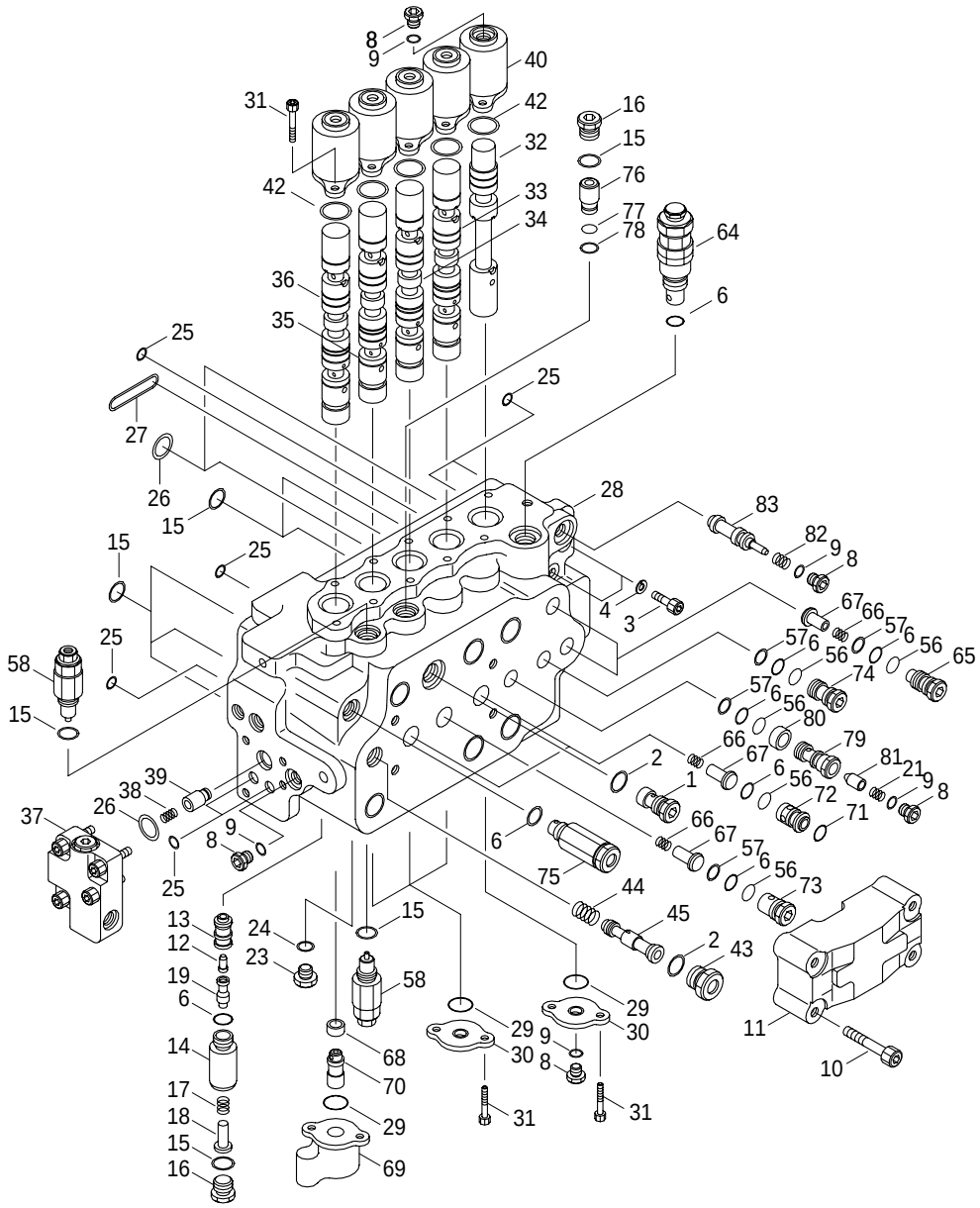
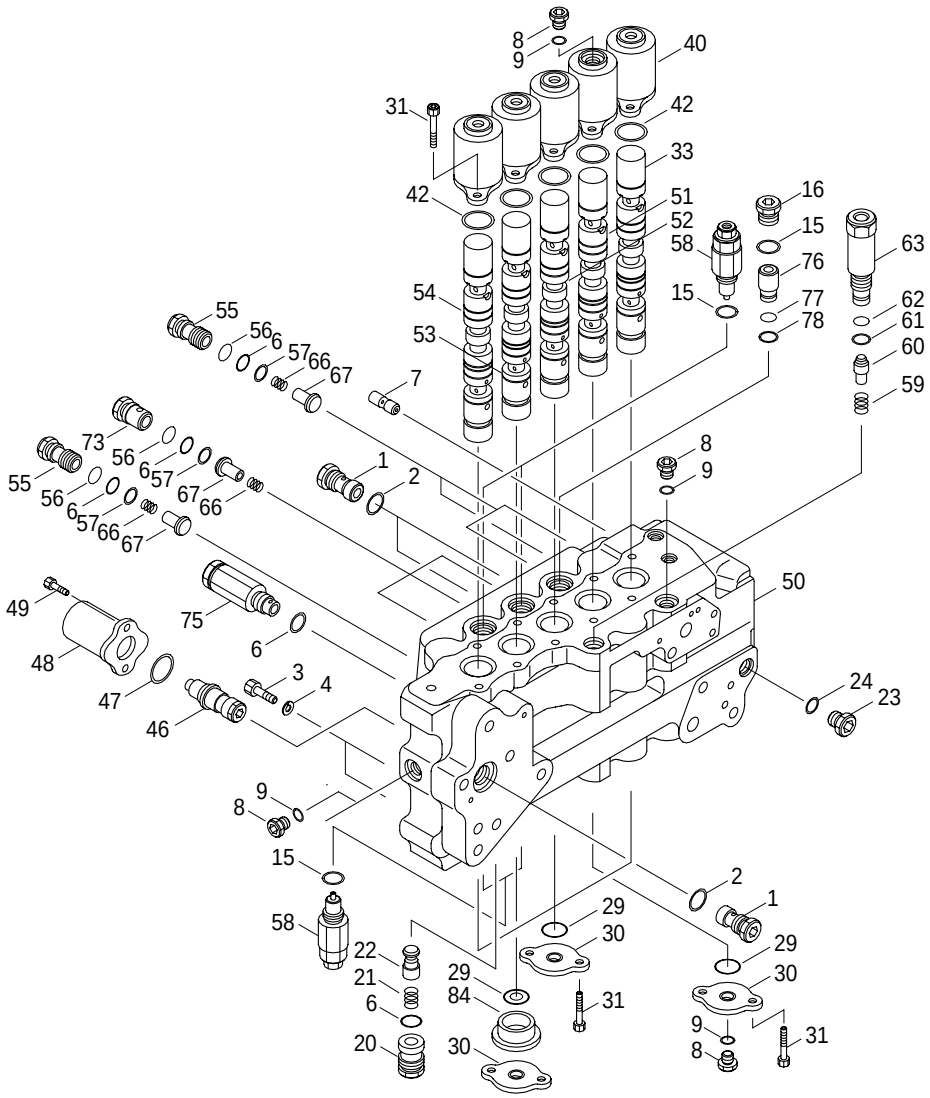
GROUP 2 MAIN CONTROL VALVE

1. STRUCTURE(1/2)



1	Cap	14	Cap	26	O-ring
2	O-ring	15	O-ring	27	O-ring
3	Socket bolt	16	Cap	28	Housing
4	Spring washer	17	Spring	29	O-ring
6	O-ring	18	Spring guide	30	Retainer
7	Orifice	19	Spool	31	Socket bolt
8	Cap	20	Cap	32	Plunger assy(TS)
9	O-ring	21	Spring	33	Plunger assy(TL, TR)
10	Cover	22	Check	34	Plunger assy(SW)
11	Socket bolt	23	Cap	35	Plunger assy(BM2)
12	Piston	24	O-ring	36	Plunger assy(AM1)
13	Sleeve	25	O-ring	37	Cover assy

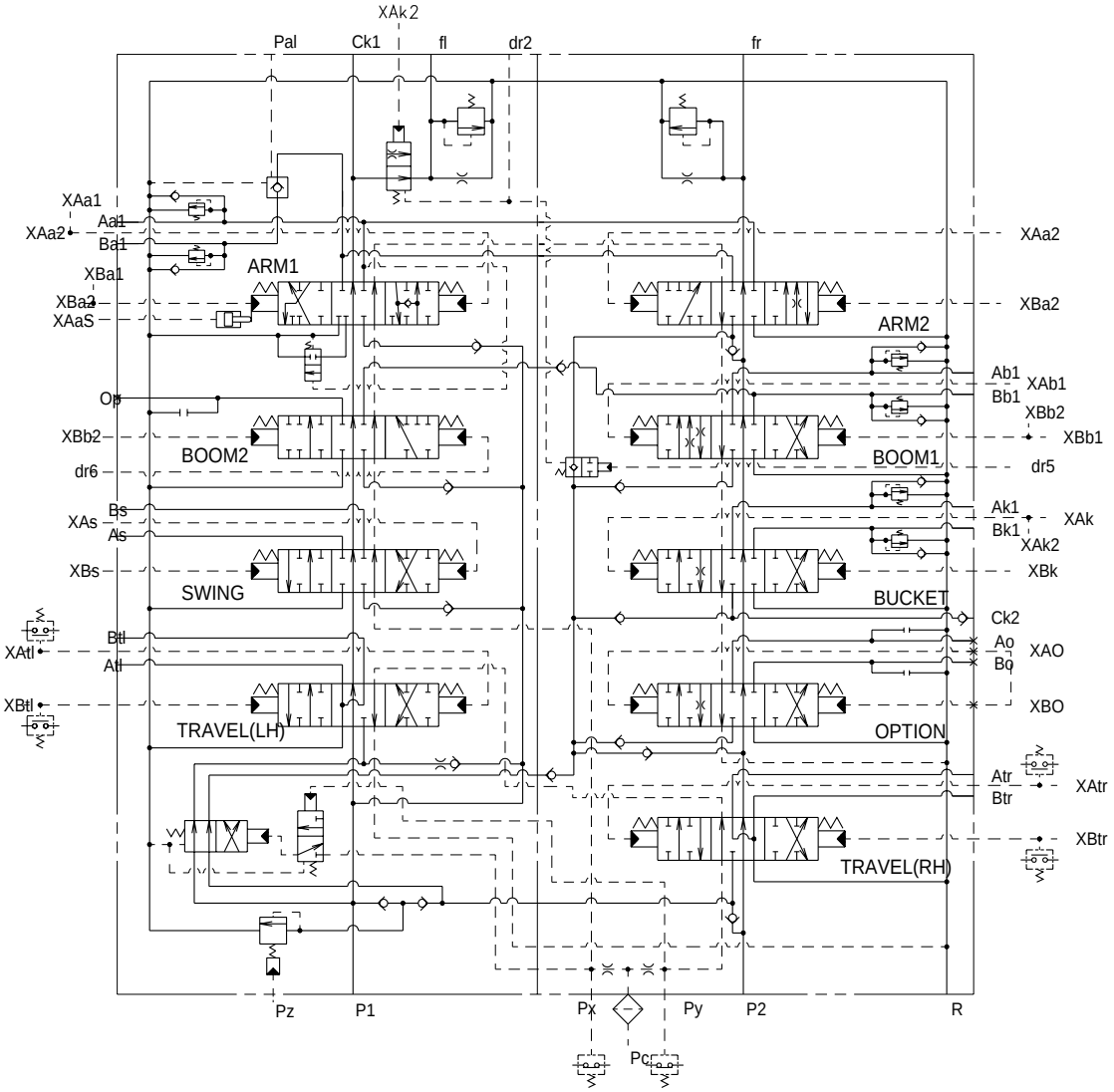
STRUCTURE(2/2)



38	Spring	55	Cap	70	Piston
39	Poppet	56	Back up ring	71	O-ring
40	Cover	57	Nylon chip	72	Sleeve
42	O-ring	58	Overload assy	73	Cap
43	Cap	59	Spring	74	Cap
44	Spring	60	Check	75	Foot relief assy
45	Spool	61	O-ring	76	Plug
46	Spool	62	Back up ring	77	Back up ring
47	O-ring	63	Cap	78	O-ring
48	Cover	64	Main relief assy	79	Cap
49	Socket bolt	65	Cap	80	Spacer
50	Housing	66	Spring	81	Check
51	Plunger assy(OPT)	67	Check	82	Spring
52	Plunger assy(BKT)	68	Spacer	83	Spool
53	Plunger assy(BM1)	69	Cover	84	Stopper
54	Plunger assy(AM2)				

2. FUNCTION

1) HYDRAULIC CIRCUIT



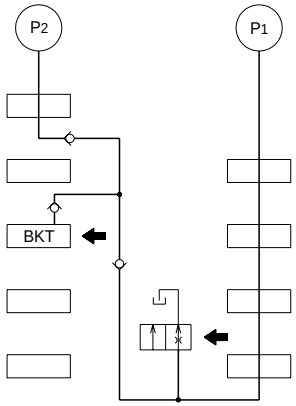
2) BASIC OPERATION

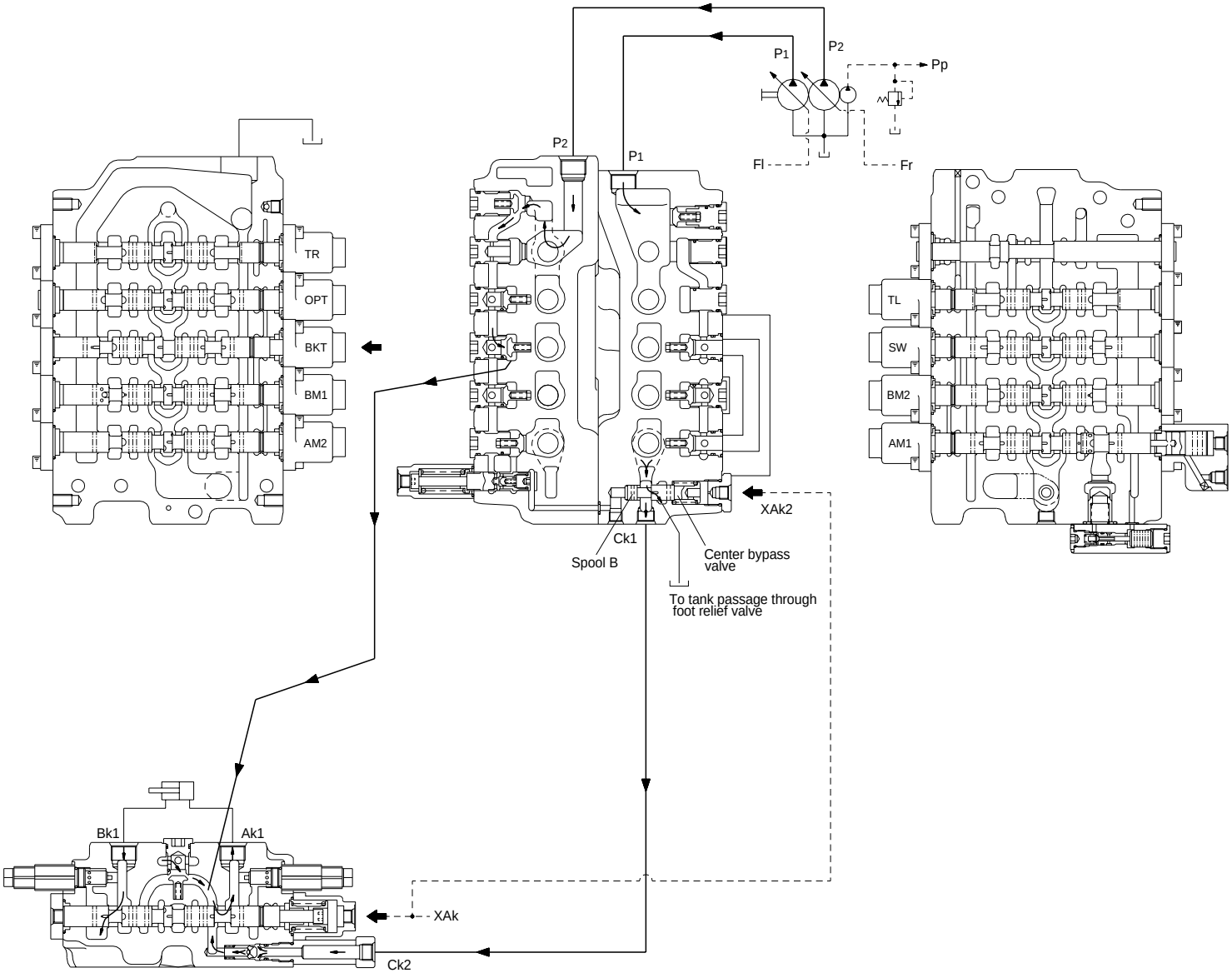
(1) Bucket flow summation circuit

Oil from pump P2 is fed into cylinder port Ak1 by adding pressure to bucket plunger pilot port XAk and the oil from actuator flow tank through cylinder port Bk1.

The center bypass valve is changeover by the pilot pressure XAk2 and the oil from center bypass passage flows to the bucket summation port Ck2 via outside piping and some others flow into foot relief valve.

Then the oil from pump P1 is joins to the flow from the pump P2 via confluence passage.





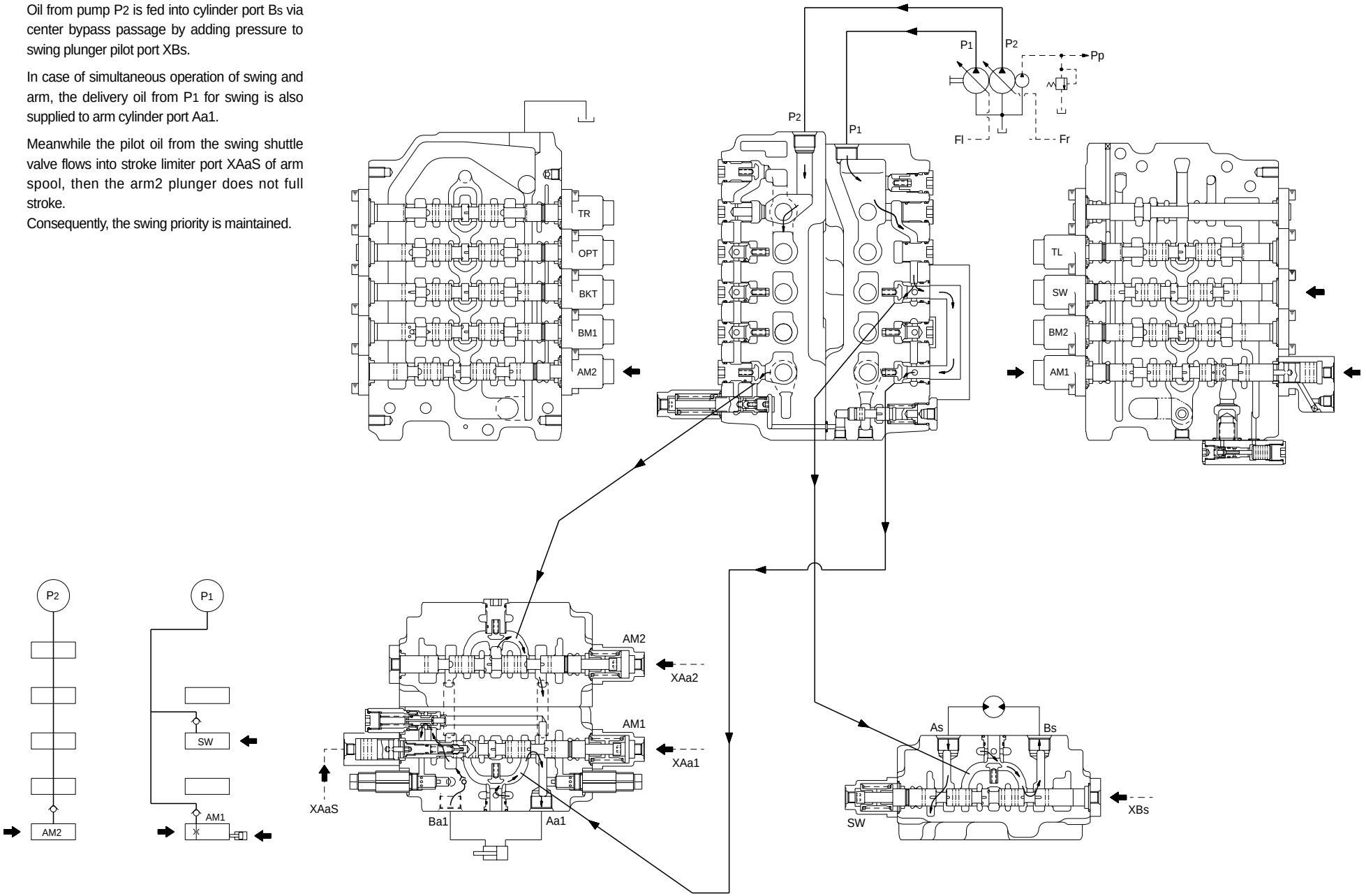
(2) Swing priority circuit

Oil from pump P2 is fed into cylinder port Bs via center bypass passage by adding pressure to swing plunger pilot port XBs.

In case of simultaneous operation of swing and arm, the delivery oil from P1 for swing is also supplied to arm cylinder port Aa1.

Meanwhile the pilot oil from the swing shuttle valve flows into stroke limiter port XAaS of arm spool, then the arm2 plunger does not full stroke.

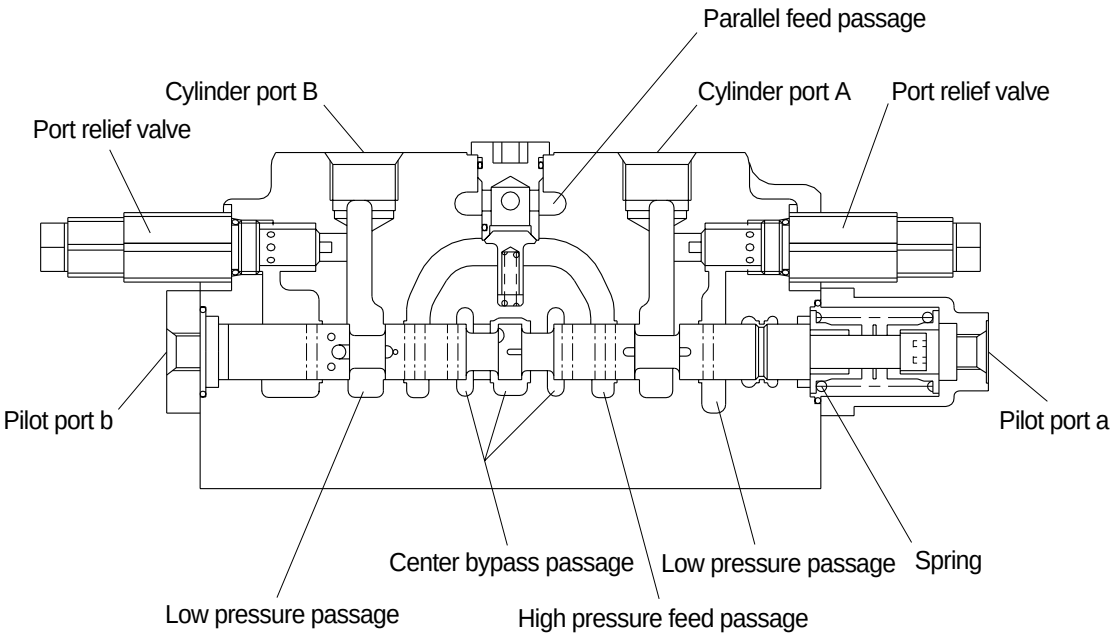
Consequently, the swing priority is maintained.



3) OPERATIONAL DESCRIPTION OF CONTROL VALVE

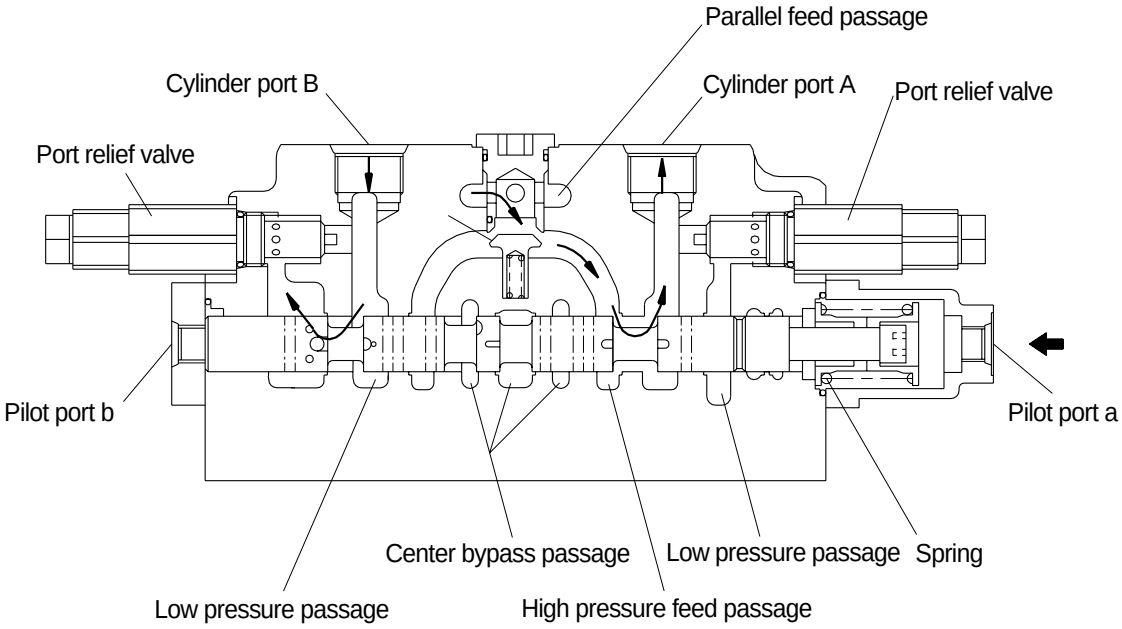
(1) Plunger operation

① Neutral position of plunger



In neutral, spring sets the plunger at the neutral position; the high pressure feed passage is shut off by the plunger; oil from the pump flows through the center bypass.

② Operation of plunger



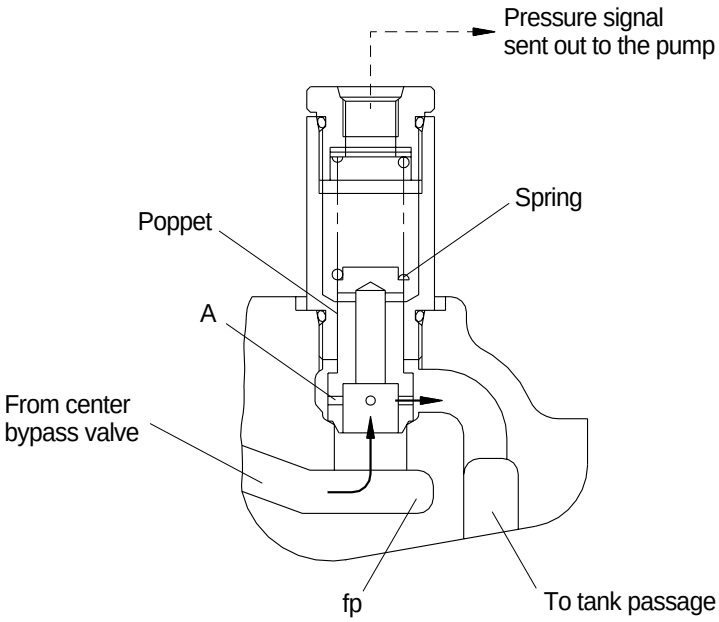
When actuated(pressure is applied to pilot port a), the plunger moves to the left, the center bypass is shut off; oil from the parallel feed passage opens the check valve C1 and flows into cylinder port A via the high pressure feed passage.

The return oil from cylinder port B flows into the tank via the low pressure feed passage.

※ Reversed when pressure is applied to pilot port b.

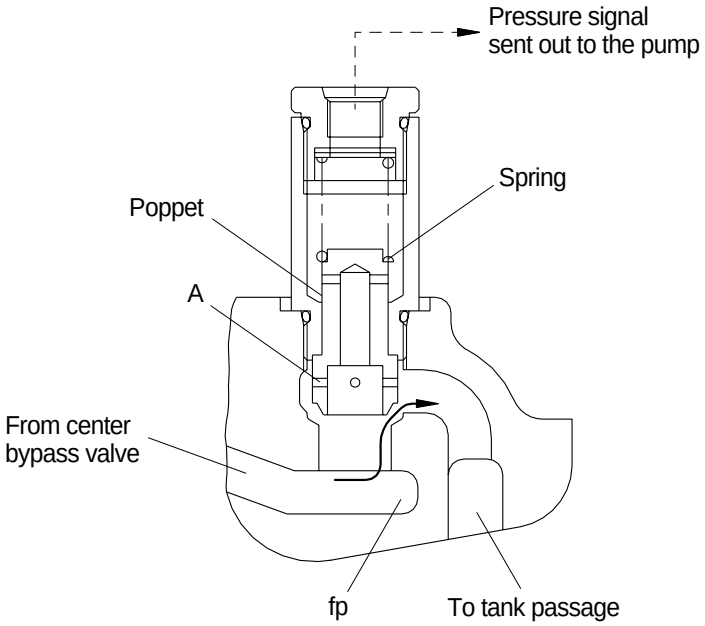
(2) Foot relief valve operation

① fp is lower than spring force



Oil from the center bypass valve flows into the tank via orifice(A) of poppet.
Pressure fp generated by orifice(A) is led to the pump, to control the pump delivery flow.

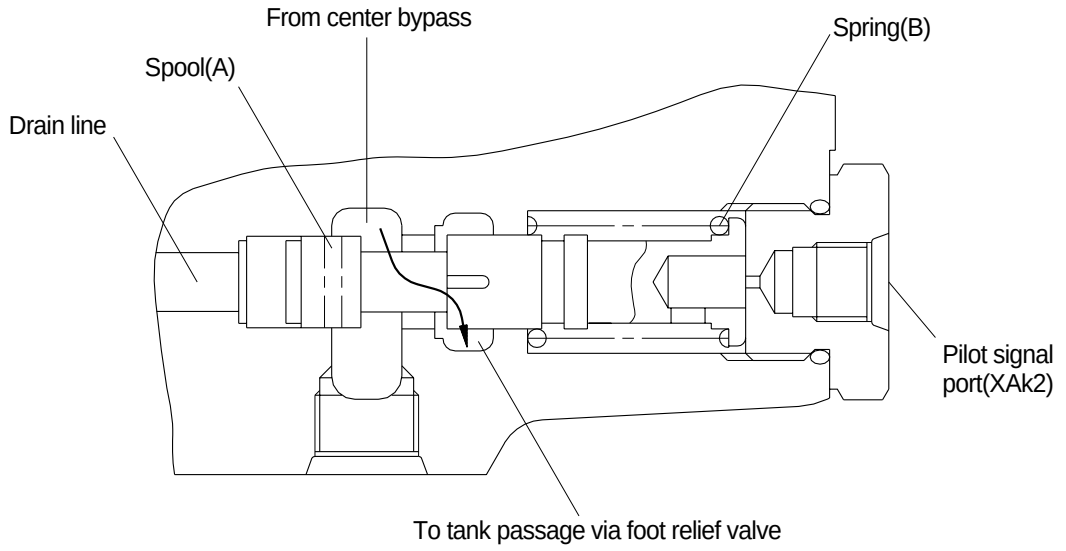
② fp is higher than spring force



If a large amount flows due to delayed pump response, etc., and pressure fp reaches the preset spring force, then the poppet is lifted and functions as a relief valve.

(3) Center bypass valve operation

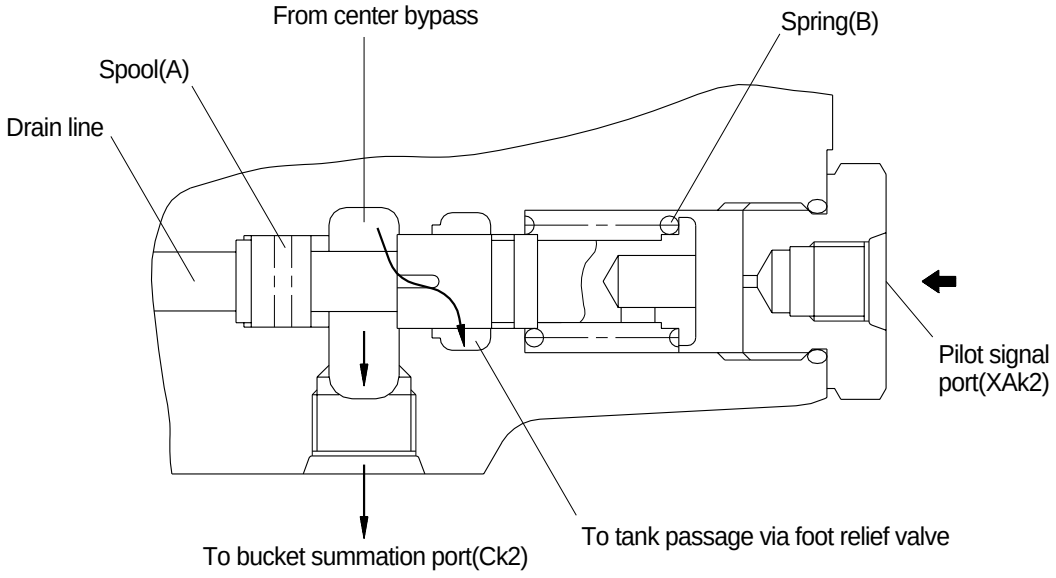
① Pilot pressure signal : OFF



Spring(B) sets spool(A) in position; oil from center bypass flows into the tank passage via the foot relief valve.

Pilot pressure signal : ON

②

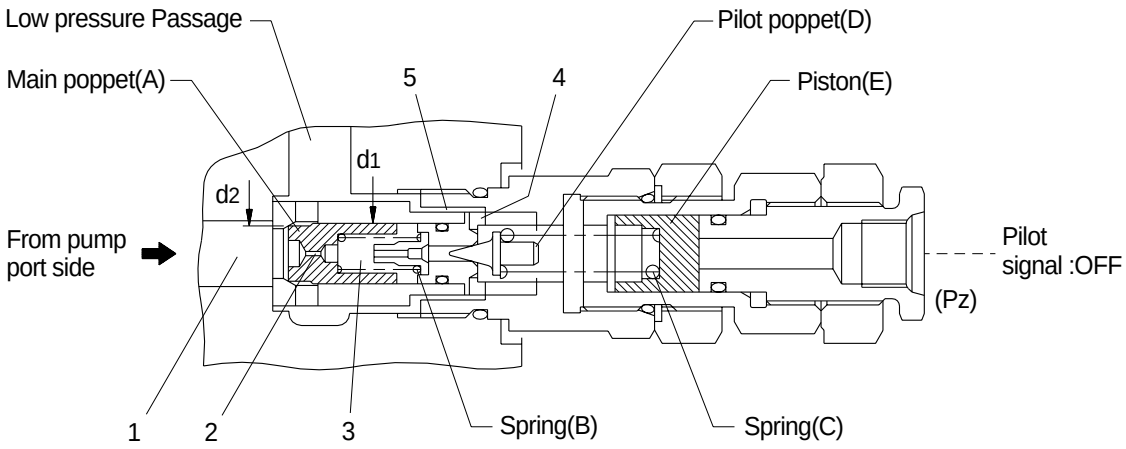


When pilot pressure reaches a preset spring force, the spool(A) moves left and orificed the flow to the foot relief valve.

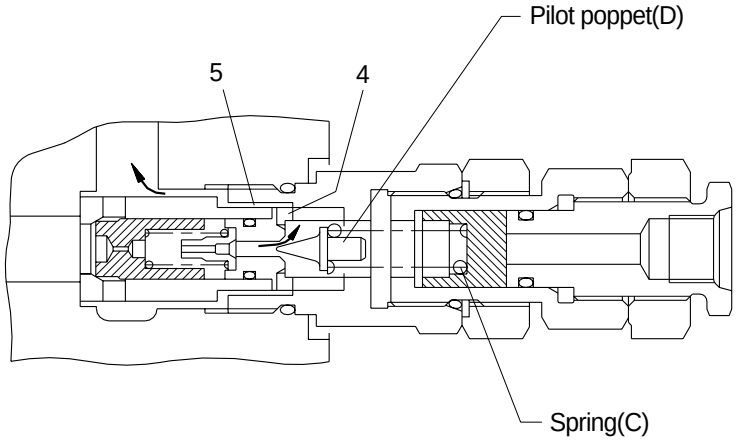
Then the oil from center bypass flow into bucket summation port Ck2 via out side piping.

(4) Main relief valve operation

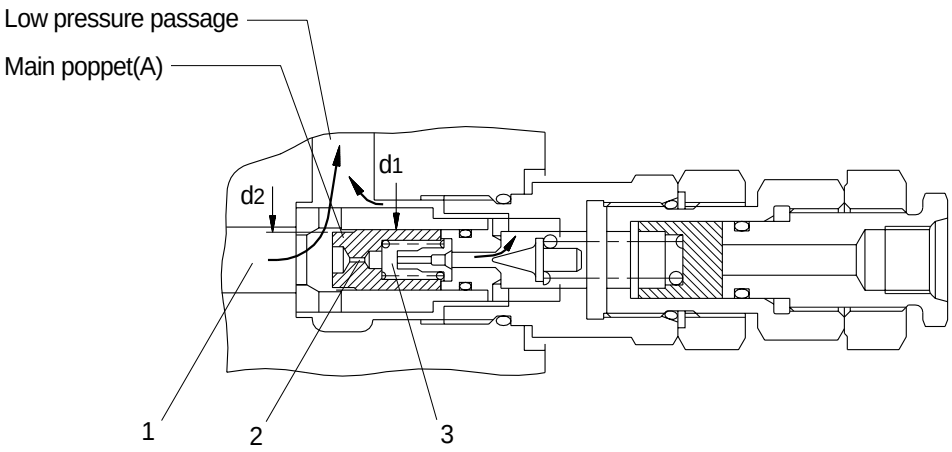
① High pressure setting pilot signal : OFF



A. This relief valve is built in between the pump port side(1) and low pressure passage.
Piston(E) is seated right end by spring(C).
Hydraulic oil from the pump port side enters chamber(3) via orifice(2) of main poppet(A). Because d2<d1, main poppet(A) is securely seated.

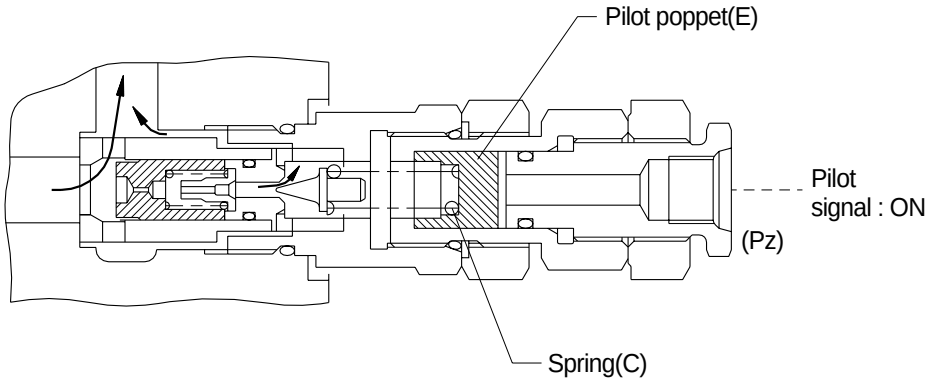


B. When hydraulic oil reaches the pressure preset by spring(C), pilot poppet(D) opens; oil flows around poppet(D) and into the low pressure passage via side hole(4) and passage(5).



C. When the above oil flow is formed, pressure drops before and behind orifice(2); when pressure of chamber(1) x area d_2 is large than pressure of chamber(3) x area d_1, main poppet(A) is opened and hydraulic oil flows into the low pressure passage.

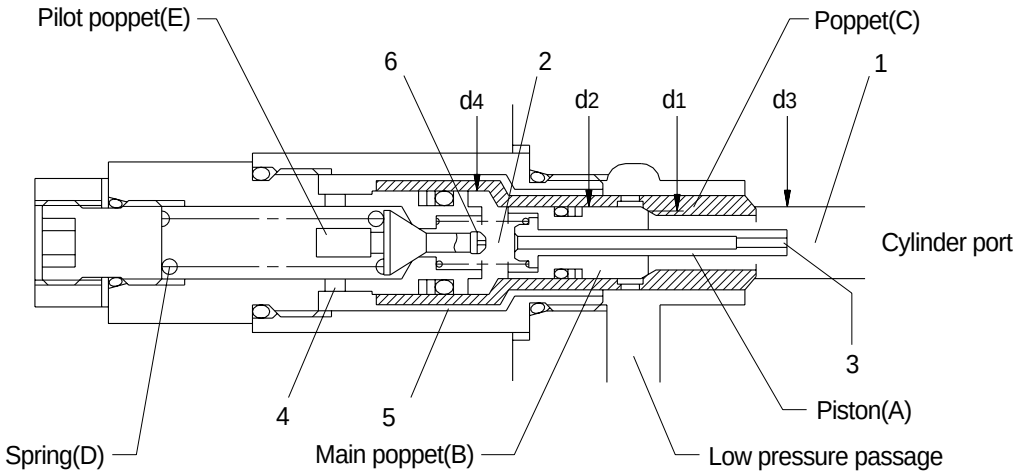
② High pressure setting pilot signal : ON



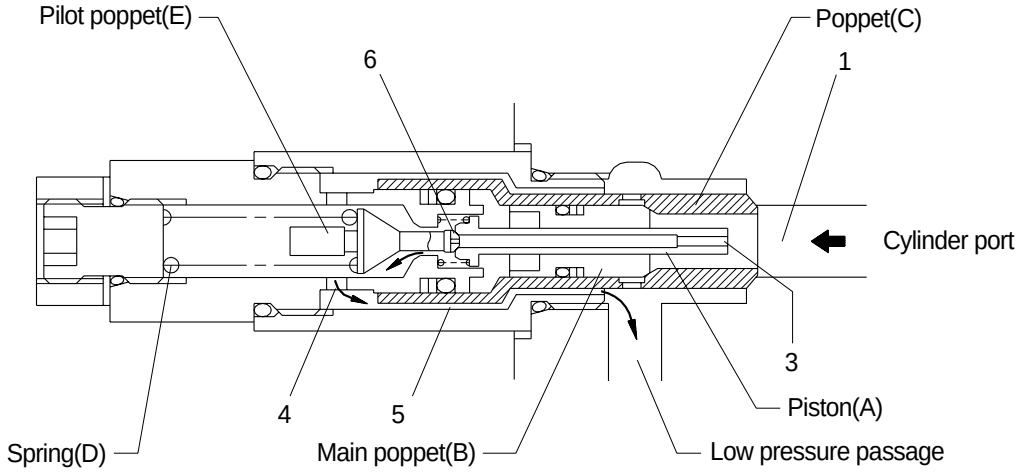
Piston(E) move to left by high pressure setting pilot signal; set pressure of spring(C) rises, making high pressure setting.

(5) Overload relief valve operation

① Overload working operation



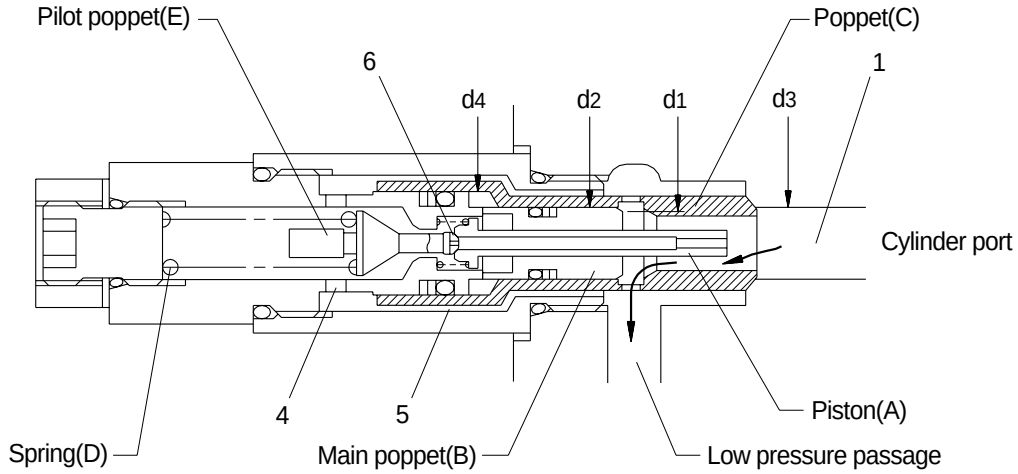
A. Hydraulic oil from cylinder port enters chamber(2) via orifice(3) of piston(A). Because $d_1<d_2$ and $d_3<d_4$, main poppet(B) and poppet(C) are securely seated.



B. When hydraulic pressure reaches the preset force of spring(D), pilot poppet(E) opens; oil flows around pilot poppet(D) and into the low pressure passage via side hole(4) and passage(5).

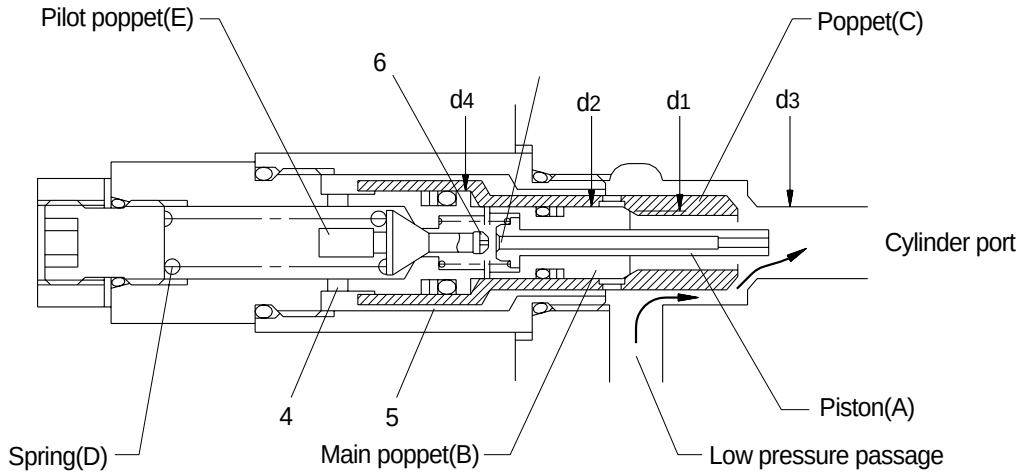
C. Oil flow is formed; pressure drops before and behind orifice(3); piston(A) moves to left and seats at the tip of pilot poppet(E).

D. Hydraulic oil from chamber(1) enters chamber(2) via throttle(6) at the tip of pilot poppet(E); it flows into the low pressure passage via side hole(4) and passage(5).



E. Pressure drops before and behind throttle(6), making pressure of chamber(1) x area d_1>pressure of chamber(2) x area d_2; main poppet(B) is opened and hydraulic oil flows into the low pressure passage.

② Make up operation

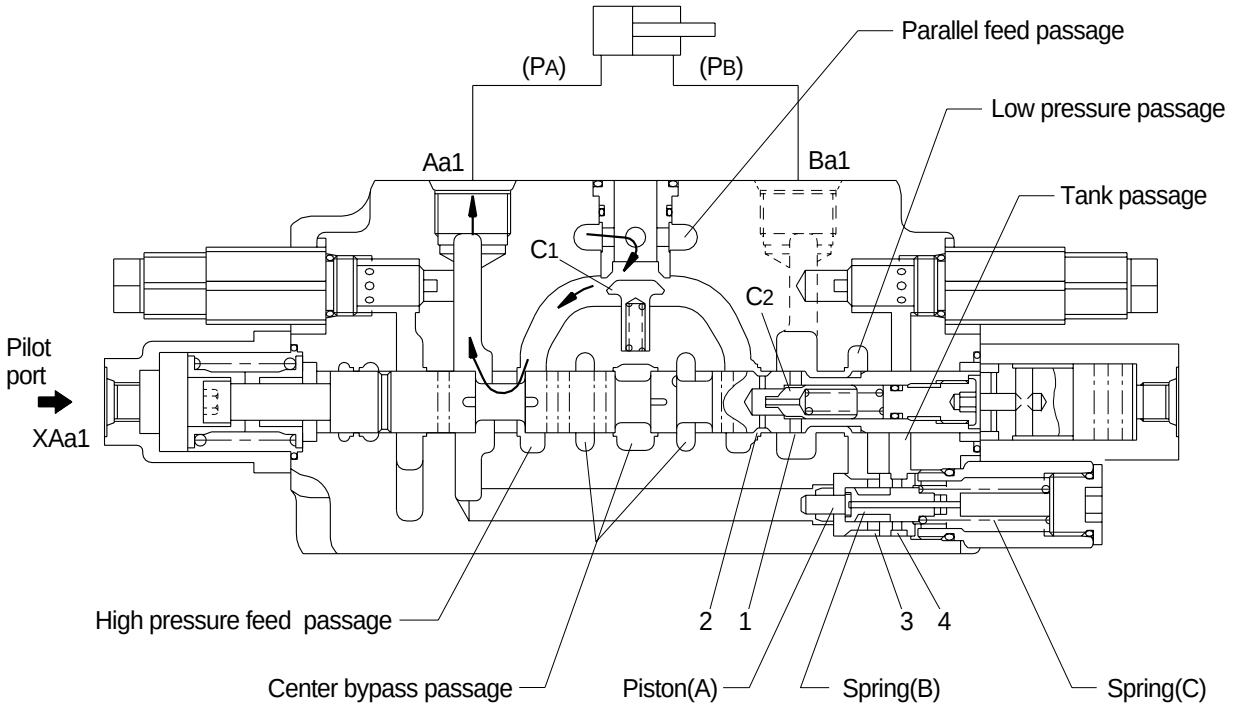


A. Poppet(C) is securely seated because the cylinder port pressure is normally higher than the tank pressure and $d_3 < d_4$.

B. When the cylinder port pressure drops(closer to negative pressure) until the cylinder port pressure is lower than the tank pressure, poppet(C) opens receiving the tank pressure for the difference in area between d_3 and d_4; oil flows from the low pressure passage(tank passage) to the cylinder port in order to prevent cavitation.

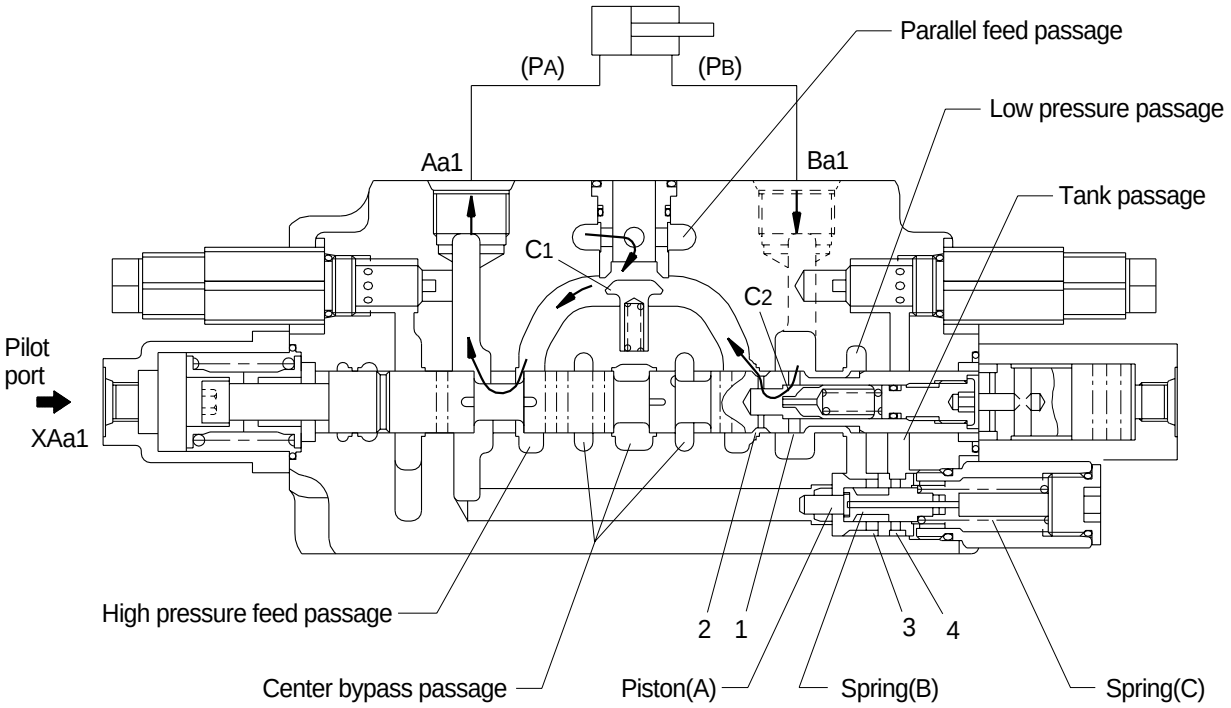
(6) Arm regeneration operation

① Arm operation



When pressure is applied to pilot port XAa1 of the arm plunger, the plunger moves to right as shown; the center bypass passage is shut off; oil from the parallel feed passage opens check valve(C1) and flows into cylinder port Aa1(head side) via the high pressure feed passage.

② **P_B is higher than P_A**



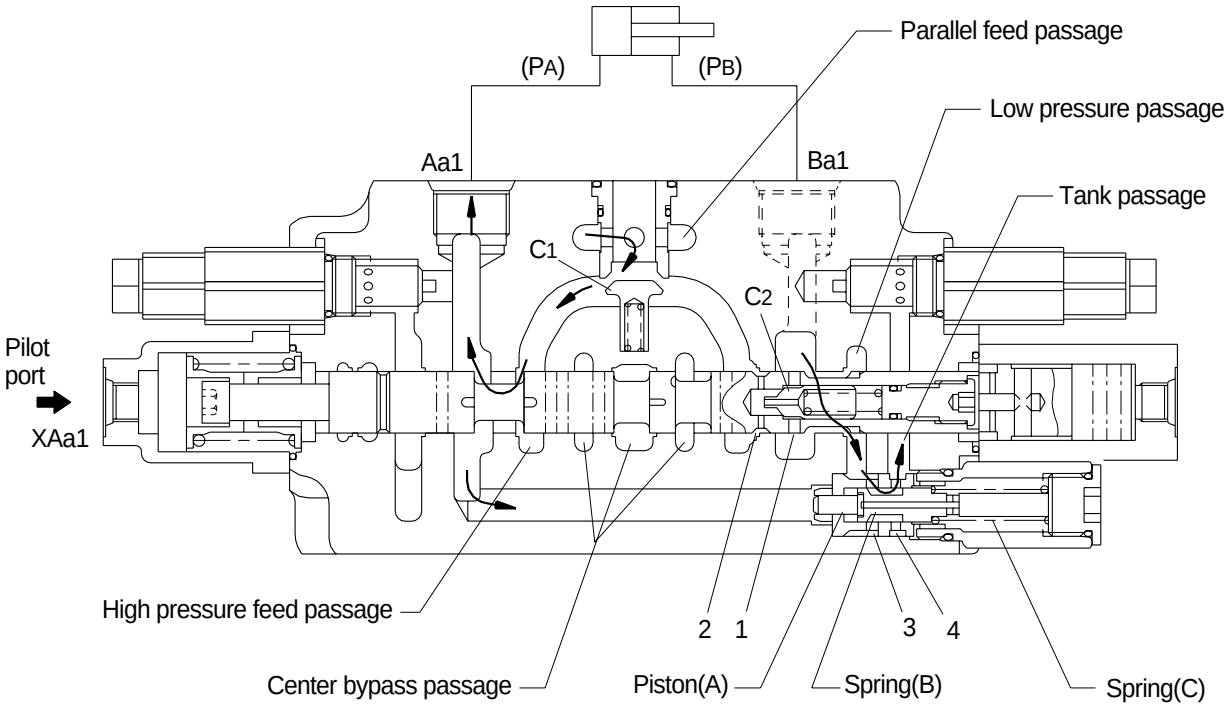
P_A : Pressure of cylinder head side.

P_B : Pressure of cylinder rod side.

Return oil from cylinder rod side opens check valve(C_2) in the plunger; it flows into cylinder head side after returning to the high pressure feed passage via passage(1) and (2) in the plunger.

At this time, the regeneration selector spool(B) is at the shown position; as passage(3) is shut off from passage(4) return oil from cylinder rod side does not flow into the tank passage.

③ P_A is higher than P_B

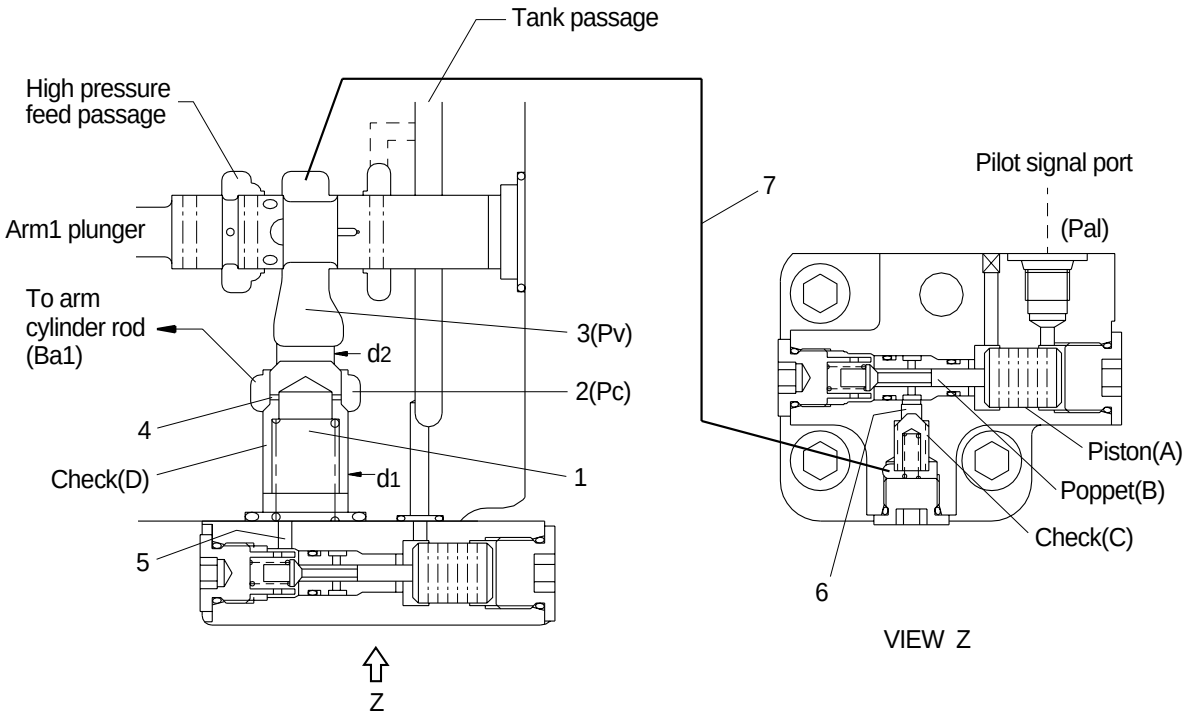


Return oil from cylinder rod side is shut off by check(C_2) in the plunger and passage(2) is blocked from passage(1).

When pressure P_A rises higher than the preset pressure of spring(C) and pushes piston(A) in the regeneration selector to right as shown; spool(B) move to right; passage(3) and passage(4) are connected; return oil from cylinder rod side flows into tank passage via low pressures passage, passage(3) and passage(4).

(7) Arm holding valve operation

① **When the plunger is in neutral** (Pal pilot signal : OFF)

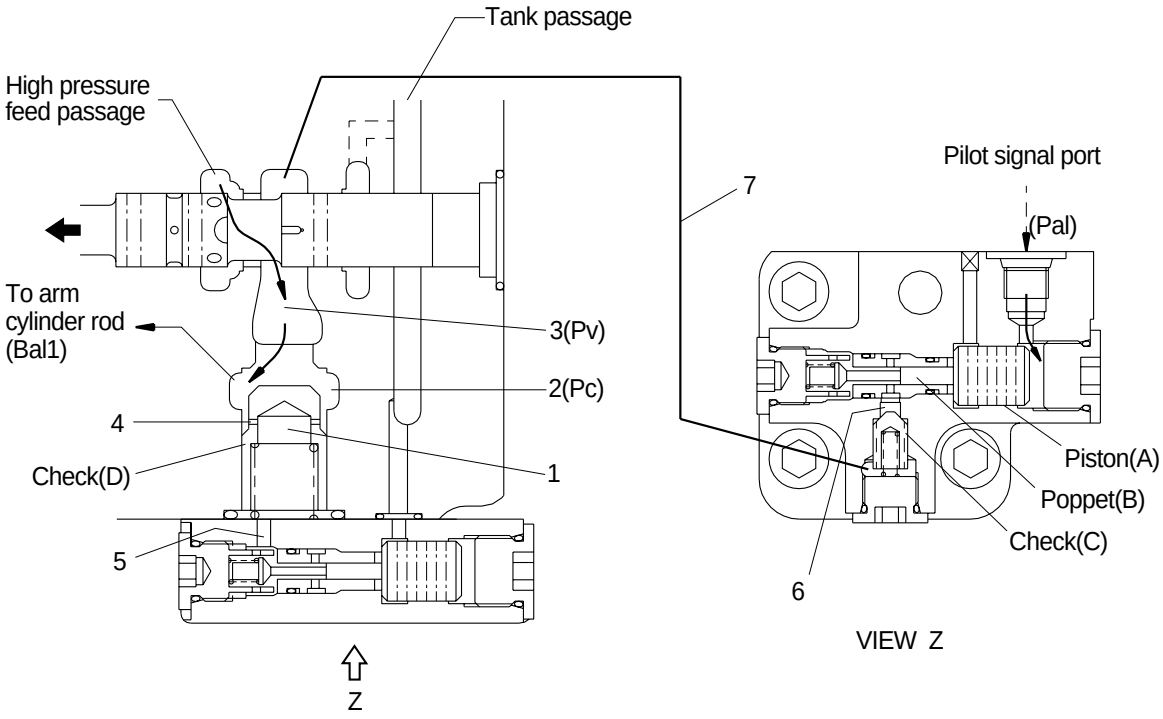


Piston(A) and poppet(B) are in the status as shown; passages(5) and (6) are shut off by poppet(B).
Therefore, the pressure of chamber(1) becomes pressure Pc as it is connected with chamber(2) via orifice(4).
Since $d_1 > d_2$, check(D) is seated and chambers(2) and (3) are completely blocked.

② **When the plunger is in operation** (Pal pilot signal : ON)

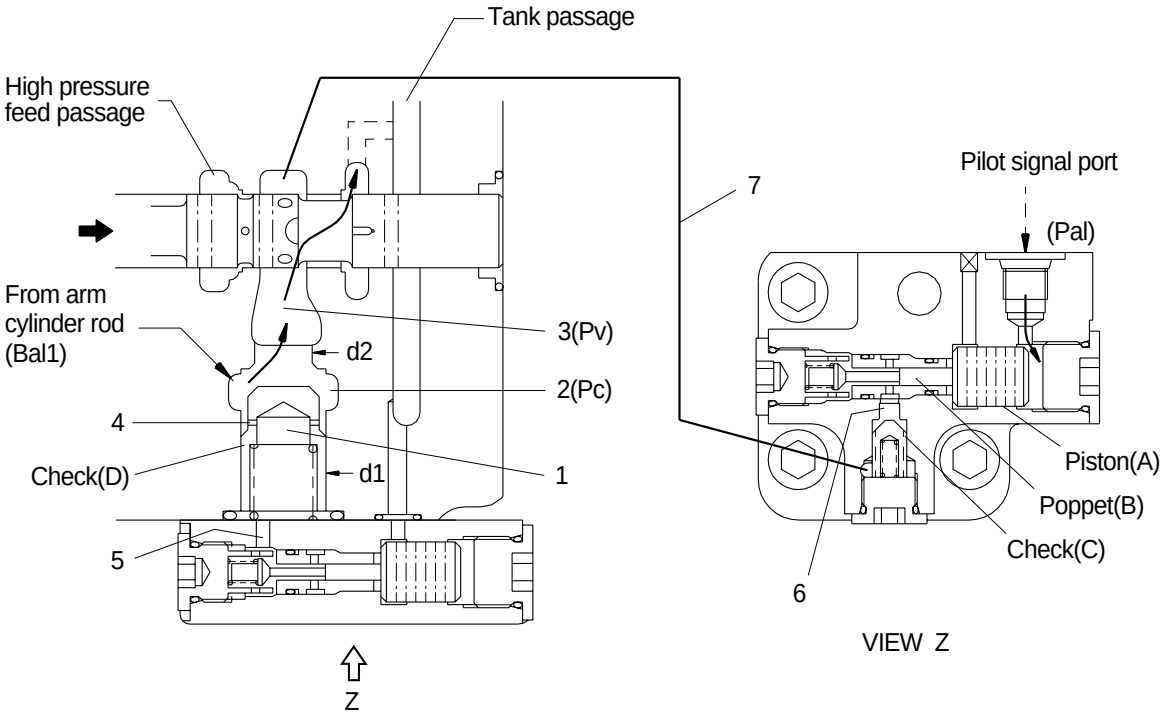
· **If Pv is higher than Pc**(in the case of arm out)

When the pressure of pilot signal enters, piston(A) moves to left and poppet(B) opens; passage(5) and (6) are connected.



Because check valve(C) is seated by pressure Pv via passage(7), passages(6) and (7) are shut off. Therefore, the pressure of chamber(1) becomes Pc as it is connected to chamber(2) via orifice(4); poppet(D) is opened; oil from high pressure feed passage flows into the cylinder rod side.

· **If Pc is higher than Pv**(in the case of arm in operation)



When the pressure of pilot signal enters, piston(A) moves to left and poppet(B) opens; passages(5) and (6) are connected.

If pressure Pc of cylinder port chamber(2) is higher than pressure Pv of chamber(3) (in the case of arm in operation) oil from chamber(1) pushes up check valve(C) via passages(5) and (6) and enters chamber(3) through passage(7). Chamber(3) is connected with the tank passage because the arm plunger is moved to right. Therefore, pressure Pc is applied to(area d1- area d2), pushing open poppet(D), and return oil from the cylinder rod side flows into the tank passage.