GROUP 4 MAIN CONTROL VALVE

1. REMOVAL AND INSTALL

1) REMOVAL

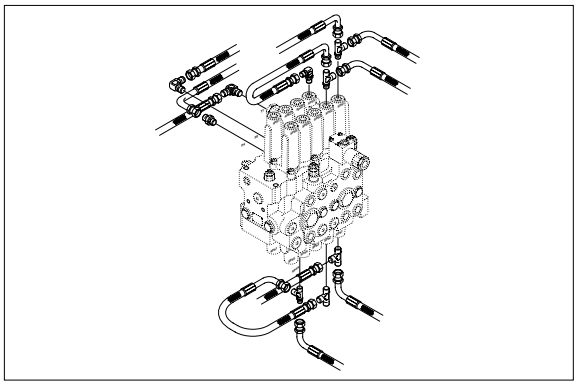
(1) Lower the work equipment to the ground and stop the engine.

(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

(3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

⚠ Escaping fluid under pressure can penetrate the skin causing serious injury.

※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.



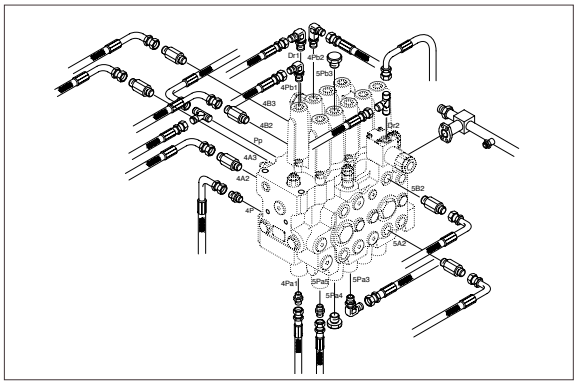
(4) Remove bolts and disconnect pipe.

(5) Disconnect pilot line hoses.

(6) Disconnect pilot piping.

(7) Sling the control valve assembly and remove the control valve mounting bolt.

· Weight : 62kg(137lb)



(8) Remove the control valve assembly.

※ When removing the control valve assembly, check that all the piping have been disconnected.

2) INSTALL

(1) Carry out installation to the reverse order of removal

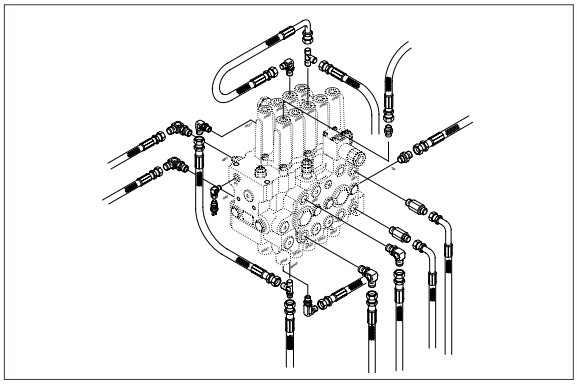
(2) Bleed the air from below items.

① Cylinder(Boom, arm, bucket)

② Swing motor

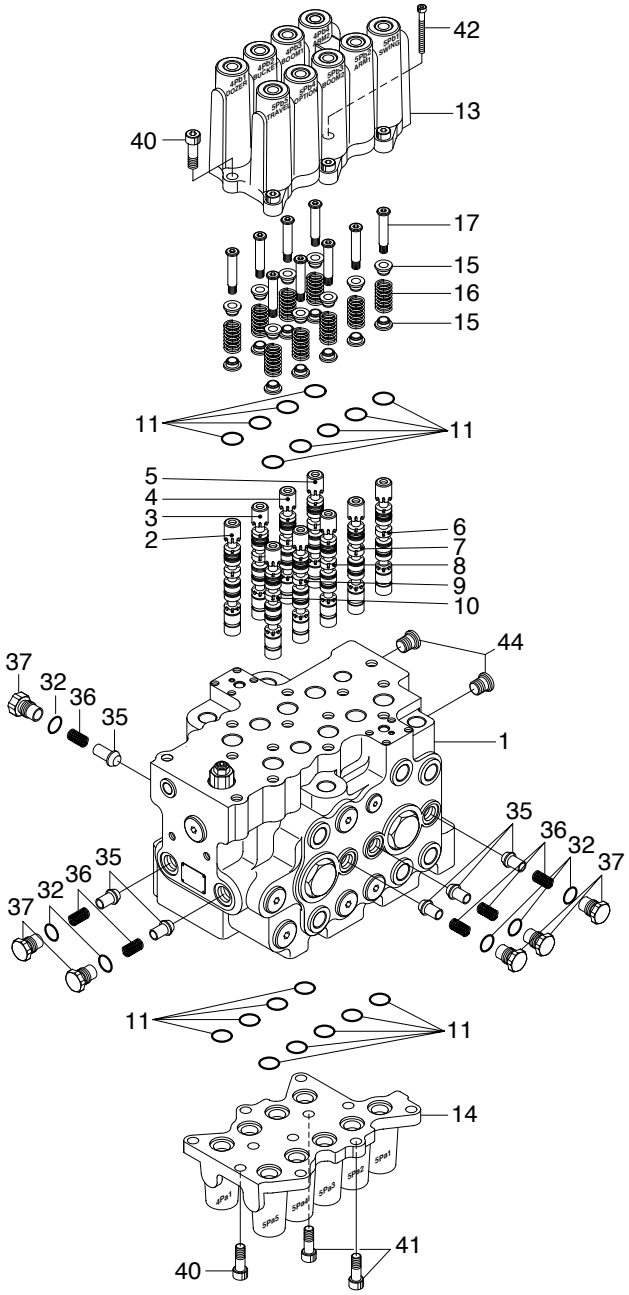
③ Travel motor

※ See each item removal and install



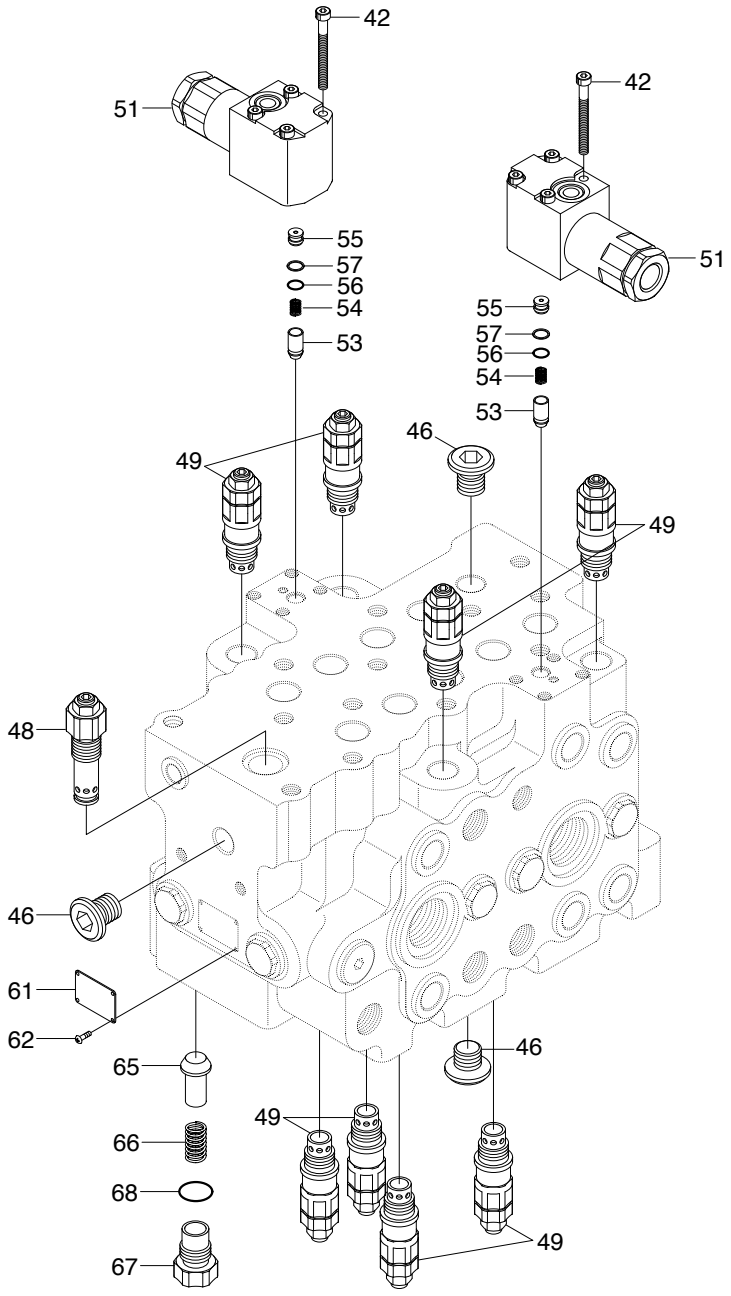
(3) Confirm the hydraulic oil level and recheck the hydraulic oil leak or not.

2. STRUCTURE(1/3)



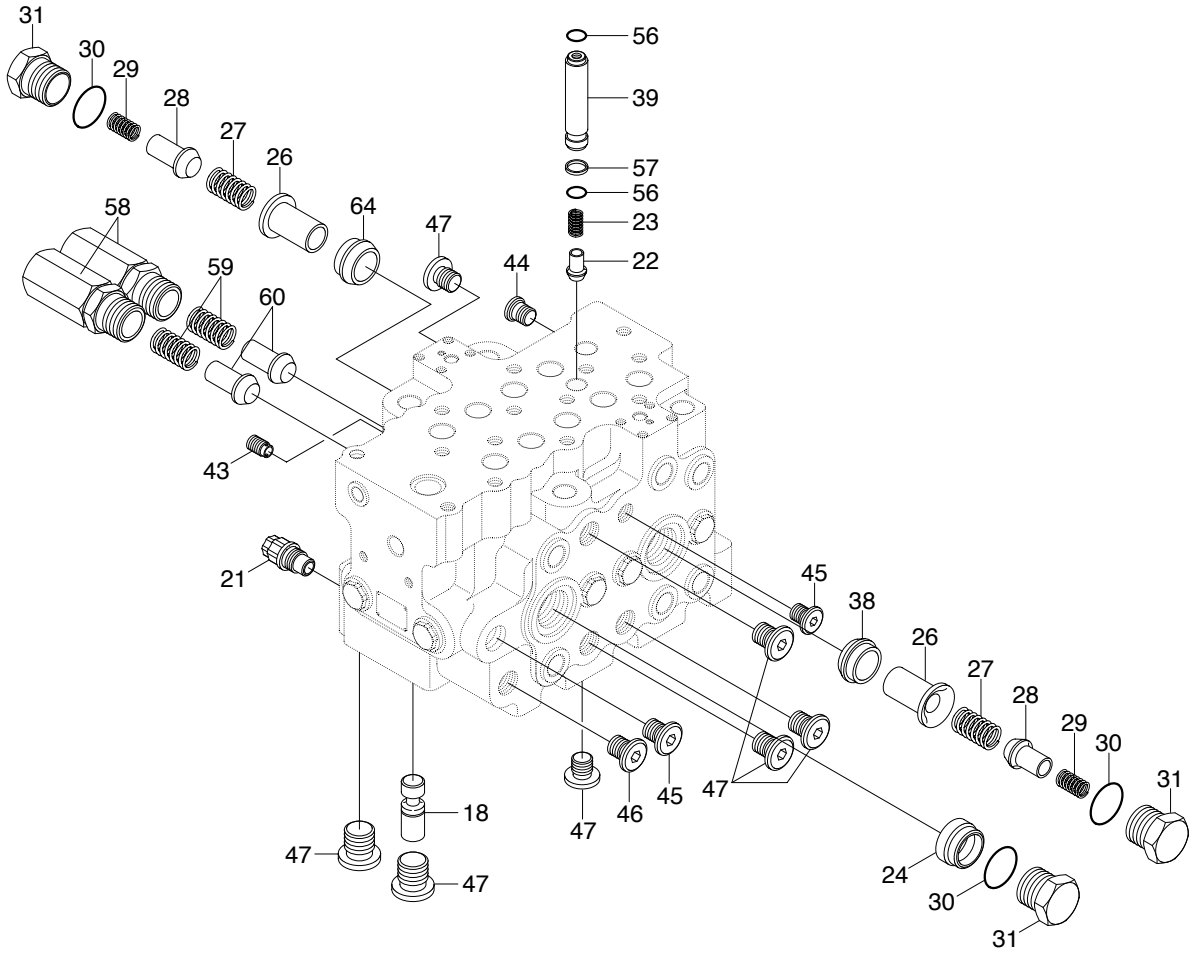
1	Housing valve	9	Service spool	32	O-ring
2	Dozer spool	10	Travel spool	35	Poppet
3	Bucket spool	11	O-ring	36	Spring
4	Boom1 spool	13	Cap	37	Plug
5	Arm2 spool	14	Cap	40	Socket head bolt
6	Swing spool	15	Spring seat	41	Socket head bolt
7	Arm1 spool	16	Spring	42	Socket head bolt
8	Boom2 spool	17	Spool end	44	Plug assembly

STRUCTURE(2/3)



42	Socket head bolt	54	Spring	62	Screw drive
46	Plug assembly	55	Spacer	65	Poppet
48	Relief valve kit	56	O-ring	66	Spring
49	Relief valve kit	57	Back up ring	67	Plug
51	Anti-drift valve assembly	61	Name plate	68	O-ring
53	Poppet				

STRUCTURE(3/3)



18	Spacer	29	Spring	46	Plug assembly
21	Plug assembly	30	O-ring	47	Plug assembly
22	Poppet	31	Plug	56	O-ring
23	Spring	38	Sleeve	57	Back up ring
24	Spacer	39	Plug	58	Check valve
26	Poppet	43	Plug	59	Spring
27	Spring	44	Plug assembly	60	Poppet
28	Poppet	45	Plug assembly	64	Sleeve

3. DISASSEMBLY

1) PRECAUTION

(1) Handle the components carefully not to drop them or bump them with each other as they are made with precision.

(2) Do not force the work by hitting or twisting as burred or damaged component may not be assembled or result in oil leakaged or low performance.

(3) When disassembled, tag the components for identification so that they can be re-assembled correctly.

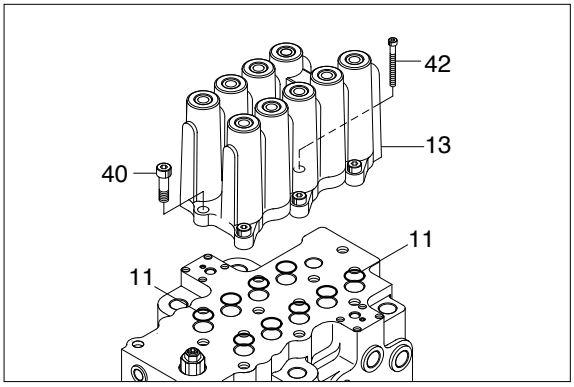
(4) Once disassembled, O-rings and backup rings are usually not to be used again. (Remove them using a wire with its end made like a shoehorn. Be careful not to damaged the slot.)

(5) If the components are left disassembled or half-disassembled, they may get rust from moisture or dust. If the work has to be interrupted, take measures to prevent rust and dust.

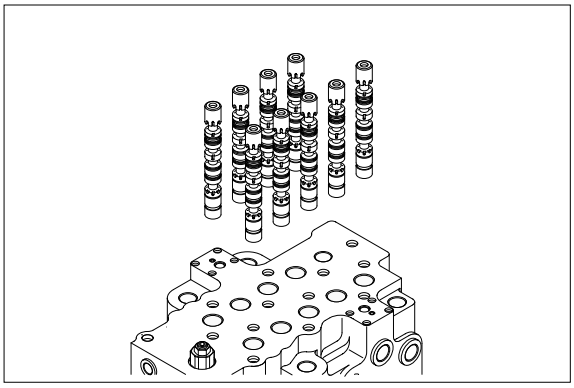
2) PROCEDURE

(1) Disassembly of spool part

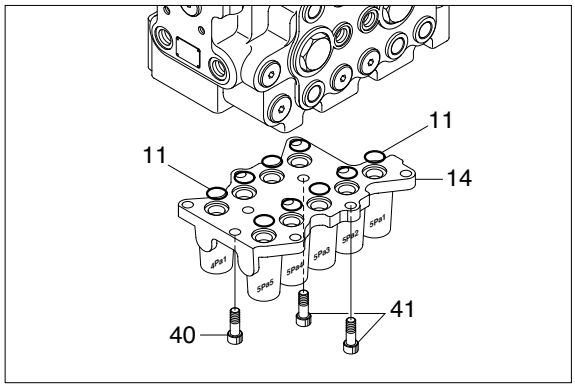
① Loosen socket head bolts(40,42) and disassemble lock cap(13).
Pull out O-ring(11) from hole of cap.



② Disassemble all spool of subassembly itself from valve housing.
Be careful not to damage while pulling out spool.
Identify them with a tag to prevent from being mistaken at disassembly.

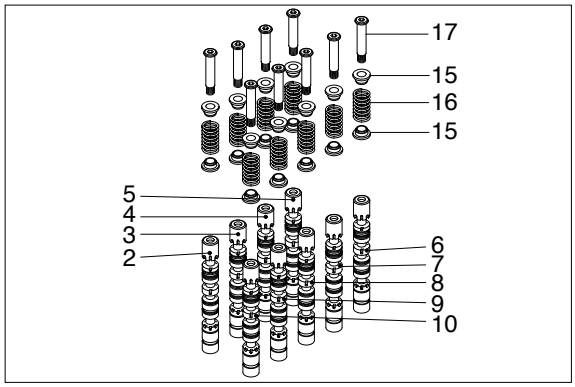


③ Loosen socket head bolt(40,41) and disassemble short cap(14).
Pull out O-ring (11) from hole of cap.

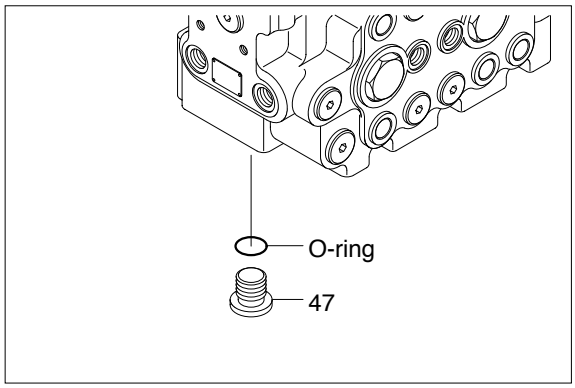


④ Loosen spool end(17) from spool(2~10), and then disassemble spring seat(15) and spring (16).

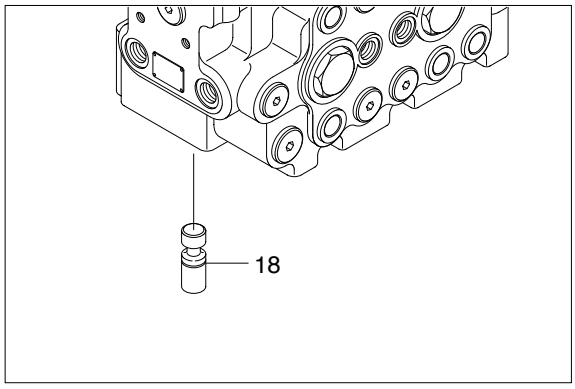
※ When disassemble spool assembly, fix the spool with vise. On this occasion, attach wood between vise blades to prevent spool from damaging.
Heat outer face of spool end to loosen screw easily with industrial drier. (Temperature : 200~250 ℃).



⑤ Loosen plug assy(47) and remove O-ring from plug.



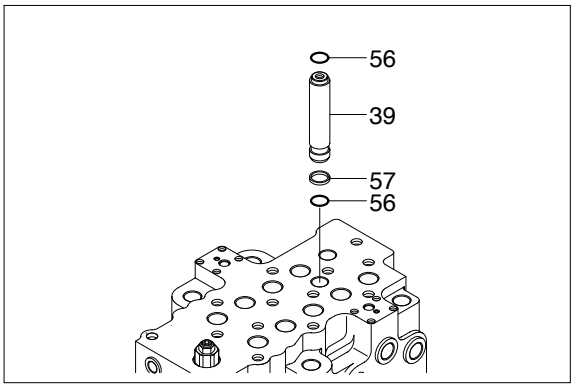
⑥ Remove the sleeve(18).



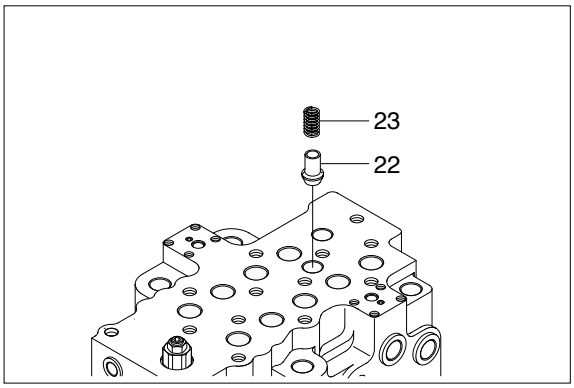
(2) Disassembly of parts between cap and valve housing

Port 5B2 of arm

① Disassemble O-ring(56) and plug(39) with screw(M6×1).
Disassemble O-ring(56) and backup ring (57) from plug(39).



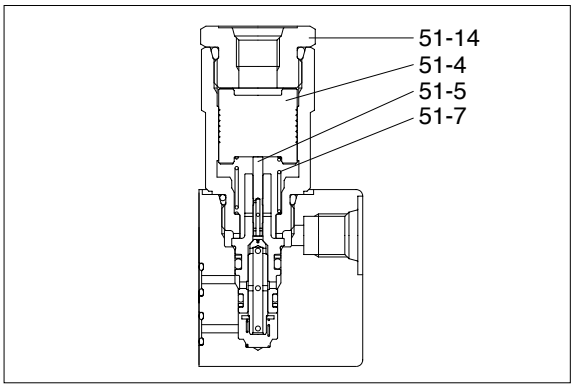
② Disassemble spring(23) and poppet(22).



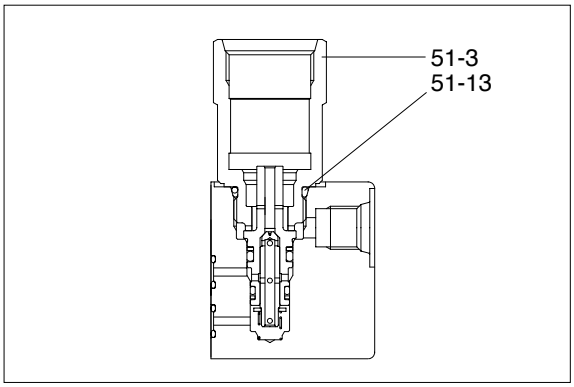
(3) Disassembly of antidrift valve(Boom and arm)

① Loosen plug assy(51-14) and disassemble O-ring.

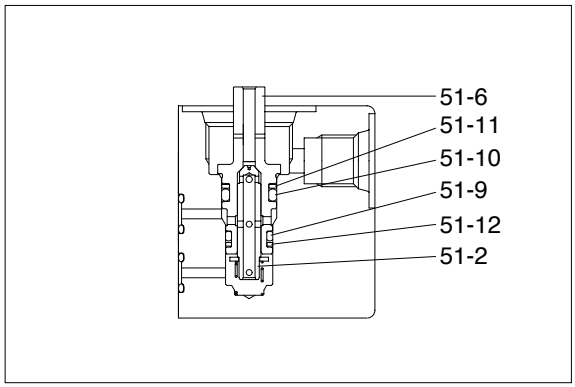
② Pull out the piston(51-4), spool and(51-5) and spring(51-7)



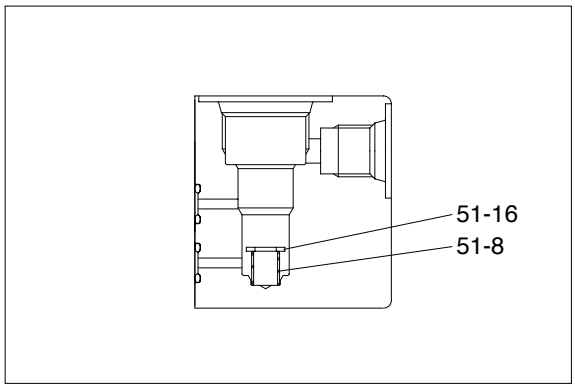
③ Loosen plug(51-3) and then disassemble O-ring(51-13).



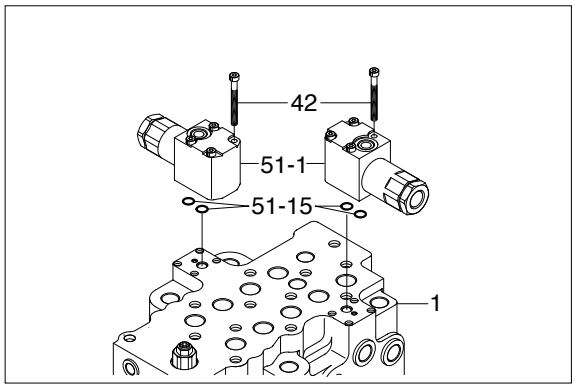
④ Disassemble poppet(51-2) and sleeve (51-6).
Disassemble O-rings(51-9, 51-10) and backup rings(51-11, 51-12) from sleeve.



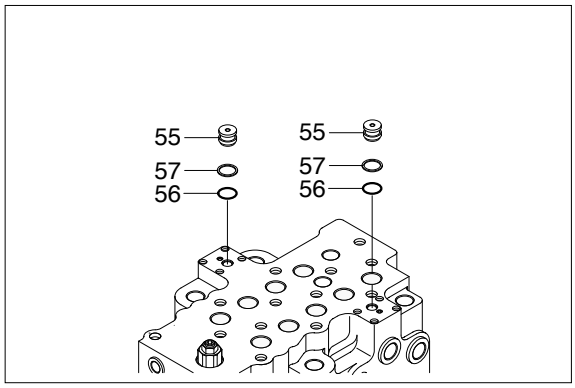
⑤ Pull out spring seat(51-16) and spring (51-8) from hole inside.



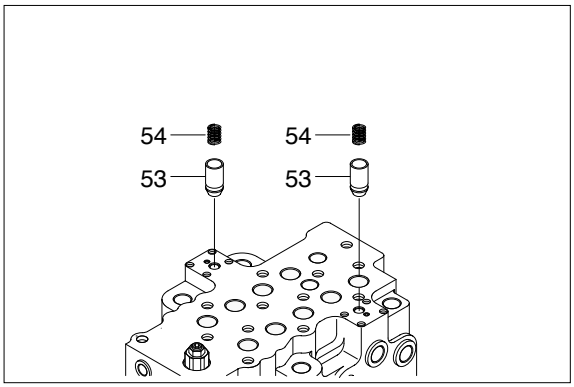
⑥ Loosen socket head bolts(42, 4 places), and then disassemble body(51-1) from valve housing(1).
Disassemble O-ring(51-15, 2 places) of mating face.



⑦ Disassemble spacer(55) with a screw (M4×0.7) from the valve housing.
Disassemble O-ring(56) and back up ring (57).

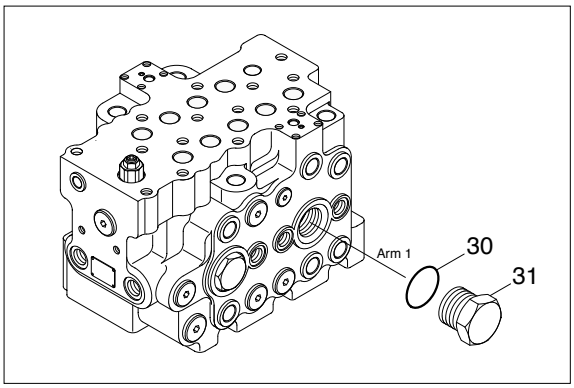


⑧ Disassemble spring(54) and poppet(53).

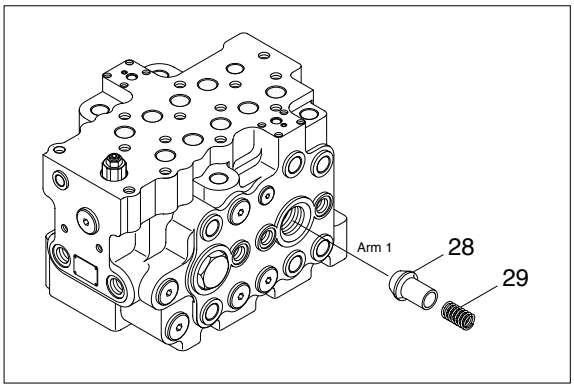


(4) Disassembly load check

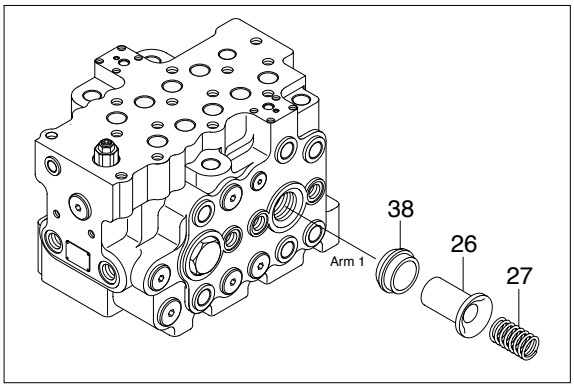
① Disassemble the plug(31) of arm1 load check and then disassemble O-ring(30) from plug(31).



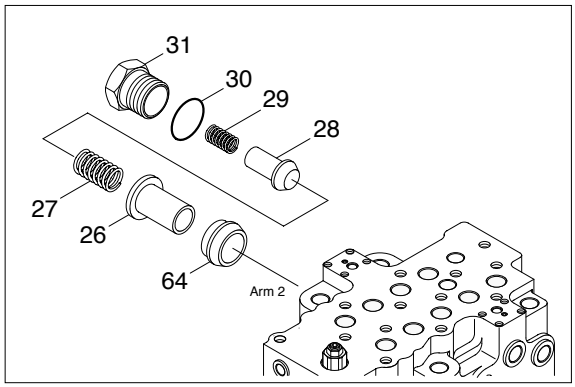
② Disassemble spring(29) and poppet(28).



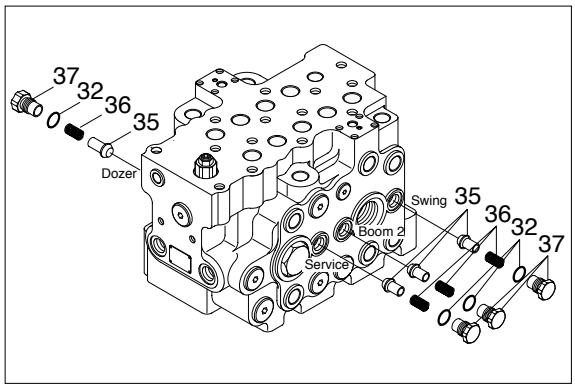
③ Disassemble sleeve(38), spring(27) and poppet(26).



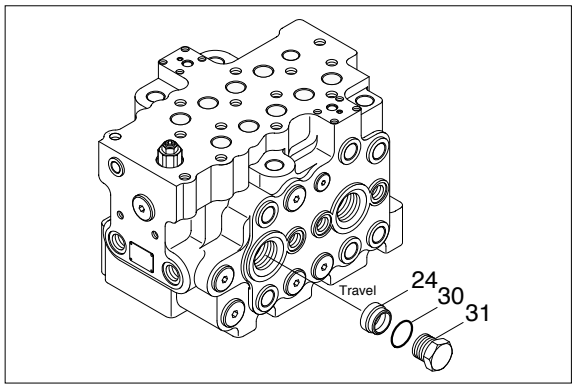
④ Disassemble plug(31), O-ring(30), spring (29), poppet(28), sleeve(64), spring(27) and poppet(26) same as above ①, ② and ③.



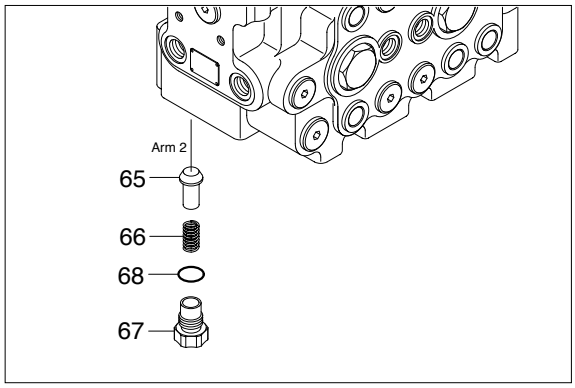
⑤ Disassemble plug(37) of boom2, service, dozer, swing part and common check(2 places), and then remove the O-ring(32) pull out spring(36) and poppet(35).



⑥ Disassemble plug(31), O-ring(30) and sleeve(24) of travel.



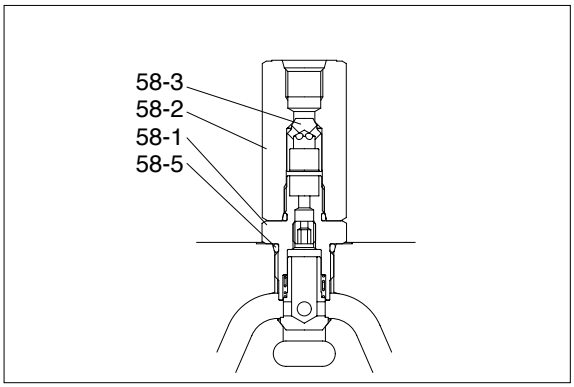
⑦ Disassemble plug(67), O-ring(68), spring(66) and poppet(65) of arm2 section.



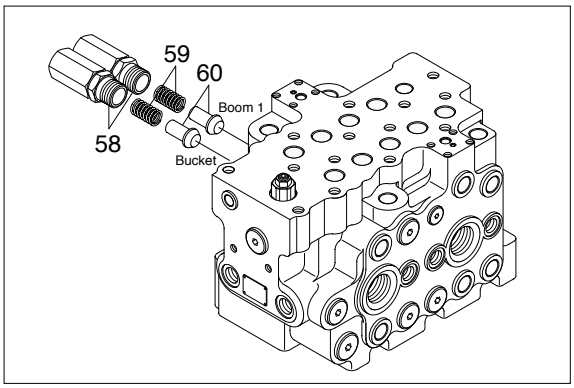
(5) Disassembly of check valve(Boom1, Bucket)

① Disassemble body(58-1) and remove poppet(58-3).

② Disassemble plug(58-2) and remove O-ring(58-5).



③ Disassemble spring(59) and poppet(60).

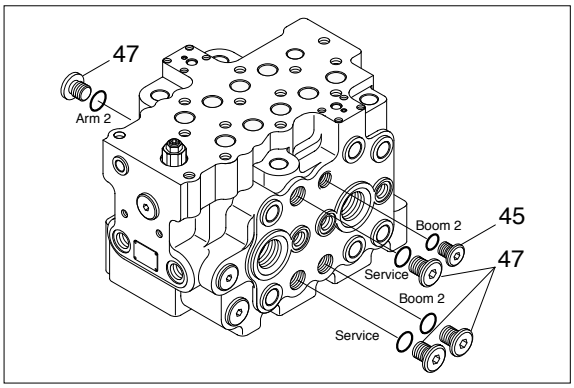


(6) Disassembly of port plug

① Disassemble plug assembly(47, 2 places) of service part.
Disassemble O-ring from plug.

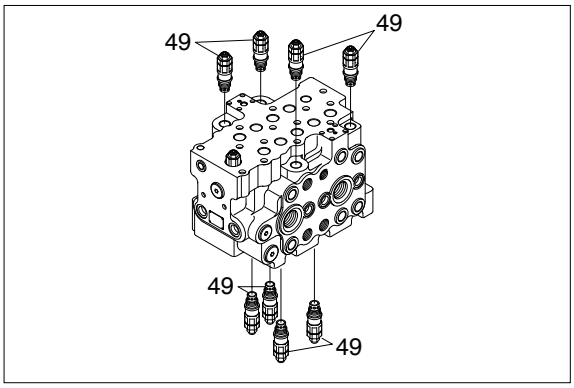
② Disassemble plug assembly(45, 47) of boom2 part.
Disassemble O-ring from plug.

③ Disassemble plug assembly(47) of arm2.
Disassemble O-ring from plug.

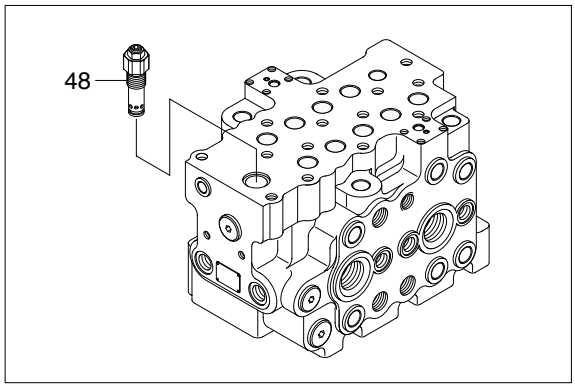


(7) Disassembly of relief valve

① Disassemble overload relief valve(49, 8 places).



② Disassemble main relief valve(48).

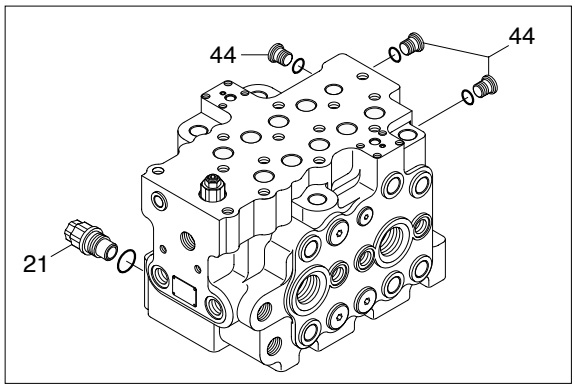


(8) Disassembly of the other plugs

① Disassemble plug(21) and remove O-ring.

② Disassemble plugs(44, 3 places) and remove O-ring.

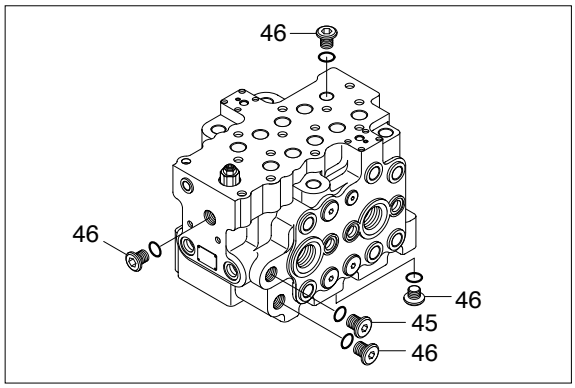
※ Do not disassemble filter compulsorily.
If disassemble and reassemble, filter is separated or fractured.



③ Disassemble plug(45) and remove O-ring.

④ Disassemble plug(46, 4 places) and remove O-ring.

※ Do not disassemble filter compulsorily.
If disassemble and reassemble, filter is separated or fractured.



3. ASSEMBLY

1) PRECAUTION

(1) Take the same precautions as for disassembly.

(2) When assembling the components, remove any metal chips or foreign objects and check them for any burrs or dents. Remove burrs and dents with oil-stone, if any.

(3) O-rings and backup rings are to be replaced with new ones, as a rule.

(4) When installing O-rings and backup rings, be careful not to damage them.(Apply a little amount of grease for smoothness.)

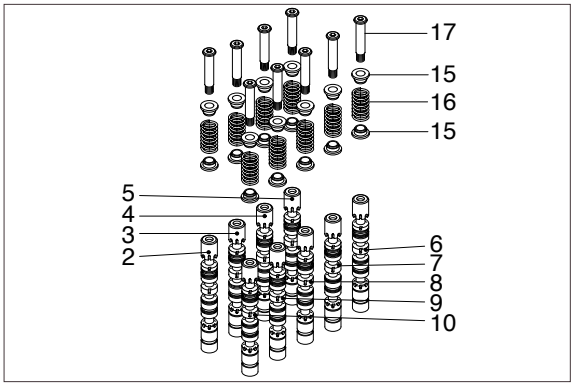
(5) Tighten the bolts and caps with specified torque.

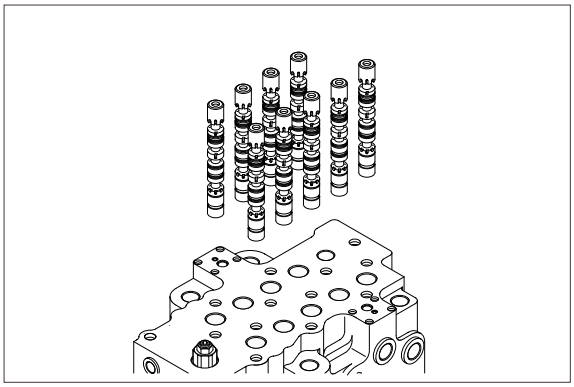
2) ASSEMBLY OF SUB ASSEMBLY

(1) Spool

① Apply sealant to thread of spools(2~10) and assemble spring seat(15), spring(16) and spool end (17).
Assemble spool to spool end after fixing spool end with a vise attached wood.
· Tightening torque : 19~22N · m
(1.9~2.2kgf · m)

※ Be careful not to flow into spool by applying sealant too much.
Do not overtighten spool.
If can cause deformation of spool.

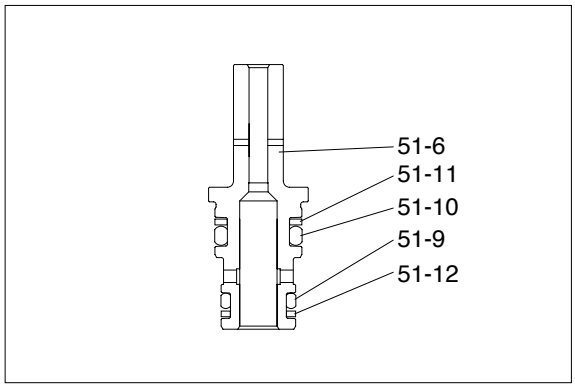




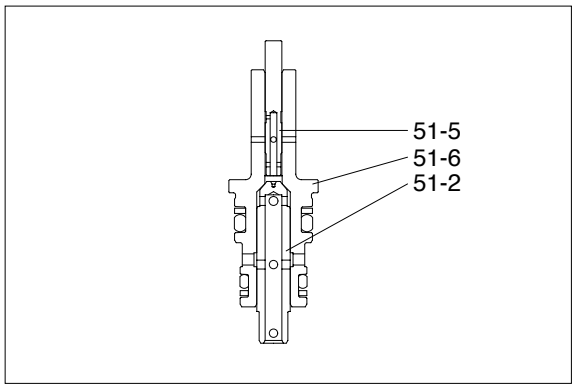
(2) Boom and arm antidrift valve

① Assemble O-rings(51-9, 51-10) and backup ring(51-11, 51-12) into groove of sleeve(51-6).

※ Be careful not to change assembling positing of O-ring and backup ring.
It can cause tearing of O-ring.

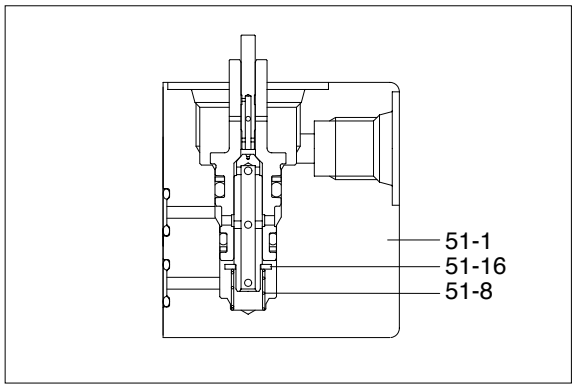


② Insert spool(51-5) and poppet(51-2) into hole of sleeve(51-6).



③ Assemble spring(51-8) and spring seat (51-16) on the end of poppet and then insert then into hole of body(51-1) with sleeve.

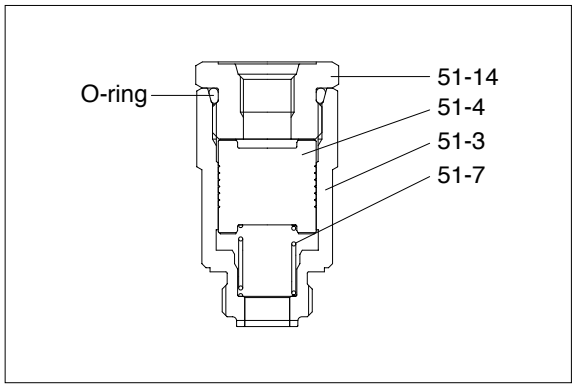
※ Apply grease to spring seat for easy assembling.



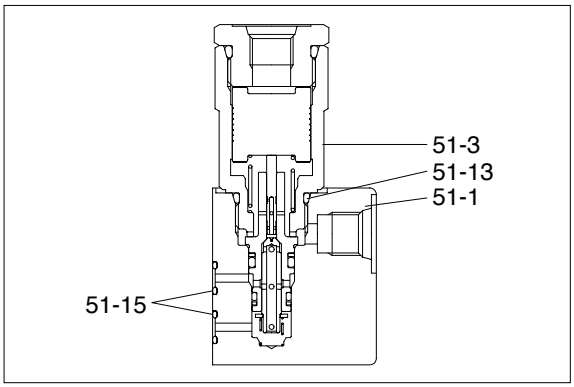
④ Assemble spring(51-7) and piston(51-4) into plug(51-3).

⑤ Assemble plug assy(51-14) with O-ring into plug(15-3).

· Tightening torque : 69~78N · m
(7~8kgf · m)



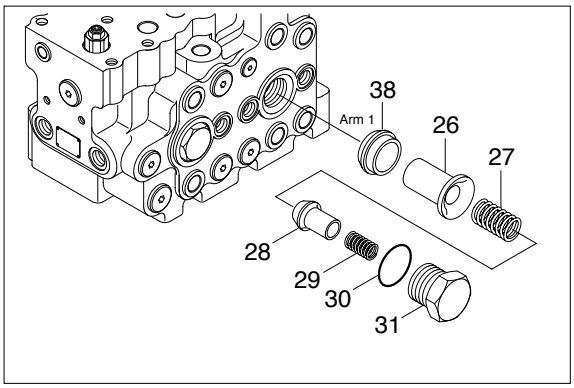
⑥ Assemble plug(51-3) with O-ring(51-13) into body(51-1).
· Tightening torque : 69~78N · m
(7~8kgf · m)
⑦ Mount O-ring(51-15) to mating groove with body.



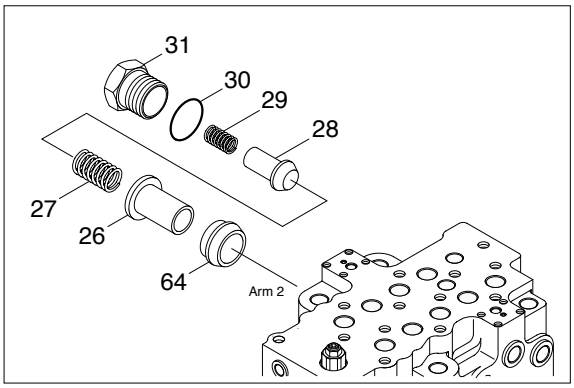
3) ASSEMBLY OF CONTROL VALVE ASSEMBLY

(1) Assembly of load check valve

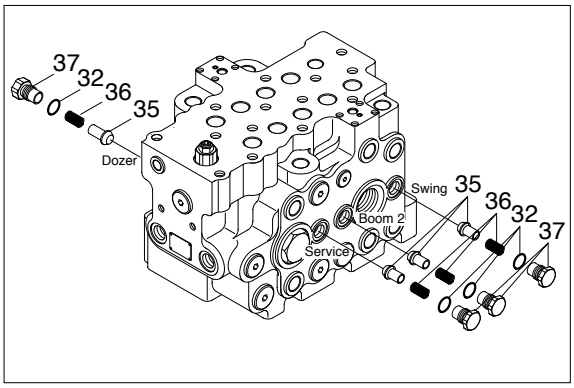
① Insert spring(27) and poppet(26) on sleeve(38) of arm1 and spring(29) and poppet(28) into sleeve(38) and then insert sleeve assembly into valve housing.
② Assemble plug(31) attached O-ring(30).
· Tightening torque : 167~196N · m
(17~20kgf · m)



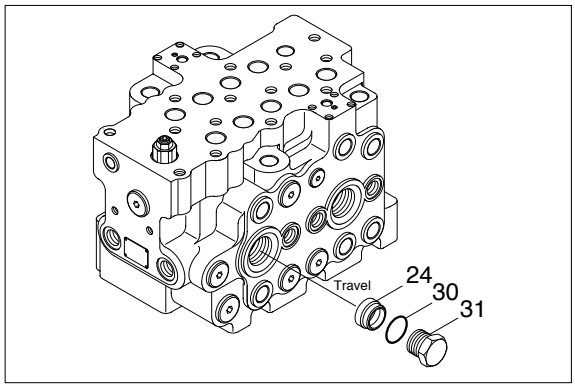
③ Insert spring(27) and poppet(26) on sleeve(64) of arm2 and poppet(28) and spring(29) into and then insert sleeve assembly(64) into valve housing.
④ Assemble plug(31) attached O-ring(30).
· Tightening torque : 167~196N · m
(17~20kgf · m)



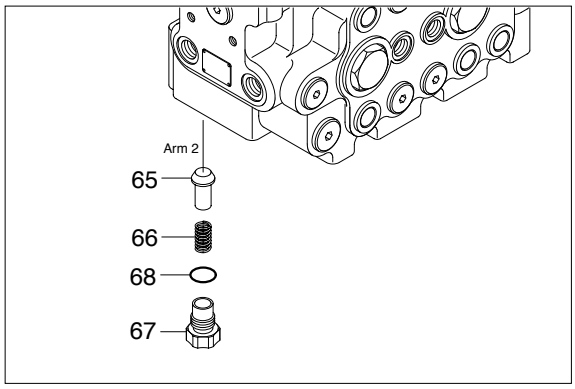
⑤ Insert poppet(35) and spring(36) into boom2, service, dozer, swing and common check(2 places) part and assemble plug(37) attached O-ring(32).
· Tightening torque : 88~98N · m
(9~10kgf · m)



⑥ Insert sleeve(24) into valve housing and assemble plug(31) attached O-ring(30).
· Tightening torque : 167~196N · m
(17~20kgf · m)

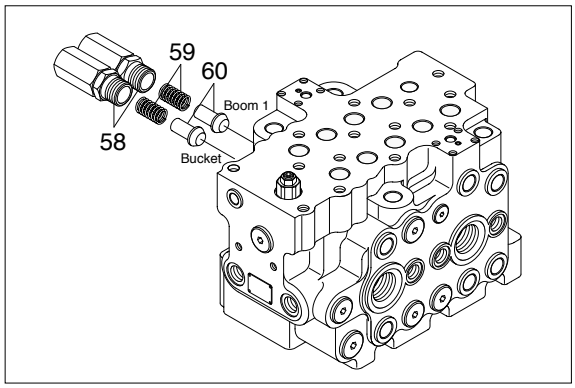


⑦ Insert poppet(65) and spring(66) into arm2 and assemble plug(67) attached O-ring(68).
· Tightening torque : 49~59N · m
(5~6kgf · m)



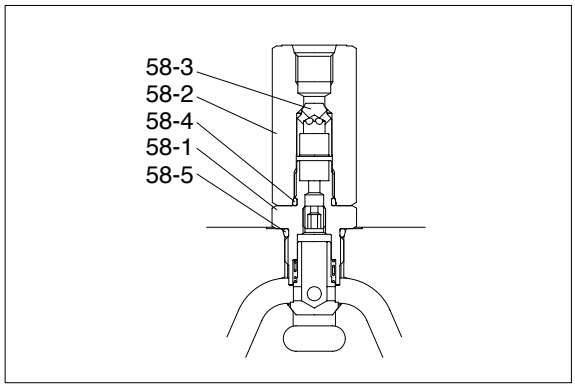
(2) Assembly of check valve

① Assemble poppet(60) and spring(59) into valve housing.



② Assemble plug(58-2) attached O-ring(58-4, 5).
· Tightening torque : 88~98N · m
(9~10kgf · m)

③ Assemble body(58-1) with poppet(58-3) on plug(58-2).
· Tightening torque : 34~39N · m
(3.5~4kgf · m)



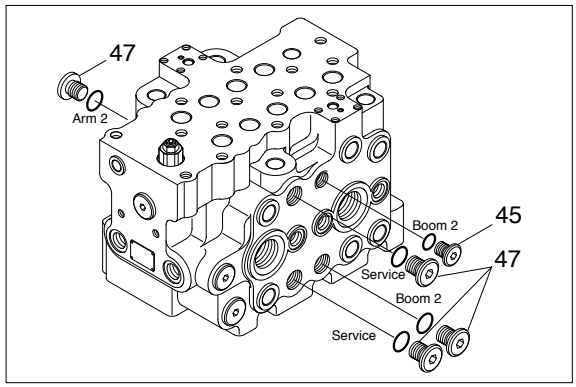
(3) Assembly of port plug and antidrift valve

① Assemble plug assembly(47) attached O-ring to ports of service and arm2 parts.

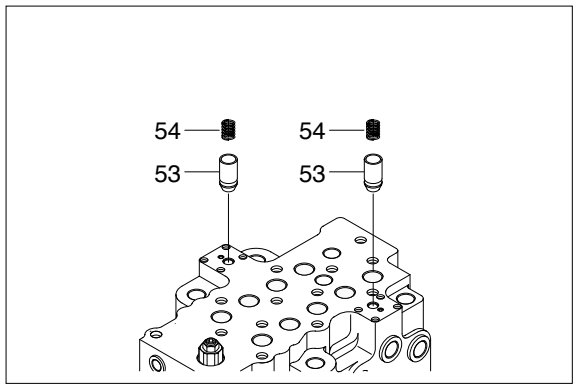
· Tightening torque : 108~144N · m
(11~14.7kgf · m)

② Assemble plug assembly(45) attached O-ring to port of boom2 part.

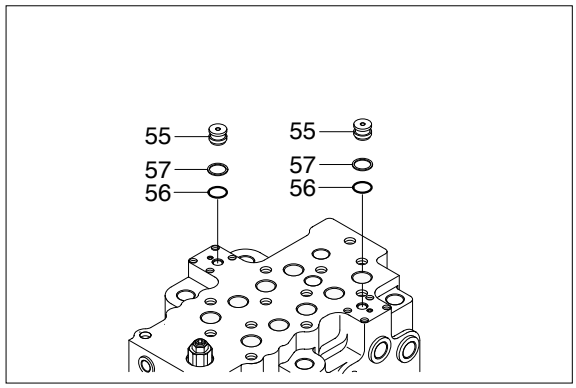
· Tightening torque : 30.5~41.2N · m
(3.1~4.2kgf · m)



③ Assemble poppet(53) and spring(54) into antidrift valve of boom1 and arm1.

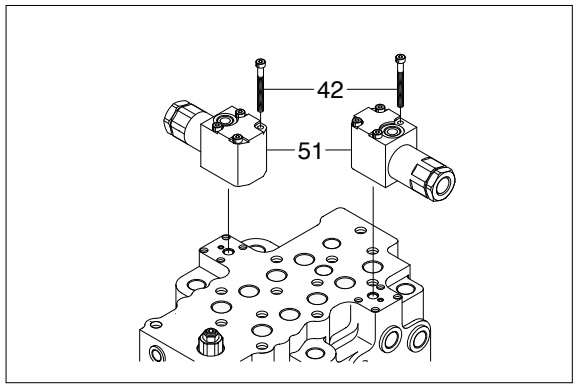


④ Insert spacer(55) attached O-ring(56) and back up ring(57).



⑤ Mount antidrift valve(51, 2 places) and tighten socket head bolt(42).

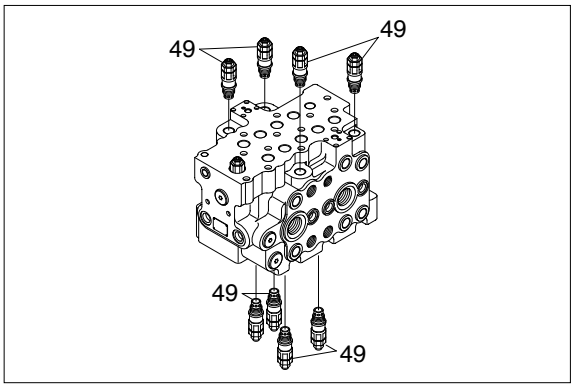
· Tightening torque : 8.8~10.8N · m
(0.9~1.1kgf · m)



(4) Assembly of relief valve

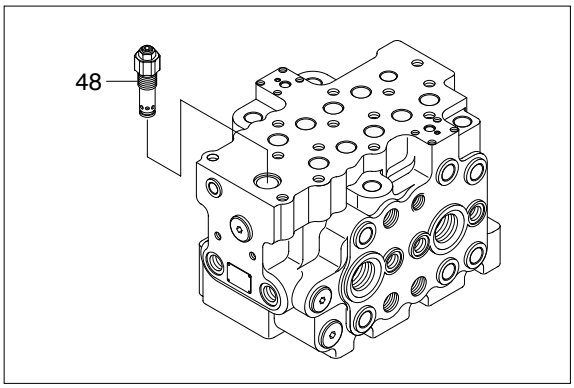
① Assemble overload relief valve(49).

· Tightening torque : 59~69N · m
(6~7kgf · m)



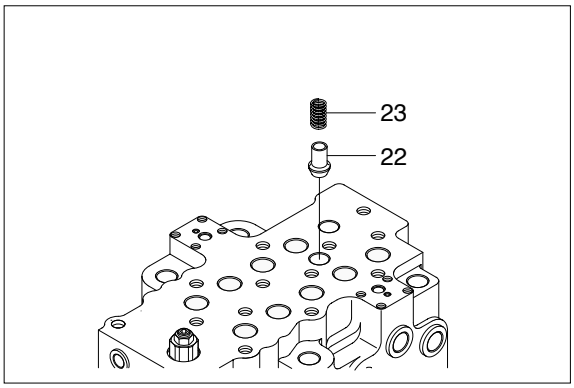
② Assemble main relief valve(48).

· Tightening torque : 49~59N · m
(5~6kgf · m)

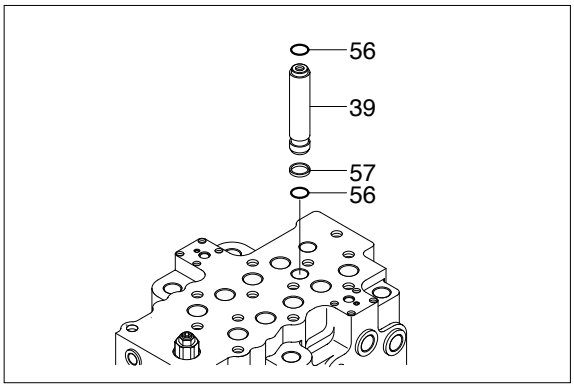


(5) Assembly of parts between cap and valve housing

① Assemble poppet(22) and spring(23) into long cap of arm1 and 2 spool.

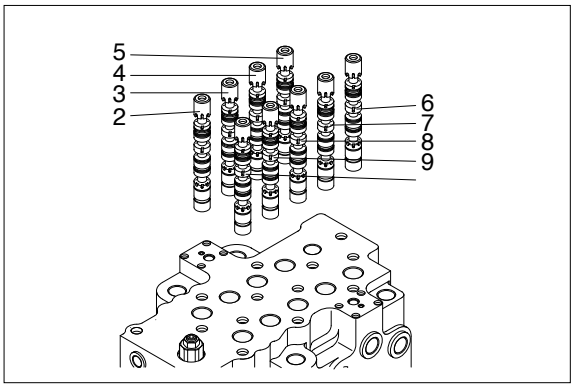


② Insert plug(39) attached O-ring(56) and backup ring(57).
Mount O-ring(56) at mating face.



(6) Assembly of spool

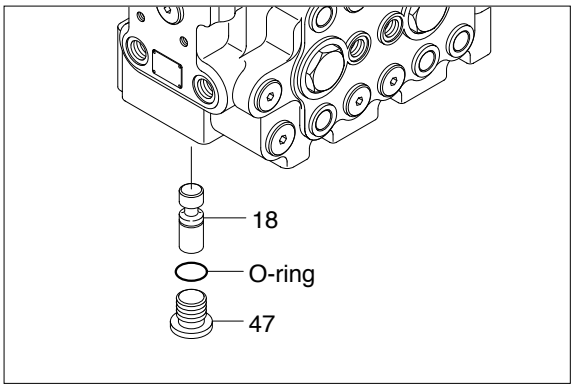
① Assemble spool(2~10) sub assembly into 5 spool sides and 4 spool sides of the same place as disassembling.



② Insert sleeve(18) into valve housing and assemble plug assembly(47) attached O-ring.

· Tightening torque : 108~144N · m
(11~14.7kgf · m)

※ Insert spool into hole slowly.
Confirm the spool sides smoothly by hand.



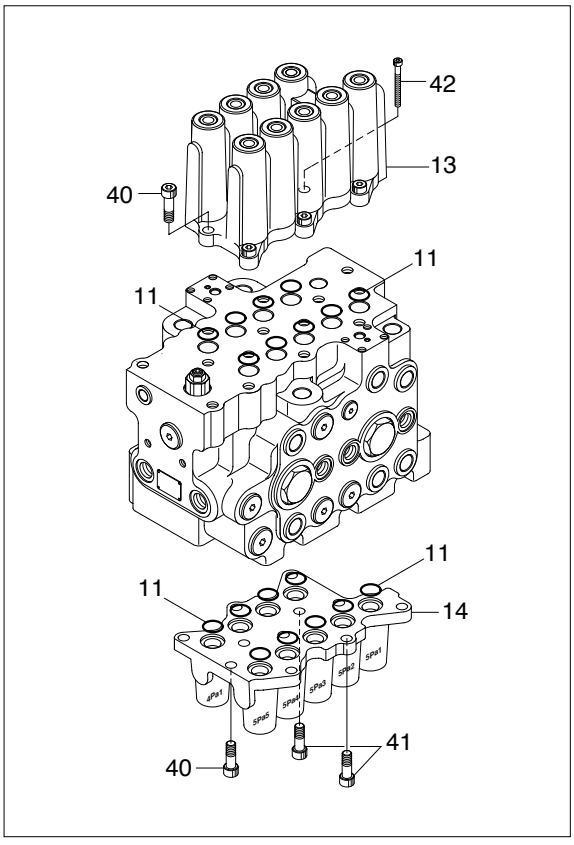
(7) Assembly of cap

① Mount O-ring(11) into hole of cap(13,14).

② Insert cap(13,14) and tighten socket head bolt(40,41 and 42).

· Tightening torque : 8.8~10.8N · m
(0.9~1.1kgf · m)

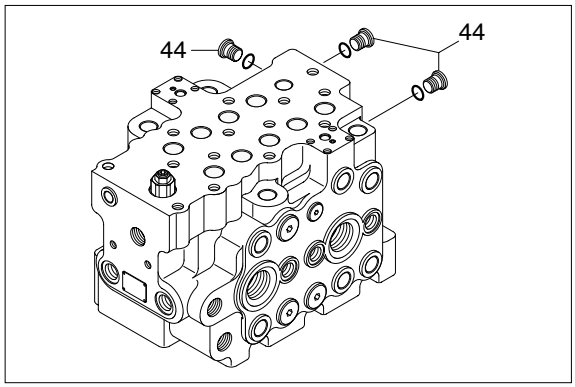
※ Be careful not to separate O-ring from cap.



(8) Assembly of other plug

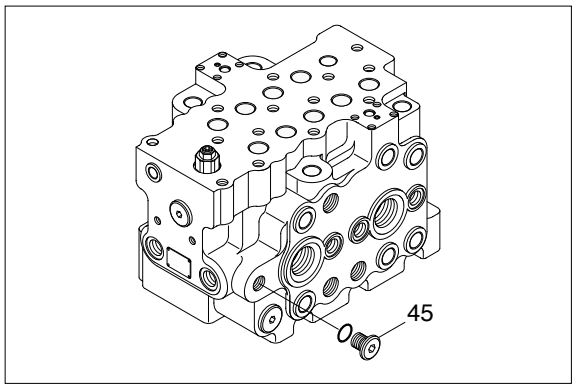
① Assemble plug assembly(44) attached O-ring.

· Tightening torque : 13.5~17N · m
(1.4~1.7kgf · m)



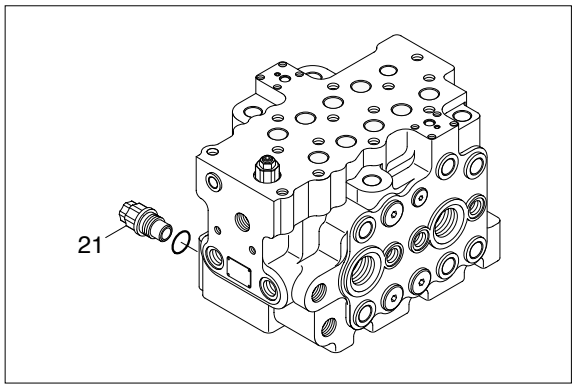
② Assemble plug assembly(45) attached O-ring.

· Tightening torque : 30.5~41N · m
(3.1~4.2kgf · m)



③ Assemble plug assembly(21) attached O-ring.

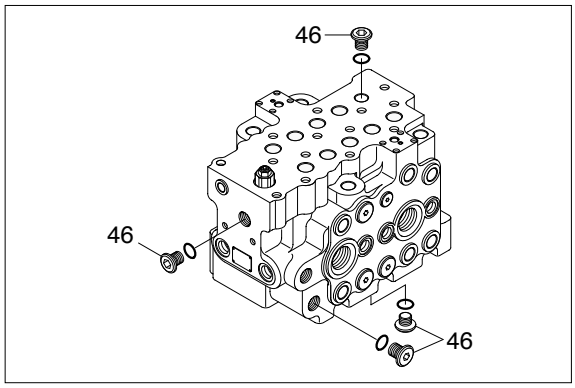
· Tightening torque : 49~59N · m
(5~6kgf · m)



④ Assemble plug assembly(46) attached O-ring.

· Tightening torque : 63~84N · m
(6.3~8.4kgf · m)

※ After finishing assembly, recheck that assembly and tightening of parts is omitted.
If tightening is omitted, it can cause leakage of oil.
The tightening torque value is all wet condition(Adhesion state of hydraulic oil).



4. DISASSEMBLY AND ASSEMBLY OF RELIEF VALVE

1) MAIN RELIEF VALVE

(1) Disassembly

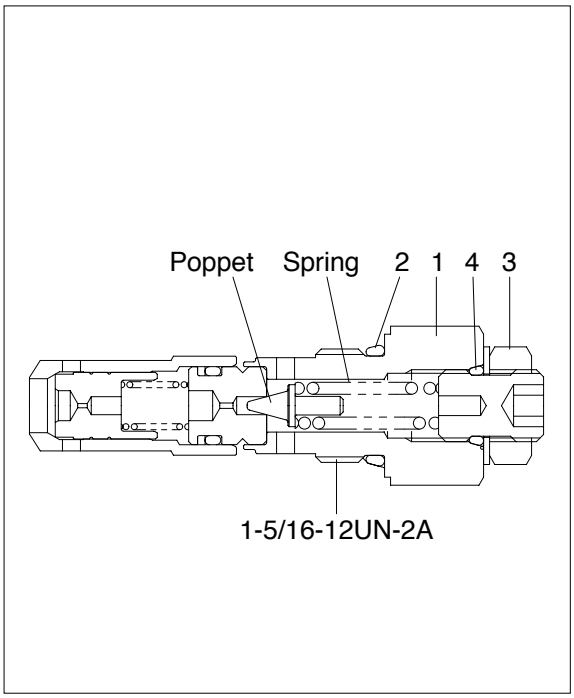
Replace this main relief valve to assembly.
Loosen cap(1) with spanner and disassemble O-ring(2).
When oil leaked from adjust kit(3), loosen adjust kit and then replace O-ring.

(2) Assembly

Remove dust or paint segment of thread of cap(1) and then O-ring with new ones.
Clean relief valve mounting part of valve housing and insert relief valve and then tighten cap(1) with the specified torque.

· Tightening torque : 49~54N · m
(5~5.5kgf · m)

※ The tightening torque value is all wet condition(Adhesion state of hydraulic oil).



2) OVERLOAD RELIEF VALVE

(1) Disassembly

Replace this overload relief valve to assembly.

Loosen cap(1) with spanner and disassemble O-ring(2).

When oil leaked from adjusting kit part(3), loosen adjust kit and replace O-ring(4) with new one.

When disassembling adjusting kit(4), be careful not to lose poppet because of spring bounce.

(2) Assembly

Remove dust or paint segment of thread of cap(1) and then O-ring(2) with new ones.

Clean relief valve mounting part of valve housing and insert relief valve and then tighten cap(1) with the specified torque.

· Tightening torque : 59~69N · m
(6.0~7.0kgf · m)

※ The tightening torque value is all wet condition(Adhesion state of hydraulic oil).