUT-OFF VALVE (OPTIONAL)
85. HAND/FOOT CONTROL PILOT FILTER
98. OFFSET BACKHOE FOOT CONTROL
102. 3 ELECTROVALVE BLOCK

Legend

- Pressure Line
- Tank line
- Pilot pressure line
- Pilot tank line
- Electric Line

Before the incline

When the discharge pressure is low, the return moment is also small and the spring (16) is not bent.

Thus the swash plate (14) is at a maximum incline angle to maintain maximum discharge.

After the incline

When the discharge pressure increases, the return moment also increases. As a result the spring (16) is bent and the incline angle of the swash plate (14) will move to the position where the return moment and the spring force become balanced, reducing the discharge volume.

As the discharge volume further increases, the incline angle decreases accordingly. The spring (17) will also start to bend to keep the volume decreasing.

2) Power-down control by discharge pressure of blade pump (blade shift)

An over-torque condition of the input shaft due to the simultaneous high-pressure operations of the main pump and the blade pump is prevented by changing the output characteristics of the main pump through the discharge pressure of the blade pump.

The discharge pressure on the blade pump acts on the shift piston (18) via passage (19).

When the discharge pressure on the blade pump increases, the force on the shift piston increases and the moment counteracting the springs (16, 17) is generated on the swash plate (14).

The moment acting on the swash plate (14) increases because extra moment generated by the shift piston force is added to the return moment which is generated by the main pump discharge pressure.

Therefore, when the discharge pressure on the blade pump is high, the swash plate (14) starts its incline even if the discharge pressure on the main pump is low.

Thus, an over-torque on the input shaft will not take place because the main pump output becomes low when the pressure on the blade pump is high.

(The operational description for the overload relief valve is provided separately).

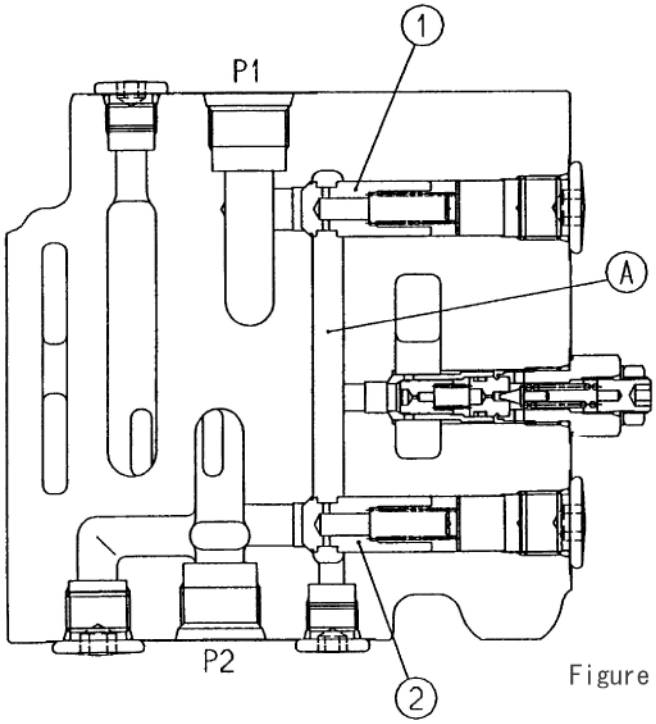


Figure 10

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10)Anti-drift valve (Boom section)

The anti-drift valve is installed on the boom bottom side of cylinder port A7 to prevent the natural drop of boom cylinder.

1] Neutral Status (Figure 11)

The pressure on cylinder Port A7 passes the hollow cavity in poppet (1) via passage (A) and will be directed to the spring chamber (C) through passage (B).

The force of the spring and the pressure acting on the area differences in the poppet (2) areas work to firmly seat poppets (1, 2).

2] Up (Figure 12)

The oil supplied from the pump pushes open poppet (1) and flows out from cylinder Port A7.

3] Down (Figure 13)

Switching poppet (1) by adding pressure to Port Pc2 will direct the oil in spring chamber (C) to the drain Port dr2 by way of passage (B), the hollow cavities in poppet (1) and spool (3). This opens poppet (2) and the returning oil from cylinder Port A7 flows into the tank passage through the boom 1 spool.

The function can also be added to the cylinder port on the arm rod side.

3) Principle of Relief Valve Operation

The relief valve determines the driving force and the braking force at the time of hydraulic shovel swing. They are installed on lines A and B of the main port. It also has a circuit which forces the returning oil from relief valve to go back to the opposing main low pressure line via makeup valve. Also, it is designed to reduce shocks at start of acceleration / deceleration. The relief valve structure has two components:

1] **Area difference direct acting relief valve**

2] **Shockless piston**

as shown in Figure 3-1.

Shockless type relief valves help eliminate shocks and stresses generated on intensified components.

- Pressure Setting of Relief Valve versus Adjustment Volume of Relief Valve (for reference)

Per one time: Approximate 9.7 MPa {1406 psi}

Do not attempt to make adjustments as long as there are no problems.

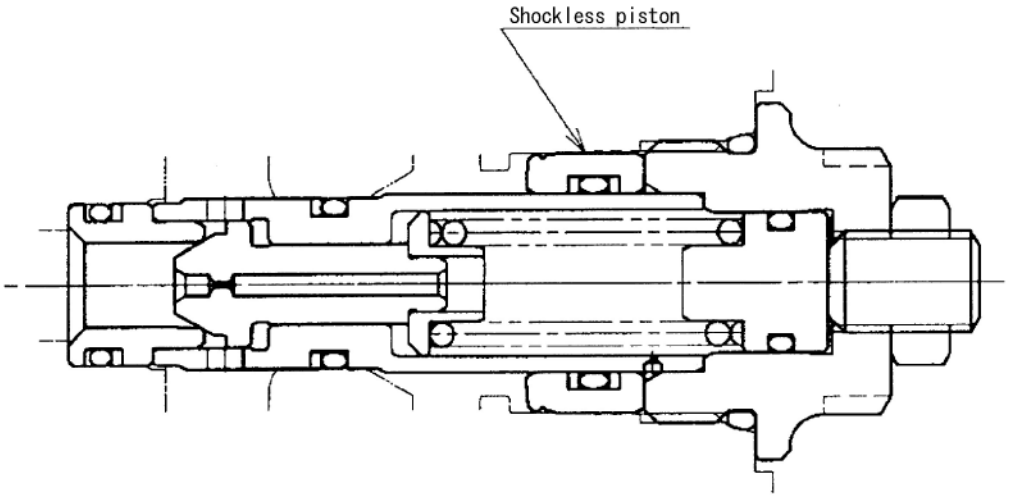

Figure 3-1. Structure of relief valve

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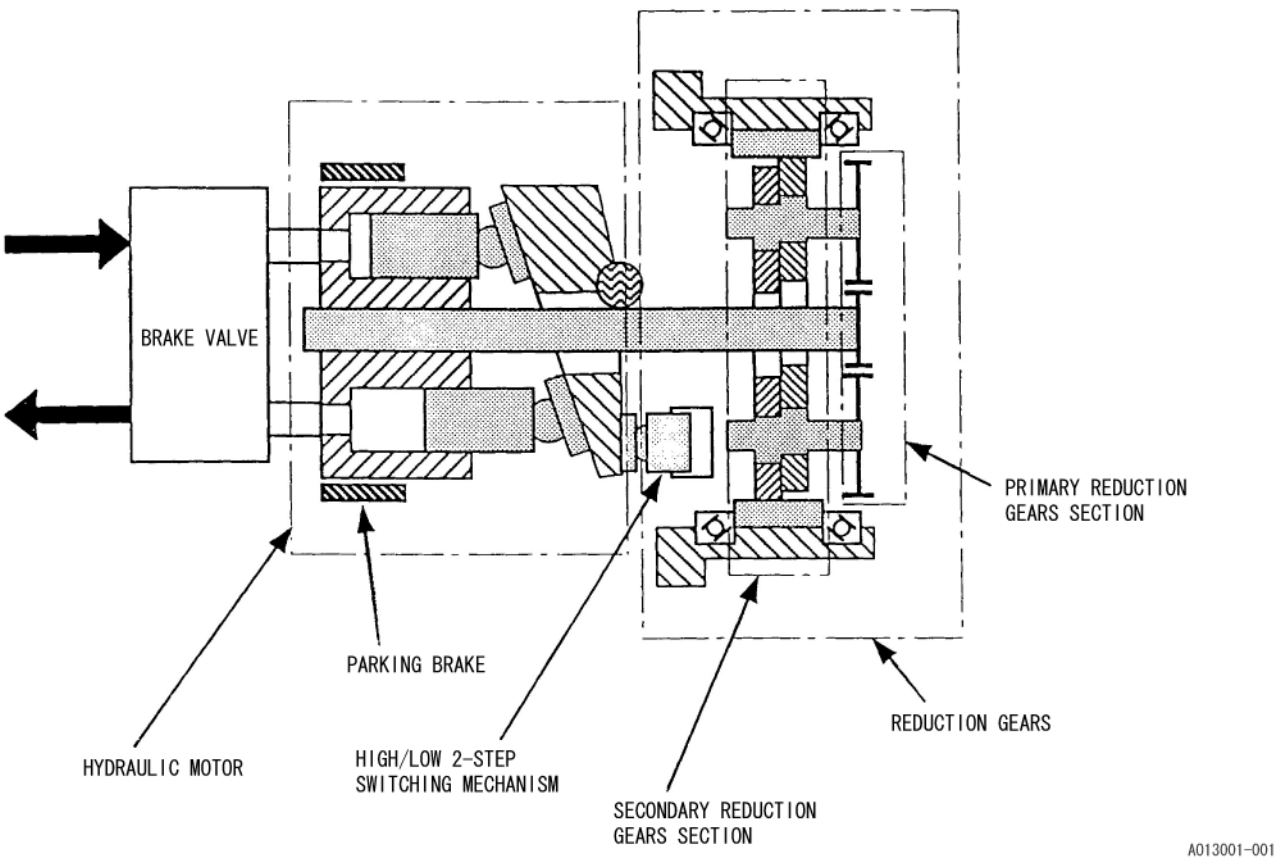
Basic Structure and Drawings

1) Basic structure of GM motor



• Reduction gears

The reduction gears are composed of a spur gearbox (referred to as “primary reduction gears”) and a differential gearbox (referred to as “secondary reduction gears”) in which pericycloid tooth profiles are adopted. The gears work to reduce the high-speed rotational motion from the hydraulic motor and to convert it into a low speed rotation with high torque.

• Hydraulic motor

The hydraulic motor is a swash plate type axial piston motor. The motor converts the force of pressurized oil delivered from the pump into a rotational movement.

• Brake valve

The brake valve consists of various types of valves. It stops the hydraulic motor smoothly, prevents the motor from overrunning, and also prevents extreme high pressure from being generated at the time the motor is stopped abruptly.

• High/low 2-step switching mechanism

The valve consists of a switching valve and a piston. It switches the piston displacement of the hydraulic motor in two different steps.

• Parking brake

The parking brake has a friction-plate type braking mechanism and is integrated into the hydraulic motor section.

3) Anti-overrun features

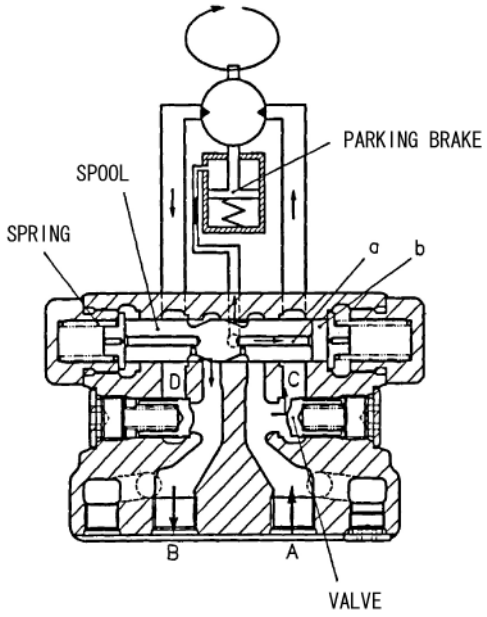
When the hydraulic motor is forced to rotate by external forces during its normal operation, an overrunning will occur. This occurs, for instance, when an excavator is traveling down a steep slope at the same time as working the travel motor for a power shovel. The mechanism against the overrun phenomenon is described below.

The hydraulic motor, during its normal operation, is forced to rotate by an external force. The pressure of the hydraulic oil (supplied to Port A or Port B) decreases.

The spool (223) starts moving toward the center as the pressure reaches the level that causes the motor to overrun. In conjunction with the movement of spool (223), the area of the passage between Port D, which is at the outlet side of the hydraulic motor, and Port B becomes smaller. The hydraulic oil flow discharged into Port B from Port D also becomes limited.

At the same time, the pressure on Port D (back pressure) also increases.

The overrunning will be prevented in this manner by controlling the oil flow/pressure at the outlet port of the hydraulic motor.



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2) Hydraulic drive section

This section describes the hydraulic motor, brake valve, parking brake, and high-low 2-speed switching mechanism of the hydraulic motor.

1] Functions

1- Hydraulic motor

Hydraulic motor is referred to as a swash plate type axial piston motor which converts the pressure oil power fed by pump into rotary motion.

2- Brake valve

1) Travel motor controls the force of rotational inertia of the body to brake and stop the rotation smoothly.
2) Check valve function to prevent hydraulic motor from cavitation.
3) Open the port to release the parking brake force at travel motor operation, and close the port at a standstill.

3- Relief valve

1) Softens the shock when starting the hydraulic motor, softens the shock when stopping the hydraulic motor, and prevents cavitation through the relief operation (reduction of the stop brake sound).
2) When sudden pressure operates on the hydraulic motor, the relief valve keeps the pressure to a predetermined level or less to prevent damage to the hydraulic motor.

4- High-low 2-speed switching mechanism

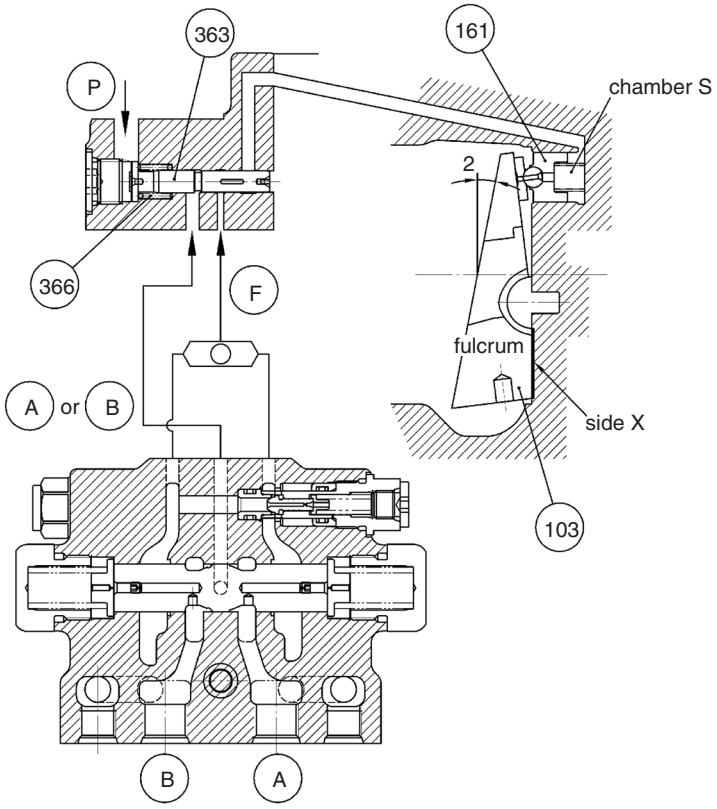
Switches the hydraulic motor between high speed rotation with low torque, and low speed rotation with high torque.

5- Parking brake

The parking brake is used the prevent machine from running away or slipping while parking on a slope using the friction plate type brake mechanism, and it installed on the hydraulic motor.

2) High speed

When the pilot pressure supplied to port *(P)*, the GM motor is high speed level. At this time the pressure overcomes the force of the spring [366] and the spool [363] is pressed the right side. The pressurized oil supply from port *(F)* is then introduced into chamber *(S)* through the spool [363] . The force of the piston [161] is increased by the pressurized oil of chamber *(S)*. The piston [161] pushes the swashl plate [103] up until it touches side *(X)* and keeps it. At this time the swash plate [103] is tilted at a minimum angle *(2)*, thus leading io high-speed operation.



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