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1. STRUCTURE

This service manual has been prepared as an aid to improve the quality of repairs by giving the serviceman an accurate understanding of the product and by showing him the correct way to perform repairs and make judgements. Make sure you understand the contents of this manual and use it to full effect at every opportunity.

This service manual mainly contains the necessary technical information for operations performed in a service workshop.

For ease of understanding, the manual is divided into the following sections.

SECTION 1 GENERAL

This section explains the safety hints and gives the specification of the machine and major components.

SECTION 2 STRUCTURE AND FUNCTION

This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.

SECTION 3 HYDRAULIC SYSTEM

This section explains the hydraulic circuit, single and combined operation.

SECTION 4 ELECTRICAL SYSTEM

This section explains the electrical circuit, monitoring system and each component. It serves not only to give an understanding electrical system, but also serves as reference material for trouble shooting.

SECTION 5 TROUBLESHOOTING

This section explains the troubleshooting charts correlating problems to causes.

SECTION 6 MAINTENANCE STANDARD

This section gives the judgement standards when inspecting disassembled parts.

SECTION 7 DISASSEMBLY AND ASSEMBLY

This section explains the order to be followed when removing, installing, disassembling or assembling each component, as well as precautions to be taken for these operations.

SECTION 8 COMPONENT MOUNTING TORQUE

This section shows bolt specifications and standard torque values needed when mounting components to the machine.

The specifications contained in this shop manual are subject to change at any time and without any advance notice. Contact your HYUNDAI distributor for the latest information.

2. HOW TO READ THE SERVICE MANUAL

Distribution and updating

Any additions, amendments or other changes will be sent to HYUNDAI distributors.
Get the most up-to-date information before you start any work.

Filing method

1. See the page number on the bottom of the page.
   File the pages in correct order.
2. Following examples shows how to read the page number.
   Example 1
   2 - 3
   - Item number (2. Structure and Function)
   - Consecutive page number for each item.
3. Additional pages : Additional pages are indicated by a hyphen(-) and number after the page number. File as in the example.
   10 - 4
   10 - 4 - 1 ┐ Added pages
   10 - 4 - 2 ┘
   10 - 5

Revised edition mark (①②③···)

When a manual is revised, an edition mark is recorded on the bottom outside corner of the pages.

Revisions

Revised pages are shown at the list of revised pages on the between the contents page and section 1 page.

Symbols

So that the shop manual can be of ample practical use, important places for safety and quality are marked with the following symbols.

Symbol	Item	Remarks
⚠	Safety	Special safety precautions are necessary when performing the work.
		Extra special safety precautions are necessary when performing the work because it is under internal pressure.
※	Caution	Special technical precautions or other precautions for preserving standards are necessary when performing the work.

3. CONVERSION TABLE

Method of using the Conversion Table

The Conversion Table in this section is provided to enable simple conversion of figures. For details of the method of using the Conversion Table, see the example given below.

Example

1. **Method of using the Conversion Table to convert from millimeters to inches**

   Convert 55mm into inches.

   (1) Locate the number 50in the vertical column at the left side, take this as ⓐ, then draw a horizontal line from ⓐ.

   (2) Locate the number 5 in the row across the top, take this as ⓑ, then draw a perpendicular line down from ⓑ.

   (3) Take the point where the two lines cross as ⓒ. This point ⓒ gives the value when converting from millimeters to inches. Therefore, 55 mm = 2.165 inches.

2. Convert 550mm into inches.

   (1) The number 550 does not appear in the table, so divide by 10(Move the decimal point one place to the left) to convert it to 55 mm.

   (2) Carry out the same procedure as above to convert 55 mm to 2.165 inches.

   (3) The original value (550 mm) was divided by 10, so multiply 2.165 inches by 10 (Move the decimal point one place to the right) to return to the original value.
   This gives 550 mm = 21.65 inches.

Millimeters to inches

ⓑ

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0		0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
ⓐ 50	1.969	2.008	2.047	2.087	2.126	ⓒ 2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

Millimeters to inches

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0		0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

Kilogram to Pound

1 kg = 2.2046 lb

	0	1	2	3	4	5	6	7	8	9
0		2.20	4.41	6.61	8.82	11.02	13.23	15.43	17.64	19.84
10	22.05	24.25	26.46	28.66	30.86	33.07	35.27	37.48	39.68	41.89
20	44.09	46.30	48.50	50.71	51.91	55.12	57.32	59.5.	61.73	63.93
30	66.14	68.34	70.55	72.75	74.96	77.16	79.37	81.57	83.78	85.98
40	88.18	90.39	92.59	94.80	97.00	99.21	101.41	103.62	105.82	108.03
50	110.23	112.44	114.64	116.85	119.05	121.25	123.46	125.66	127.87	130.07
60	132.28	134.48	136.69	138.89	141.10	143.30	145.51	147.71	149.91	152.12
70	154.32	156.53	158.73	160.94	163.14	165.35	167.55	169.76	171.96	174.17
80	176.37	178.57	180.78	182.98	185.19	187.39	189.60	191.80	194.01	196.21
90	198.42	200.62	202.83	205.03	207.24	209.44	211.64	213.85	216.05	218.26

Liter to U.S. Gallon

1 ℓ = 0.2642 U.S.Gal

	0	1	2	3	4	5	6	7	8	9
0		0.264	0.528	0.793	1.057	1.321	1.585	1.849	2.113	2.378
10	2.642	2.906	3.170	3.434	3.698	3.963	4.227	4.491	4.755	5.019
20	5.283	5.548	5.812	6.6076	6.340	6.604	6.869	7.133	7.397	7.661
30	7.925	8.189	8.454	8.718	8.982	9.246	9.510	9.774	10.039	10.303
40	10.567	10.831	11.095	11.359	11.624	11.888	12.152	12.416	12.680	12.944
50	13.209	13.473	13.737	14.001	14.265	14.529	14.795	15.058	15.322	15.586
60	15.850	16.115	16.379	16.643	16.907	17.171	17.435	17.700	17.964	18.228
70	18.492	18.756	19.020	19.285	19.549	19.813	20.077	20.341	20.605	20.870
80	21.134	21.398	21.662	21.926	22.190	22.455	22.719	22.983	23.247	23.511
90	23.775	24.040	24.304	24.568	24.832	25.096	25.631	25.625	25.889	26.153

Liter to U.K. Gallon

1 ℓ = 0.21997 U.K.Gal

	0	1	2	3	4	5	6	7	8	9
0		0.220	0.440	0.660	0.880	1.100	1.320	1.540	1.760	1.980
10	2.200	2.420	2.640	2.860	3.080	3.300	3.520	3.740	3.950	4.179
20	4.399	4.619	4.839	5.059	5.279	5.499	5.719	5.939	6.159	6.379
30	6.599	6.819	7.039	7.259	7.479	7.969	7.919	8.139	8.359	8.579
40	8.799	9.019	9.239	9.459	9.679	9.899	10.119	10.339	10.559	10.778
50	10.998	11.281	11.438	11.658	11.878	12.098	12.318	12.528	12.758	12.978
60	13.198	13.418	13.638	13.858	14.078	14.298	14.518	14.738	14.958	15.178
70	15.398	15.618	15.838	16.058	16.278	16.498	16.718	16.938	17.158	17.378
80	17.598	17.818	18.037	18.257	18.477	18.697	18.917	19.137	19.357	19.577
90	19.797	20.017	20.237	20.457	20.677	20.897	21.117	21.337	21.557	21.777

kgf · m to lbf · ft

1 kgf · m = 7.233 lbf · ft

	0	1	2	3	4	5	6	7	8	9
		7.2	14.5	21.7	28.9	36.2	43.4	50.6	57.9	65.1
10	72.3	79.6	86.8	94.0	101.3	108.5	115.7	123.0	130.2	137.4
20	144.7	151.9	159.1	166.4	173.6	180.8	188.1	195.3	202.5	209.8
30	217.0	224.2	231.5	238.7	245.9	253.2	260.4	267.6	274.9	282.1
40	289.3	396.6	303.8	311.0	318.3	325.5	332.7	340.0	347.2	354.4
50	361.7	368.9	376.1	383.4	390.6	397.8	405.1	412.3	419.5	426.8
60	434.0	441.2	448.5	455.7	462.9	470.2	477.4	484.6	491.8	499.1
70	506.3	513.5	520.8	528.0	535.2	542.5	549.7	556.9	564.2	571.4
80	578.6	585.9	593.1	600.3	607.6	614.8	622.0	629.3	636.5	643.7
90	651.0	658.2	665.4	672.7	679.9	687.1	694.4	701.6	708.8	716.1
100	723.3	730.5	737.8	745.0	752.2	759.5	766.7	773.9	781.2	788.4
110	795.6	802.9	810.1	817.3	824.6	831.8	839.0	846.3	853.5	860.7
120	868.0	875.2	882.4	889.7	896.9	904.1	911.4	918.6	925.8	933.1
130	940.3	947.5	954.8	962.0	969.2	976.5	983.7	990.9	998.2	10005.4
140	1012.6	1019.9	1027.1	1034.3	1041.5	1048.8	1056.0	1063.2	1070.5	1077.7
150	1084.9	1092.2	1099.4	1106.6	1113.9	1121.1	1128.3	1135.6	1142.8	1150.0
160	1157.3	1164.5	1171.7	1179.0	1186.2	1193.4	1200.7	1207.9	1215.1	1222.4
170	1129.6	1236.8	1244.1	1251.3	1258.5	1265.8	1273.0	1280.1	1287.5	1294.7
180	1301.9	1309.2	1316.4	1323.6	1330.9	1338.1	1345.3	1352.6	1359.8	1367.0
190	1374.3	1381.5	1388.7	1396.0	1403.2	1410.4	1417.7	1424.9	1432.1	1439.4

kgf/cm² to lbf/in²

1 kgf / cm² = 14.2233 lbf / in²

	0	1	2	3	4	5	6	7	8	9
		14.2	28.4	42.7	56.9	71.1	85.3	99.6	113.8	128.0
10	142.2	156.5	170.7	184.9	199.1	213.4	227.6	241.8	256.0	270.2
20	284.5	298.7	312.9	327.1	341.4	355.6	369.8	384.0	398.3	412.5
30	426.7	440.9	455.1	469.4	483.6	497.8	512.0	526.3	540.5	554.7
40	568.9	583.2	597.4	611.6	625.8	640.1	654.3	668.5	682.7	696.9
50	711.2	725.4	739.6	753.8	768.1	782.3	796.5	810.7	825.0	839.2
60	853.4	867.6	881.8	896.1	910.3	924.5	938.7	953.0	967.2	981.4
70	995.6	1010	1024	1038	1053	1067	1081	1095	1109	1124
80	1138	1152	1166	1181	1195	1209	1223	1237	1252	1266
90	1280	1294	1309	1323	1337	1351	1365	1380	1394	1408
100	1422	1437	1451	1465	1479	1493	1508	1522	1536	1550
110	1565	1579	1593	1607	1621	1636	1650	1664	1678	1693
120	1707	1721	1735	1749	1764	1778	1792	1806	1821	1835
130	1849	2863	1877	1892	1906	1920	1934	1949	1963	1977
140	1991	2005	2020	2034	2048	2062	2077	2091	2105	2119
150	2134	2148	2162	2176	2190	2205	2219	2233	2247	2262
160	2276	2290	2304	2318	2333	2347	2361	2375	2389	2404
170	2418	2432	2446	2460	2475	2489	2503	2518	2532	2546
180	2560	2574	2589	5603	2617	2631	2646	2660	2674	2688
200	2845	2859	2873	2887	2901	2916	2930	2944	2958	2973
210	2987	3001	3015	3030	3044	3058	3072	3086	3101	3115
220	3129	3143	3158	3172	3186	3200	3214	3229	3243	3257
230	3271	3286	3300	3314	3328	3343	3357	3371	3385	3399
240	3414	3428	3442	3456	3470	3485	3499	3513	3527	3542

TEMPERATURE

Fahrenheit-Centigrade Conversion.

A simple way to convert a fahrenheit temperature reading into a centigrade temperature reading or vice verse is to enter the accompanying table in the center or boldface column of figures.

These figures refer to the temperature in either Fahrenheit or Centigrade degrees.

If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left.

If it is desired to convert from Centigrade to Fahrenheit degrees, consider the center column as a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

˚C		˚F	˚C		˚F	˚C		˚F	˚C		˚F
-40.4	-40	-40.0	-11.7	11	51.8	7.8	46	114.8	27.2	81	117.8
-37.2	-35	-31.0	-11.1	12	53.6	8.3	47	116.6	27.8	82	179.6
-34.4	-30	-22.0	-10.6	13	55.4	8.9	48	118.4	28.3	83	181.4
-31.7	-25	-13.0	-10.0	14	57.2	9.4	49	120.2	28.9	84	183.2
-28.9	-20	-4.0	-9.4	15	59.0	10.0	50	122.0	29.4	85	185.0
-28.3	-19	-2.2	-8.9	16	60.8	10.6	51	123.8	30.0	86	186.8
-27.8	-18	-0.4	-8.3	17	62.6	11.1	52	125.6	30.6	87	188.6
-27.2	-17	1.4	-7.8	18	64.4	11.7	53	127.4	31.1	88	190.4
-26.7	-16	3.2	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-26.1	-15	5.0	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-25.6	-14	6.8	-6.1	21	69.8	13.3	56	132.8	32.8	91	195.8
-25.0	-13	8.6	-5.6	22	71.6	13.9	57	134.6	33.3	92	197.6
-24.4	-12	10.4	-5.0	23	73.4	14.4	58	136.4	33.9	93	199.4
-23.9	-11	12.2	-4.4	24	75.2	15.0	59	138.2	34.4	94	201.2
-23.3	-10	14.0	-3.9	25	77.0	15.6	60	140.0	35.0	95	203.0
-22.8	-9	15.8	-3.3	26	78.8	16.1	61	141.8	35.6	96	204.8
-22.2	-8	17.6	-2.8	27	80.6	16.7	62	143.6	36.1	97	206.6
-21.7	-7	19.4	-2.2	28	82.4	17.2	63	145.4	36.7	98	208.4
-21.1	-6	21.2	-1.7	29	84.2	17.8	64	147.2	37.2	99	210.2
-20.6	-5	23.0	-1.1	35	95.0	21.1	70	158.0	51.7	125	257.0
-20.0	-4	24.8	-0.6	31	87.8	18.9	66	150.8	40.6	105	221.0
-19.4	-3	26.6	0	32	89.6	19.4	67	152.6	43.3	110	230.0
-18.9	-2	28.4	0.6	33	91.4	20.0	68	154.4	46.1	115	239.0
-18.3	-1	30.2	1.1	34	93.2	20.6	69	156.2	48.9	120	248.0
-17.8	0	32.0	1.7	35	95.0	21.1	70	158.0	51.7	125	257.0
-17.2	1	33.8	2.2	36	96.8	21.7	71	159.8	54.4	130	266.0
-16.7	2	35.6	2.8	37	98.6	22.2	72	161.6	57.2	135	275.0
-16.1	3	37.4	3.3	38	100.4	22.8	73	163.4	60.0	140	284.0
-15.6	4	39.2	3.9	39	102.2	23.3	74	165.2	62.7	145	293.0
-15.0	5	41.0	4.4	40	104.0	23.9	75	167.0	65.6	150	302.0
-14.4	6	42.8	5.0	41	105.8	24.4	76	168.8	68.3	155	311.0
-13.9	7	44.6	5.6	42	107.6	25.0	77	170.6	71.1	160	320.0
-13.3	8	46.4	6.1	43	109.4	25.6	78	172.4	73.9	165	329.0
-12.8	9	48.2	6.7	44	111.2	26.1	79	174.2	76.7	170	338.0
-12.2	10	50.0	7.2	45	113.0	26.7	80	176.0	79.4	172	347.0

SECTION 1 GENERAL

Group 1 Safety Hints ···························· 1-1
Group 2 Specifications ···························· 1-9

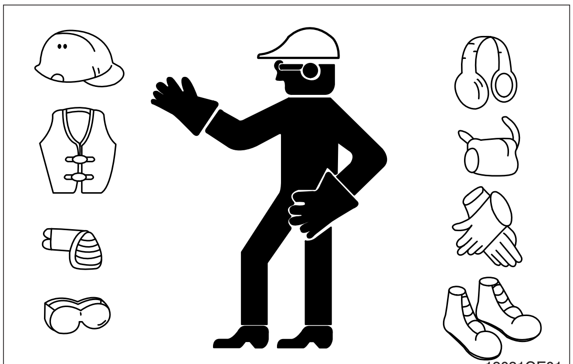
GROUP 1 SAFETY

FOLLOW SAFE PROCEDURE

Unsafe work practices are dangerous. Understand service procedure before doing work; Do not attempt shortcuts.

WEAR PROTECTIVE CLOTHING

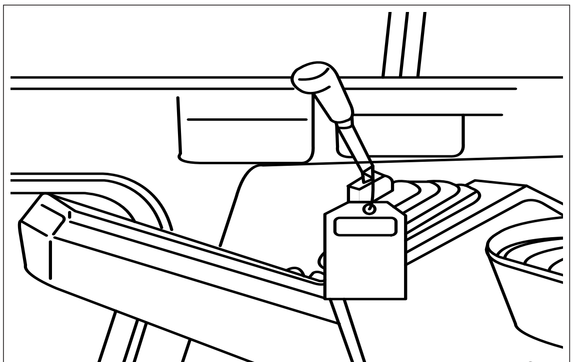
Wear close fitting clothing and safety equipment appropriate to the job.



13031GE01

WARN OTHERS OF SERVICE WORK

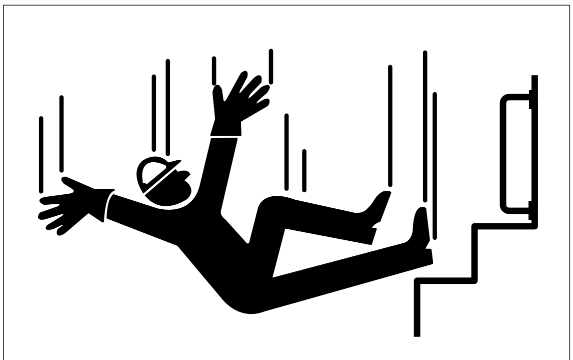
Unexpected machine movement can cause serious injury.
Before performing any work on the excavator, attach a「**Do Not Operate**」tag on the right side control lever.



13031GE02

USE HANDHOLDS AND STEPS

Falling is one of the major causes of personal injury.
When you get on and off the machine, always maintain a three point contact with the steps and handrails and face the machine. Do not use any controls as handholds.
Never jump on or off the machine. Never mount or dismount a moving machine.
Be careful of slippery conditions on platforms, steps, and handrails when leaving the machine.



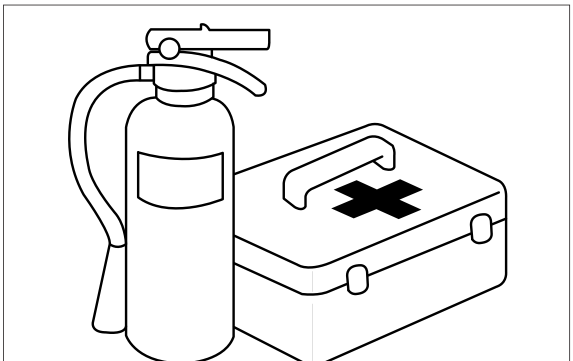
13031GE03

PREPARE FOR EMERGENCIES

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

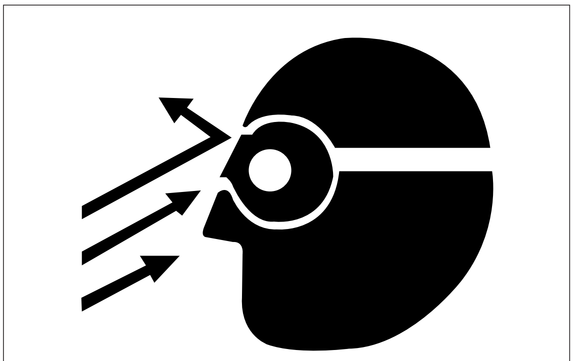
Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



13031GE04

PROTECT AGAINST FLYING DEBRIS

Guard against injury from flying pieces of metal or debris; Wear goggles or safety glasses.

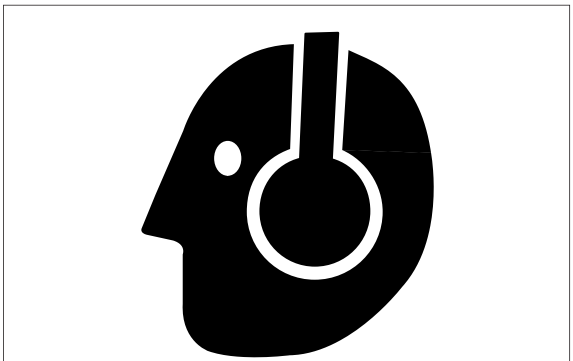


13031GE05

PROTECT AGAINST NOISE

Prolonged exposure to loud noise can cause impairment or loss of hearing.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

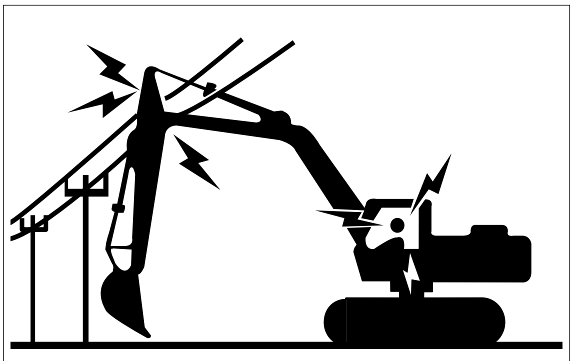


13031GE06

AVOID POWER LINES

Serious injury or death can result from contact with electric lines.

Never move any part of the machine or load closer to electric line than 3m(10ft) plus twice the line insulator length.

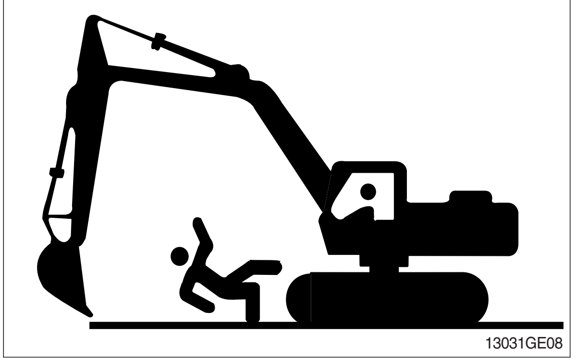


13031GE07

KEEP RIDERS OFF EXCAVATOR

Only allow the operator on the excavator. Keep riders off.

Riders on excavator are subject to injury such as being struck by foreign objects and being thrown off the excavator. Riders also obstruct the operator's view resulting in the excavator being operated in an unsafe manner.



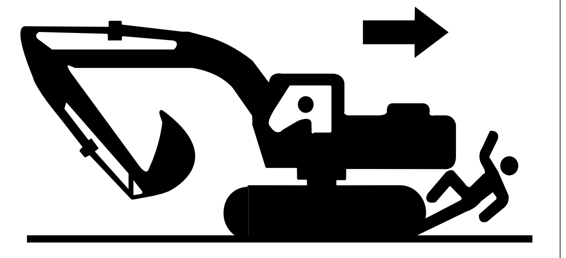
13031GE08

MOVE AND OPERATE MACHINE SAFELY

Bystanders can be run over. Know the location of bystanders before moving, swinging, or operating the machine.

Always keep the travel alarm in working condition. It warns people when the excavator starts to move.

Use a signal person when moving, swinging, or operating the machine in congested areas. Coordinate hand signals before starting the excavator.

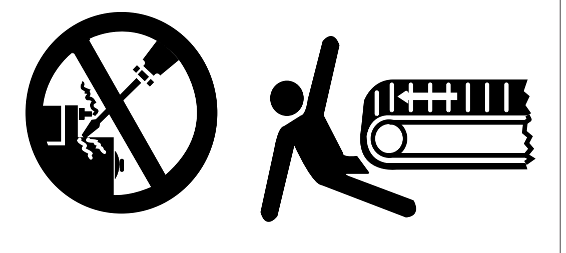


13031GE09

OPERATE ONLY FORM OPERATOR'S SEAT

Avoid possible injury machine damage. Do not start engine by shorting across starter terminals.

NEVER start engine while standing on ground. Start engine only from operator's seat.



13031GE26

PARK MACHINE SAFELY

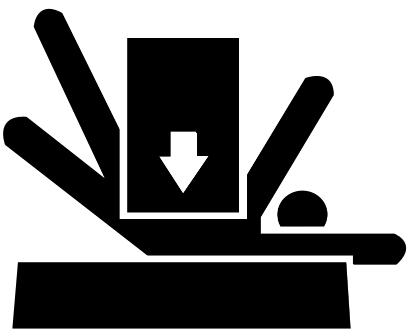
Before working on the machine:

· Park machine on a level surface.
· Lower bucket to the ground.
· Turn auto idle switch off.
· Run engine at 1/2 speed without load for 2 minutes.
· Turn key switch to OFF to stop engine. Remove key from switch.
· Move pilot control shutoff lever to locked position.
· Allow engine to cool.

SUPPORT MACHINE PROPERLY

Always lower the attachment or implement to the ground before you work on the machine. If you must work on a lifted machine or attachment, securely support the machine or attachment.

Do not support the machine on cinder blocks, hollow tiles, or props that may crumble under continuous load.
Do not work under a machine that is supported solely by a jack. Follow recommended procedures in this manual.

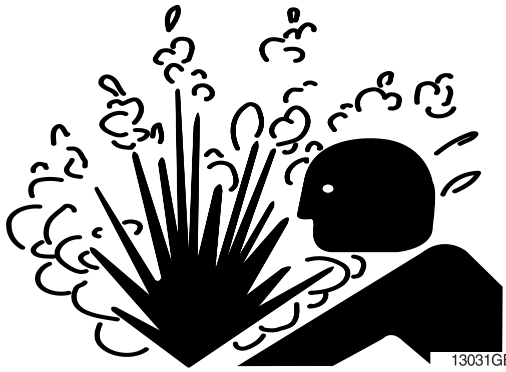


13031GE10

SERVICE COOLING SYSTEM SAFELY

Explosive release of fluids from pressurized cooling system can cause serious burns.

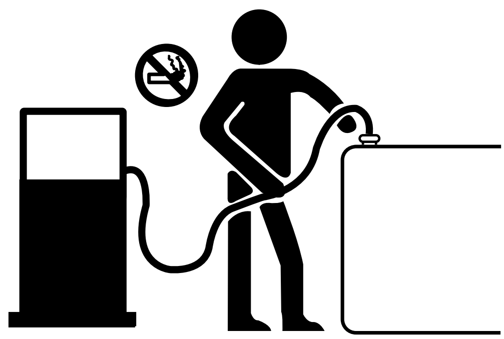
Shut off engine. Only remove filler cap when cool enough to touch with bare hands.



13031GE11

HANDLE FLUIDS SAFELY-AVOID FIRES

Handle fuel with care; It is highly flammable. Do not refuel the machine while smoking or when near open flame or sparks. Always stop engine before refueling machine.
Fill fuel tank outdoors.



13031GE12

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

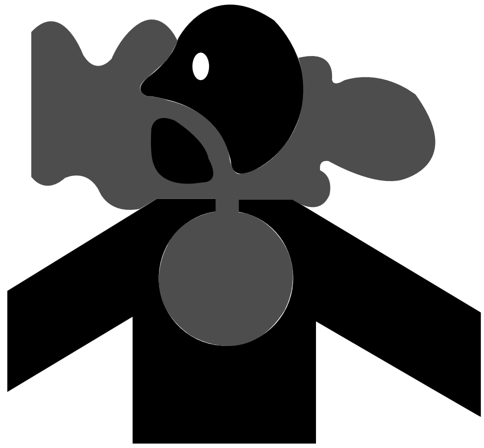
Do not store oily rags; They can ignite and burn spontaneously.

13031GE13

BEWARE OF EXHAUST FUMES

Prevent asphyxiation. Engine exhaust fumes can cause sickness or death.

If you must operate in a building, be positive there is adequate ventilation. Either use an exhaust pipe extension to remove the exhaust fumes or open doors and windows to bring enough outside air into the area.



13031GE14

REMOVE PAINT BEFORE WELDING OR HEATING

Avoid potentially toxic fumes and dust.

Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

Do all work outside or in a well ventilated area. Dispose of paint and solvent properly.

Remove paint before welding or heating:

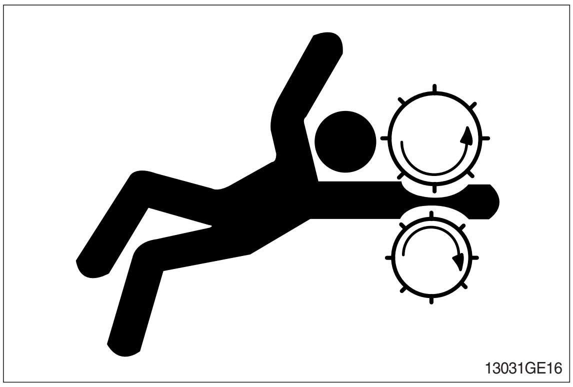
· If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.

· If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

ILLUMINATE WORK AREA SAFELY

Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.

13031GE15

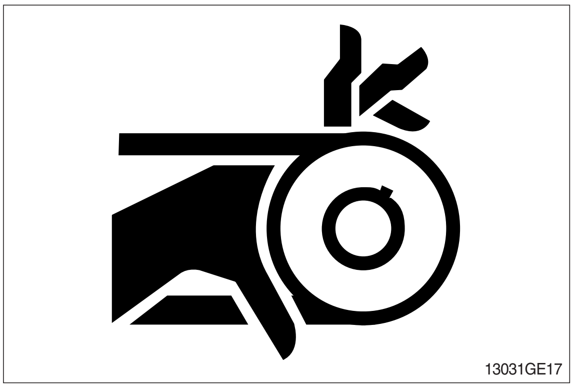


13031GE16

STAY CLEAR OF MOVING PARTS

Entanglements in moving parts can cause serious injury.

To prevent accidents, use care when working around rotating parts.



13031GE17

AVOID HIGH PRESSURE FLUIDS

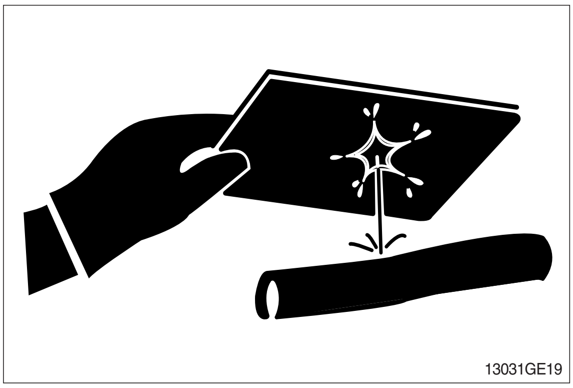
Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result.

13031GE18



13031GE19

AVOID HEATING NEAR PRESSURIZED FLUID LINES

13031GE20

Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials.

Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area. Install fire resisting guards to protect hoses or other materials.

PREVENT BATTERY EXPLOSIONS

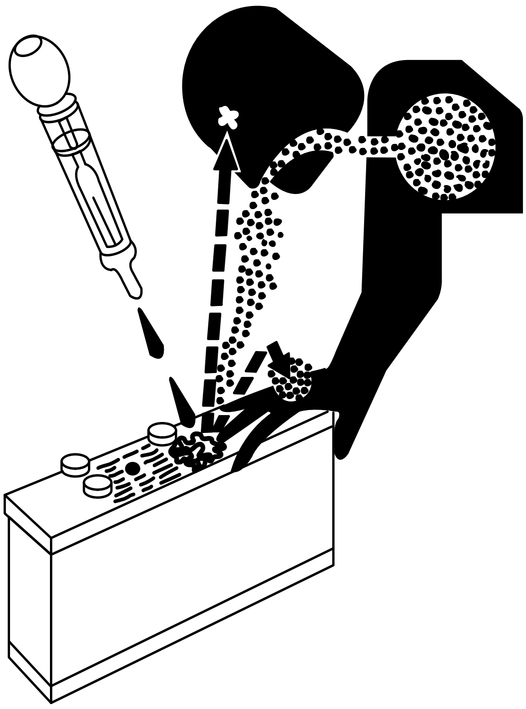
13031GE21

Keep sparks, lighted matches, and flame away from the top of battery. Battery gas can explode.

Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.

Do not charge a frozen battery; It may explode. Warm battery to 16°C(60°F).

PREVENT ACID BURNS



13031GE22

Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid the hazard by:

1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling of dripping electrolyte.
5. Use proper jump start procedure.

If you spill acid on yourself:

1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 10-15 minutes. Get medical attention immediately.

If acid is swallowed:

1. Drink large amounts of water or milk.
2. Then drink milk of magnesia, beaten eggs, or vegetable oil.
3. Get medical attention immediately.

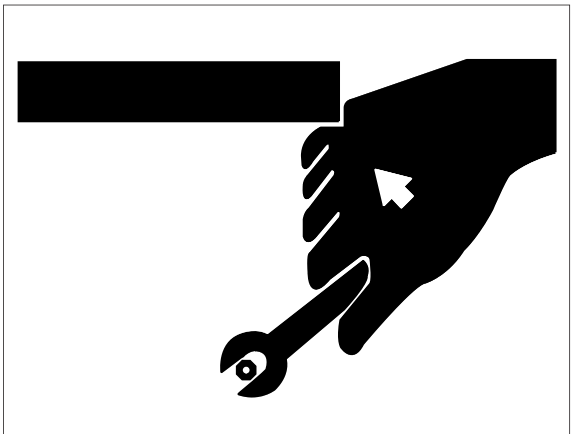
USE TOOLS PROPERLY

Use tools appropriate to the work. Makeshift tools, parts, and procedures can create safety hazards.

Use power tools only to loosen threaded tools and fasteners.

For loosening and tightening hardware, use the correct size tools. DO NOT use U.S. measurement tools on metric fasteners. Avoid bodily injury caused by slipping wrenches.

Use only recommended replacement parts. (See Parts catalogue.)



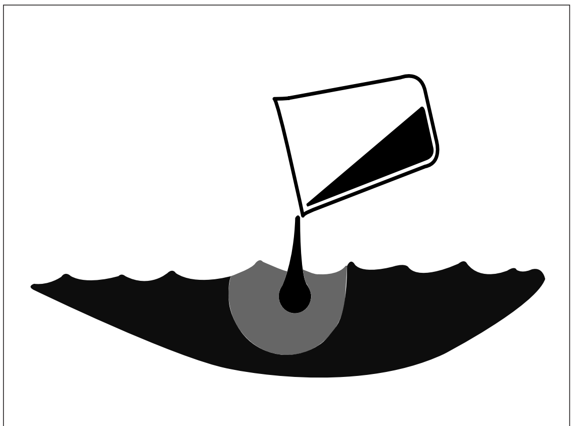
13031GE23

DISPOSE OF FLUIDS PROPERLY

Improperly disposing of fluids can harm the environment and ecology. Before draining any fluids, find out the proper way to dispose of waste from your local environmental agency.

Use proper containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

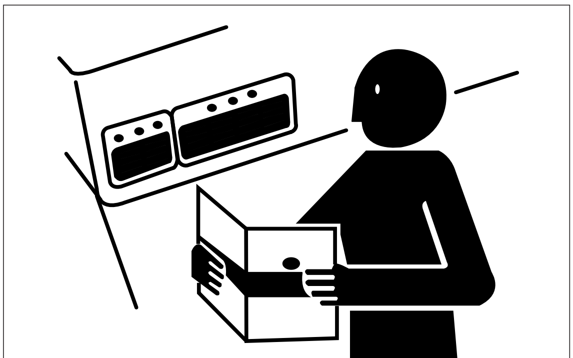
DO NOT pour oil into the ground, down a drain, or into a stream, pond, or lake. Observe relevant environmental protection regulations when disposing of oil, fuel, coolant, brake fluid, filters, batteries, and other harmful waste.



13031GE24

REPLACE SAFETY SIGNS

Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.



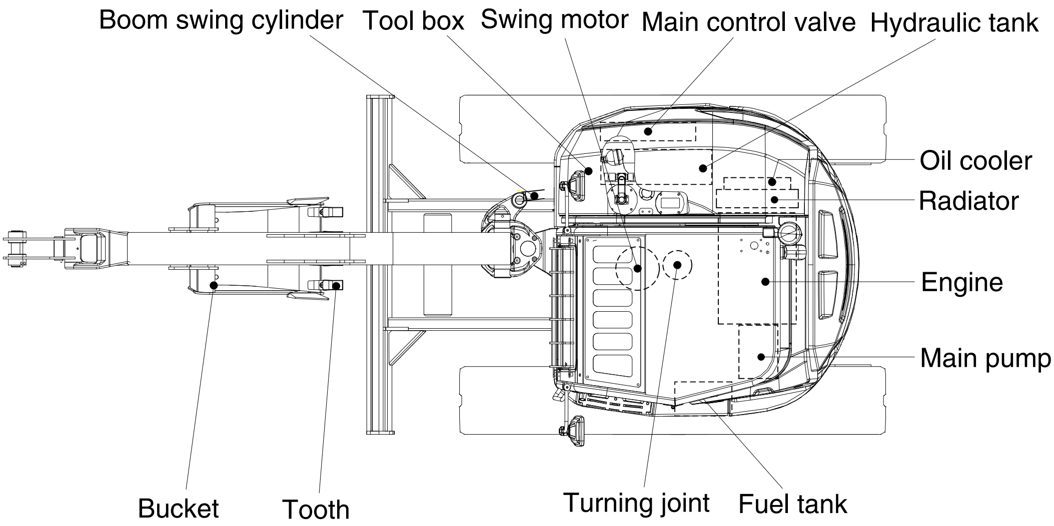
13031GE25

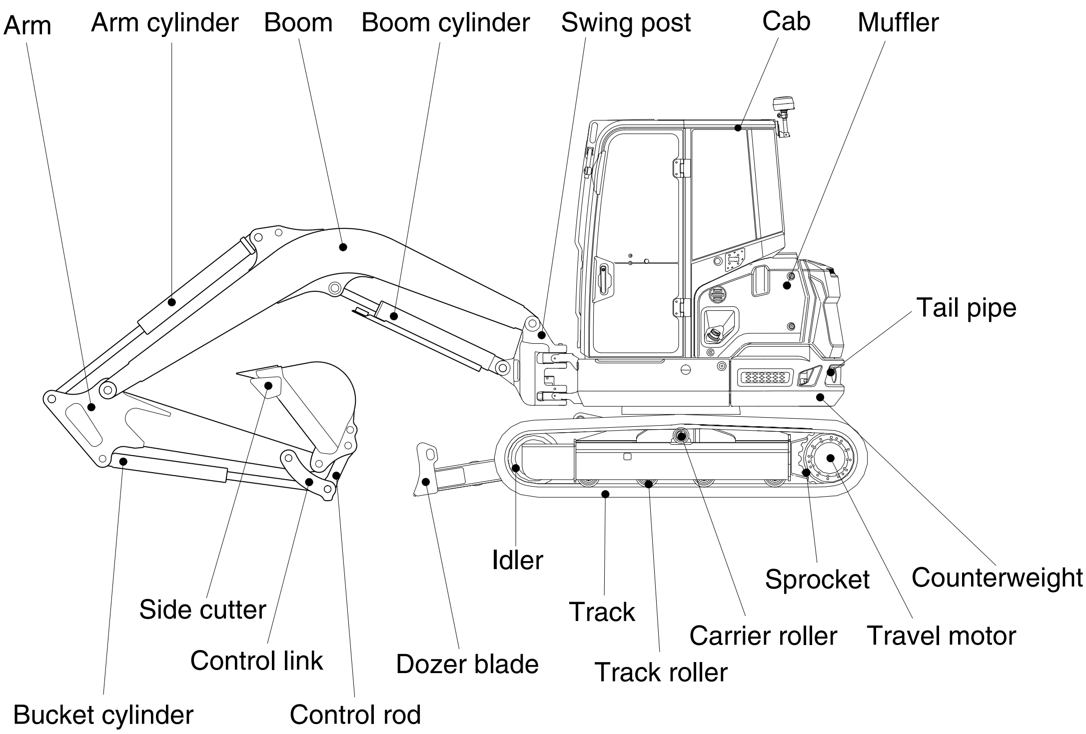
LIVE WITH SAFETY

Before returning machine to customer, make sure machine is functioning properly, especially the safety systems. Install all guards and shields.

GROUP 2 SPECIFICATIONS

1. MAJOR COMPONENT



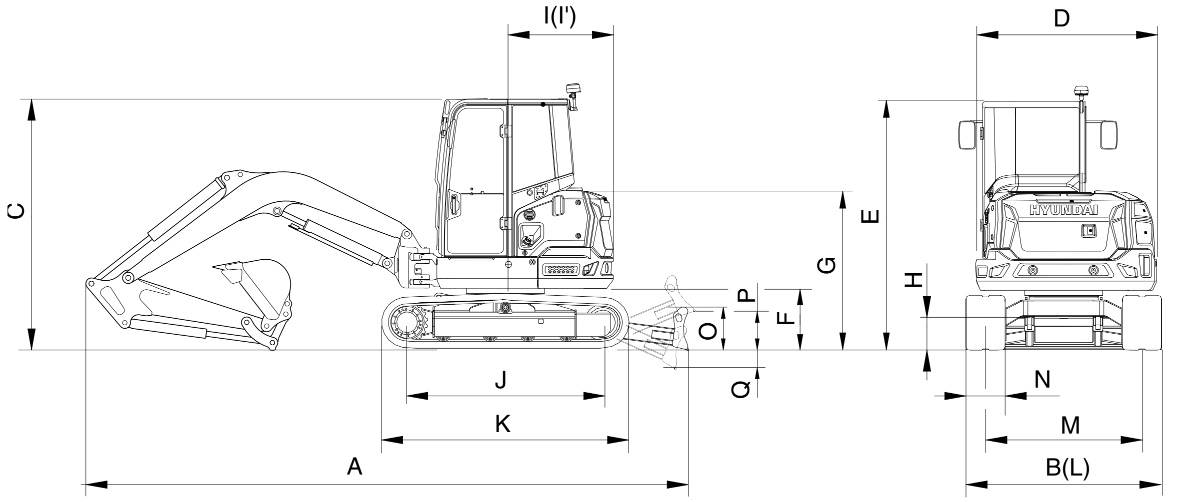


55ACR2SP01

2. SPECIFICATIONS

1) CAB TYPE

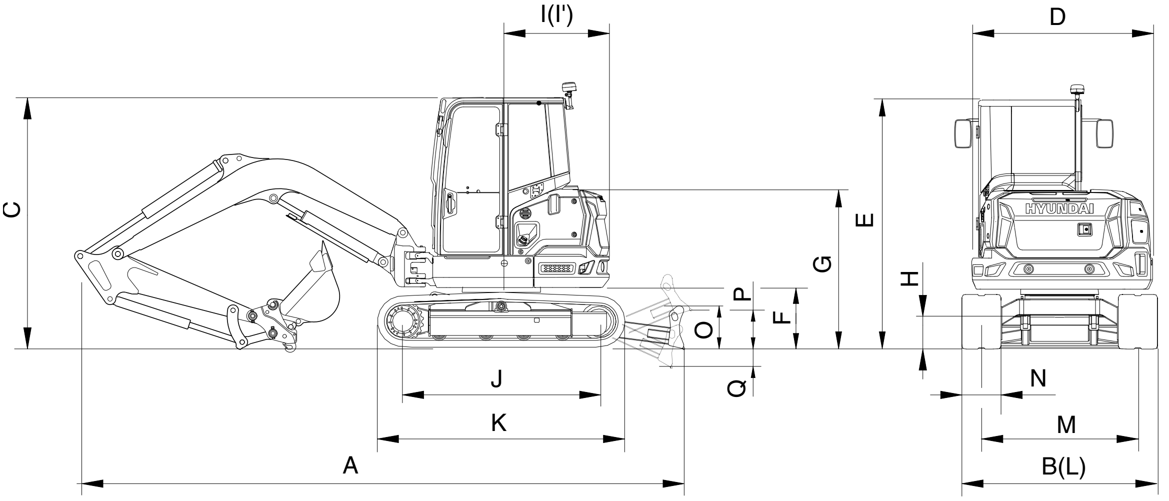
(1) 2.8 m (9' 2") boom, 1.65 m (5' 5") arm, steel track, without quick coupler (general standard)



55ACR2SP02

Description		Unit	Specification
Operating weight		kg (lb)	5635 (12420)
Bucket capacity (SAE heaped), standard		m3 (yd3)	0.15 (0.18)
Overall length	A	mm (ft-in)	5510 (18' 1")
Overall width, with 300 mm shoe	B		2000 (6' 7")
Overall width, with dozer	-		2000 (6' 7")
Overall height	C		2550 (8' 4")
Overall width of upper structure	D		1850 (6' 1")
Overall height of cab	E		2550 (8' 4")
Ground clearance of counterweight	F		608 (2' 0")
Overall height of engine hood	G		1600 (5' 3")
Minimum ground clearance	H		215 (0' 8")
Rear-end distance	I		1100 (3' 7")
Rear-end swing radius	I'		1100 (3' 7")
Distance between tumblers	J		2000 (6' 7")
Undercarriage length (without grouser)	K		2515 (8' 3")
Undercarriage width	L		2000 (6' 7")
Track gauge	M		1600 (5' 3")
Track shoe width, standard	N		400 (1' 4")
Height of blade	O		350 (1' 2")
Ground clearance of blade up	P		410 (1' 4")
Depth of blade down	Q		580 (1' 11")
Travel speed (low/high)		km/hr (mph)	2.6/4.7 (1.6/2.9)
Swing speed		rpm	10
Gradeability		Degree (%)	35
Ground pressure		kgf/cm^2 (psi)	0.33 (4.64)
Max traction force		kg (lb)	5662 (12480)

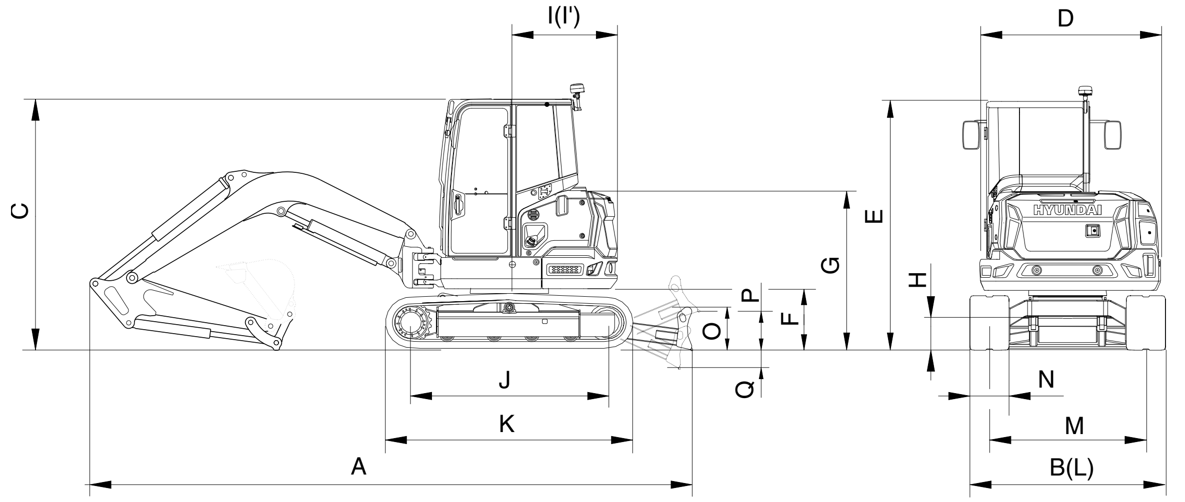
(2) 2.8 m (9' 2") boom, 1.4 m (4' 7") thumb bracket arm, rubber track, add counterweight with quick coupler (North america standard)



55ACR2SP03

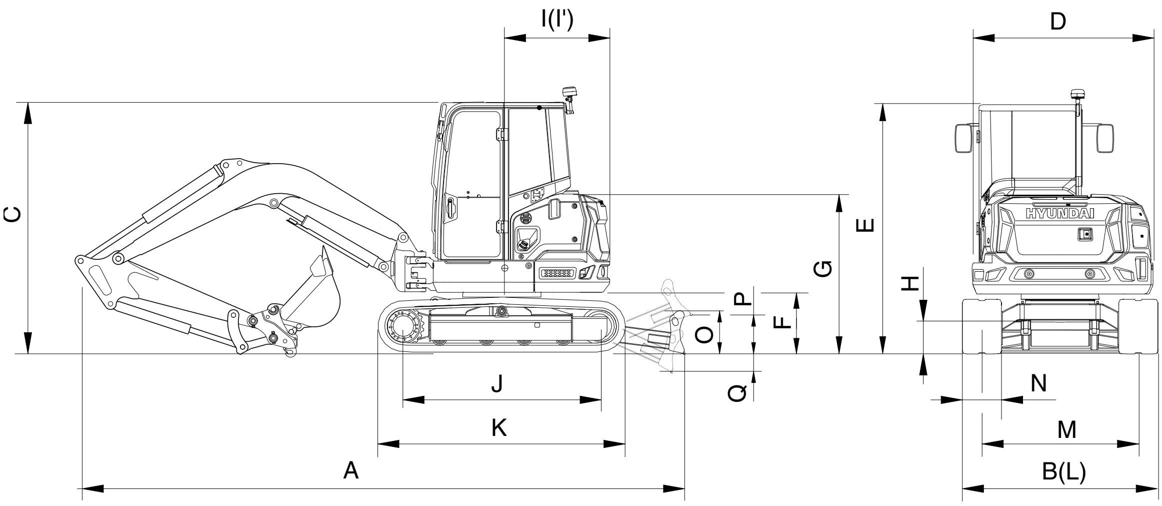
Description		Unit	Specification
Operating weight		kg (lb)	5715 (12600)
Bucket capacity (SAE heaped), standard		m3 (yd3)	0.15 (0.18)
Overall length	A	mm (ft-in)	5490 (18' 0")
Overall width, with 300 mm shoe	B		2000 (6' 7")
Overall width, with dozer	-		2000 (6' 7")
Overall height	C		2555 (8' 5")
Overall width of upper structure	D		1850 (6' 1")
Overall height of cab	E		2555 (8' 5")
Ground clearance of counterweight	F		608 (2' 0")
Overall height of engine hood	G		1605 (5' 3")
Minimum ground clearance	H		215 (0' 8")
Rear-end distance	I		1175 (3' 10")
Rear-end swing radius	I'		1175 (3' 10")
Distance between tumblers	J		2000 (6' 7")
Undercarriage length (without grouser)	K		2515 (8' 3")
Undercarriage width	L		2000 (6' 7")
Track gauge	M		1600 (5' 3")
Track shoe width, standard	N		400 (1' 4")
Height of blade	O		350 (1' 2")
Ground clearance of blade up	P		410 (1' 4")
Depth of blade down	Q		580 (1' 11")
Travel speed (low/high)		km/hr (mph)	2.6/4.7 (1.6/2.9)
Swing speed		rpm	10
Gradeability		Degree (%)	35
Ground pressure		kgf/cm² (psi)	0.33 (4.67)
Max traction force		kg (lb)	5662 (12480)

(3) 2.8 m (9' 2") boom, 1.4 m (4' 7") thumb bracket arm, rubber track, without bucket and without quick coupler (Europe standard)



Description		Unit	Specification
Operating weight		kg (lb)	5355 (11810)
Bucket capacity (SAE heaped), standard		m3 (yd3)	0.15 (0.18)
Overall length	A	mm (ft-in)	5490 (18' 0")
Overall width, with 300 mm shoe	B		2000 (6' 7")
Overall width, with dozer	-		2000 (6' 7")
Overall height	C		2555 (8' 5")
Overall width of upper structure	D		1850 (6' 1")
Overall height of cab	E		2555 (8' 5")
Ground clearance of counterweight	F		608 (2' 0")
Overall height of engine hood	G		1605 (5' 3")
Minimum ground clearance	H		225 (0' 9")
Rear-end distance	I		1175 (3' 10")
Rear-end swing radius	I'		1175 (3' 10")
Distance between tumblers	J		2000 (6' 7")
Undercarriage length (without grouser)	K		2515 (8' 3")
Undercarriage width	L		2000 (6' 7")
Track gauge	M		1600 (5' 3")
Track shoe width, standard	N		400 (1' 4")
Height of blade	O		350 (1' 2")
Ground clearance of blade up	P		485 (1' 7")
Depth of blade down	Q		670 (2' 2")
Travel speed (low/high)		km/hr (mph)	2.6/4.7 (1.6/2.9)
Swing speed		rpm	10
Gradeability		Degree (%)	35
Ground pressure		kgf/cm² (psi)	0.31 (4.37)
Max traction force		kg (lb)	5662 (12480)

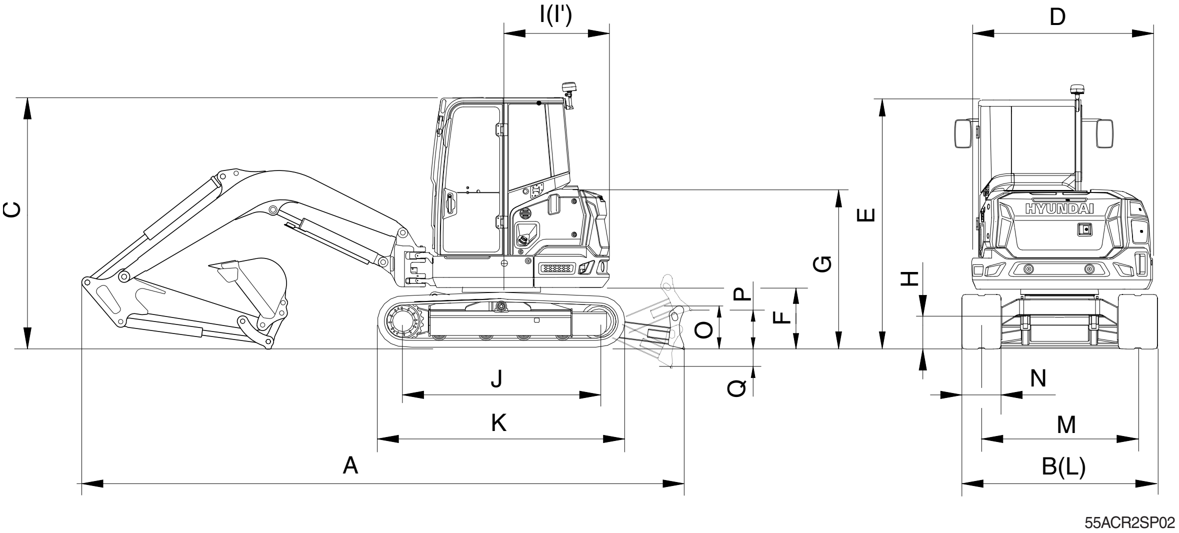
(4) 2.8 m (9' 2") boom, 1.4 m (4' 7") arm, rubber track, with quick coupler (Oceania standard)



55ACR2SP03

Description		Unit	Specification
Operating weight		kg (lb)	5585 (12310)
Bucket capacity (SAE heaped), standard		m3 (yd3)	0.15 (0.18)
Overall length	A	mm (ft-in)	5490 (18' 0")
Overall width, with 300 mm shoe	B		2000 (6' 7")
Overall width, with dozer	-		2000 (6' 7")
Overall height	C		2555 (8' 5")
Overall width of upper structure	D		1850 (6' 1")
Overall height of cab	E		2555 (8' 5")
Ground clearance of counterweight	F		608 (2' 0")
Overall height of engine hood	G		1605 (5' 3")
Minimum ground clearance	H		215 (0' 8")
Rear-end distance	I		1175 (3' 10")
Rear-end swing radius	I'		1175 (3' 10")
Distance between tumblers	J		2000 (6' 7")
Undercarriage length (without grouser)	K		2515 (8' 3")
Undercarriage width	L		2000 (6' 7")
Track gauge	M		1600 (5' 3")
Track shoe width, standard	N		400 (1' 4")
Height of blade	O		350 (1' 2")
Ground clearance of blade up	P		410 (1' 4")
Depth of blade down	Q		580 (1' 11")
Travel speed (low/high)		km/hr (mph)	2.6/4.7 (1.6/2.9)
Swing speed		rpm	10
Gradeability		Degree (%)	35
Ground pressure		kgf/cm² (psi)	0.32 (4.55)
Max traction force		kg (lb)	5662 (12480)

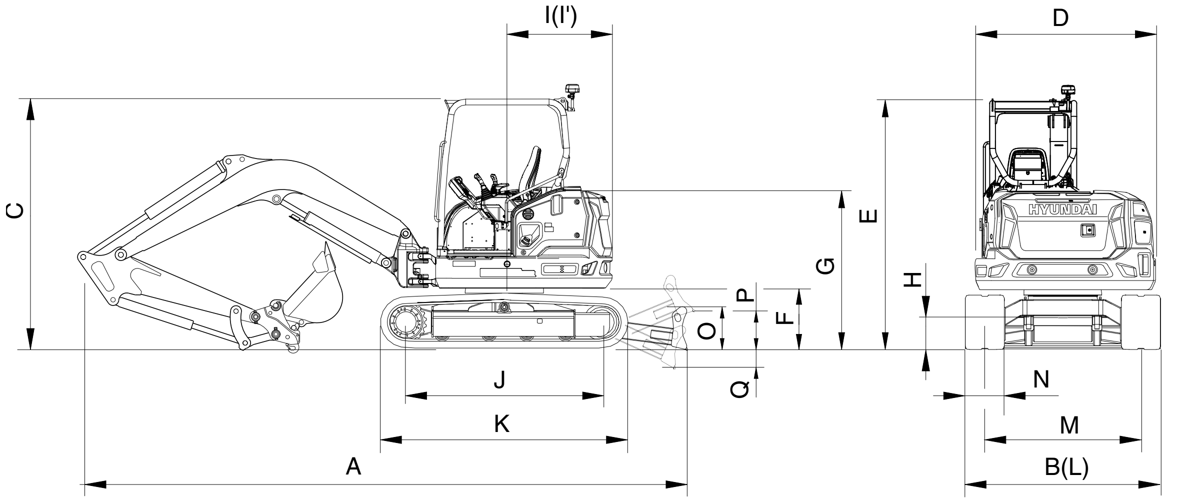
(5) 2.8 m (9' 2") boom, 1.4 m (4' 7") thumb bracket arm, rubber track, add counterweight without quick coupler and angle dozer (North america 2)



Description		Unit	Specification
Operating weight		kg (lb)	5790 (12760)
Bucket capacity (SAE heaped), standard		m3 (yd3)	0.15 (0.18)
Overall length	A	mm (ft-in)	5490 (18' 0")
Overall width, with 300 mm shoe	B		2000 (6' 7")
Overall width, with dozer	-		2000 (6' 7")
Overall height	C		2580 (8' 6")
Overall width of upper structure	D		1850 (6' 1")
Overall height of cab	E		2580 (8' 6")
Ground clearance of counterweight	F		608 (2' 0")
Overall height of engine hood	G		1605 (5' 3")
Minimum ground clearance	H		225 (0' 9")
Rear-end distance	I		1175 (3' 10")
Rear-end swing radius	I'		1175 (3' 10")
Distance between tumblers	J		2000 (6' 7")
Undercarriage length (without grouser)	K		2515 (8' 3")
Undercarriage width	L		2000 (6' 7")
Track gauge	M		1600 (5' 3")
Track shoe width, standard	N		400 (1' 4")
Height of blade	O		400 (1' 4")
Ground clearance of blade up	P		485 (1' 7")
Depth of blade down	Q		670 (2' 2")
Travel speed (low/high)		km/hr (mph)	2.6/4.7 (1.6/2.9)
Swing speed		rpm	10
Gradeability		Degree (%)	35
Ground pressure		kgf/cm2 (psi)	0.33 (4.72)
Max traction force		kg (lb)	5662 (12480)

2) CANOPY

(1) 2.8 m (9' 2") boom, 1.65 m (5' 5") long arm, rubber track, add counterweight with quick coupler (Oceania canopy 2)

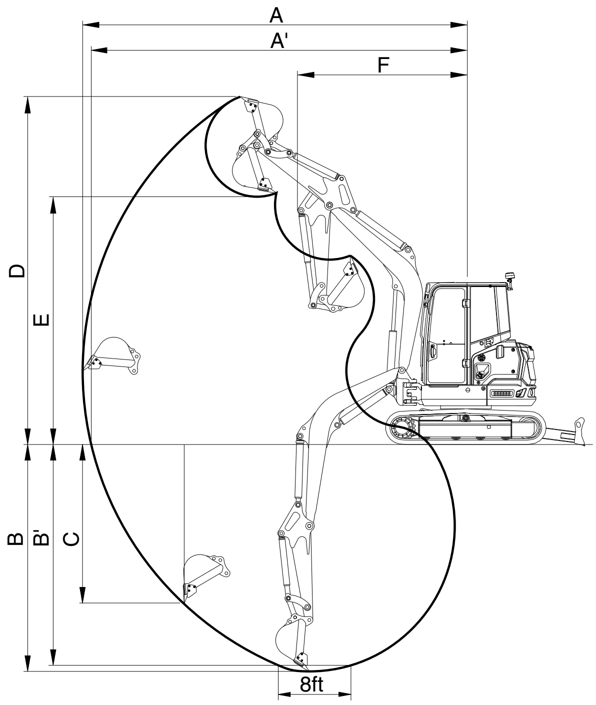


55ACR2SP05

Description		Unit	Specification
Operating weight		kg (lb)	5560 (12260)
Bucket capacity (SAE heaped), standard		m3 (yd3)	0.15 (0.18)
Overall length	A	mm (ft-in)	5510 (18' 1")
Overall width, with 300 mm shoe	B		2000 (6' 7")
Overall width, with dozer	-		2000 (6' 7")
Overall height	C		2580 (8' 6")
Overall width of upper structure	D		1850 (6' 1")
Overall height of cab	E		2580 (8' 6")
Ground clearance of counterweight	F		608 (2' 0")
Overall height of engine hood	G		1605 (5' 3")
Minimum ground clearance	H		225 (0' 9")
Rear-end distance	I		1175 (3' 10")
Rear-end swing radius	I'		1175 (3' 10")
Distance between tumblers	J		2000 (6' 7")
Undercarriage length (without grouser)	K		2515 (8' 3")
Undercarriage width	L		2000 (6' 7")
Track gauge	M		1600 (5' 3")
Track shoe width, standard	N		400 (1' 4")
Height of blade	O		400 (1' 4")
Ground clearance of blade up	P		485 (1' 7")
Depth of blade down	Q		670 (2' 2")
Travel speed (low/high)		km/hr (mph)	2.6/4.7 (1.6/2.9)
Swing speed		rpm	10
Gradeability		Degree (%)	35
Ground pressure		kgf/cm^2 (psi)	0.32 (4.54)
Max traction force		kg (lb)	5662 (12480)

3. WORKING RANGE

1) 2.8 m (9' 2") BOOM, WITHOUT QUICK COUPLER (GENERAL STANDARD)

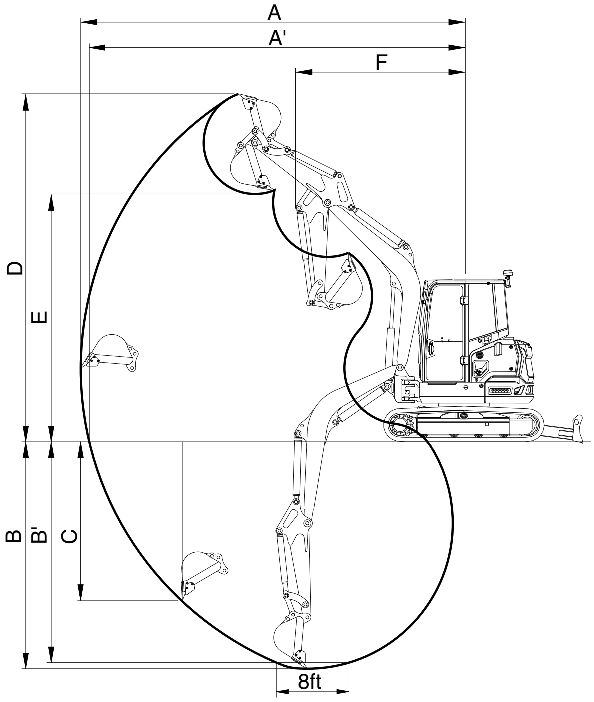


55ACR2SP10

Description		Unit	1.65 m (5' 5") Long arm
Max digging reach	A	mm (ft-in)	6230 (20' 5")
Max digging reach on ground	A'		6100 (20' 0")
Max digging depth	B		3750 (12' 4")
Max digging depth (8ft level)	B'		3380 (11' 1")
Max vertical wall digging depth	C		2900 (9' 6")
Max digging height	D		5740 (18' 10")
Max dumping height	E		4035 (13' 3")
Min swing radius	F		2580 (8' 6")
Boom swing radius (left/right)		degree	70°/60°
Bucket digging force	SAE	kN	38
		kgf	3835
		lbf	8454
	ISO	kN	43
		kgf	4340
		lbf	9567
Arm crowd force	SAE	kN	24
		kgf	2392
		lbf	5273
	ISO	kN	24
		kgf	2457
		lbf	5417

[ ] : Power boost

2) 2.8 m (9' 2") BOOM, ADD COUNTERWEIGHT, RUBBER TRACK, WITH QUICK COUPLER (NORTH AMERICA STANDARD)

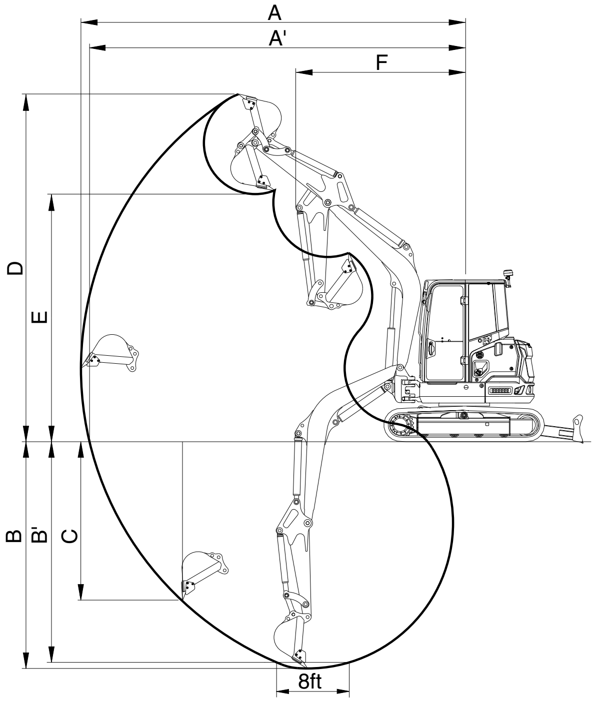


55ACR2SP10

Description		Unit	1.4 m (4' 7") Arm
Max digging reach	A	mm (ft-in)	6110 (20' 1")
Max digging reach on ground	A'		5970 (19' 7")
Max digging depth	B		3620 (11' 11")
Max digging depth (8ft level)	B'		3240 (10' 8")
Max vertical wall digging depth	C		1790 (5' 10")
Max digging height	D		5670 (18' 7")
Max dumping height	E		3740 (12' 3")
Min swing radius	F		2540 (8' 4")
Boom swing radius (left/right)		degree	70°/60°
Bucket digging force	SAE	kN	34
		kgf	3506
		lbf	7730
	ISO	kN	37
		kgf	3789
		lbf	8354
Arm crowd force	SAE	kN	25
		kgf	2512
		lbf	5539
	ISO	kN	25
		kgf	2559
		lbf	5642

[ ] : Power boost

3) 2.8 m (9' 2") BOOM, RUBBER TRACK, WITH BUCKET AND WITHOUT QUICK COUPLER (EUROPE STANDARD)

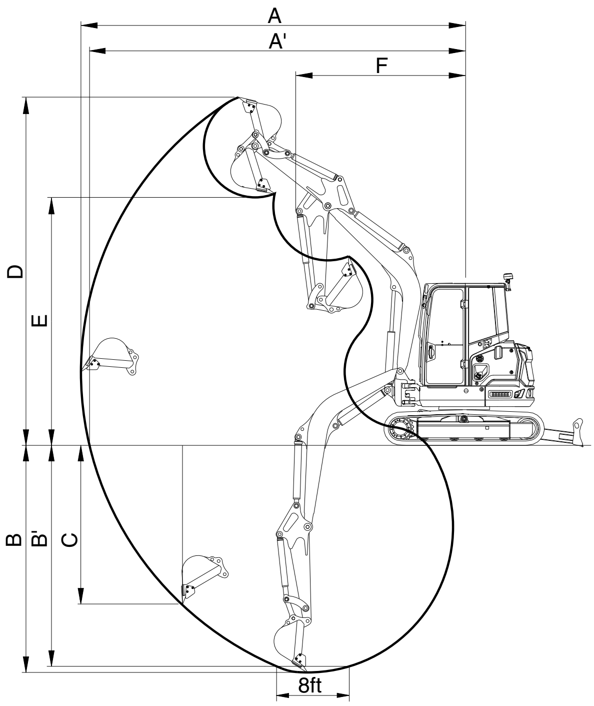


55ACR2SP10

Description		Unit	1.4 m (4' 7") Thumb bracket arm
Max digging reach	A	mm (ft-in)	5990 (19' 8")
Max digging reach on ground	A'		5850 (19' 2")
Max digging depth	B		3500 (11' 6")
Max digging depth (8ft level)	B'		3095 (10' 2")
Max vertical wall digging depth	C		2650 (8' 8")
Max digging height	D		5570 (18' 3")
Max dumping height	E		3860 (12' 8")
Min swing radius	F		2540 (8' 4")
Boom swing radius (left/right)		degree	70°/60°
Bucket digging force	SAE	kN	38
		kgf	3835
		lbf	8454
	ISO	kN	43
		kgf	4340
		lbf	9567
Arm crowd force	SAE	kN	26
		kgf	2661
		lbf	5866
	ISO	kN	27
		kgf	2744
		lbf	6050

[ ] : Power boost

4) 2.8 m (9' 2") BOOM, RUBBER TRACK, WITH QUICK COUPLER (OCEANIA STANDARD)

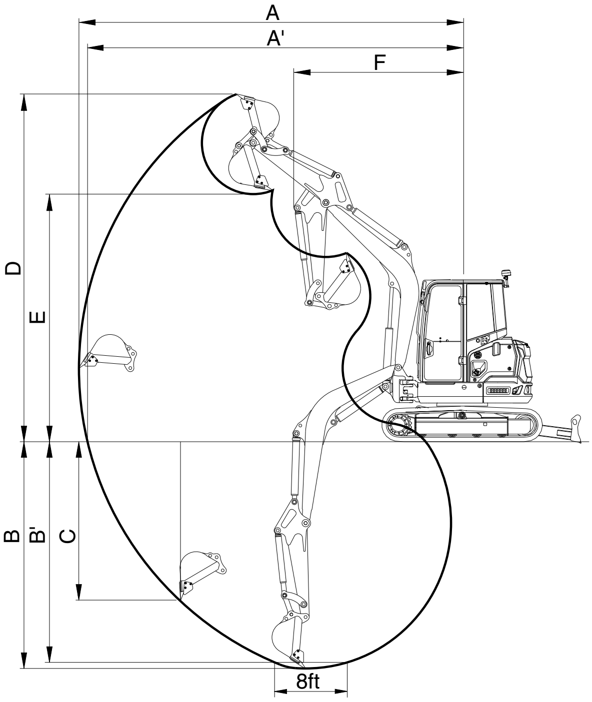


55ACR2SP10

Description		Unit	1.4 m (4' 7") Thumb bracket arm
Max digging reach	A	mm (ft-in)	6110 (20' 1")
Max digging reach on ground	A'		5970 (19' 7")
Max digging depth	B		3620 (11' 11")
Max digging depth (8ft level)	B'		3240 (10' 8")
Max vertical wall digging depth	C		1790 (5' 10")
Max digging height	D		5670 (18' 7")
Max dumping height	E		3740 (12' 3")
Min swing radius	F		2540 (8' 4")
Boom swing radius (left/right)		degree	70°/60°
Bucket digging force	SAE	kN	34
		kgf	3506
		lbf	7730
	ISO	kN	37
		kgf	3789
		lbf	8354
Arm crowd force	SAE	kN	25
		kgf	2512
		lbf	5539
	ISO	kN	25
		kgf	2559
		lbf	5642

[ ] : Power boost

5) 2.8 m (9' 2") BOOM, RUBBER TRACK, ANGLE DOZER AND WITHOUT QUICK COUPLER (NORTH AMERICA 2)

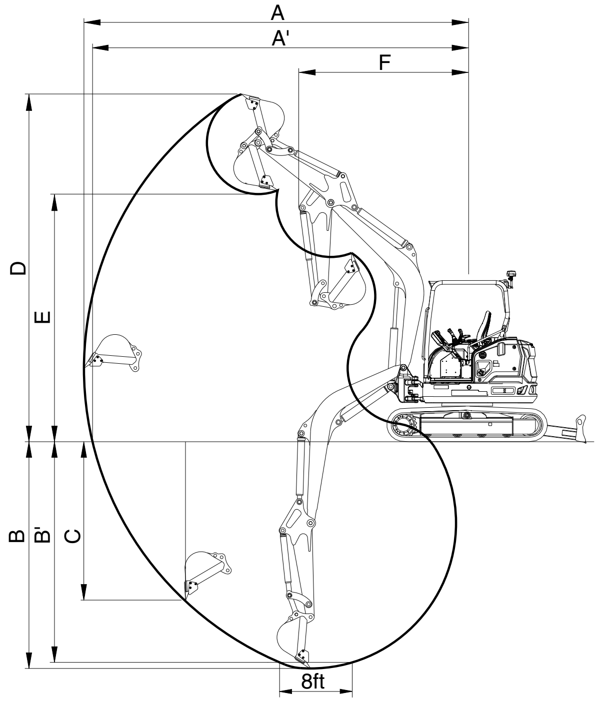


55ACR2SP10

Description		Unit		1.4 m (4' 7") Thumb bracket arm
Max digging reach	A	mm (ft-in)		5990 (19' 8")
Max digging reach on ground	A'			5850 (19' 2")
Max digging depth	B			3500 (11' 6")
Max digging depth (8ft level)	B'			3095 (10' 2")
Max vertical wall digging depth	C			2650 (8' 8")
Max digging height	D			5570 (18' 3")
Max dumping height	E			3860 (12' 8")
Min swing radius	F			2540 (8' 4")
Boom swing radius (left/right)		degree		70°/60°
Bucket digging force	SAE	kN		38
		kgf		3835
		lbf		8454
	ISO	kN		43
		kgf		4340
		lbf		9567
Arm crowd force	SAE	kN		26
		kgf		2661
		lbf		5866
	ISO	kN		27
		kgf		2744
		lbf		6050

[ ] : Power boost

6) 2.8 ㎙ (9' 2") BOOM, RUBBER TRACK, AND WITH QUICK COUPLER (OCEANIA CANOPY 2)



55ACR2SP11

Description		Unit	1.65 ㎙ (5' 5") Long arm
Max digging reach	A	mm (ft-in)	6350 (20' 10")
Max digging reach on ground	A'		6220 (20' 5")
Max digging depth	B		3870 (12' 8")
Max digging depth (8ft level)	B'		3520 (11' 7")
Max vertical wall digging depth	C		2010 (6' 7")
Max digging height	D		5840 (19' 2")
Max dumping height	E		3910 (12' 10")
Min swing radius	F		2580 (8' 6")
Boom swing radius (left/right)		degree	70°/60°
Bucket digging force	SAE	kN	34
		kgf	3506
		lbf	7730
	ISO	kN	37
		kgf	3789
		lbf	8354
Arm crowd force	SAE	kN	22
		kgf	2271
		lbf	5007
	ISO	kN	23
		kgf	2308
		lbf	5088

[ ] : Power boost

4. WEIGHT

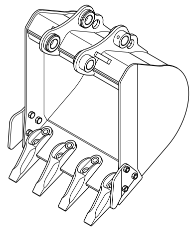
Item	kg	lb
Upperstructure assembly		
· Main frame weld assembly	667	1470
· Engine assembly (including DFP)	209	461
· Main pump assembly	25	54
· Main control valve assembly	55	121
· Swing motor assembly	46	101
· Hydraulic oil tank wa	74	163
· Fuel tank wa	12	26
· Counterweight	500	1102
· Counterweight-add	650	1433
· Cab assembly	455	1003
Lower chassis assembly		
· Track frame weld assembly	562	1239
· Dozer blade assembly	225	496
· Swing bearing	94	207
· Travel motor assembly	80	180
· Turning joint	26	57
· Sprocket	14	31
· Track recoil spring	24	53
· Idler	43.5	96
· Upper roller	5.5	12
· Lower roller	12.4	27
· Track-chain assembly-steel	315	694
· Track-chain assembly-rubber	228	503
Front attachment assembly		
· Boom assembly-2.8 m	186	410
· Arm assembly-1.4 m	89	196
· Arm assembly-1.4 m, thumb	92	203
· Arm assembly-1.65 m	108	239
· Arm assembly-1.65 m, thumb	112	246
· Bucket assembly	136	299
· Boom cylinder assembly	49	108
· Arm cylinder assembly	54	119
· Bucket cylinder assembly	37	82
· Cylinder assy-dozer	37	82
· Bucket control linkage total	35	76

※ This information is different with operating weight and transportation weight because it is not including harness, pipe, oil, fuel so on.

※ Refer to transportation for actual weight information and specifications for operating weight.

※ The weight is based on one piece.

5. BUCKET SELECTION GUIDE



0.15 m^3
SAE heaped bucket

Capacity		Width		Weight	Recommendation	
					2.8 m (9' 2") boom	
SAE heaped	CECE heaped	Without side cutter	With side cutter		1.4 m (4' 7") arm	1.65 m (5' 5") arm
0.15 m^3 (0.20 yd^3)	0.13 m^3 (0.17 yd^3)	490 mm (19.3")	610 mm (24.0")	137 kg (302 lb)	●	●

● Applicable for materials with density of 2100 kg/m^3 (3500 lb/yd^3) or less

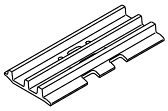
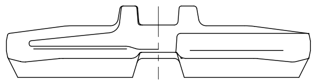
※ These recommendations are for general conditions and average use.
Work tools and ground conditions have effects on machine performance.
Select an optimum combination according to the working conditions and the type of work that is being done.
Consult with your local Hyundai dealer for information on selecting the correct boom-arm-bucket combination.

6. UNDERCARRIAGE

1) TRACKS

X-leg type center frame is integrally welded with reinforced box-section track frames. The design includes dry tracks, lubricated rollers, idlers, sprockets, hydraulic track adjusters with shock absorbing springs and assembled track-type tractor shoes with double grousers.

2) TYPES OF SHOES

Model	Shapes		Steel triple grouser	Rubber track
				
HX55A CR	Shoe width	mm (in)	400 (16")	400 (16")
	Operating weight	kg (lb)	5635 (12420)	5485 (12090)
	Ground pressure	kgf/cm^2 (psi)	0.33 (4.64)	0.29 (4.10)
	Overall width	mm (ft-in)	2000 (6' 7")	2000 (6' 7")

3) NUMBER OF ROLLERS AND SHOES ON EACH SIDE

Item	Quantity
Carrier rollers	1EA
Track rollers	4EA
Track shoes (steel grouser)	39EA

4) SELECTION OF TRACK SHOE

Suitable track shoes should be selected according to operating conditions.

Method of selecting shoes

Confirm the category from the list of applications in **table 2**, then use **table 1** to select the shoe. Wide shoes (categories B and C) have limitations on applications. Before using wide shoes, check the precautions, then investigate and study the operating conditions to confirm if these shoes are suitable.

Select the narrowest shoe possible to meet the required flotation and ground pressure. Application of wider shoes than recommendations will cause unexpected problem such as bending of shoes, crack of link, breakage of pin, loosening of shoe bolts and the other various problems.

Table 1

Model	Track shoe	Specification	Category
HX55A CR	T/chain-triple for mini (400 mm)	Option	B
	T/chain-rubber for rail interlocking (400 mm)	Standard	A

Table 2

Category	Applications	Precautions
A	Rocky ground, river beds, normal soil	· Travel at low speed on rough ground with large obstacles such as boulders or fallen trees or a wide range of general civil engineering work
B	Normal soil, soft ground	· These shoes cannot be used on rough ground with large obstacles such as boulders or fallen trees · Travel at high speed only on flat ground · Travel slowly at low speed if it is impossible to avoid going over obstacles
C	Extremely soft ground (swampy ground)	· Use the shoes only in the conditions that the machine sinks and it is impossible to use the shoes of category A or B · These shoes cannot be used on rough ground with large obstacles such as boulders or fallen trees · Travel at high speed only on flat ground · Travel slowly at low speed if it is impossible to avoid going over obstacles

7. SPECIFICATIONS FOR MAJOR COMPONENTS

1) ENGINE

Item	Specification
Model	Yanmar 4TNV86CT
Type	4 cycle, inline, water-cooled diesel engine
Cooling method	Water cooling
Number of cylinders and arrangement	4 cylinders, in-line
Firing order	1-3-4-2
Combustion chamber type	Direct injection
Cylinder bore × stroke	86 × 90 mm (3.46" × 3.39")
Piston displacement	2091 cc (128 cu in)
Compression ratio	19.2
Rated gross horse power (SAE J1995)	47.6 hp (35.5 kW)
Rated net horse power (SAE J1995)	-
Max. power	47.6 hp (35.5 kW)
Peak torque	176.6 N · m (130.3 lbf · ft)
Engine oil quantity	7.4 ℓ (1.95 U.S. gal)
Dry weight	239 kg (527 lb)
Starting motor	12V-3.0 kW
Alternator	12V-80 A

2) MAIN PUMP

Item	Specification
Type	AL A10V O 63LA7DS (Load sensing system)
Capacity	63 cc/rev
Maximum pressure	275 kgf/cm² (3920 psi)
Rated oil flow	138 ℓ/min (36.5 U.S. gpm / 30.4 U.K. gpm)
Rated speed	2200 rpm

3) MAIN CONTROL VALVE

Item		Specification
Type		10EL, RS12 (load sensing system)
Operating method		Hydraulic pilot system
Main relief valve pressure		254 kgf/cm^2 (3613 psi)
Overload relief valve pressure	Boom	295 kgf/cm^2 (4196 psi)
	Arm	275 kgf/cm^2 (3912 psi)
	Bucket	275 kgf/cm^2 (3912 psi)

4) SWING MOTOR

Item	Specification
Type	Hydraulic radial motor
Capacity	500 cc
Relief pressure	350 kgf/cm^2 (4980 psi)
Braking system	Automatic, spring applied hydraulic released
Braking torque	181.5 kgf · m (1313 lbf · ft)
Brake release pressure	12~30 kgf/cm^2 (171~427 psi)

5) TRAVEL MOTOR

Item	Specification
Type	Two fixed displacement axial piston motor
Capacity	47.0/25.0 cc/rev
Relief pressure	285 kgf/cm^2 (4060 psi)
Reduction gear type	2-stage planetary
Braking system	Automatic, spring applied hydraulic released
Brake release pressure	12 kgf/cm^2 (171 psi)
Braking torque	14.5 kgf · m (105 lbf · ft)

6) CYLINDER

Item		Specification
Boom cylinder	Bore dia × Rod dia × Stroke	Ø95× Ø55×643 mm
	Cushion	Extend only
Arm cylinder	Bore dia × Rod dia × Stroke	Ø85× Ø55×710 mm
	Cushion	Extend and retract
Bucket cylinder	Bore dia × Rod dia × Stroke	Ø80× Ø50×590 mm
	Cushion	-
Boom swing cylinder	Bore dia × Rod dia × Stroke	Ø80× Ø50×525 mm
	Cushion	-
Dozer cylinder	Bore dia × Rod dia × Stroke	Ø115× Ø60×212 mm
	Cushion	-
Dozer cylinder (DPC)	Bore dia × Rod dia × Stroke	Ø115× Ø60×212 mm
	Cushion	-
Angle swing cylinder	Bore dia × Rod dia × Stroke	Ø95× Ø45×335 mm
	Cushion	-

※ Discoloration of cylinder rod can occur when the friction reduction additive of lubrication oil spreads on the rod surface.

※ Discoloration does not cause any harmful effect on the cylinder performance.

7) BUCKET

Item	Capacity		Tooth quantity	Width	
	SAE heaped	CECE heaped		Without side cutter	With side cutter
STD	0.15 m^3 (0.20 yd^3)	0.13 m^3 (0.17 yd^3)	4	490 mm (19.3")	610 mm (24.0")

8. RECOMMENDED OILS

HYUNDAI genuine lubricating oils have been developed to offer the best performance and service life for your equipment. These oils have been tested according to the specifications of HYUNDAI and, therefore, will meet the highest safety and quality requirements.
We recommend that you use only HYUNDAI genuine lubricating oils and grease officially approved by HYUNDAI.

Service point	Kind of fluid	Capacity ℓ (U.S. gal)	Ambient temperature °C(°F) -50 (-58), -30 (-22), -20 (-4), -10 (14), 0 (32), 10 (50), 20 (68), 30 (86), 40 (104)
Engine oil pan	Engine oil	7.4 (2.0)	SAE 5W-40 ★SAE 0W-40 SAE 5W-30 SAE 15W-40
Final drive	Gear oil	1.1×2 (0.29×2)	★SAE 75W-90 SAE 80W-90
Hydraulic tank	Hydraulic oil	Tank: 44 (11.6) System: 63 (16.6)	★ISO VG 15 ISO VG 32 ISO VG 46★3 ISO VG 68
Fuel tank	Diesel fuel★1	66.8 (17.6)	★ASTM D975 NO.1 ASTM D975 NO.2
Fitting (grease nipple)	Grease	As required	★NLGI NO.1 NLGI NO.2
Radiator (reservoir tank)	Mixture of antifreeze and soft water★2	11.5 (3.0)	Ethylene glycol base permanent type (50 : 50) ★Ethylene glycol base permanent type (60 : 40)

※ Using any lubricating oils other than HYUNDAI genuine products may lead to a deterioration of performance and cause damage to major components.
※ Do not mix HYUNDAI genuine oil with any other lubricating oil as it may result in damage to the systems of major components.
※ For HYUNDAI genuine lubricating oils and grease for use in regions with extremely low temperatures, please contact your local Hyundai dealer.

SAE : Society of Automotive Engineers
API : American Petroleum Institute
ISO : International Organization for Standardization
NLGI : National Lubricating Grease Institute
ASTM : American Society of Testing and Material

★ : Cold region
Russia, CIS, Mongolia
★1 : Ultra low sulfur diesel
- sulfur content ≤ 10 ppm
★2 : Soft water
City water or distilled water
★3 : HD Hyundai Bio hydraulic oil

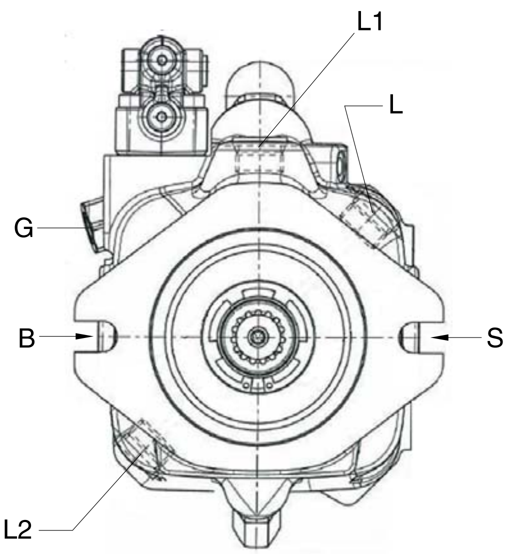
SECTION 2 STRUCTURE AND FUNCTION

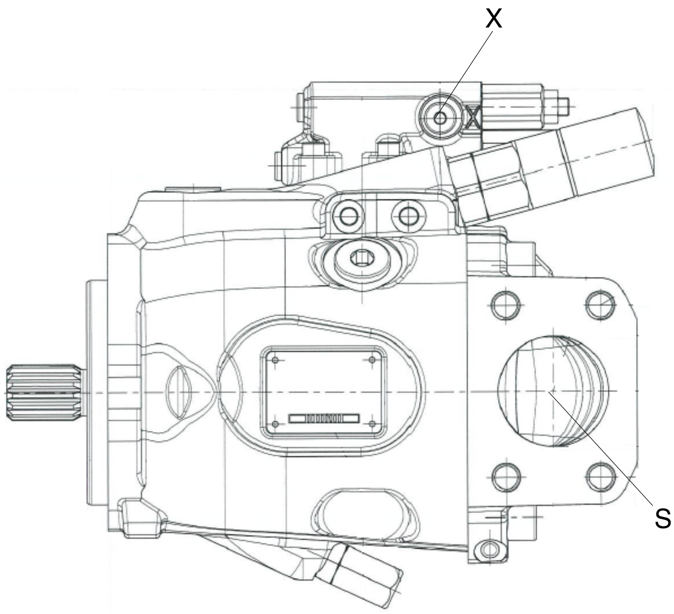
Group 1 Pump Device 2-1
Group 2 Main Control Valve 2-10
Group 3 Swing Device 2-43
Group 4 Travel Device 2-47
Group 5 RCV Lever 2-62
Group 6 RCV Pedal 2-77

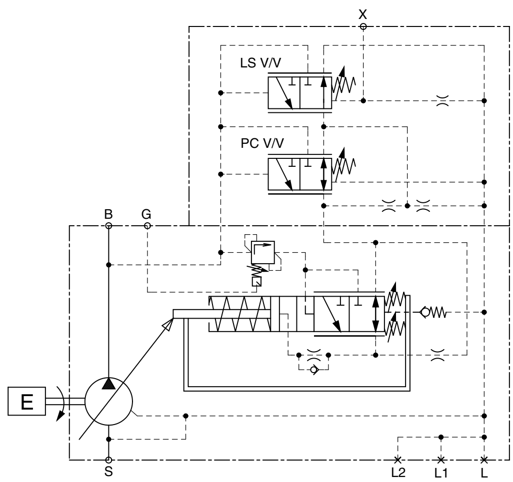
GROUP 1 HYDRAULIC PUMP

1. GENERAL

This main pump is variable displacement piston type with load sensing system.







Hydraulic circuit

55ACR2MP01

Description of the ports

Port	Name	Bore
S	Suction port	SAE 2"
B	Discharge port	SAE 1"
G	High pressure port for dual torque function	M10x1
X	Pilot pressure port	PF7/16-20UNF
L, L1, L2	Case drain port	PF7/8-14UNF

2. START OF POWER CONTROL

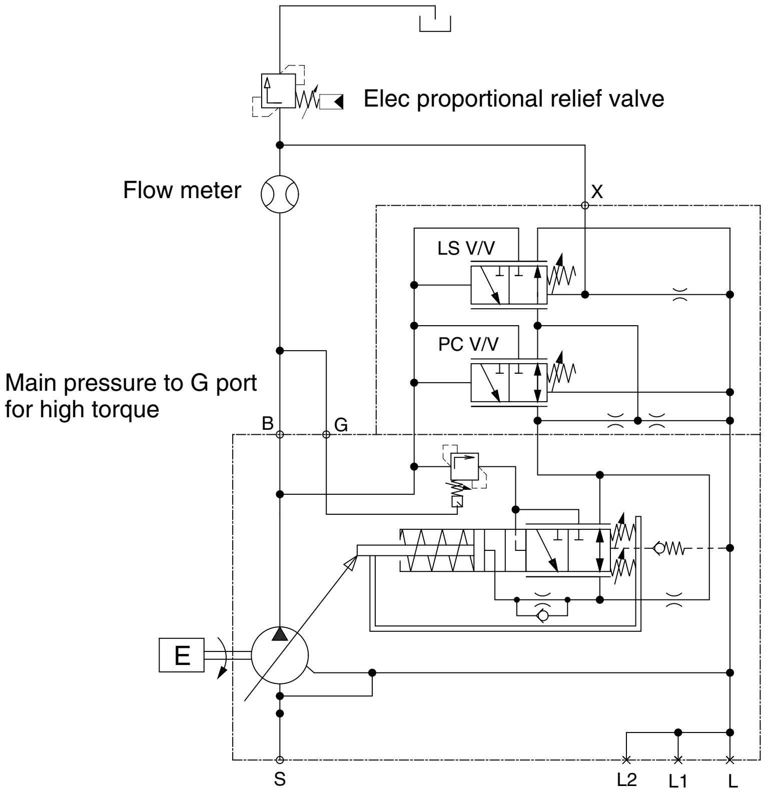
Setting of starting point in P-Q curve shall be carried out as per following conditions and procedures.

1) CONDITIONS

(1) Engine shall be running at 2000 rpm.

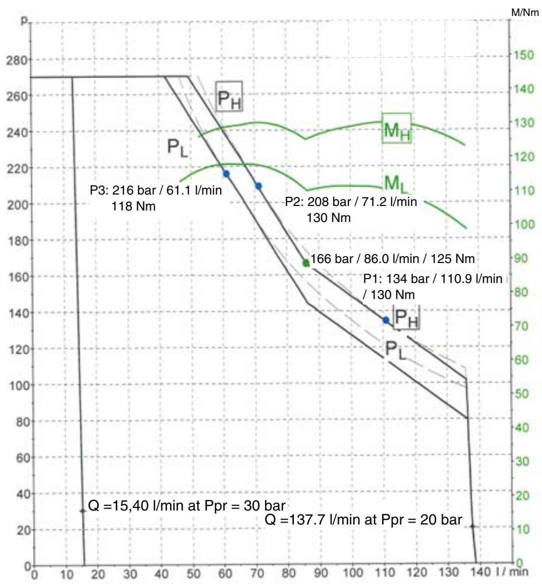
(2) Oil temperature shall be adjusted at 40 ℃.

(3) Pressure gauges and a flow meter shall be installed.

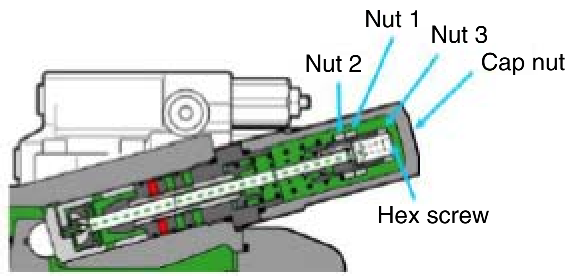


Schematic circuit

55ACR2MP10



P-Q curve



Pump schematic drawing

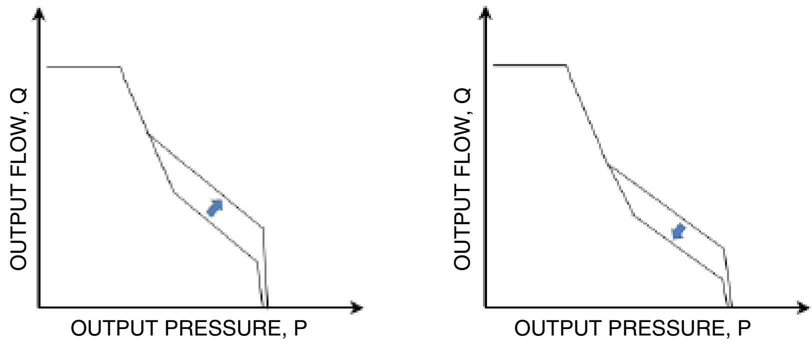
55ACR2MP11

2) PROCEDURES

(1) Loosen nut 1 fixing nut 2.
(2) Adjust outer spring by tightening or loosening nut 2.
 ① Increase pressure up to 170 bar.
 ② Turn Nut 2 clockwise to increase power until pumping flow reaches 123 ℓ/min (±4 ℓ/min).
(3) Secure the setting of nut 2 by tightening nut 1.

3) CHANGE OF P-Q CURVE

(1) If length of outer spring is decreased by tightening nut 2, the P-Q curve is moved to right in general like a graph left under as the spring tension is increased.
(2) If length of outer spring is increased by loosening nut 2, the P-Q curve is moved to left in general like a graph right under as the spring tension is decreased.



85A2MP12

3. END OF POWER CONTROL

Setting of ending point in P-Q curve shall be carried out following procedures and conditions.

1) CONDITIONS

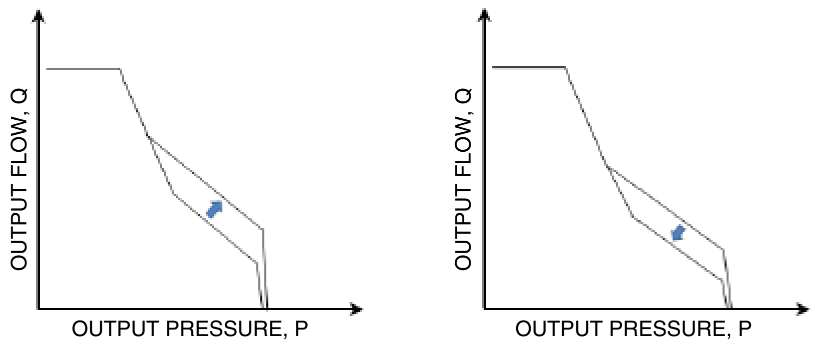
(1) The conditions shall be set same as above.

2) PROCEDURES

(1) Loosen the nut 3.
(2) Set end of control by turning Hexagonal screw.
 ① Increase pressure to 220 bar.
 ② Turn Screw clockwise to increase power until 92 ℓ/min (±4 ℓ/min) is reached.
(3) Secure the setting of nut 3.
(4) Tighten Cap nut.

3) CHANGE OF P-Q CURVE

(1) If length of Inner spring is deceased by tightening hexagonal screw, lower part of P-Q curve is moved to right like a graph left under as the tension force of spring is increased.
(2) If length of Inner spring is increased by loosening hexagonal screw, lower part of P-Q curve is moved to left like a graph left under as the tension force of spring is decreased.



85A2MP13

4. APPENDIXES

Required torque for bolt tightening

Part	Name	Required torque	
		kgf·m	lbf·ft
Nut 1	14 mm	5.1	36.9
Nut 2	14 mm	5.1	36.9
Nut 3	10 mm	4.1	29.7
Cap nut	32 mm	7.1	51.4
Hexagon screw	10 mm	-	-

5. DUAL TORQUE MODE

Pump power needs to be decreased in case that engine power is not enough to cover air condition operating at maximum pump operating. This function lets the pump power decrease by operating of dual torque valve.

(1) Normal operating condition (without air conditioner mode)
Solenoid valve (7) maintains the pushed position and allows oil to flow from passage (15) to passage (19). The pressure pushes dual torque valve (5) not to allow the pumping oil to flow toward control valve (6) inside. As a result, pressure in front of dual torque valve (5) does not effect on the angle of swash plate (25).

(2) Excessive operating condition (by air conditioner mode)

If air conditioner operates with maximum pump operating, the increased power will overload engine. Therefore, pump power needs to be decreased to share power consumption with air conditioner without overload to engine.

Connection between passage (15) and passage (19) is blocked by deactivation of solenoid valve (7). Dual torque valve which was pushed by the pressure in passage (19) also returns to initial position by spring force. This return allows the pumping oil to flow toward control valve (6) inside. The angel of swash plate (25) is decreased by the pressure in control valve. As a result, pump flow is decreased and power consumption by pump also is decreased.

6. UPSTROKE

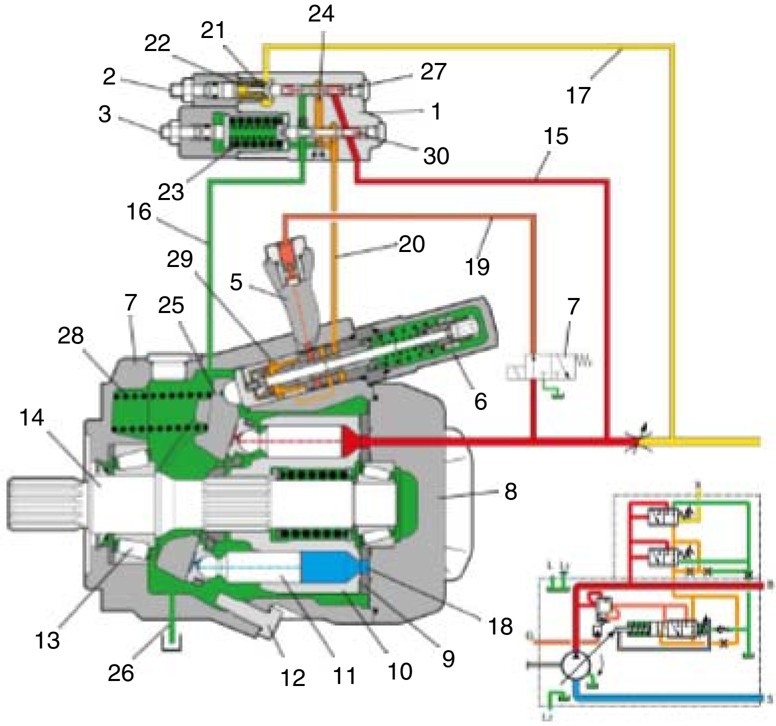
Upstroking of the pump occurs as a demand for flow from attachment.

The increased demand for flow causes a LS pressure in passage (17). The LS pressure in passage (17) combines with the force of spring (22) in cavity (21). The force of spring (22) causes pump pressure to be higher than pressure of passage (17).

If the combination of LS pressure and spring force is greater than the pump discharge pressure in passage (15), this difference pressure causes a spool (27) to move right. As the spool (27) moves right, the spool (27) blocks inflow of pumping oil to control piston (6) through passage (20). Swash plate (25) is controlled by pressure and flow as much as hydraulic system requests.

Pilot oil in passage (20) drains to passage (24). The oil then flows into housing through passage (16) into the housing and finally drains to tank. It also causes pumping flow to increase. As flow requirement is satisfied, pump output pressure increases. The pressure increases until the pressure in passage (24) moves flow compensator spool (27) up to be satisfied with system requirement for pressure and flow.

· Pump discharge pressure = force of spring (22) + LS pressure (17)



1 Regulator	13 Bearing	21 Cavity
2 Flow adjustment screw	14 Drive shaft	22 Spring
3 Pressure adjustment screw	15 Passage (high pressure)	23 Spring
4 Pump housing	16 Passage (leakage pressure)	24 Passage
5 Dual torque valve	17 Passage (pilot pressure)	25 Swash plate
6 Control valve	18 Passage (suction pressure)	26 Casing drain
7 Solenoid valve	19 Passage (dual torque valve pilot pressure)	27 Flow compensator spool
8 Port plate	20 Passage (control piston pilot pressure)	28 Spring
9 Distributor plate		29 Cross drilled hole
10 Cylinder block		30 Pressure compensator spool
11 Piston		
12 Minimum flow limitation valve		

7. DESTROKE

The decreased flow demand causes LS pressure in passage (17). LS pressure in passage (17) combines with force of spring (22) in cavity (21).

This combination of LS pressure and spring force is less than the pump pressure in passage (15). It causes flow compensator spool (27) to move left.

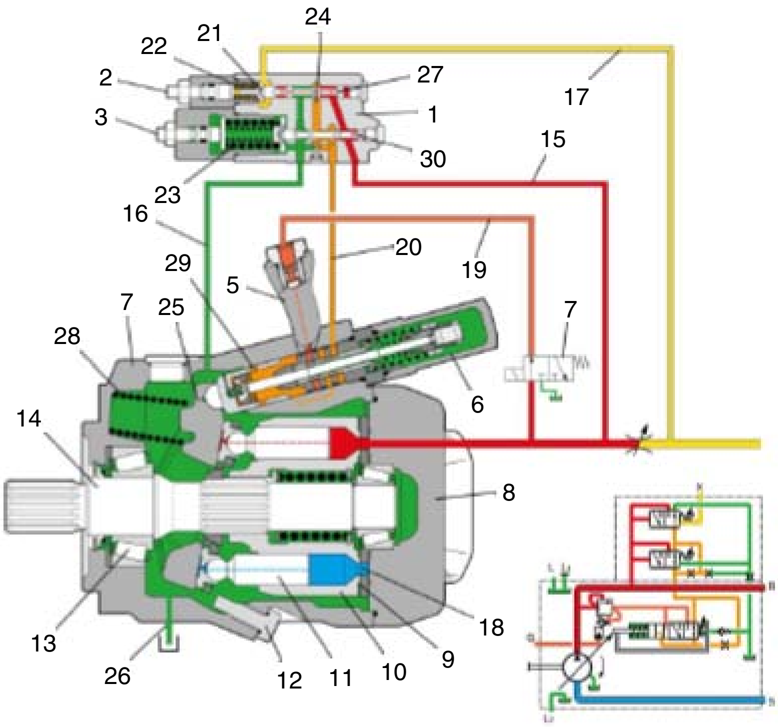
Pumping oil now flows through passage (15). The oil then flows past flow compensator spool (27), and then to control piston (6) through passage (20).

Combined force of pump pressure behind control piston (6) and counter spring (28) is bigger than force of springs inside control piston (6). Angle of swash plate (25) decreases.

This action results in decreasing of pump output and system pressure.

When the flow is decreased enough, flow compensator spool (27) moves right up to the balance position.

Swash plate (25) maintains the angle that is sufficient to provide the lower required pressure. If the operator does not operate RCV lever or pedal, the pump will return to low pressure stand-by.



85A2MP15

8. LOW PRESSURE STAND-BY

Low pressure standby constitutes the following condition: a running engine and inactive attachment. There is no flow demand or pressure demand on the pump. Therefore, there is no LS pressure in passage (17).

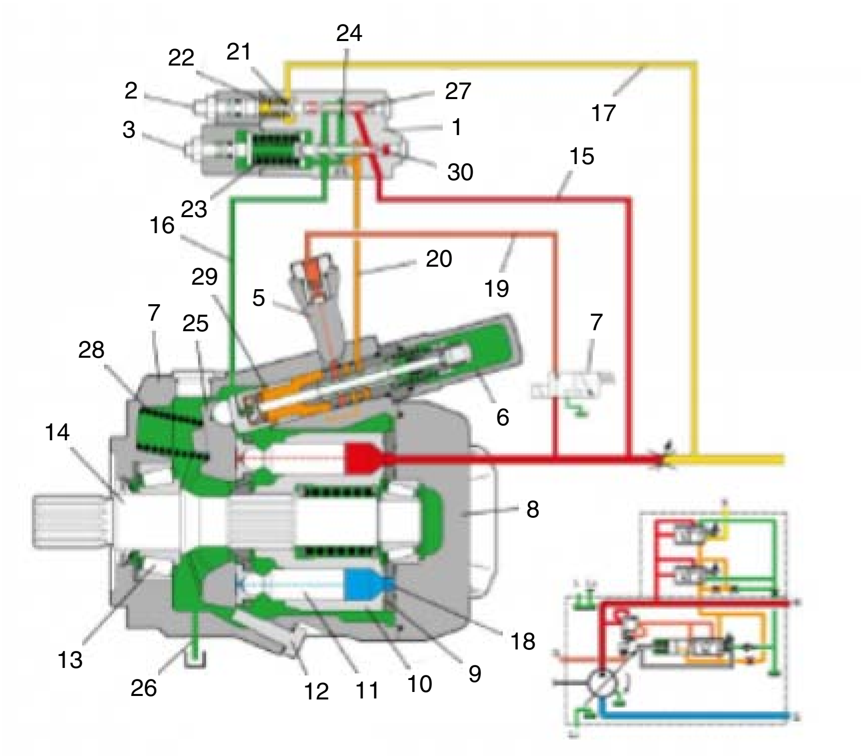
Before you start the engine, counter spring (28) holds swash plate (25) at the maximum angle. As the pump begins to operate, oil begins to flow and pressure increases in the system.

As the pressure increases, the pressure pushes flow compensator spool (27) against spring (22). It causes flow compensator spool (27) to move left. It opens passage (24) in order to allow pumping oil to flow to control piston (6) via passage (20).

The oil acts against control piston (6) in order to overcome the force of counter spring (28). The oil causes control piston (6) to move to the left. When control piston (6) moves to the left, the piston moves swash plate (25) toward the minimum angle. Control piston (6) continues to move to the left until cross-drilled hole (29) allows the oil to drain to pump housing. Cross-drilled hole (29) limits the maximum travel of control piston (6) toward the left.

The pump supplies a sufficient amount of flow that can compensate for the system leakage and the pump leakage. The leakage to the pump housing is flowed from the cross-drilled hole. The pump maintains low pressure stand-by. Low pressure stand-by should not exceed 15 bar.

※ **Low pressure standby will vary in the same pump as the system leakage or the pump leakage increases. The pump will slightly upstroke in order to compensate for the leakage increasing. Control piston (6) will cover much flow control than the flow through the cross-drilled hole.**



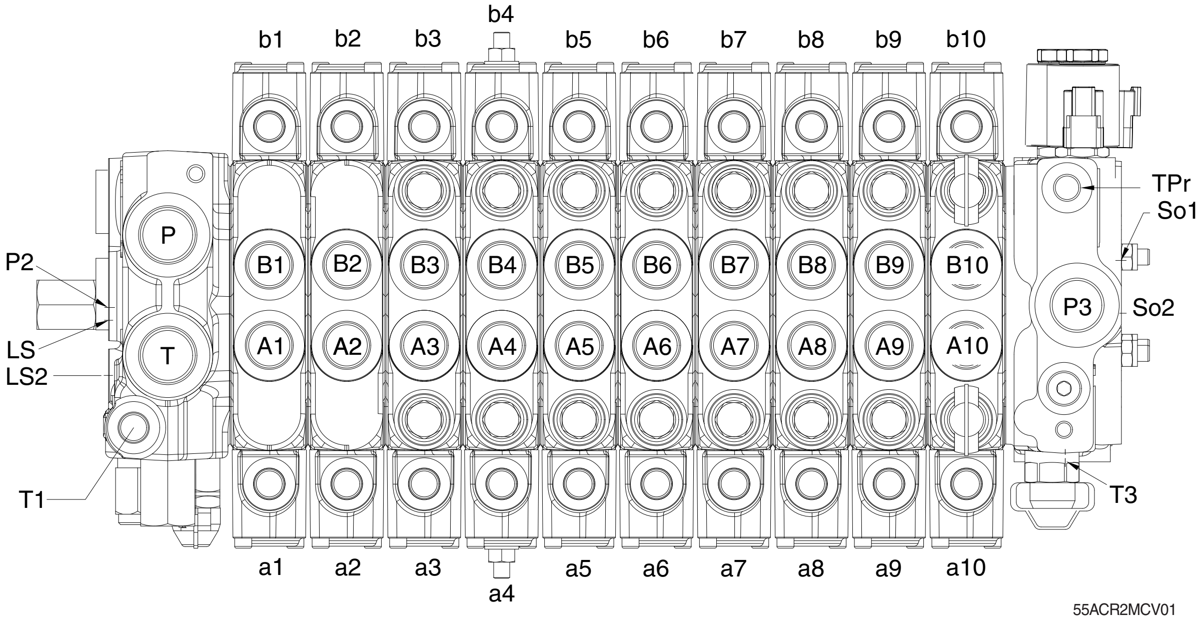
85A2MP16

9. CUT OFF FUNCTION

Once sudden pressure increasing in LS line occurs while attachments work, flow decreasing should be a necessary function to prevent a shock inside the pump. When high pressure in passage (15) flows to regulator (1), spools are likely to move by its force. However, shift of flow compensator spool (27) is restricted by LS pressure pushing spring (22) which is generated from attachments. Therefore, flow compensator spool (27) still blocks a connection from passage (27) to passage (24). The flow blocked by flow compensator spool (27) alternatively shifts pressure compensator spool (30) to right. Passage (15) connects to passage (20) by this shift. High pressure flows to control valve (6), then decreases an angle of swash plate (25). Pumping flow finally will decrease by shift of flow compensator spool (27) although flow compensator spool (27) does not shift.

GROUP 2 MAIN CONTROL VALVE

1. OUTLINE

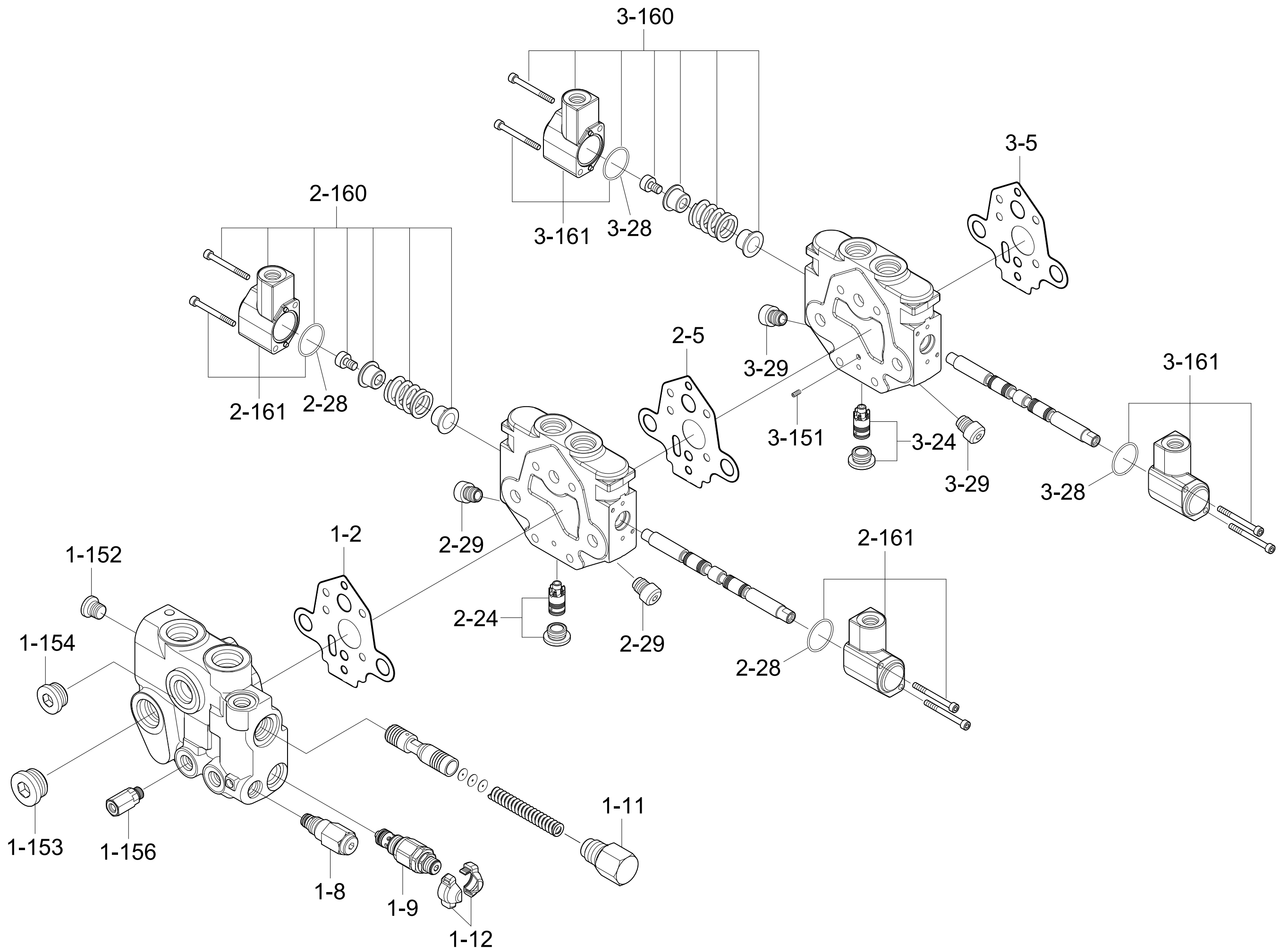


55ACR2MCV01

Mark	Port name
P	Pump port
P3	Pump port
A4	Swing port (LH)
B4	Swing port (RH)
A7	Dozer down port
B7	Dozer up port
A8	Boom swing port (LH)
B8	Boom swing port (RH)
A10	Rotating port-CCW
B10	Rotating port-CW
A5	Arm out port
B5	Arm in port
A2	Travel port [LH/FW]
B2	Travel port [LH/RR]
A1	Travel port [RH/FW]
B1	Travel port [RH/RR]
A3	Boom up port
B3	Boom down port
A6	Bucket in port
B6	Bucket out port
A9	Auxiliary 1 port (opt)
B9	Auxiliary 1 port (opt)
T	Tank return port
T1, T3	Tank return port
a4	Swing pilot port (LH)

Mark	Port name
b4	Swing pilot port (RH)
a7	Dozer down pilot port
b7	Dozer up pilot port
a8	Boom swing pilot port (LH)
b8	Boom swing pilot port (RH)
a10	Rotating pilot port-CCW
b10	Rotating pilot port-CW
a5	Arm out pilot port
b5	Arm in pilot port
a2	Travel pilot port (LH/FW)
b2	Travel pilot port (LH/RR)
a1	Travel pilot port (RH/FW)
b1	Travel pilot port (RH/RR)
a3	Boom up pilot port
b3	Boom down pilot port
a6	Bucket in pilot port
b6	Bucket out pilot port
a9	Auxiliary 1 pilot port (opt)
b9	Auxiliary 1 pilot port (opt)
LS	Load sensing port
LS2	Load sensing port
TPr	Drain port
So1	Pilot out port
So2	Travel speed port

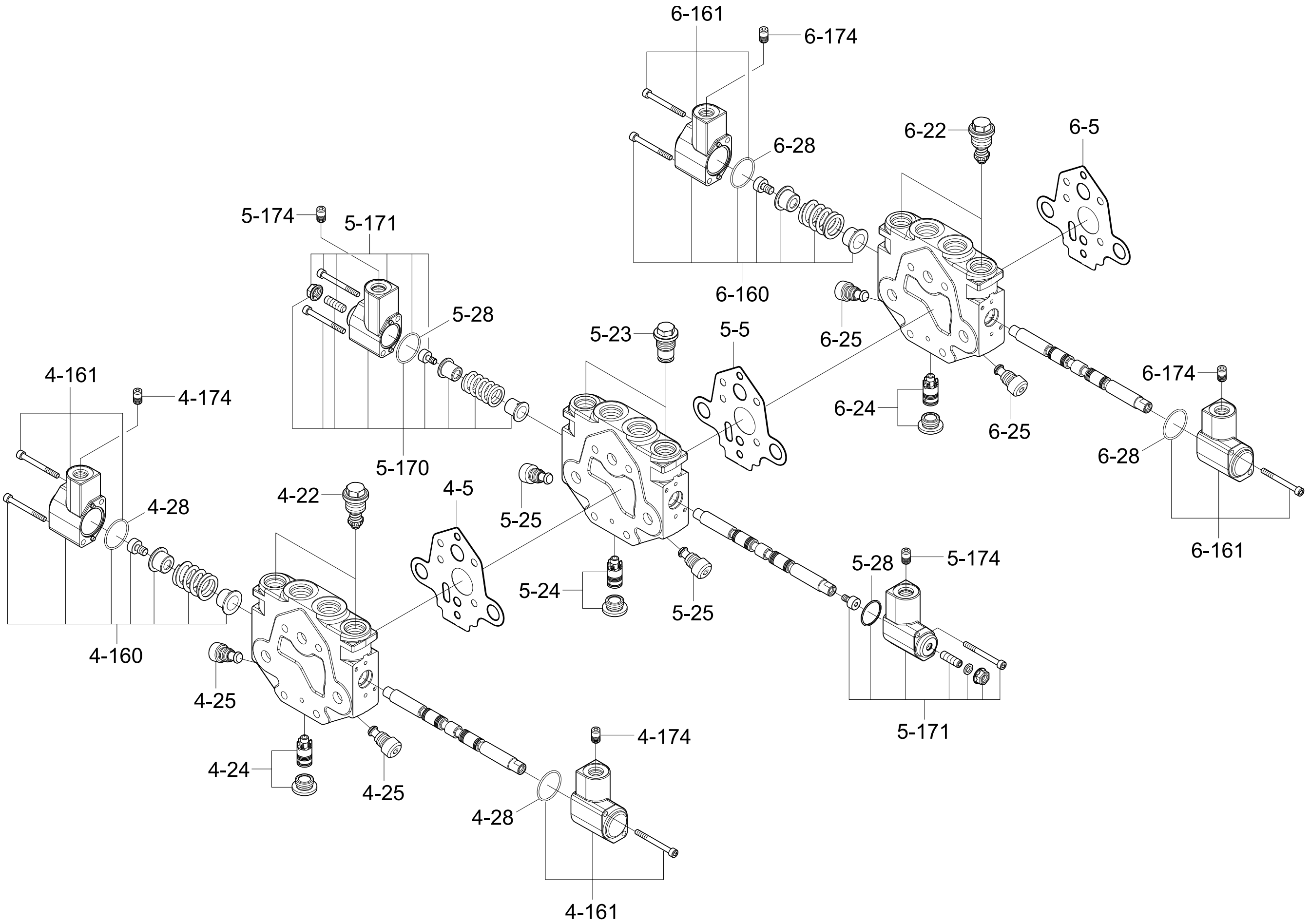
2. STRUCTURE (1/4)



55ACR2MCV02

1	Inlet block assy	1-154	Sealing plug	3	Travel block assy
1-2	Plate seal	1-156	Shuttle valve	3-5	Plate seal
1-8	Flow regulator	2	Travel block assy	3-24	Compensator kit
1-9	Relief valve	2-5	Plate seal	3-28	Seal kit
1-11	Plug	2-24	Compensator kit	3-29	Orifice plug
1-12	Locking cover	2-28	Seal kit	3-151	Throttle screw
1-12	Locking cover	2-29	Orifice plug	3-160	W/spool cover kit
1-152	Sealing plug	2-160	W/spool cover kit	3-161	Cover kit
1-153	Sealing plug	2-161	Cover kit		

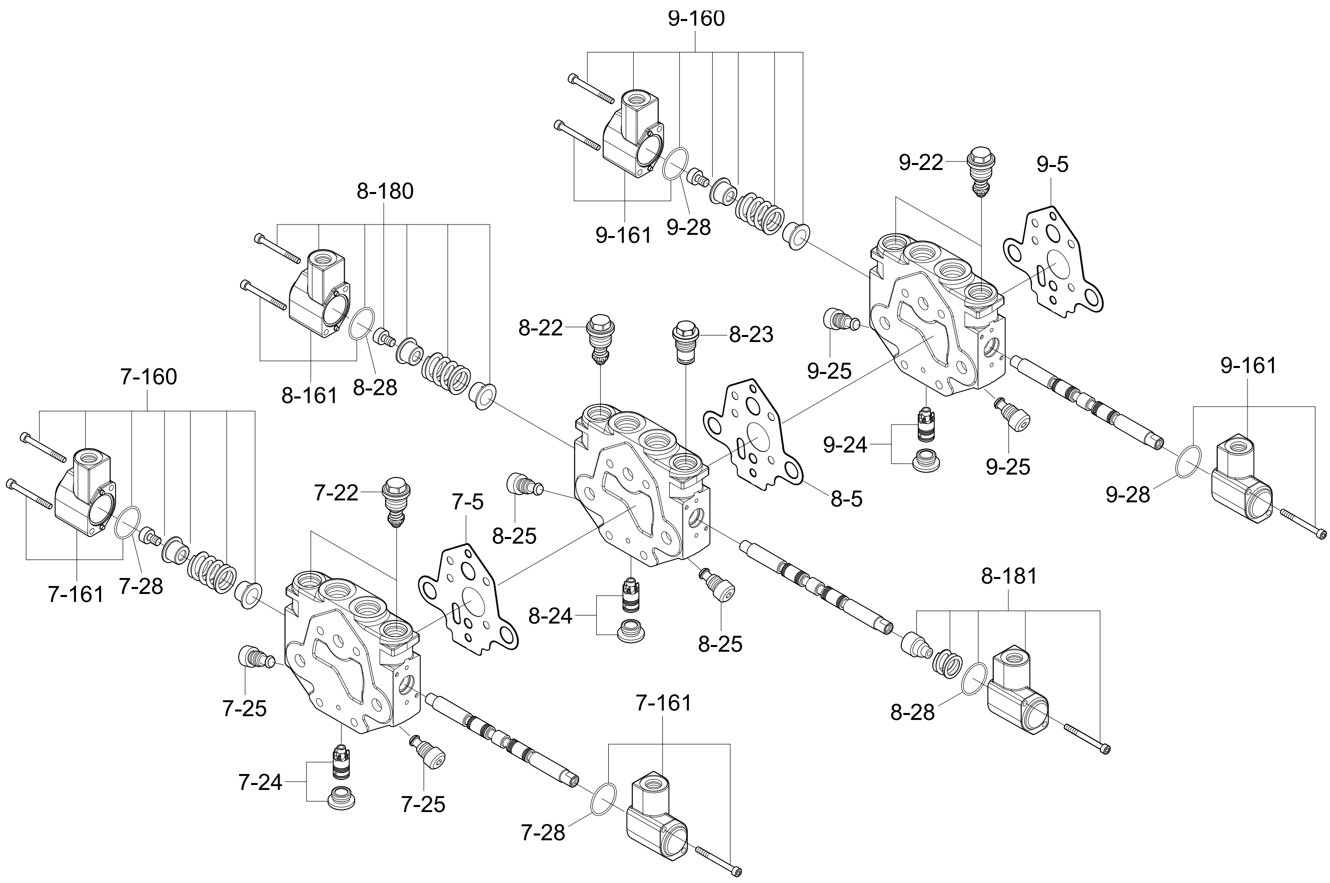
STRUCTURE (2/4)



48AZ2MCV03

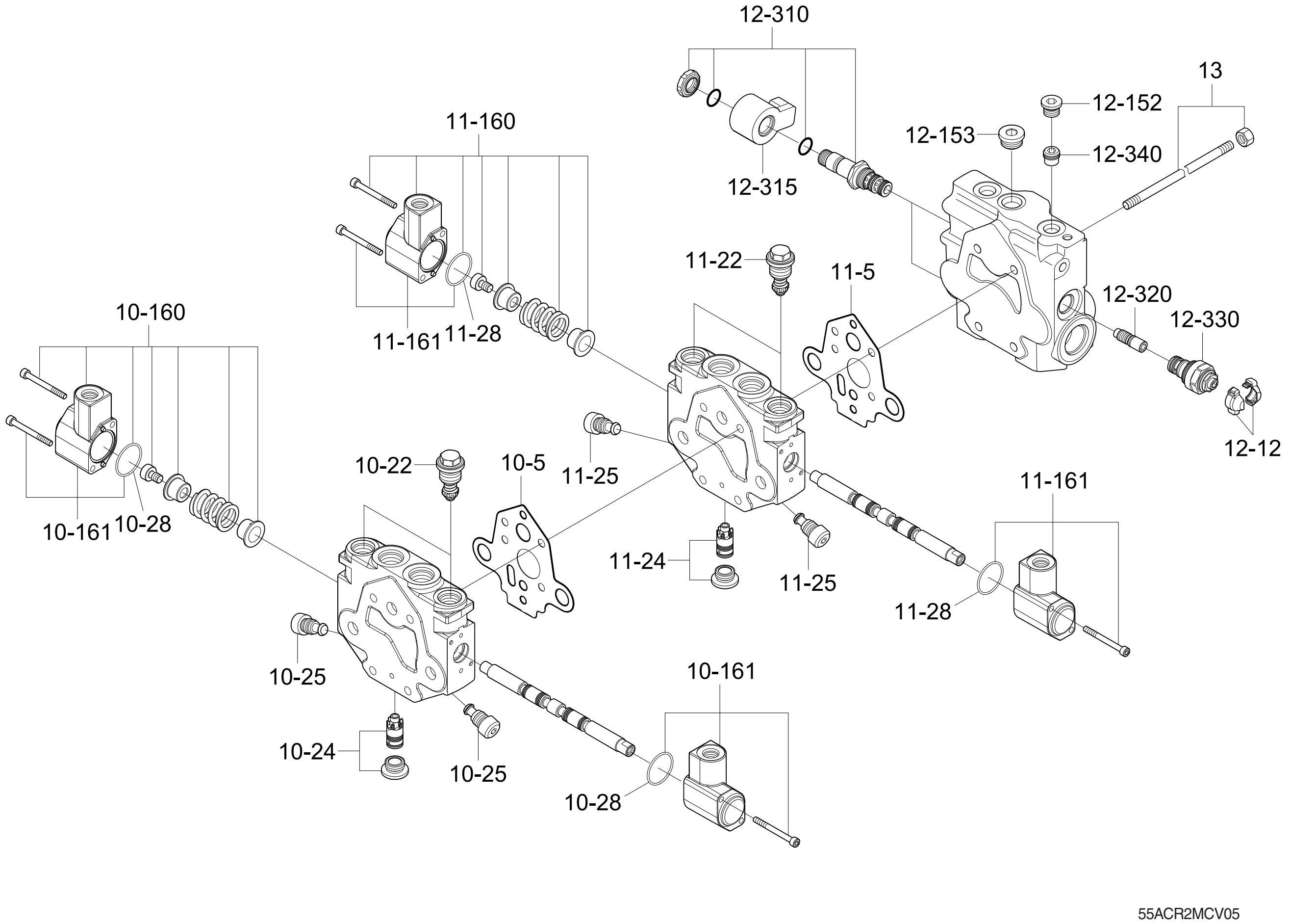
4	Boom block assy	5	Swing block assy	6	Arm block assy
4-5	Plate seal	5-5	Plate seal	6-5	Plate seal
4-22	Relief valve	5-23	Plug	6-22	Relief valve
4-24	Compensator kit	5-24	Compensator kit	6-24	Compensator kit
4-25	Check valve	5-25	Check valve	6-25	Check valve
4-28	Seal kit	5-28	Seal kit	6-28	Seal kit
4-160	W/spool cover kit	5-170	W/spool cover kit	6-160	W/spool cover kit
4-161	Cover kit	5-171	Cover kit	6-161	Cover kit
4-174	Snubber	5-174	Snubber	6-174	Snubber

STRUCTURE (3/4)



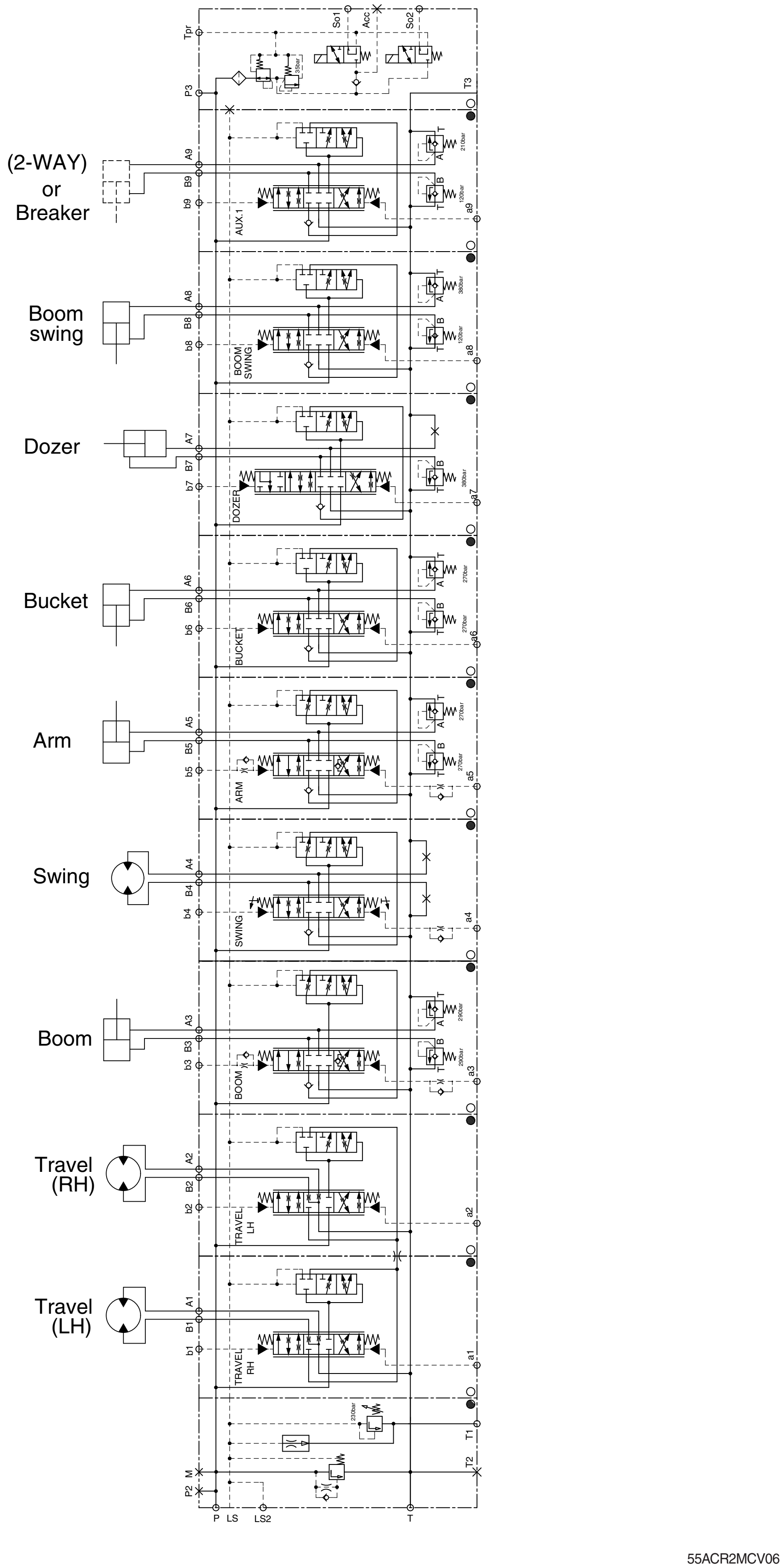
7	Bucket block assy	8-5	Plate seal	9	Boom swing block assy
7-5	Plate seal	8-22	Anticavitation valve	9-5	Plate seal
7-22	Relief valve	8-23	Plug	9-22	Relief valve
7-24	Compensator kit	8-24	Compensator kit	9-24	Compensator kit
7-25	Check valve	8-25	Check valve	9-25	Check valve
7-28	Seal kit	8-28	Seal kit	9-28	Seal kit
7-160	W/spool cover kit	8-161	Cover kit	9-160	W/spool cover kit
7-161	Cover kit	8-180	W/spool cover kit	9-161	Cover kit
8	Dozer block assy	8-181	W/spool cover kit		

STRUCTURE (4/4)



10	Aux 1 block assy	11-5	Plate seal	12-152	Sealing plug
10-5	Plate seal	11-22	Relief valve	12-153	Sealing plug
10-22	Relief valve	11-24	Compensator kit	12-310	Valve kit
10-24	Compensator kit	11-25	Check valve	12-315	Solenoid
10-25	Check valve	11-28	Seal kit	12-320	Shuttle
10-28	Seal kit	11-160	W/spool cover kit	12-330	Pressure relief valve
10-160	W/spool cover kit	11-161	Cover kit	12-340	Filter
10-161	Cover kit	12	Outlet block assy	13	Tie rod
11	Aux 2 block assy	12-12	Locking cover		

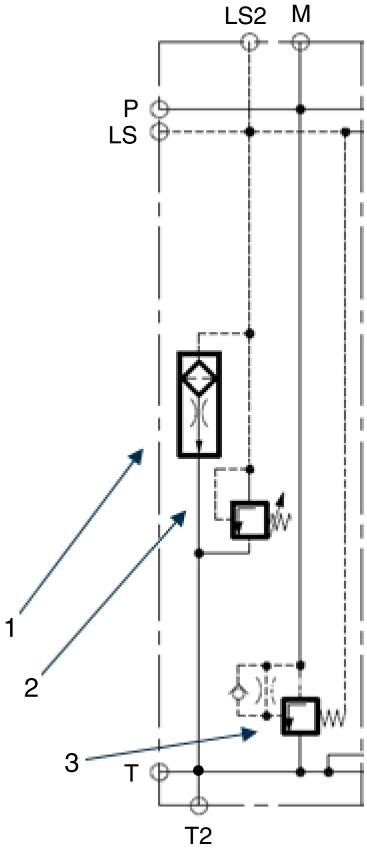
3. HYDRAULIC CIRCUIT (boom swing, 2-way)



4. FUNCTION

1) INLET ELEMENT DESCRIPTION

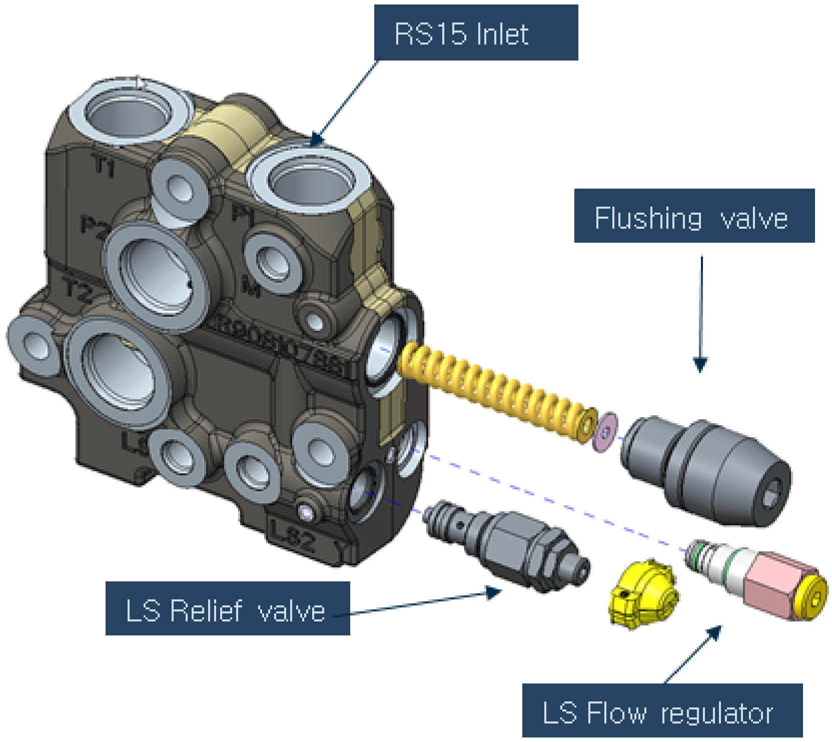
- The inlet plate has the line connections P, T, LS, T2 and M.
- The inlet element moreover comprises all components necessary for the system function: One flow control valve (1) for the controlled unloading of the LS line and one LS pressure relief valve (2) to limit the maximum system pressure.
- Protection of the system by means of LS pressure relief valve (2) combined with flushing valve (3).



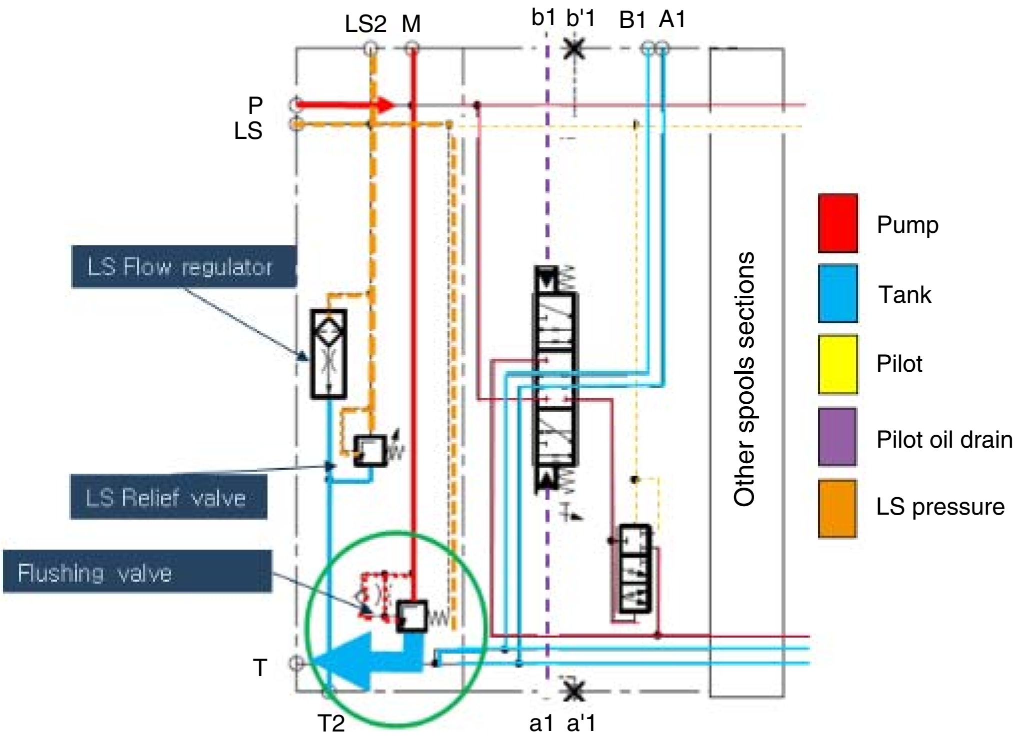
48AZ2MCV10

(1) Inlet description - all spools at neutral position

First section-travel-represented at neutral



85A2MC11



48AZ2MCV12

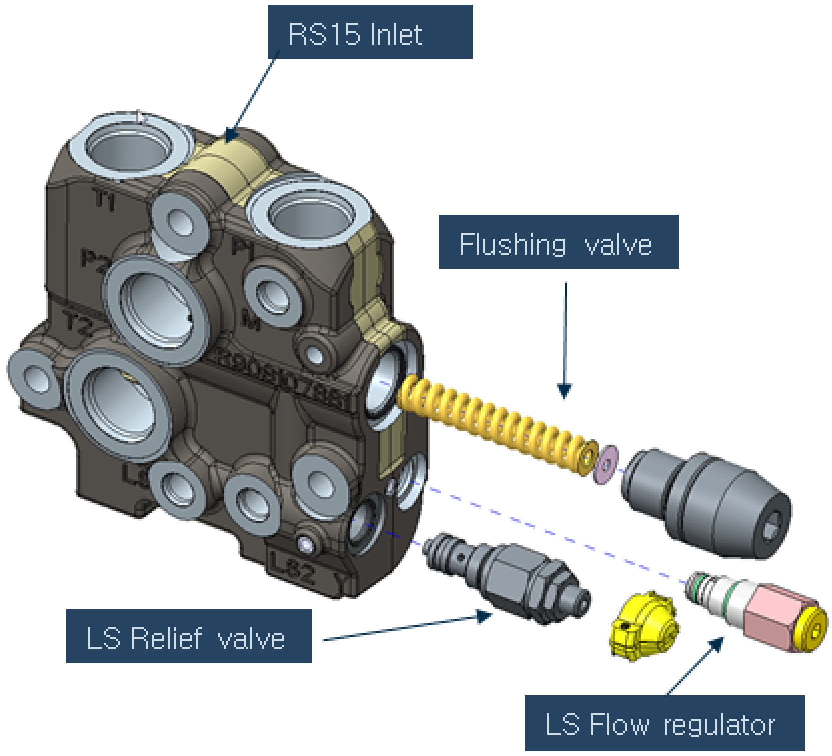
The Inlet element allows the exchange of the in the flow from the pump and the out flow to the tank.

When all sections are in neutral position, the pump is in stand-by and flow is reduced to the minimum pump flow (14 ℓ/min).

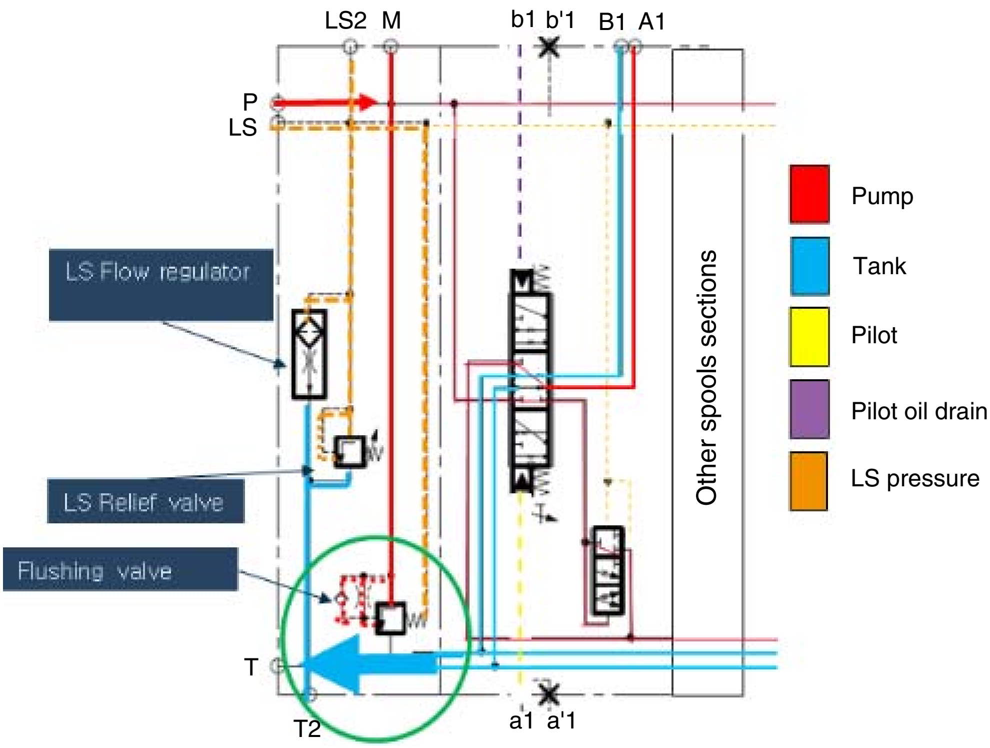
All the minimum pump flow pass through the flushing valve which is open, it means connected to the tank.

(2) Inlet description - spool actuated

First section-travel-PABT spool position represented.



85A2MC13

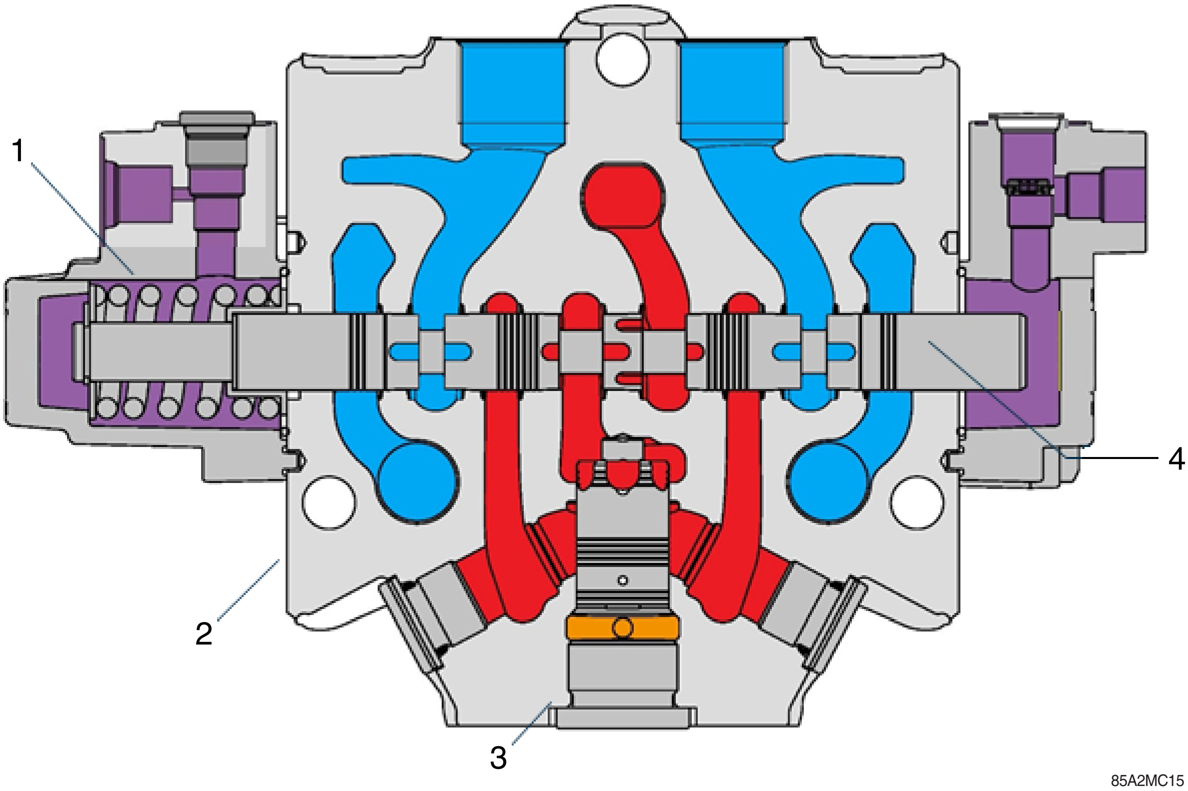


48AZ2MCV14

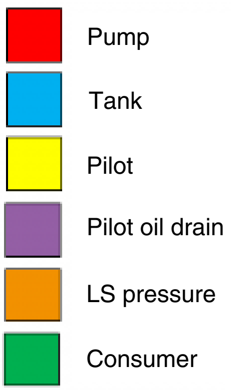
As soon as one or more spool moves, the flow stop to pass trough the flushing valve, which is closed, not anymore connected to the tank. The flow pass trough the spool to reach the movement, and then go to the tank by the T line after the spool.

2) TRAVEL SECTION DESCRIPTION - SECTION 1 AND 2

(1) Component description



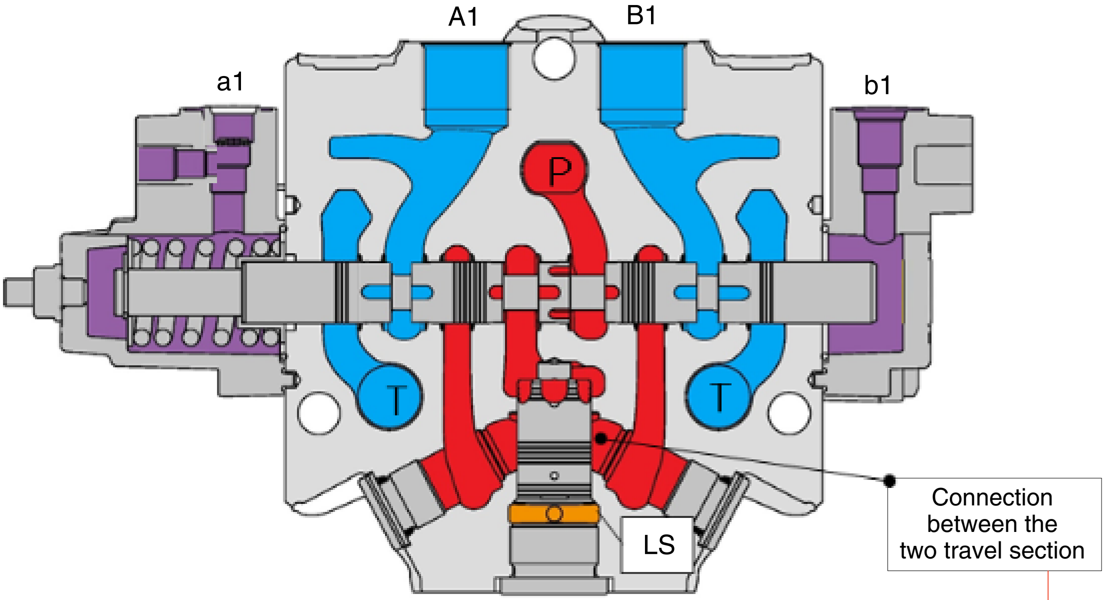
85A2MC15



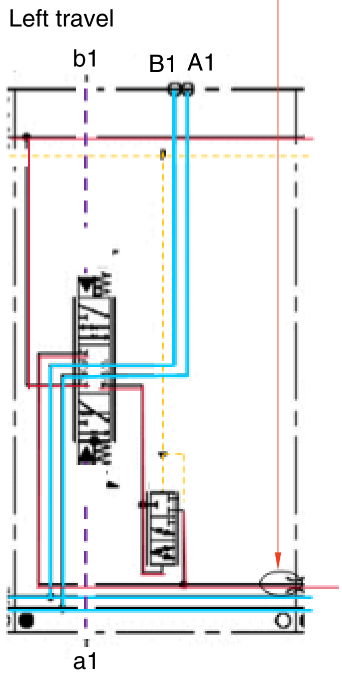
85A2MC16

1 Spring pack
2 Housing
3 Pressure compensator
4 Spool

(2) Neutral position

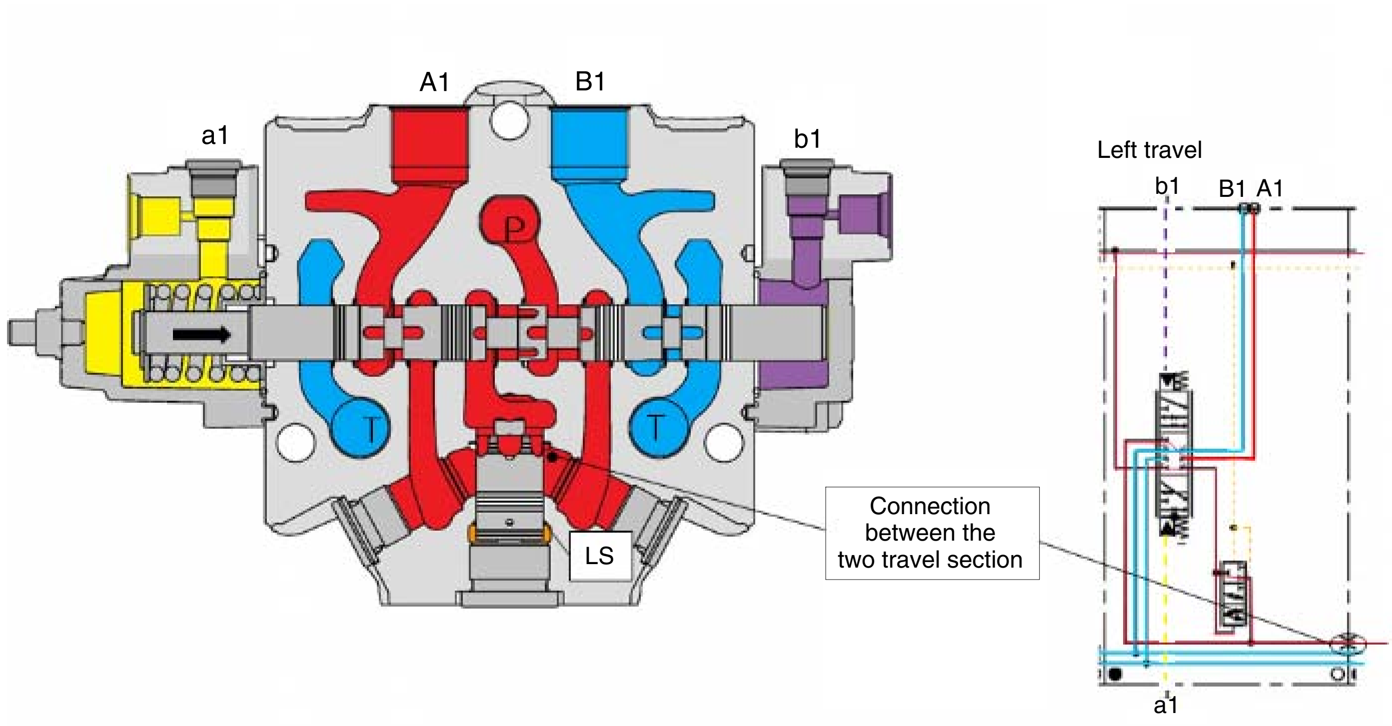


The spool is in neutral position, pump is in low pressure stand-by. The A and B ports are not connected to the pumps but to the tank. This is in order to ensure A and B to be drained to tank. The two translation branches, 1 and 2, are connected in order not to have differences in traction.



85A2MC15

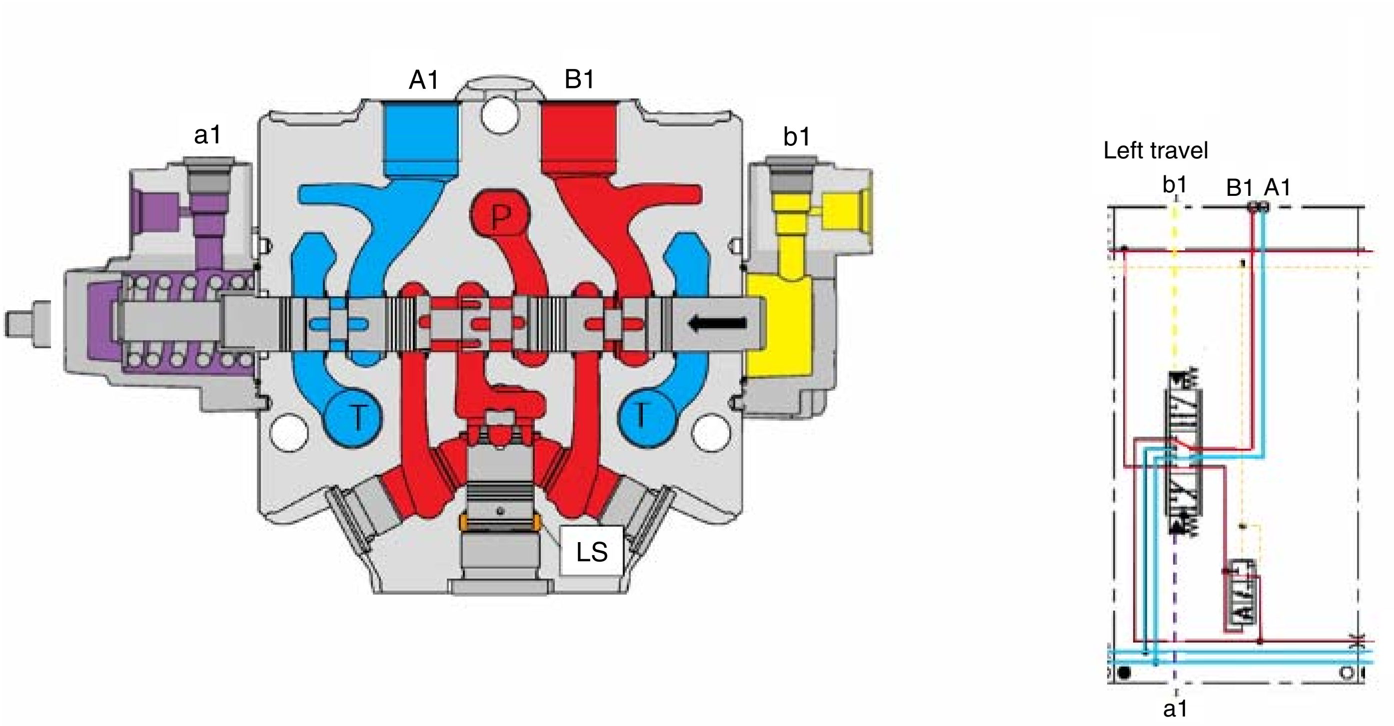
(3) Travel forward position



85A2MC18

When the pilot pressure is led to the port a1, the oil from the pump flows to the cylinder port A1 and oil from the cylinder flows into the tank through the cylinder port B1.

(4) Travel reverse position

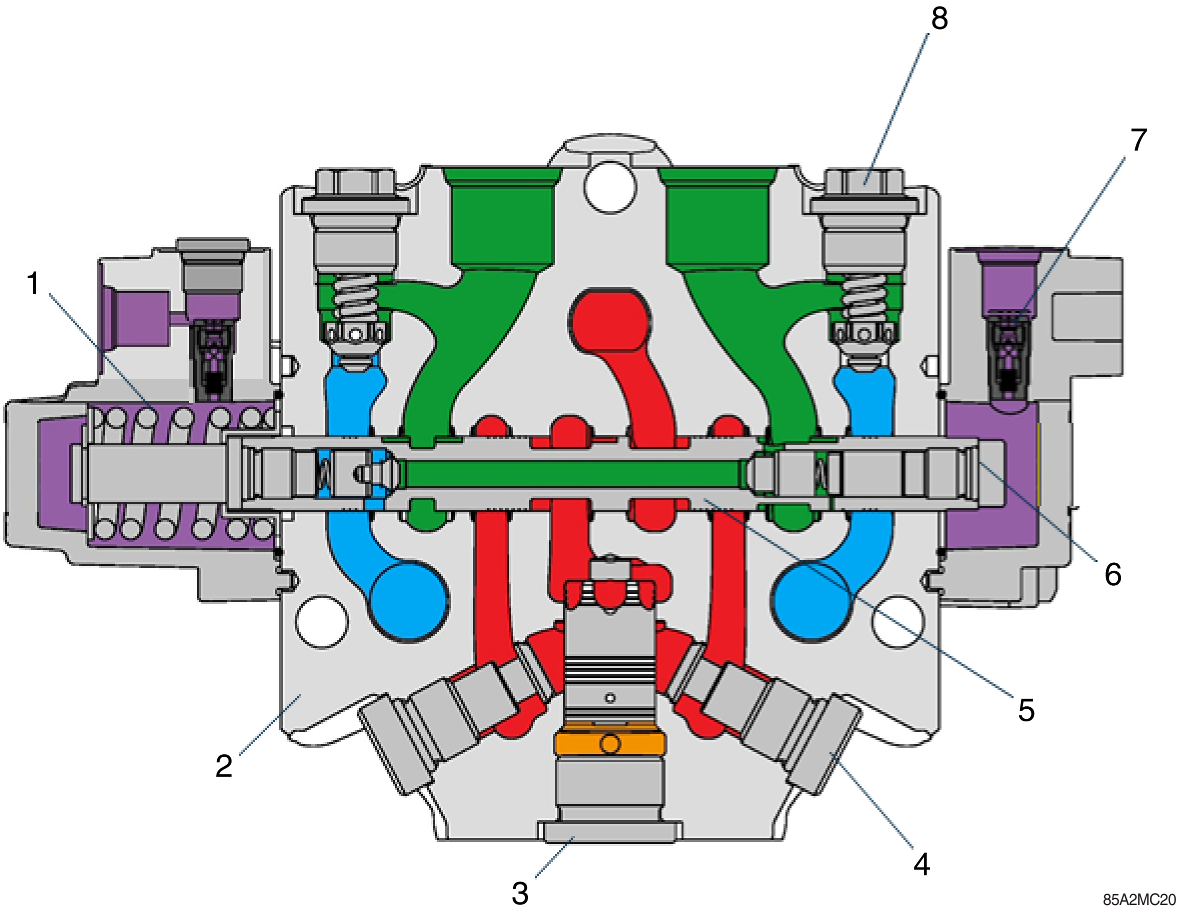


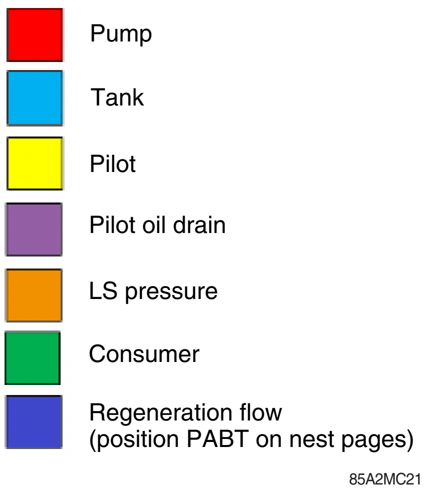
85A2MC19

When the pilot pressure is led to the port b1, the oil from the pump flows to the cylinder port B1 and oil from the cylinder flows into the tank through the cylinder port A1.

3) BOOM AND ARM SECTION 3 AND 5 DESCRIPTION - WITH REGENERATION SPOOLS

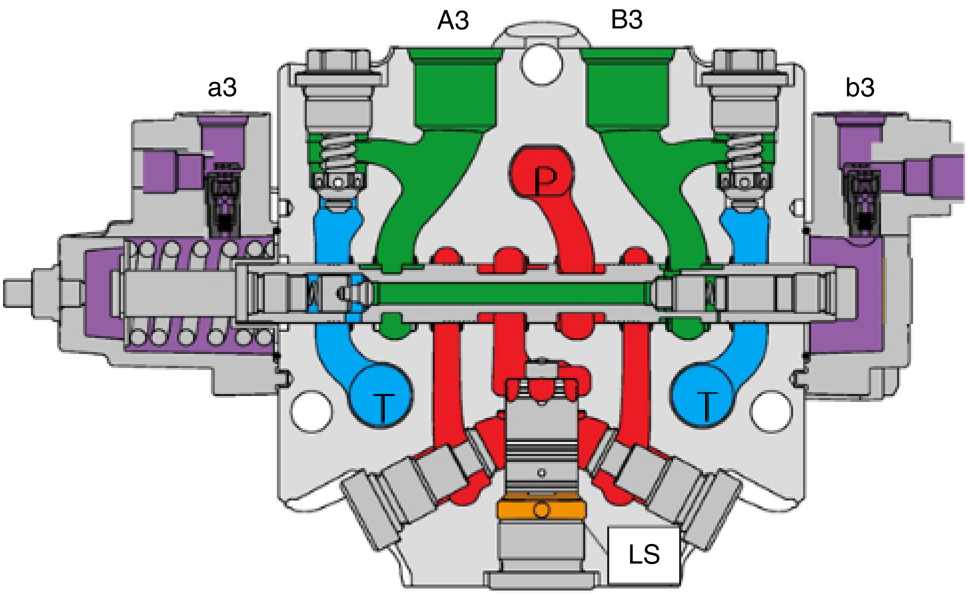
(1) Component description



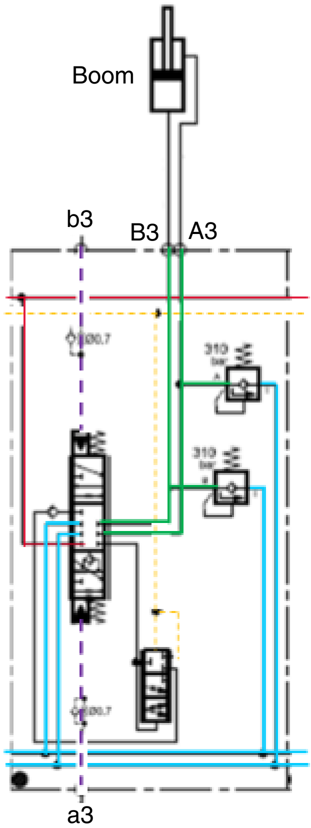


1 Spring pack
2 Housing
3 Pressure compensator
4 Check valves
5 Regeneration spool
6 Spool
7 Shuttle valve
8 Relief valves

(2) Neutral position



85A2MC22

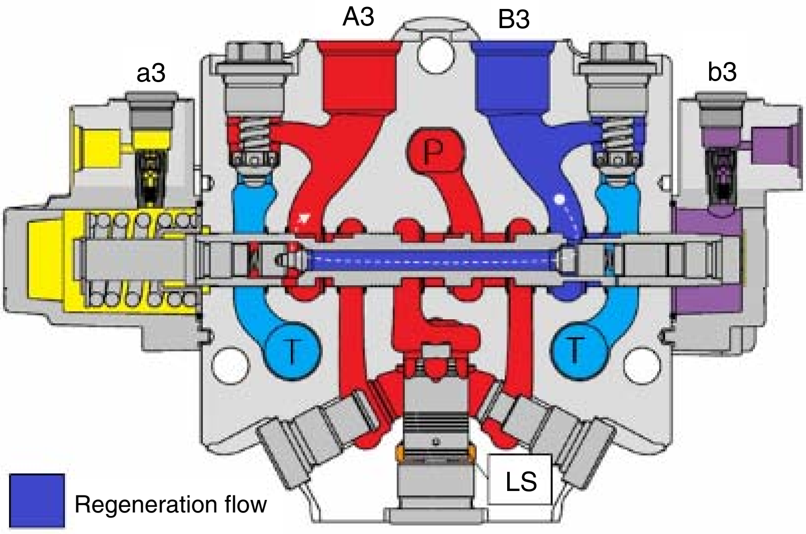


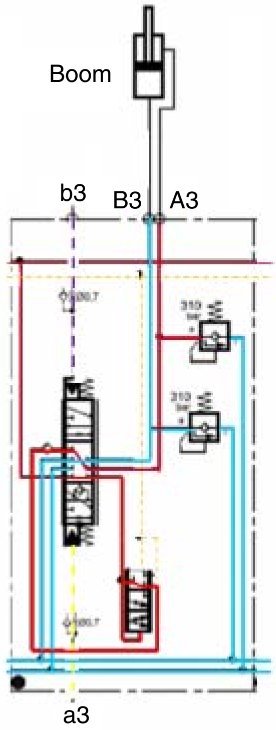
85A2MC23

The spool is in neutral position, oil from the pump is blocked, pump is in low pressure stand-by. The A and B ports are not connected to the pump nor the tank.

(3) Boom section description

① Boom down position

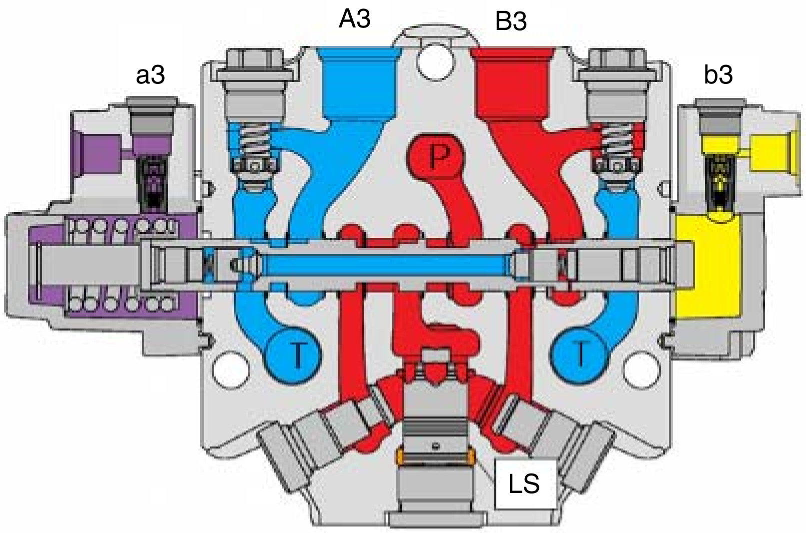


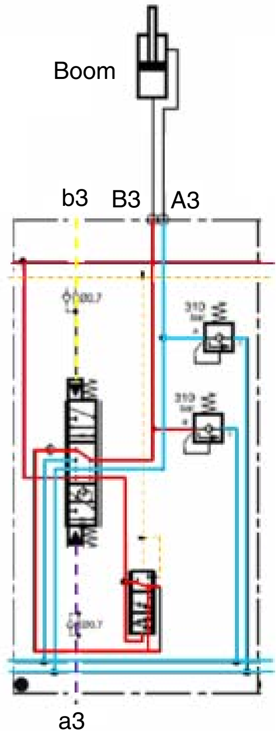


85A2MC24

When the pilot pressure is led to the port a4, the oil from the pump flows to the cylinder port A4 and oil from the cylinder flows partially into the tank and partially trough regeneration path B to A through the cylinder port B4 .

② Boom up position



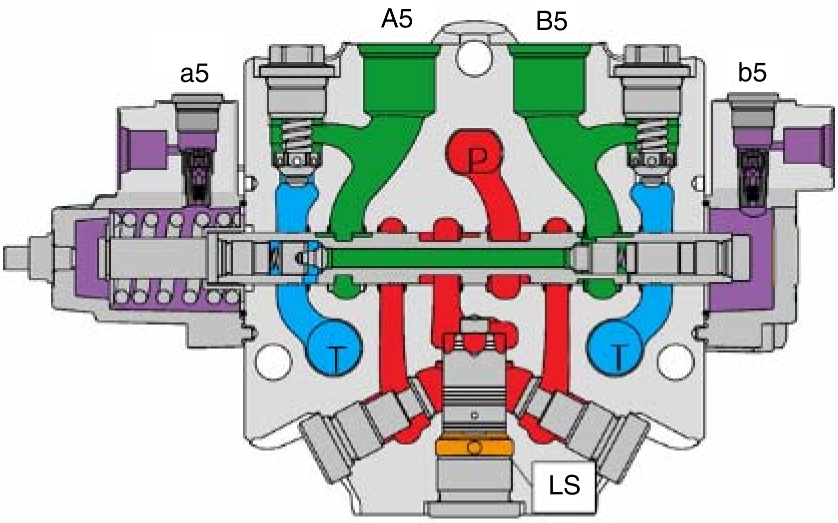


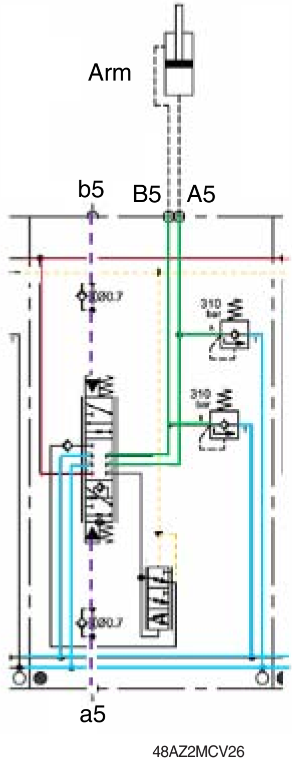
85A2MC25

When the pilot pressure is led to the port b4, the oil from the pump flows to the cylinder port B4 and oil from the cylinder flows into the tank through the cylinder port A4.

(4) Arm section description

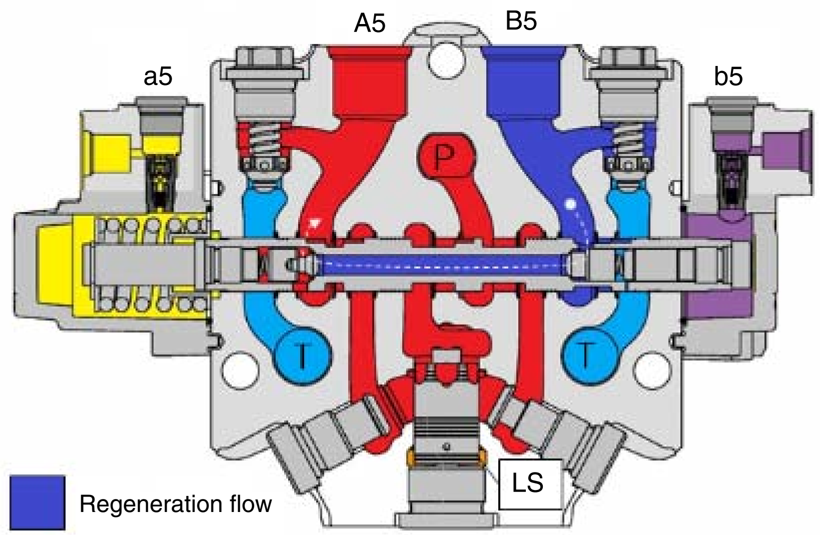
① Neutral position

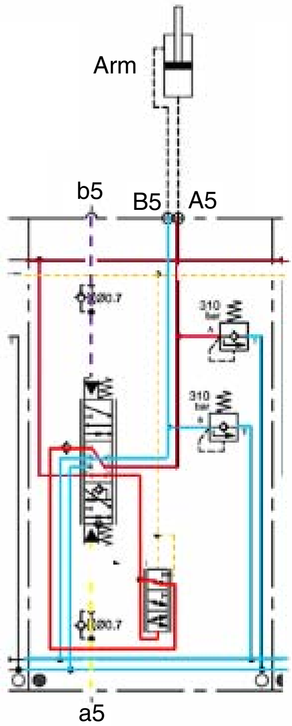




The spool is in neutral position, oil from the pump is blocked, pump is in low pressure stand-by. The A5 and B4 ports are not connected to the pump nor the tank.

② Arm roll in position

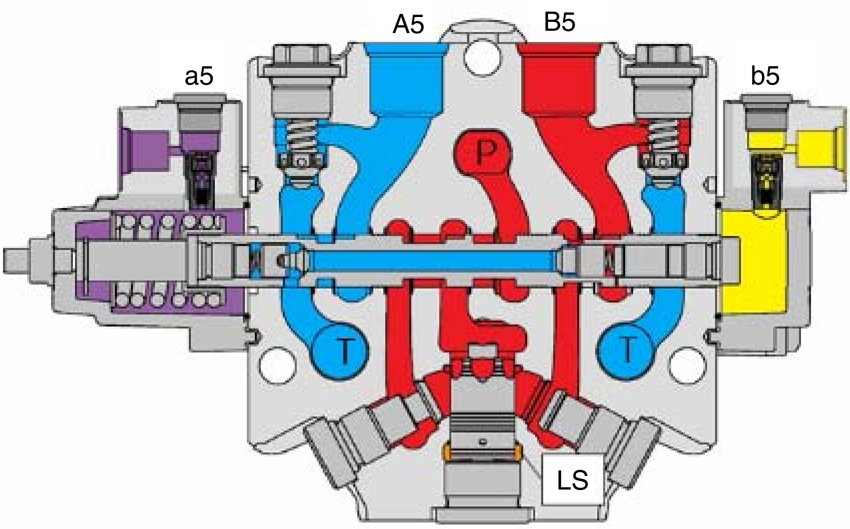


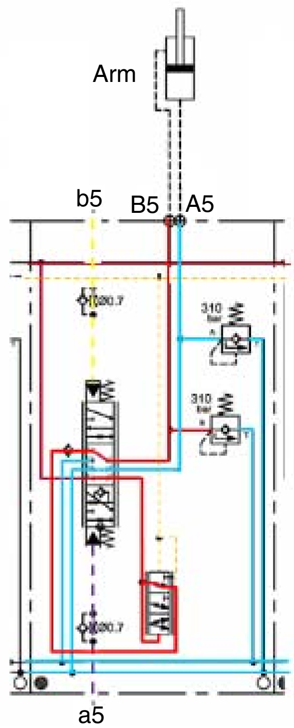


48AZ2MCV27

When the pilot pressure is led to the port a5, the oil from the pump flows to the cylinder port A5 and oil from the cylinder flows partially into the tank and partially trough regeneration path B to A through the cylinder port B5.

③ Arm roll out position



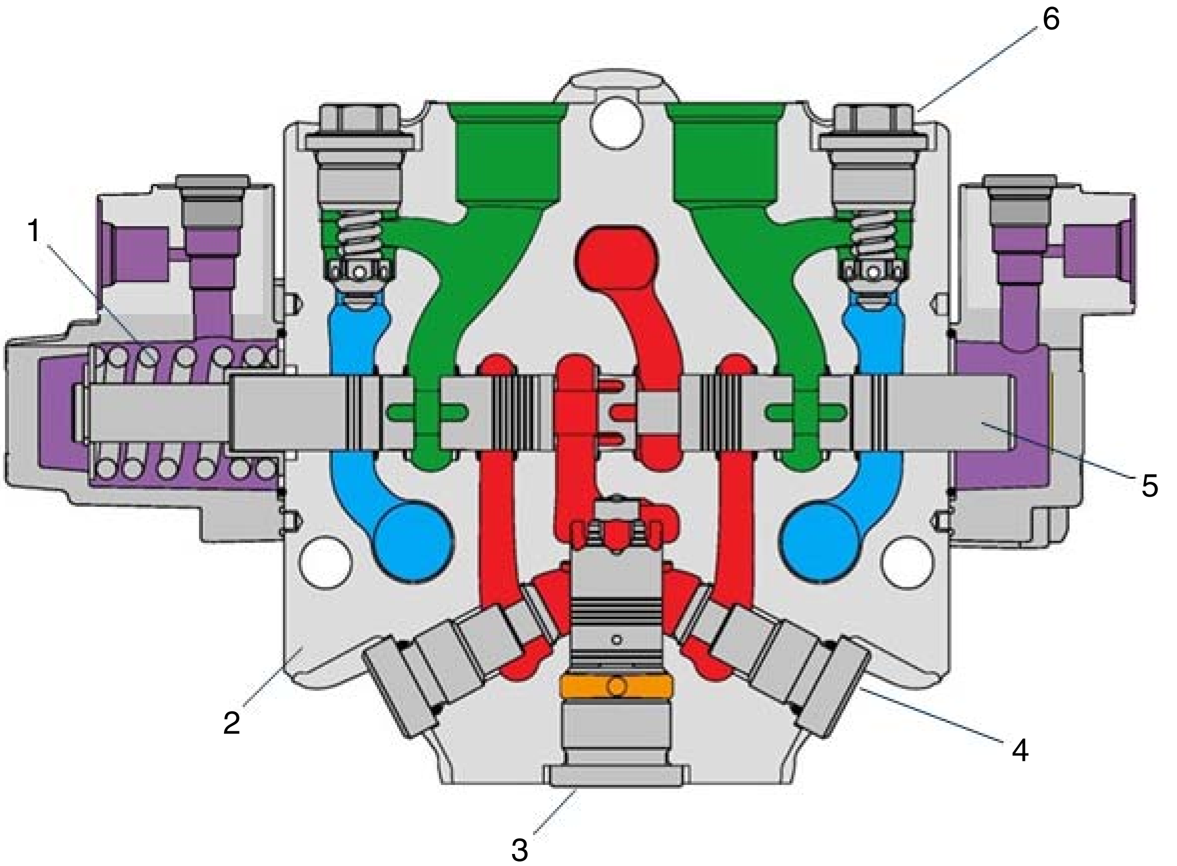


48AZ2MCV28

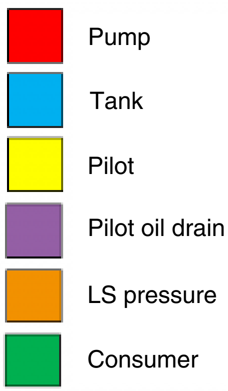
When the pilot pressure is led to the port b5, the oil from the pump flows to the cylinder port B5 and oil from the cylinder flows into the tank through the cylinder port A5.

4) BUCKET SECTION DESCRIPTION - SECTION 6

(1) Component description



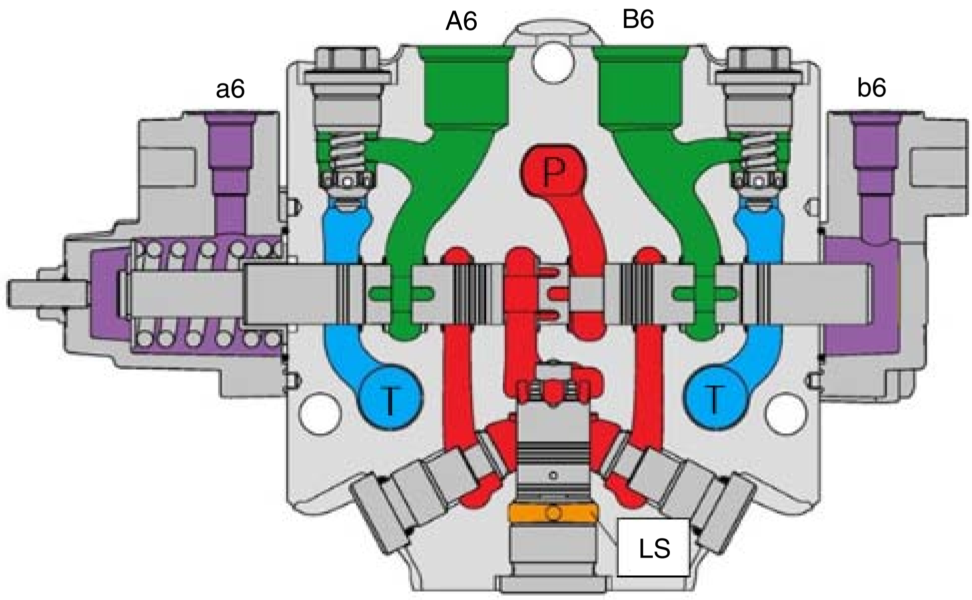
85A2MC29



85A2MC30

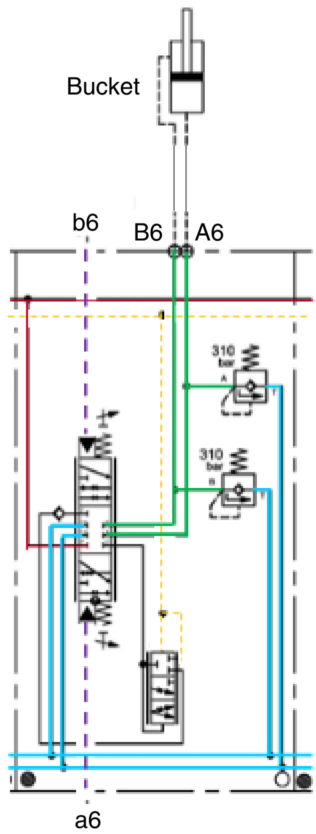
1 Spring pack
2 Housing
3 Pressure compensator
4 Check valves
5 Spool
7 Overload relief valves

(2) Neutral position



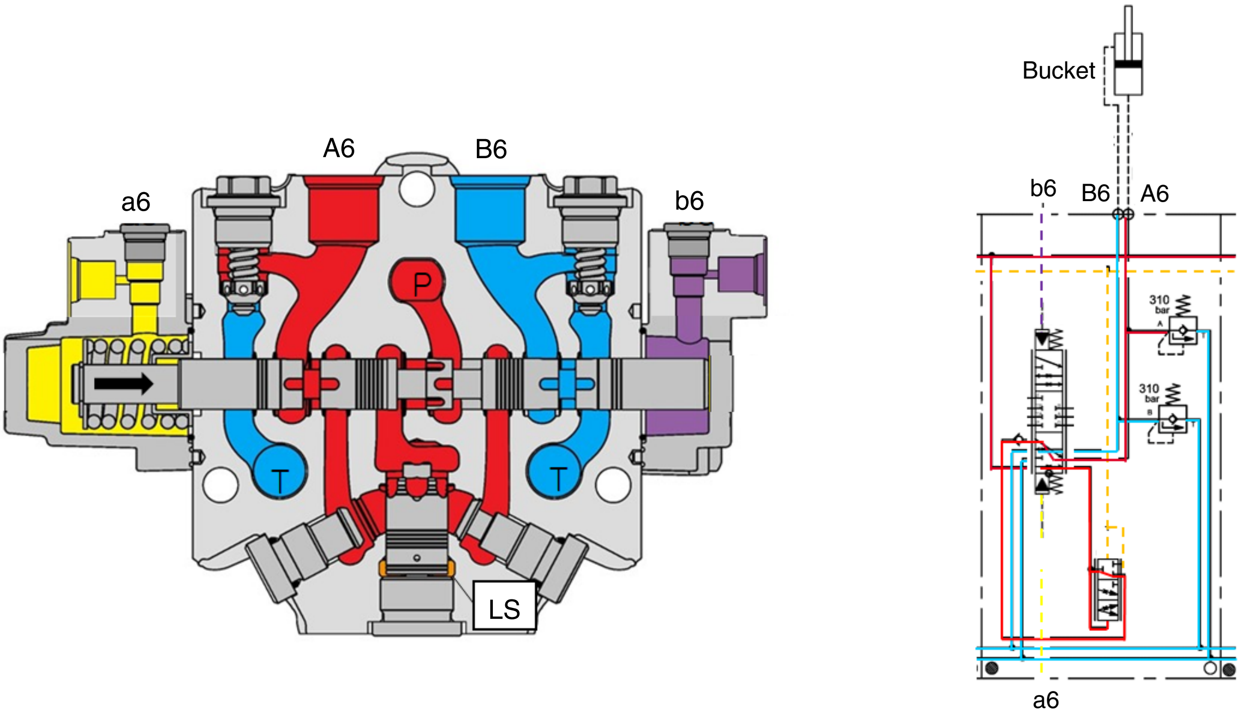
48AZ2MCV31

The spool is in neutral position, pump is in low pressure stand-by. The A6 and B6 ports are not connected to the pumps nor the tank.



48AZ2MCV32

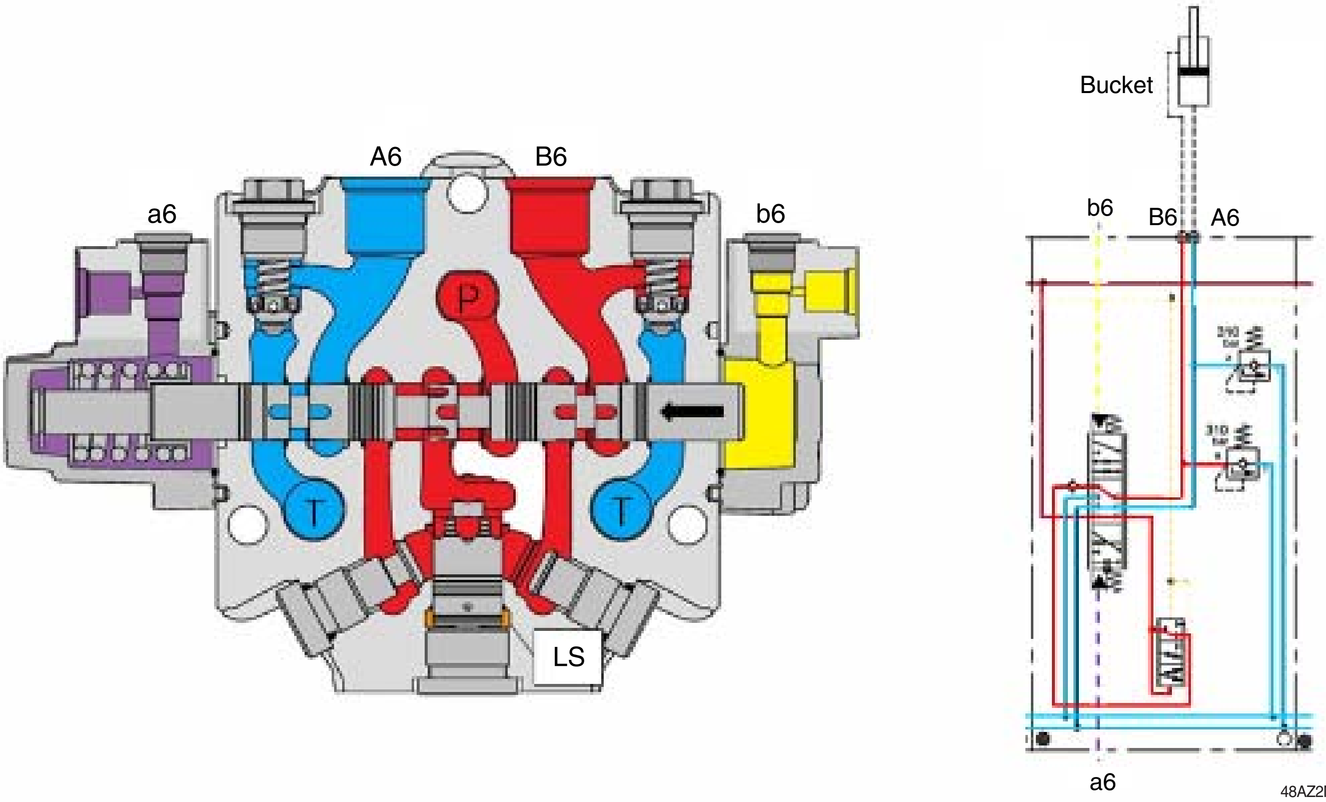
(3) Bucket roll in position



48AZ2MCV33

When the pilot pressure is led to the port a6, the oil from the pump flows to the cylinder port A6 and oil from the cylinder flows into the tank through the cylinder port B6.

(4) Bucket roll out position

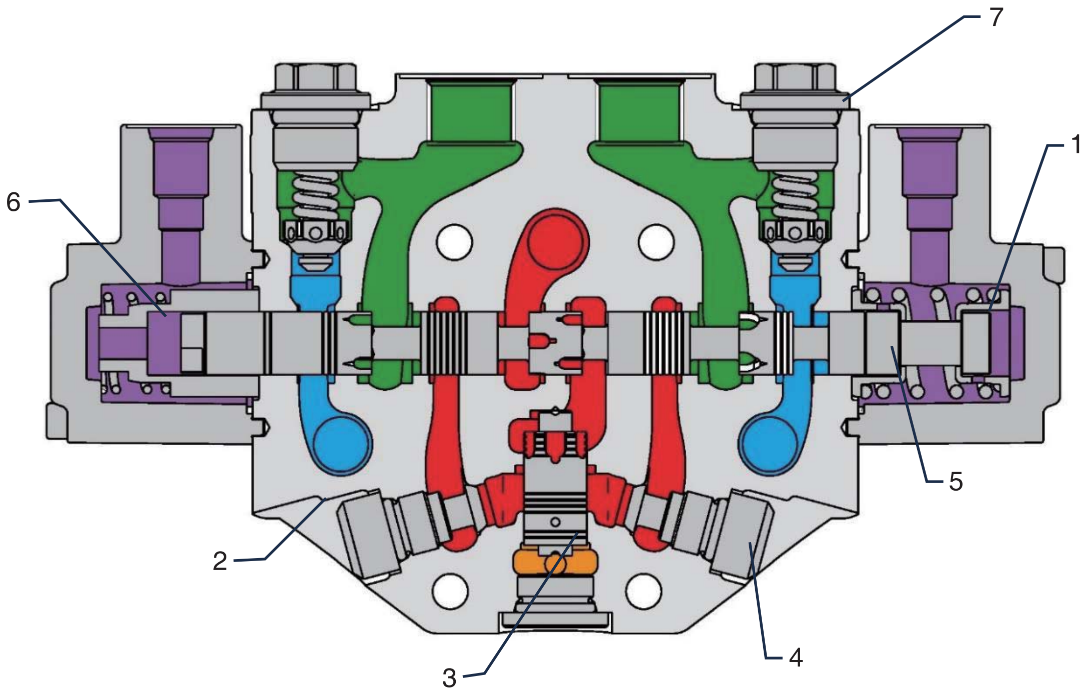


48AZ2MCV34

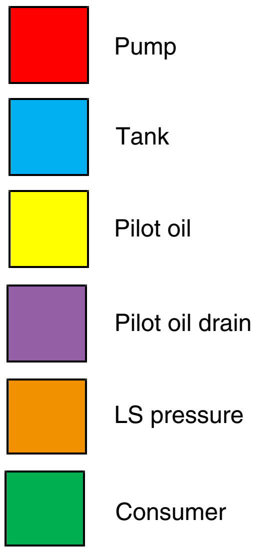
When the pilot pressure is led to the port b6, the oil from the pump flows to the cylinder port B6 and oil from the cylinder flows into the tank through the cylinder port A6.

5) DOZER SECTION DESCRIPTION - SECTION 7

(1) Component description



85A2MC35

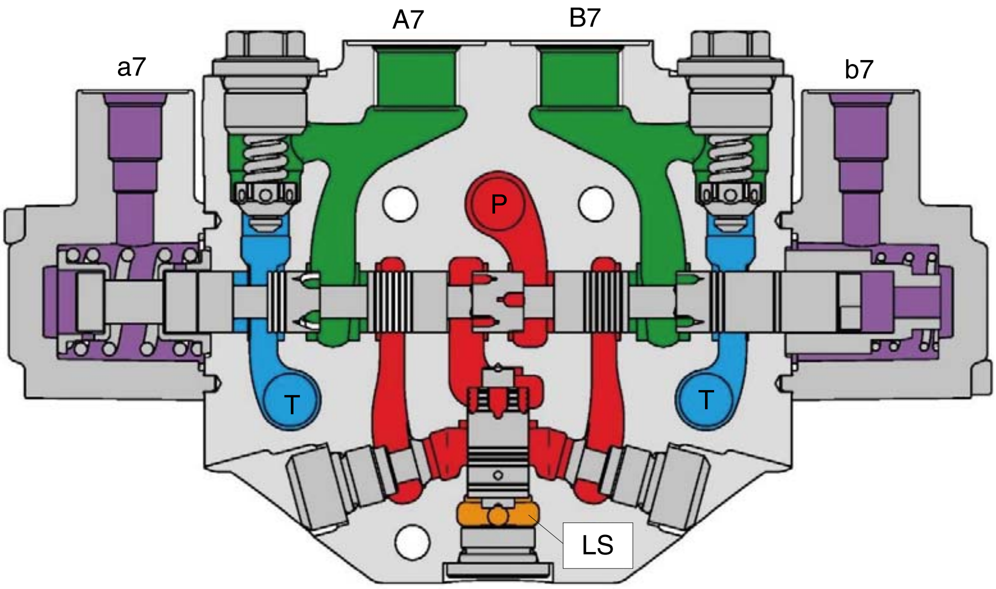


48AA2MC43

1 Spring pack
2 Housing
3 Pressure compensator
4 Check valves
5 Spool
6 Fourth position spring pack
7 Relief valves

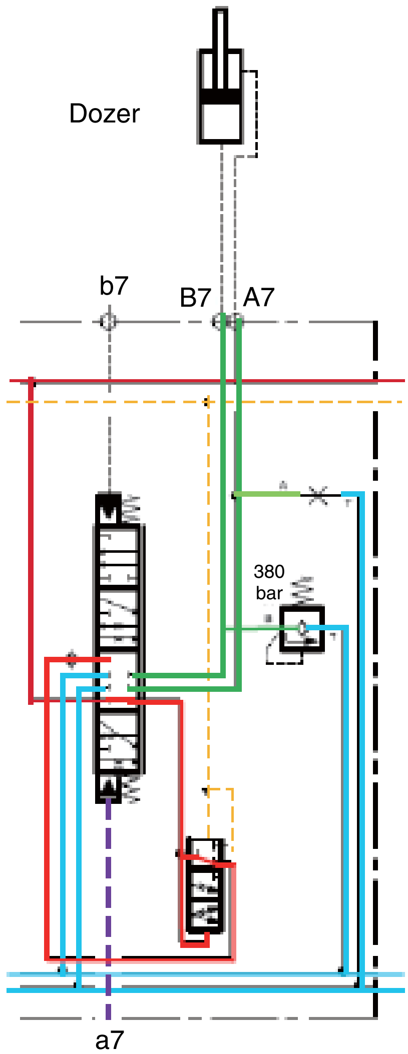
※ This particular slide has a four position spool: neutral, PABT, PBAT and floating position.

(2) Neutral position



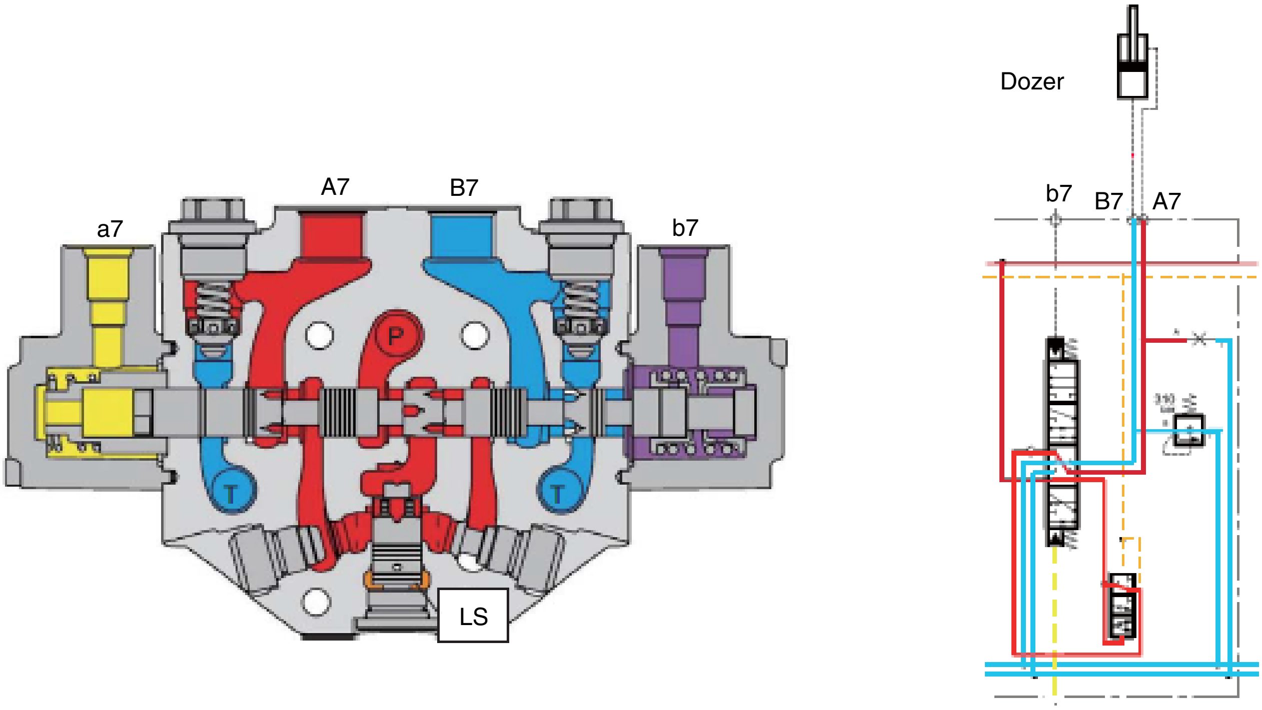
48AZ2MCV37

The spool is in neutral position, oil from the pump is not connected to the A7 or to the B7 ports. Pump is in low pressure stand-by.



55ACR2MCV38

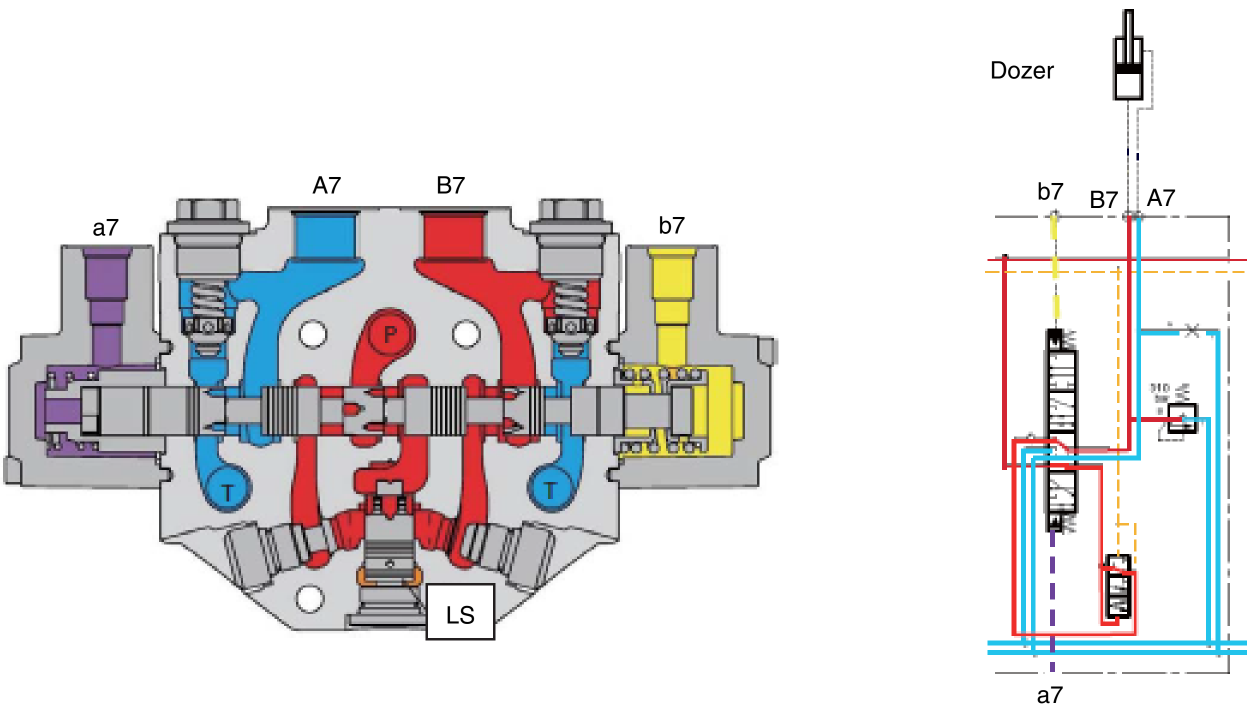
(3) PABT position (dozer up)



48AZ2MCV39

When the pilot pressure is led to the port a7, the oil from the pump flows to the cylinder port A7 and oil from the cylinder flows into the tank through the cylinder port B7.

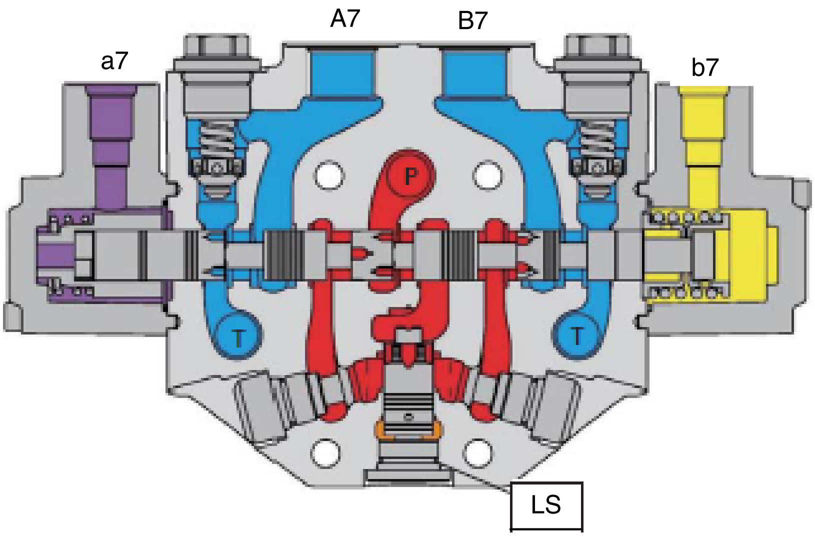
(4) PBAT position (dozer down)

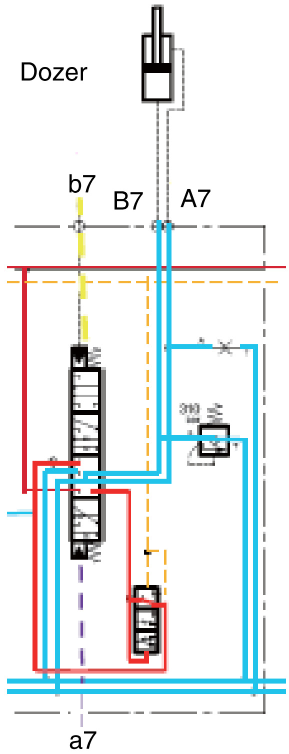


48AZ2MCV40

When the pilot pressure is led to the port b7, the oil from the pump flows to the cylinder port B7 and oil from the cylinder flows into the tank through the cylinder port A7.

(5) Floating position



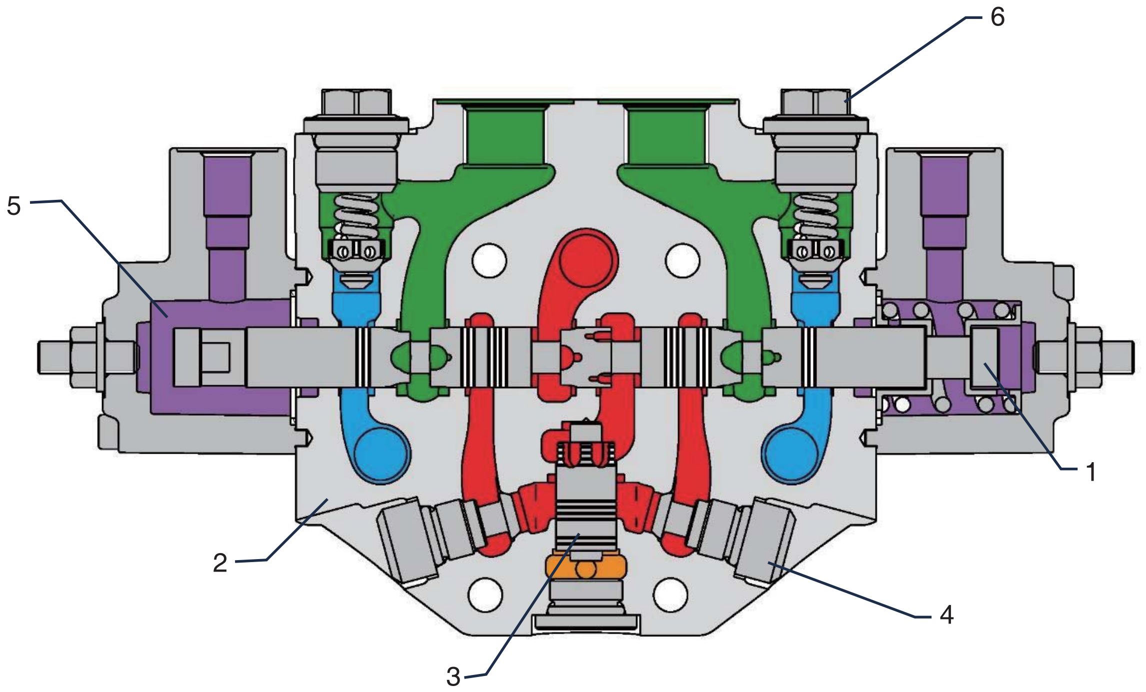


48AZ2MCV41

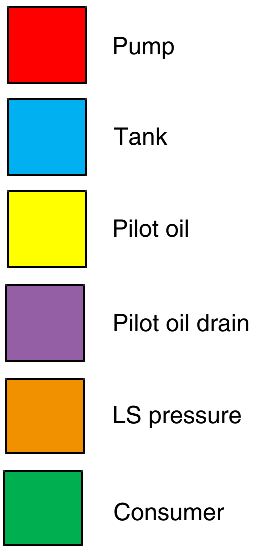
When the pilot pressure is led to the port b6 to maximal pressure, the spool is in the forth position, floating. The pump is in low pressure stand-by while A7 and B7 are connected to tank.

6) SLICES DESCRIPTION 8 : BOOM SWING

(1) Component description



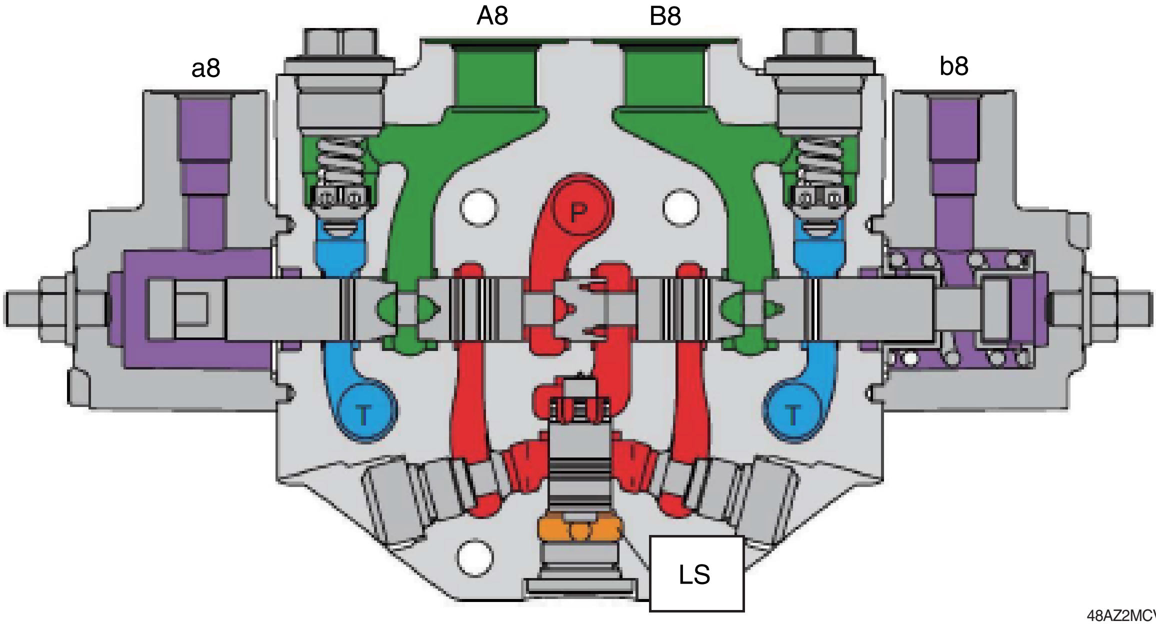
85A2MC42



1 Spring pack
2 Housing
3 Pressure compensator
4 Check valves
5 Spool
6 Relief valves

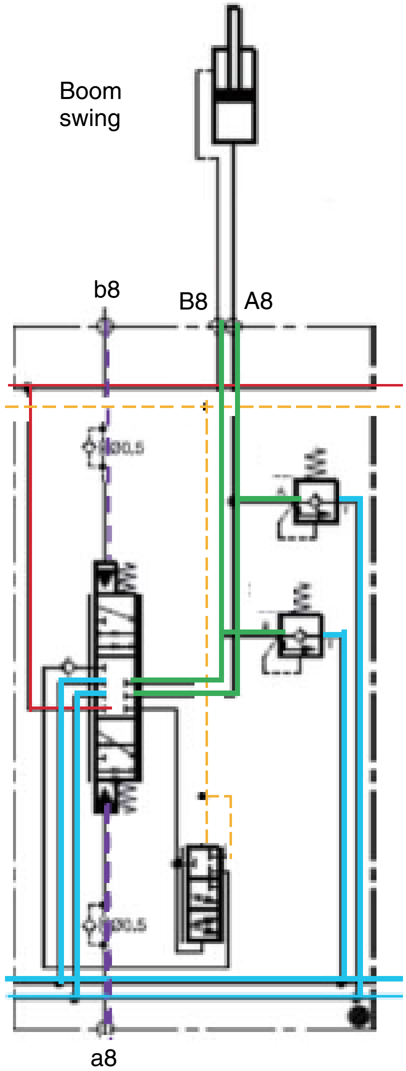
48AA2MC43

(2) Neutral position



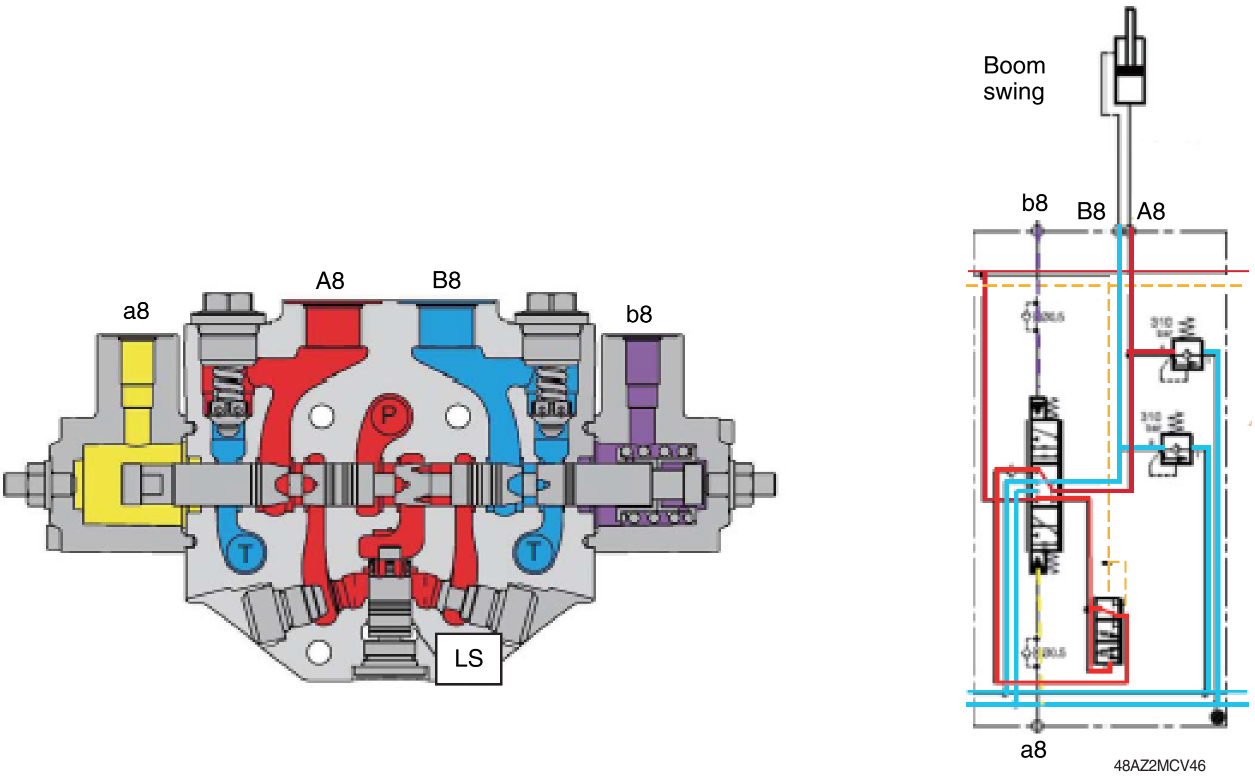
48AZ2MCV44

The spool is in neutral position, pump is in low pressure stand-by. The A8 and B8 ports are not connected to the pumps nor the tank.



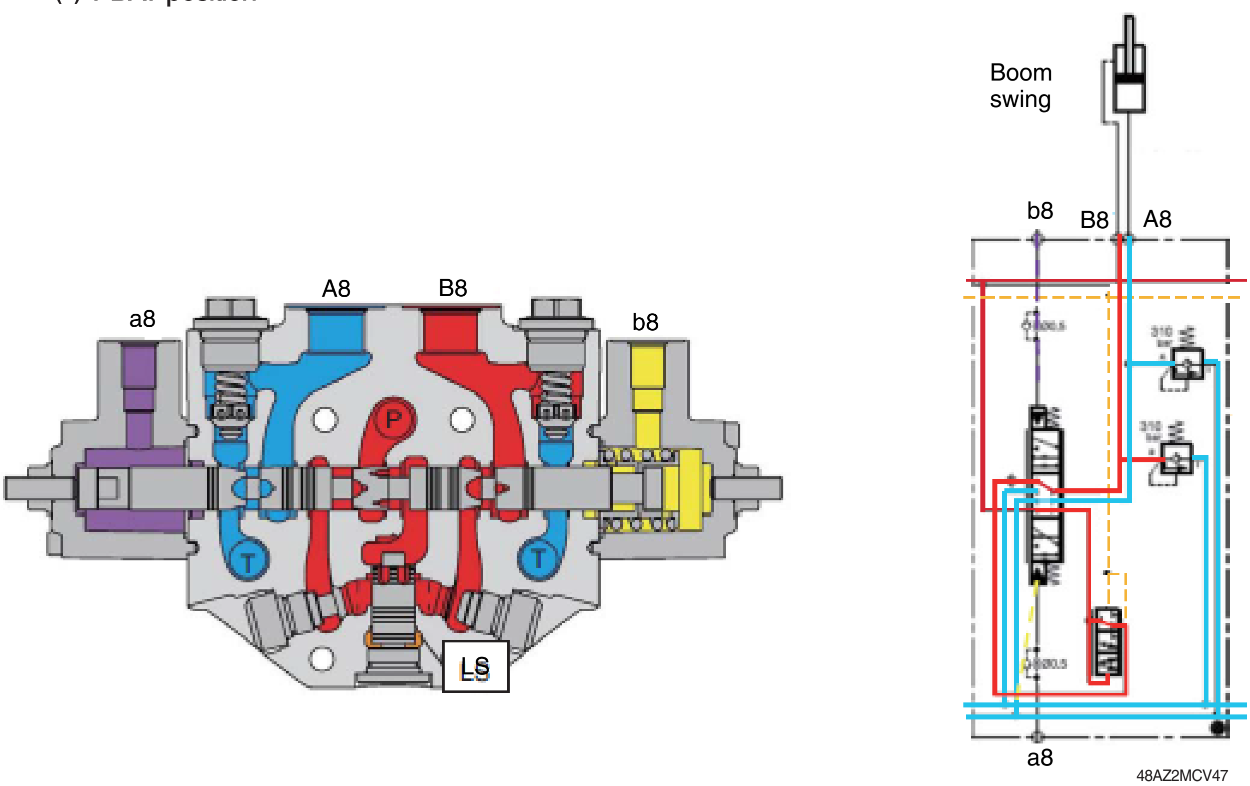
48AZ2MCV45

(3) PABT position



When the pilot pressure is led to the port a7, the oil from the pump flows to the cylinder port A7 and oil from the cylinder flows into the tank through the cylinder port B7.

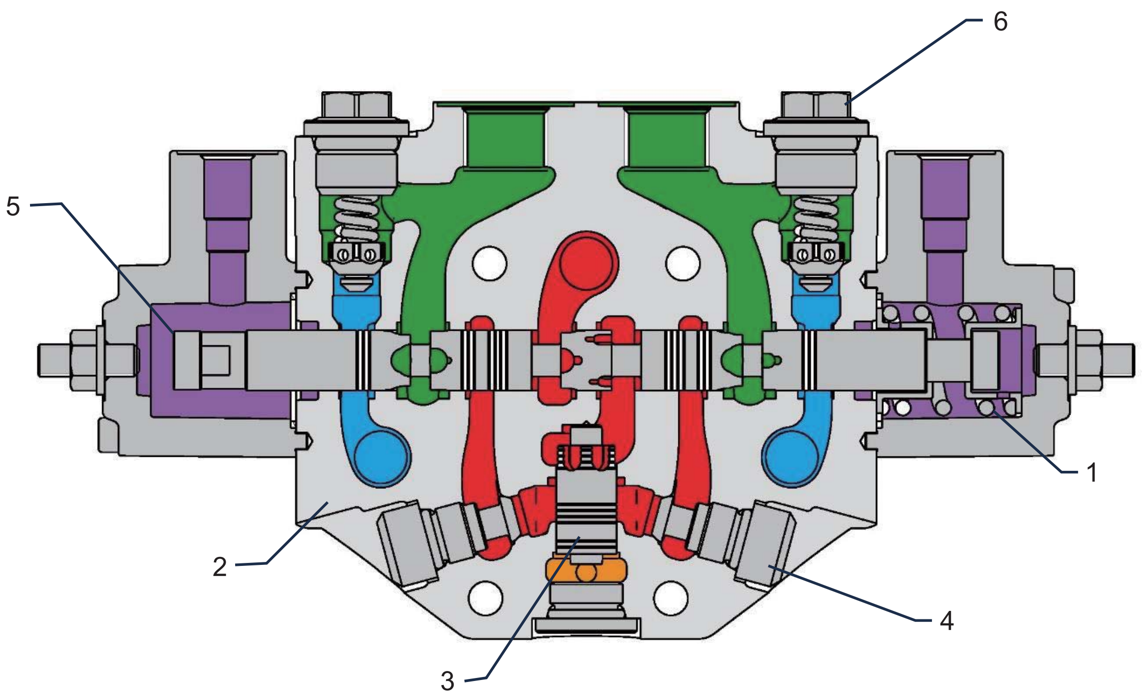
(4) PBAT position



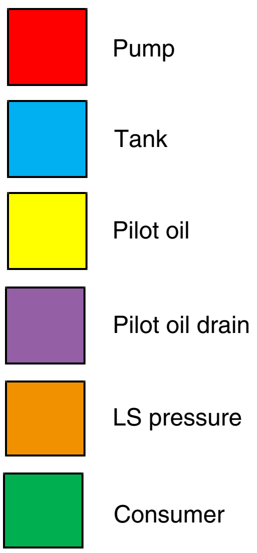
When the pilot pressure is led to the port b7, the oil from the pump flows to the cylinder port B7 and oil from the cylinder flows into the tank through the cylinder port A7.

7) SLICES DESCRIPTION 9 : AUX 1

(1) Component description



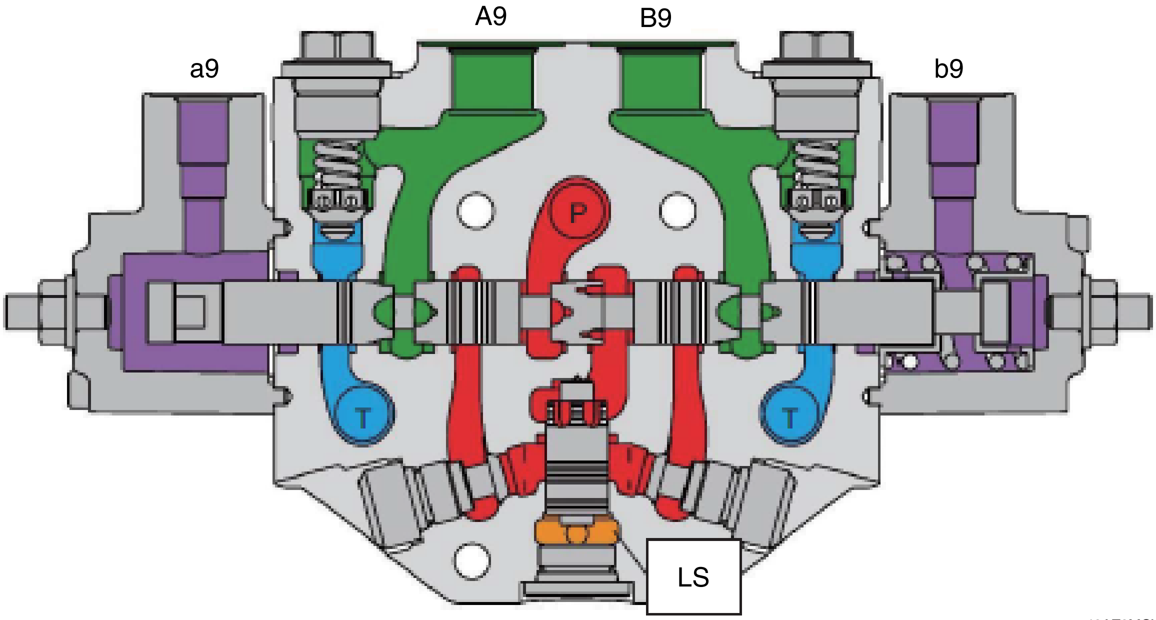
85A2MC48



48AA2MC43

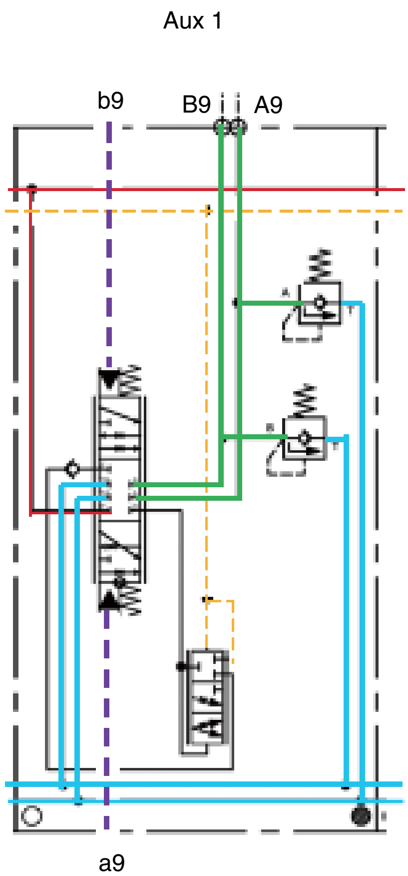
1 Spring pack
2 Housing
3 Pressure compensator
4 Check valves
5 Spool
6 Relief valves

(2) Neutral position



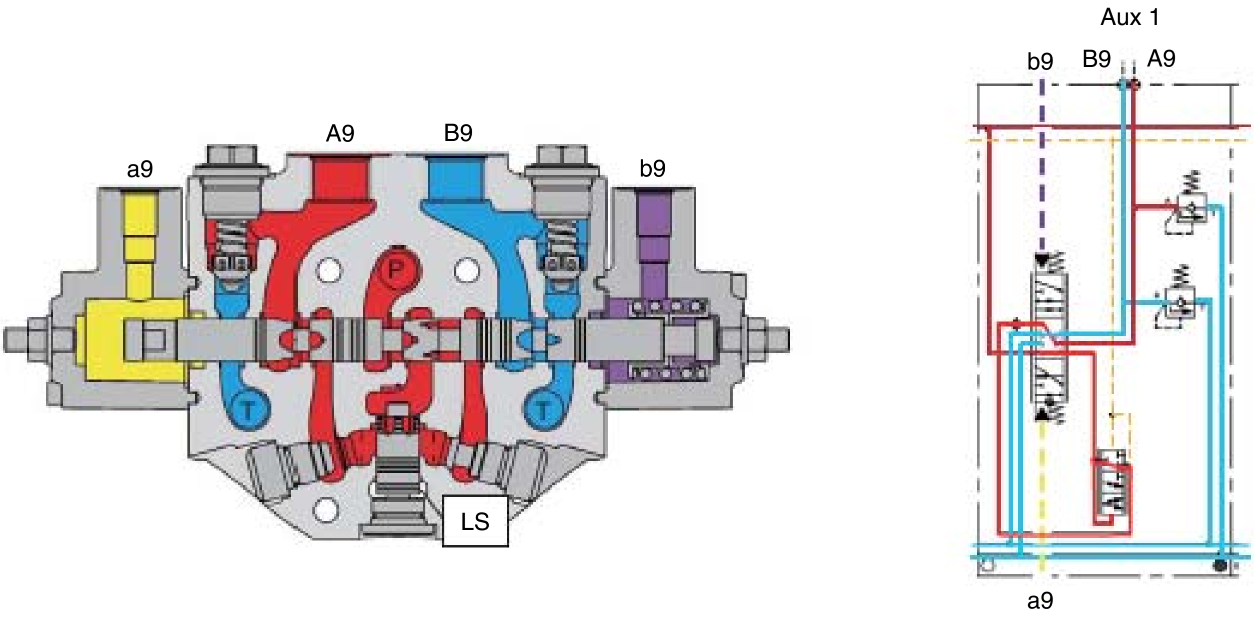
48AZ2MCV49

The spool is in neutral position, pump is in low pressure stand-by. The A9 and B9 ports are not connected to the pumps nor the tank.



48AZ2MCV50

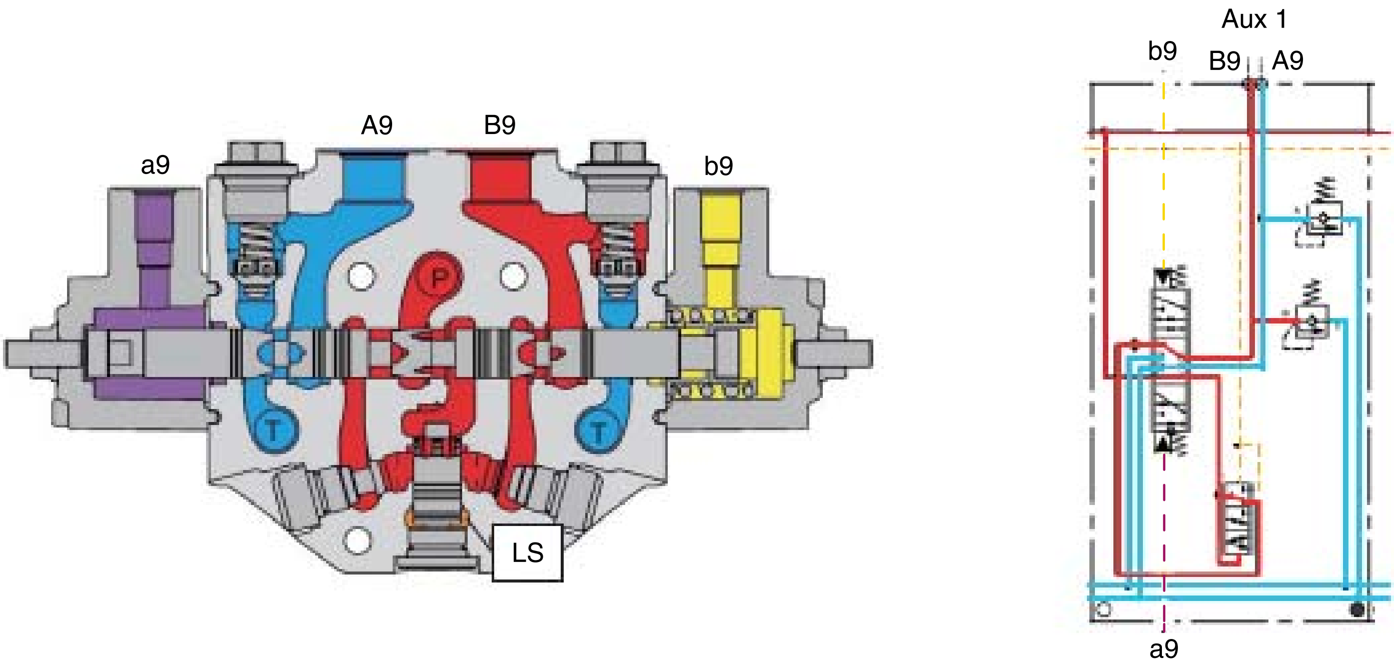
(3) PABT position



48AZ2MCV51

When the pilot pressure is led to the port a9, the oil from the pump flows to the cylinder port A9 and oil from the cylinder flows into the tank through the cylinder port B9.

(4) PBAT position

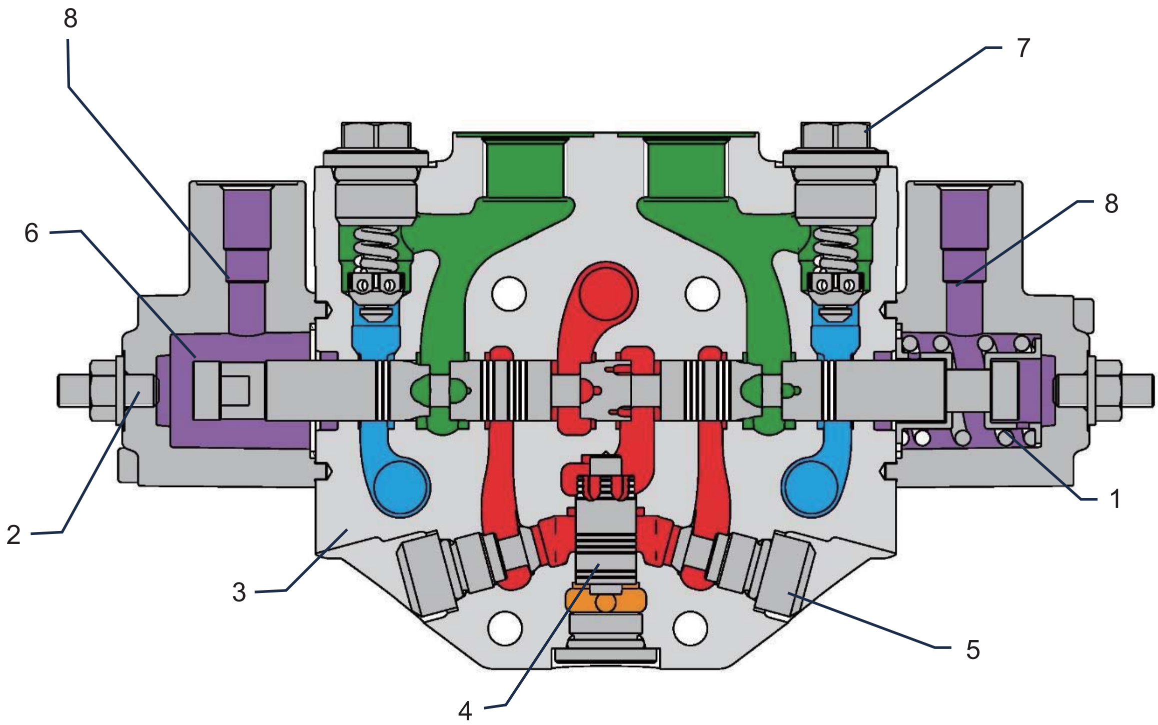


48AZ2MCV52

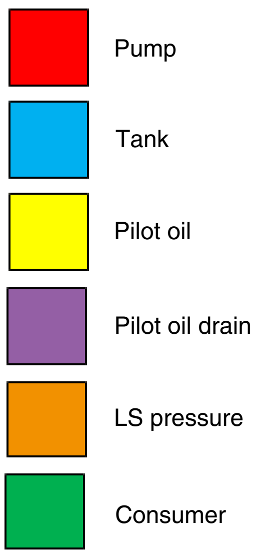
When the pilot pressure is led to the port b9, the oil from the pump flows to the cylinder port B9 and oil from the cylinder flows into the tank through the cylinder port A9.

8) SWING SLICE DESCRIPTION

(1) Component description



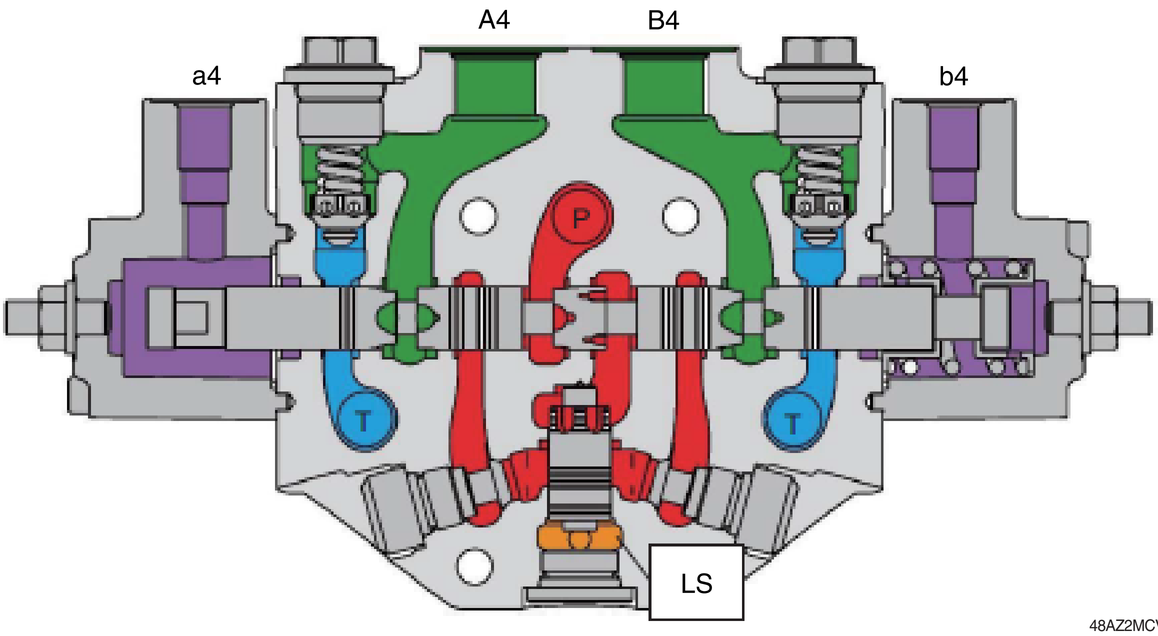
85A2MC53



1 Spring pack
2 Stroke limitation device
3 Housing
4 Pressure compensator
5 Check valves
6 Spool
7 Plug
8 Snubbers

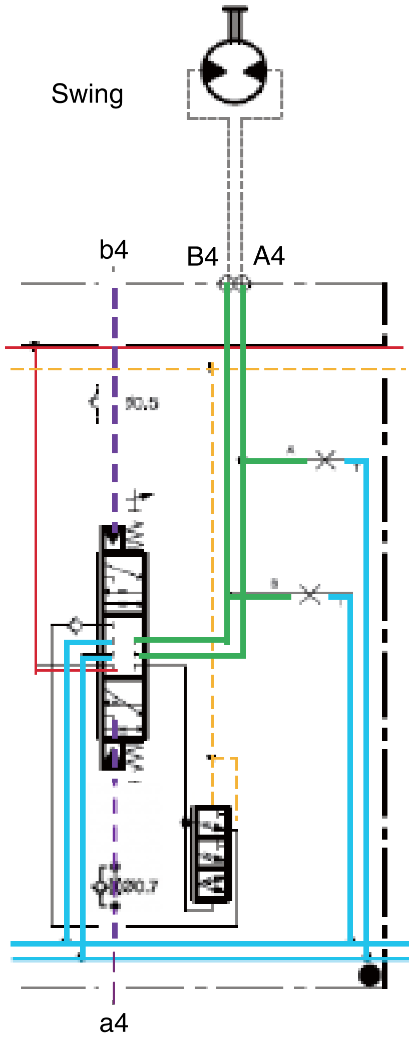
48AA2MC43

(2) Neutral position



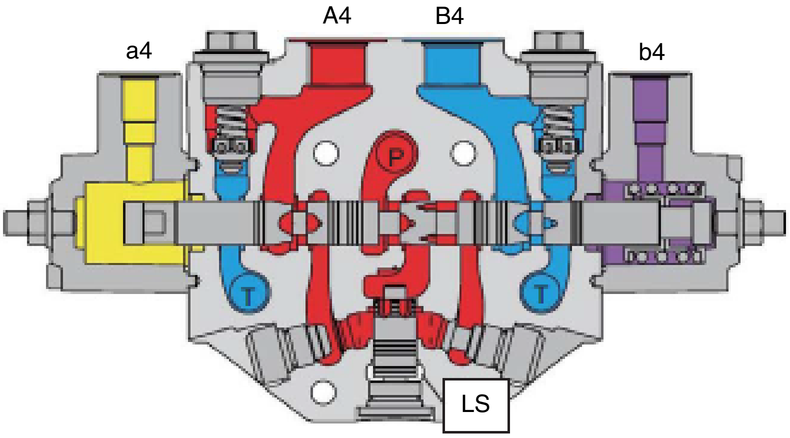
48AZ2MCV54

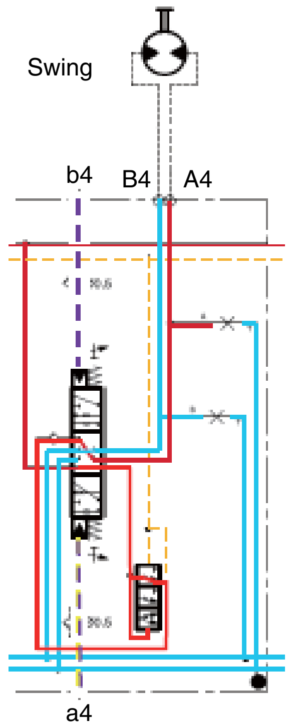
The spool is in neutral position, pump is in low pressure stand-by. The A4 and B4 ports are not connected to the pumps nor the tank. This slice is equipped with spool stroke limiters



55ACR2MCV55

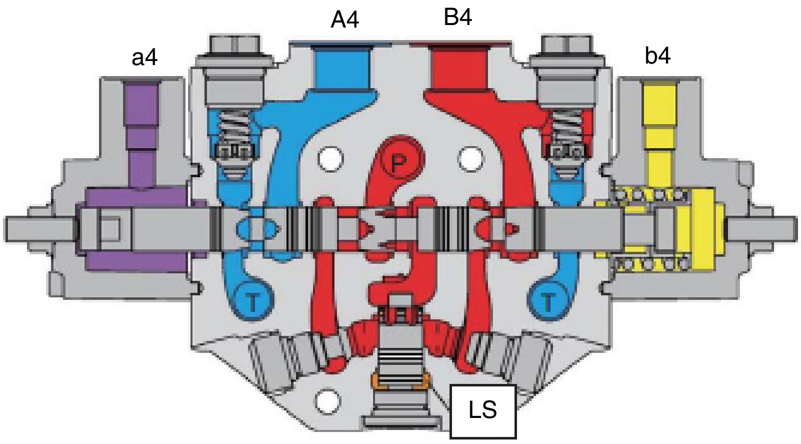
(3) PABT position

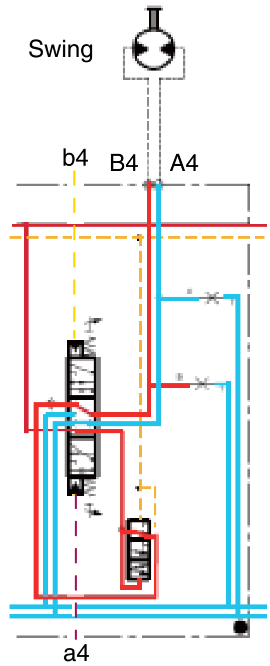




When the pilot pressure is led to the port a4, the oil from the pump flows to the motor port A4 and oil from the cylinder flows into the tank through the motor B4.

(4) PBAT position





When the pilot pressure is led to the port b4, the oil from the pump flows to the motor port B4 and oil from the cylinder flows into the tank through the motor port A4.

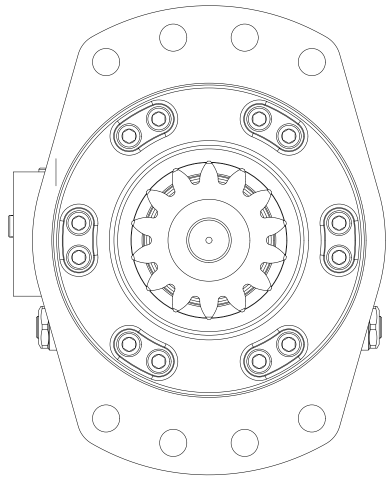
GROUP 3 SWING DEVICE

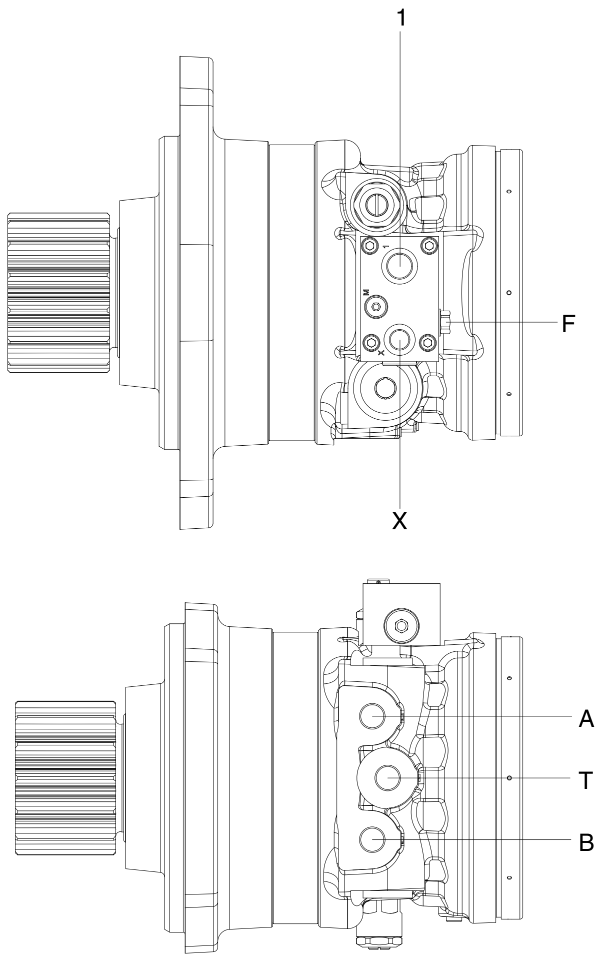
1. STRUCTURE

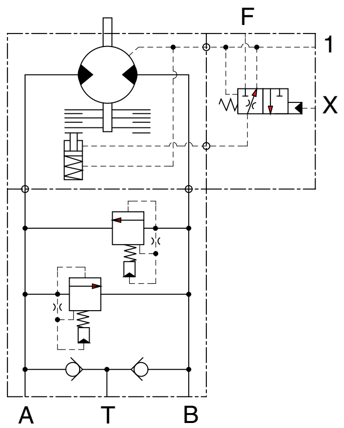
Swing device consists swing motor and swing reduction gear.

1) SWING MOTOR

Swing motor include mechanical parking valve, relief valve and make up valve.





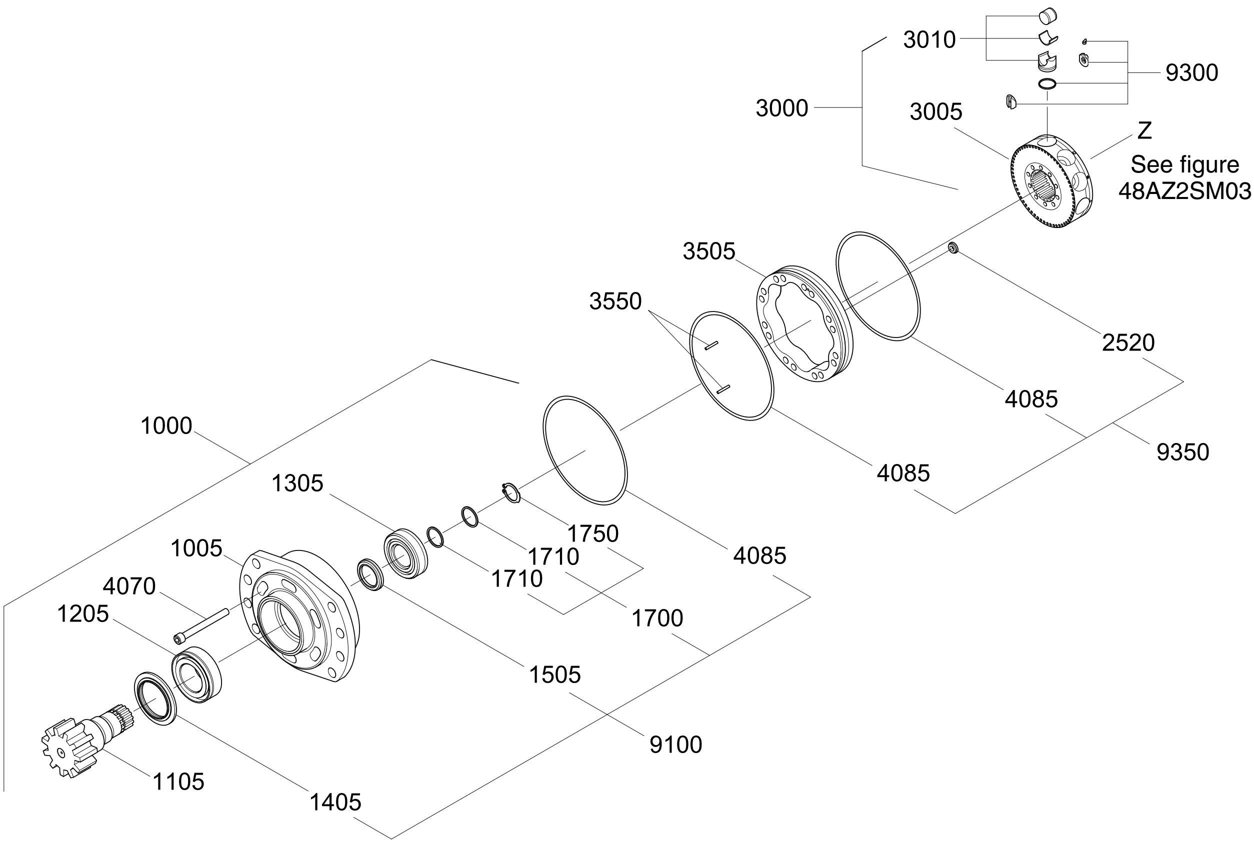


Hydraulic circuit

48AZ2SM01

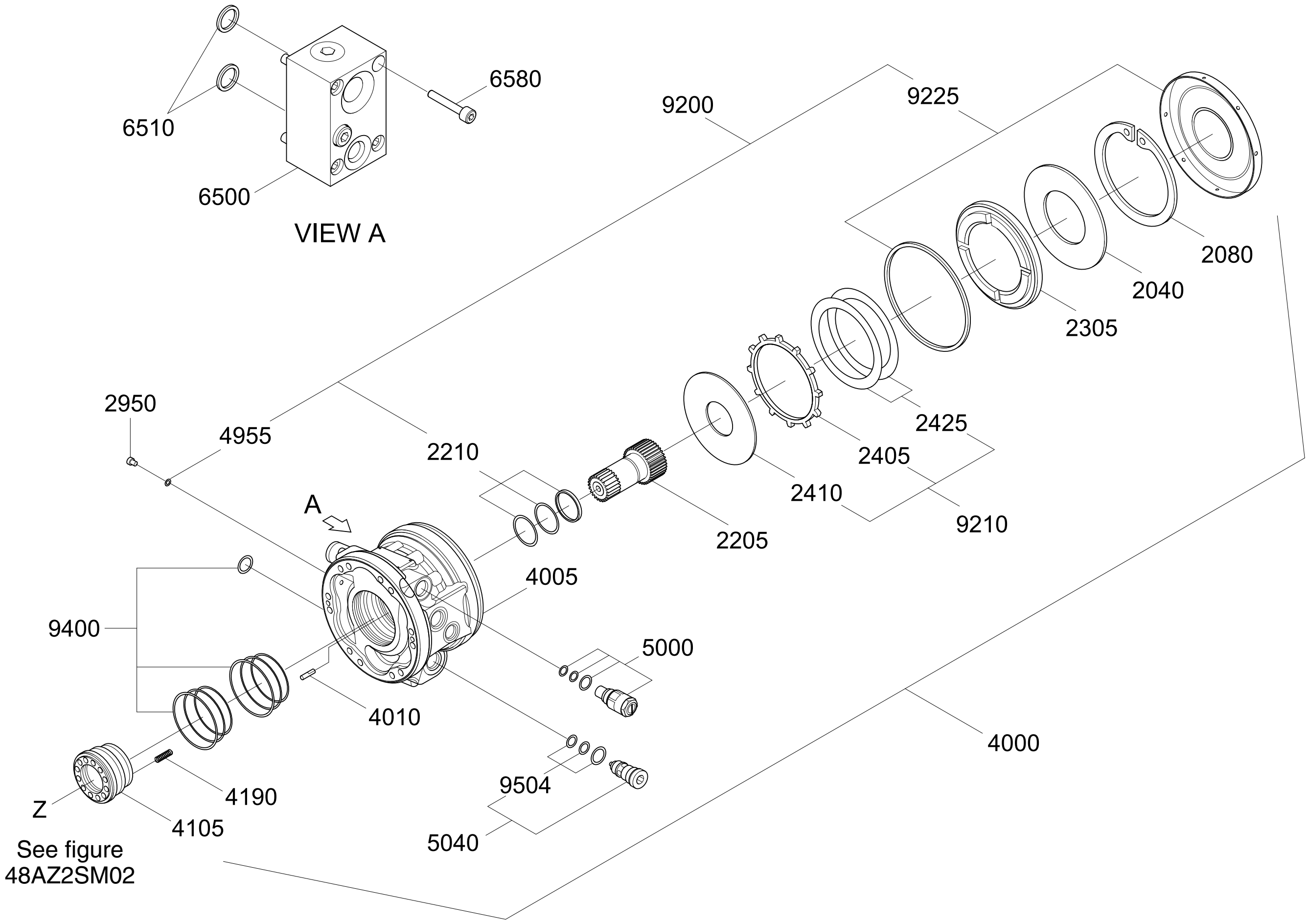
Port	Port name	Port size
A	Main port	PF 3/8
B	Main port	PF 3/8
1	Drain port	PF 3/8
X	Pilot port	PF 1/4
T	Make up port	PF 3/8
F	Brake release port	PF 1/4

2) COMPONENTS (1/2)



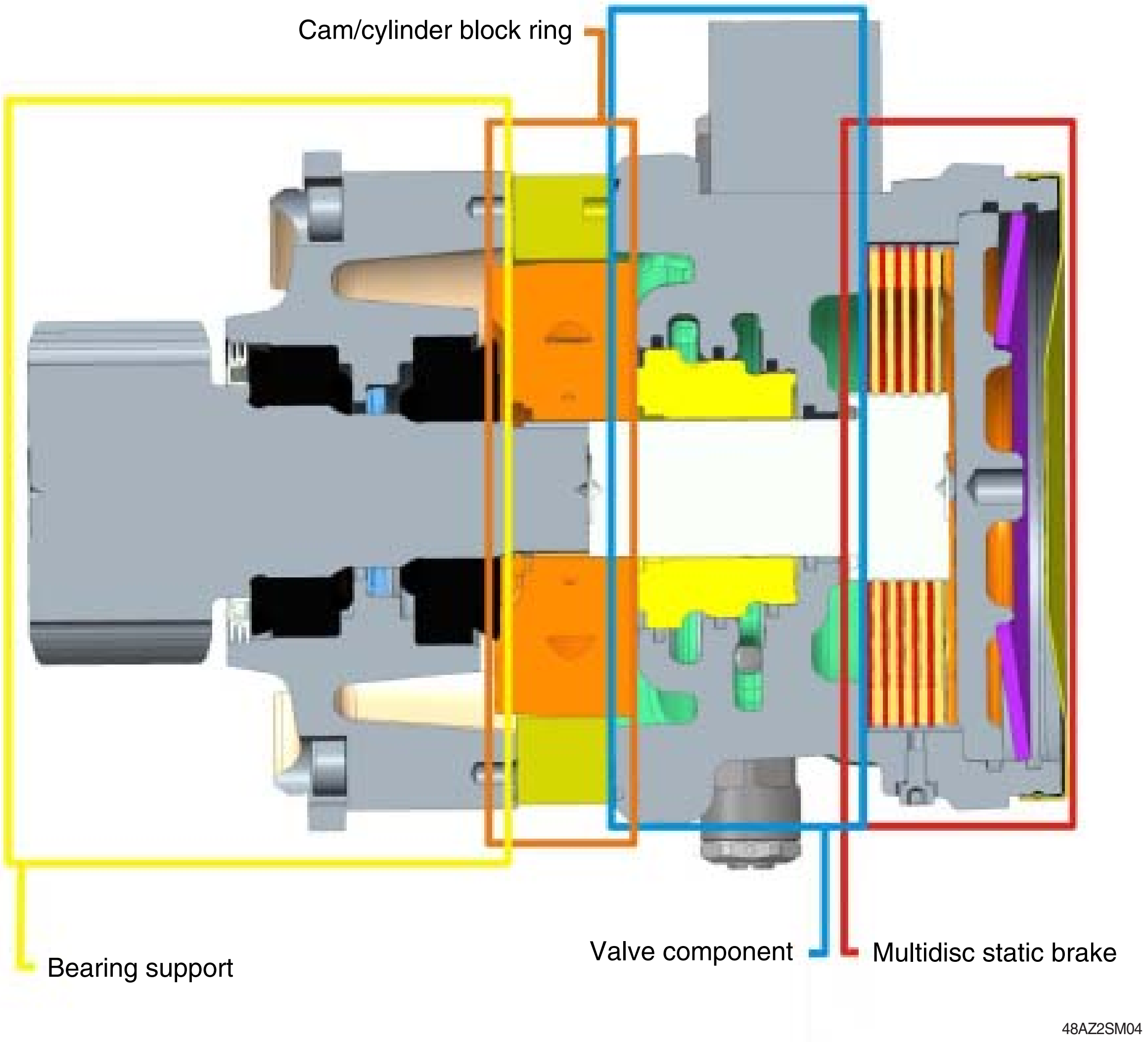
1000	Bearing support assy	1700	Shim kit	3505	Cam ring
1005	Support	1710	Shim	3550	Spring pin
1105	Shaft	1750	Snap ring	4070	Screw
1205	Taper roller bearing	2520	Plug	4085	O-ring
1305	Taper roller bearing	3000	Cylinder block assy	9100	Seal kit
1405	Seal ring	3005	Block	9300	Piston service kit
1505	Oil seal	3010	Piston kit	9350	Seal kit

COMPONENTS (2/2)



2040	Spring washer	4000	Brake valve housing assy	6500	Brake valve
2080	Snap ring	4005	Housing	6510	O-ring
2205	Brake shaft	4010	Roll pin	6580	Screw
2210	Seal kit	4105	Brake valve	9200	Brake service kit
2305	Brake piston	4190	Spring	9210	Brake service kit
2405	External disc	4955	O-ring	9225	Brake cover kit
2410	Internal disc	5000	Release valve	9400	Seal kit
2425	Shim kit	5040	Check valve	9504	Seal kit
2950	Screw				

2. MAJOR PARTS

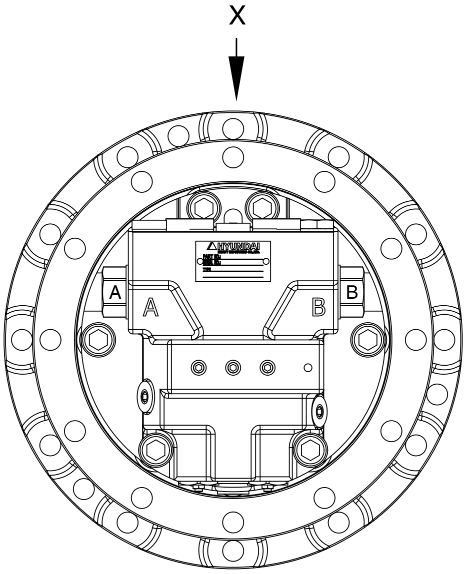


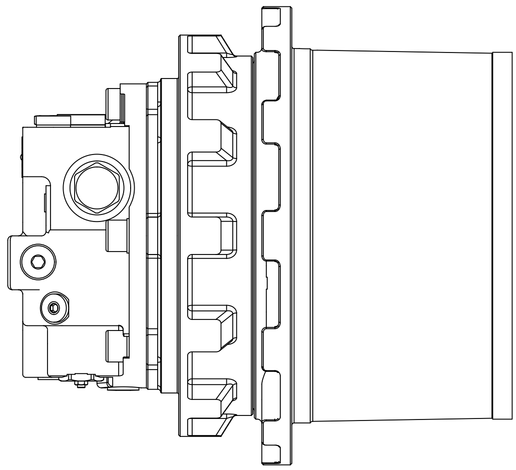
GROUP 4 TRAVEL DEVICE

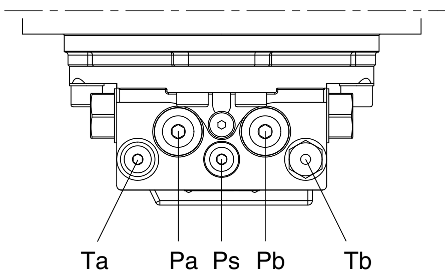
1. CONSTRUCTION

Travel device consists travel motor and gear box.

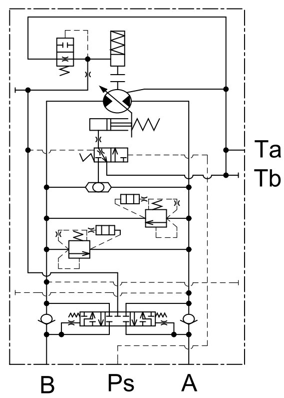
Travel motor includes brake valve, parking brake and high/low speed changeover mechanism.







VIEW X

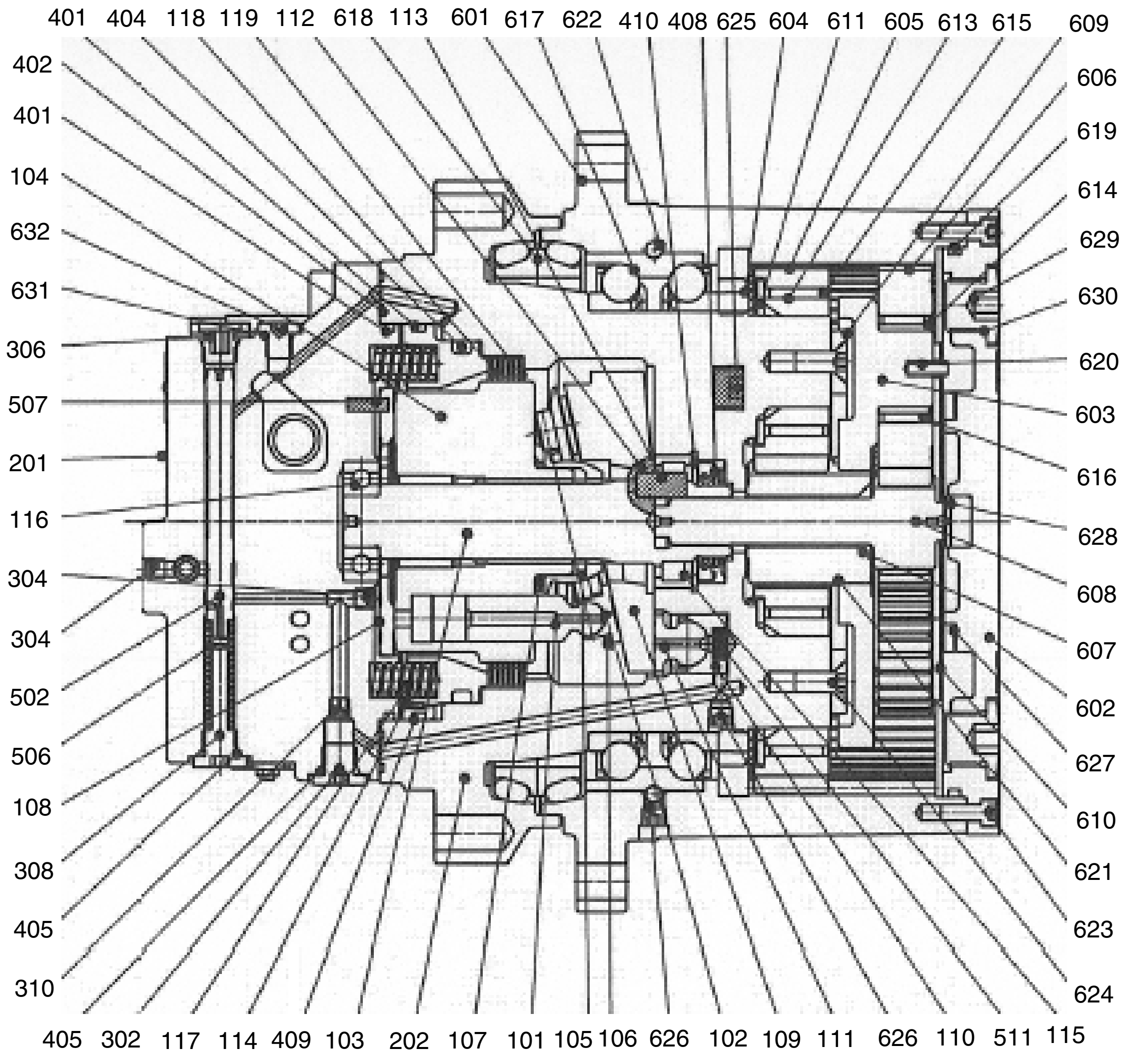


Hydraulic circuit

55ACR2TM01

Port	Port name	Port size
Pa	Main port	PF 1/2
Pb	Main port	PF 1/2
a1, a2	Gauge port	PT 1/4
Ta, Tb	Drain port	PF 3/8
Ps	2 speed control port	PF 1/4

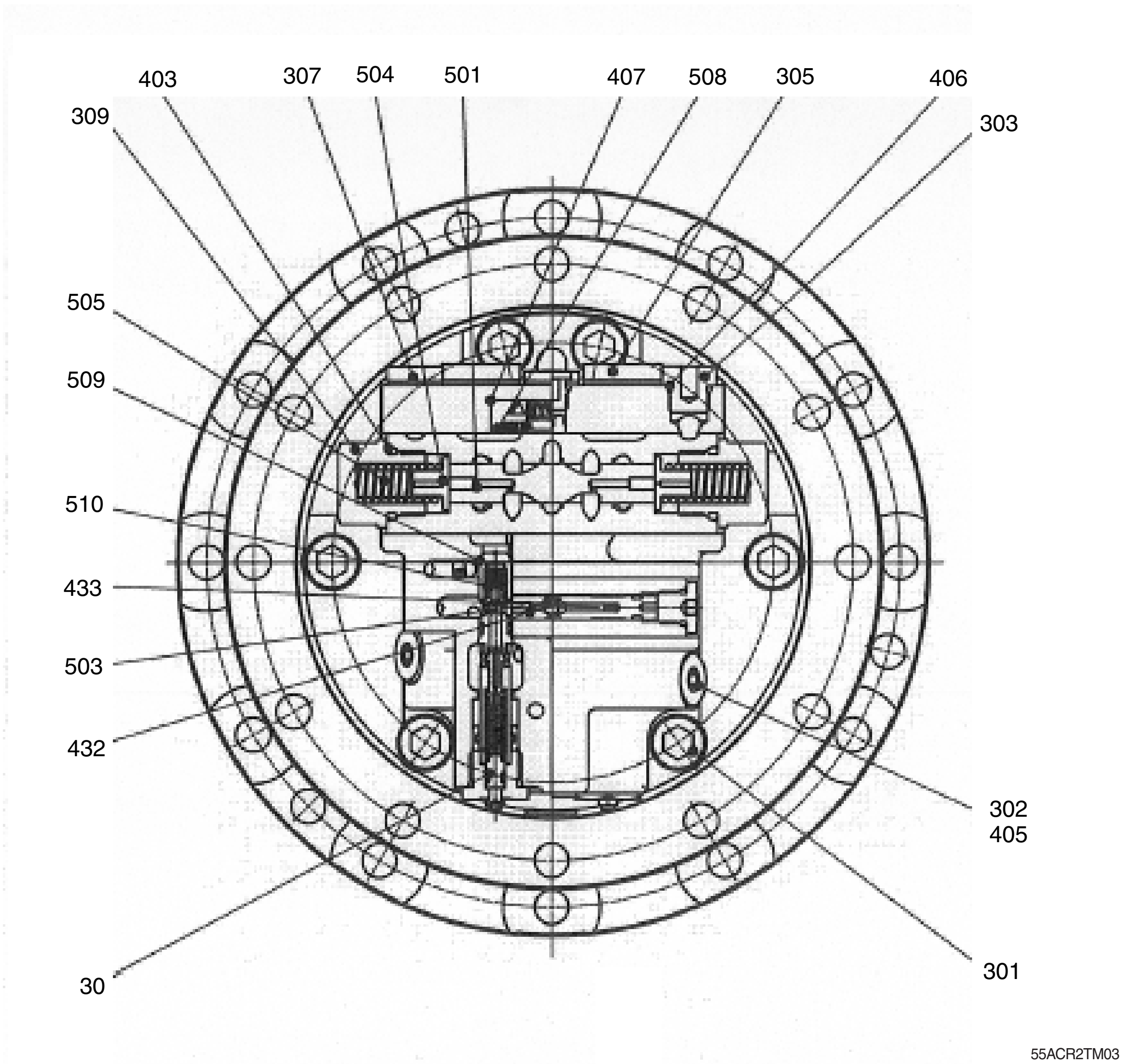
1) STRUCTURE (1/2)



48AZ2TM02

101 Piston
102 Shoe
103 Drive shaft
104 Cylinder block
105 Spherical bushing
106 Set plate
107 Cylinder spring
108 Valve plate
109 Swash plate
110 Swash piston
111 Swash shoe
112 Pivot
113 Pivot pin
114 Brake piston
115 Roller bearing
116 Ball bearing
117 Brake spring
118 Friction plate
119 Separator plate
201 Valve casing
202 Casing
302 Plug
304 NPTF plug
306 Dust plug
308 2 speed plug
310 Restrictor
401 O-ring
402 O-ring
404 O-ring
408 Oil seal
409 Back up ring
410 Snap ring
502 2 speed spool
506 Spring
507 Spring pin
511 Spring
601 Housing
602 Cover
603 Holder
604 Ring nut
605 Planetary gear F
606 Planetary gear R
607 Sun gear
608 Ring nut
609 Thrust plate F
610 Thrust plate R
611 Thrust washer
613 Collar
614 Inner race
615 Needle bearing
616 Needle bearing
617 Angular bearing
618 Floating seal kit
619 O-ring
620 Spring pin
621 Snap ring
622 Steel ball
623 Socket bolt
624 Bolt
625 Plug
626 Plug
627 Side plate A
628 Side plate B
629 Plug
630 O-ring
631 O-ring
632 Plug

STRUCTURE (2/2)

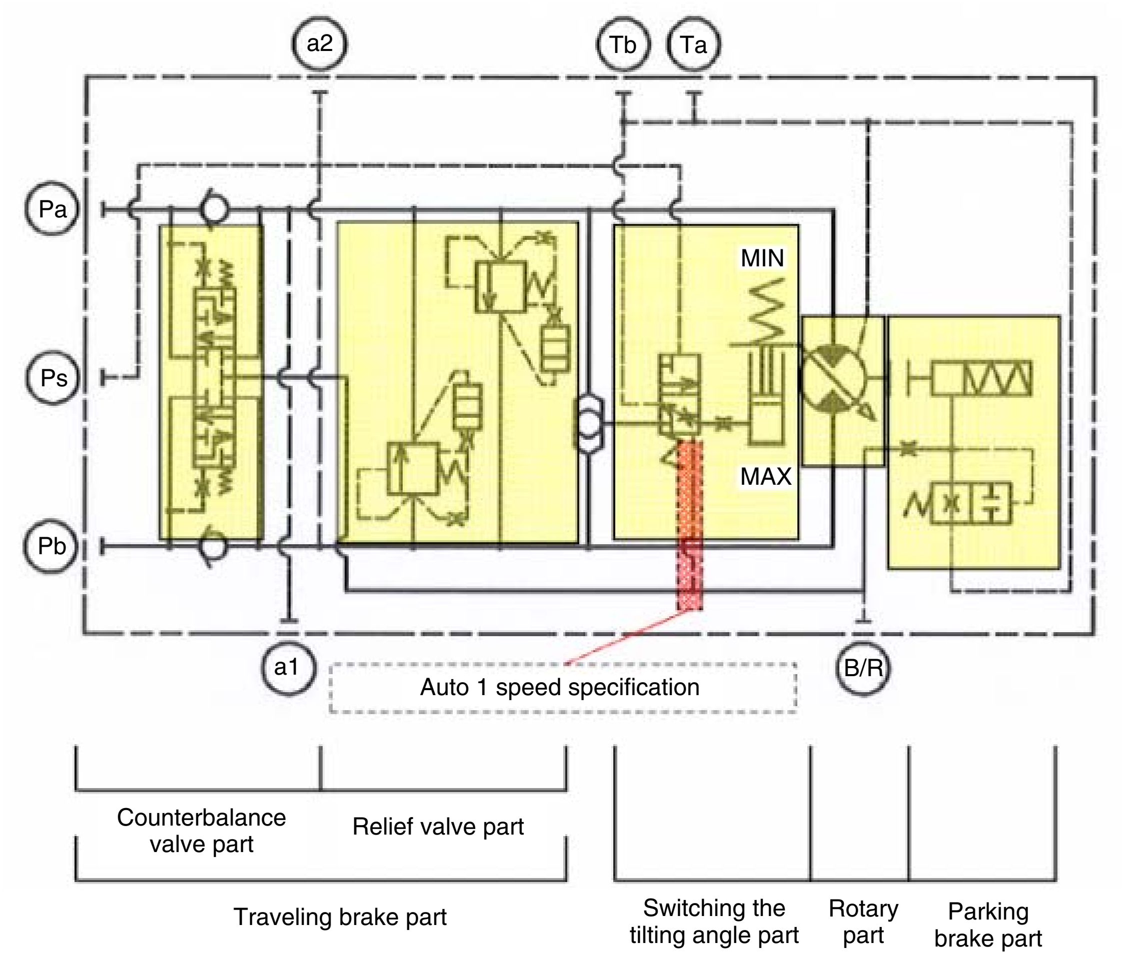


30	Relief valve assy	403	O-ring	503	Steel ball
301	Socket bolt	405	O-ring	504	Plunger
302	Plug	406	O-ring	505	Main spool spring
303	Drain plug	407	Name plate	508	Pin
305	Dust plug	432	Seat	509	Spring cap
307	Dust plug	433	Seat casing	510	Cap
309	Set plug	501	Main spool		

2) MAJOR COMPONENT

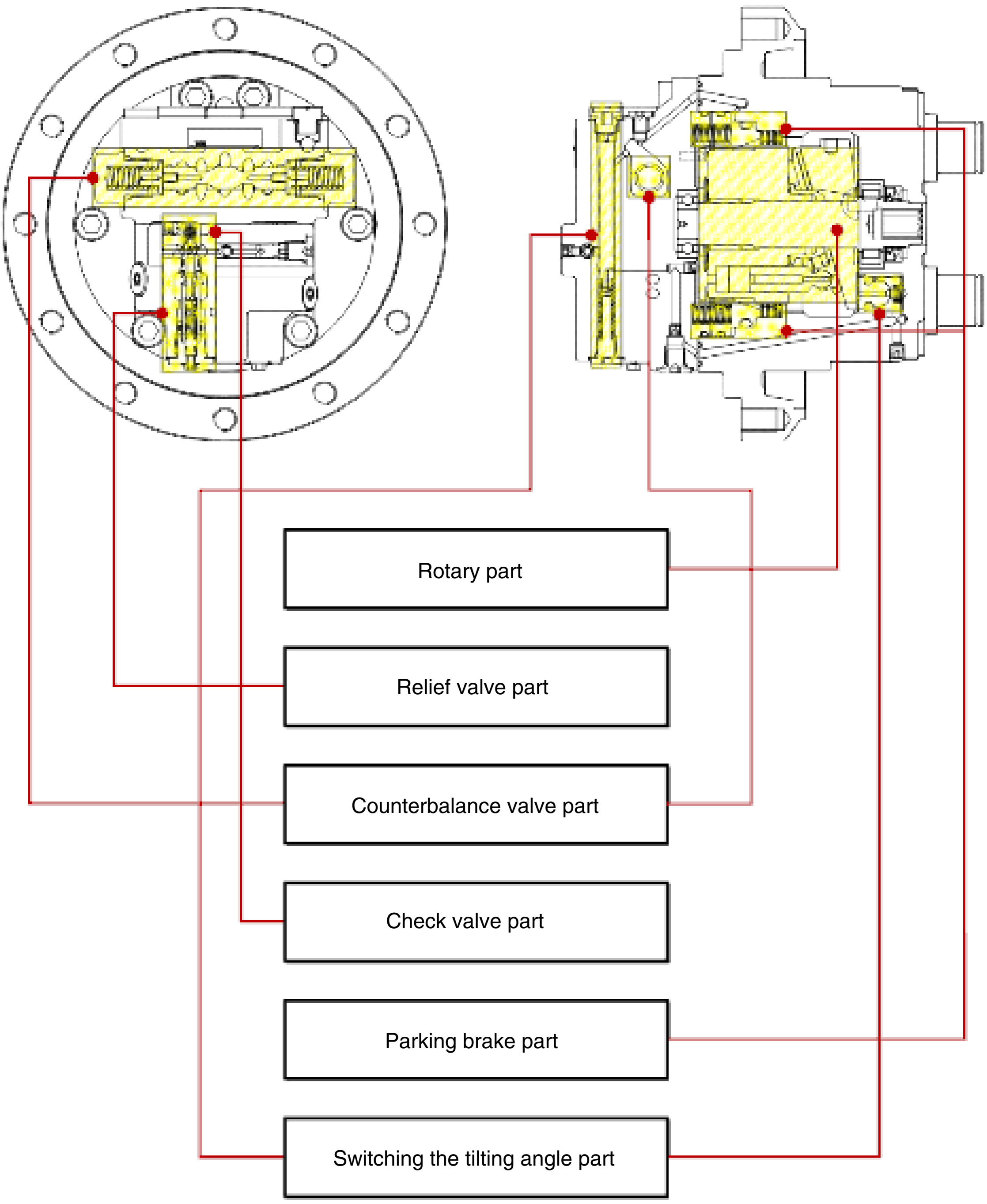
This product is only composed of hydraulic motor. Reduction parts are not composed.
This hydraulic motor is variable swash plate axial piston motor. It is composed of 4 parts.

- Rotary part which makes rotatory power
- Traveling brake valve part
- Parking brake part
- Switching the tilting angle part (auto 1/2 speed control part)



559A2TM52

3) BASIC STRUCTURE



559A2TM53

2. WORKING PRINCIPLE

1) HYDRAULIC MOTOR SECTION

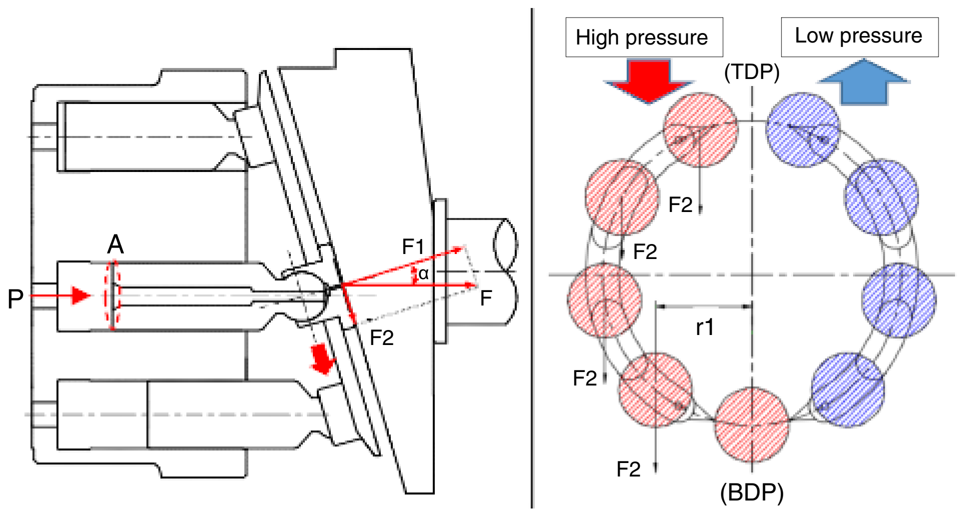
When high pressure oil passes from pump through the inlet port of the valve plate(108) and flows into the cylinder (104) as shown in figure, the oil pressure acts upon the piston (101) to generate the axial force "F". The force "F" acts on the swash (109) plane in the axial direction.

F = P×A (P : Pressure, A : Area)

The swash plate (109) is fixed with an inclination angle of α to the axis of the drive shaft (103). Therefore, this force is divided into two vector forces through the shoe (102) : namely, the force F1 vertical to the swash plate (109) and the force F2 perpendicular to the drive shaft (103).
Because of the force "F2", piston (101) slides along with shoe (102) in the direction of the arrow in Figure. This force "F2" is transmitted to the cylinder block (104) via the piston (101) and generates a couple of forces which turn the output drive shaft (103).
In the cylinder block (104) nine pistons are equispaced and the pistons connected to the high pressure oil inlet ports give their rotating torque to the output shaft sequentially.
When the oil inflow/outflow direction are reversed, the rotating direction of the output shaft is reversed.
The theoretical output torque "T [N/m]" is given by the flowing.

$$T = \frac{P \times q}{2\pi}$$

P : Effective pressure difference (Mpa), q : Displacement per revolution (cm^3)



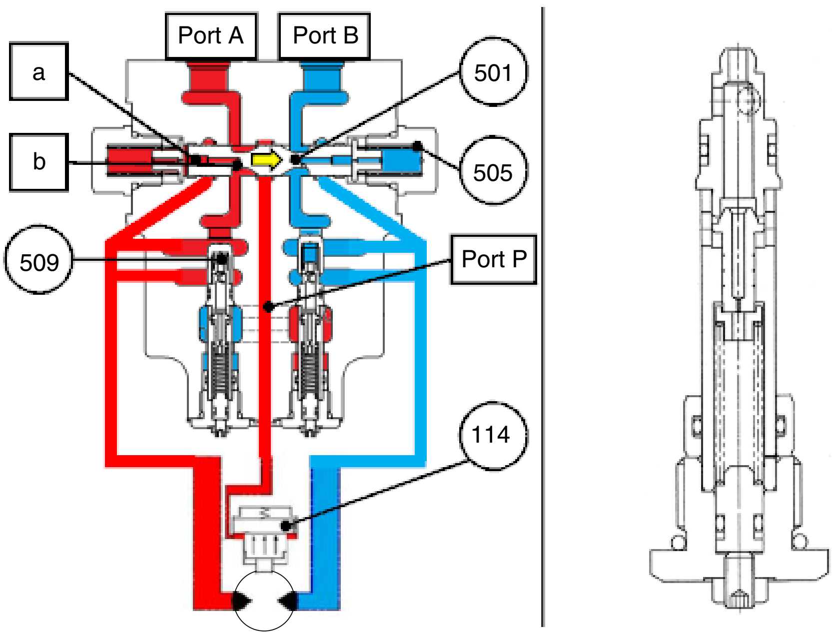
559A2TM54

2) TRAVELING BRAKE VALVE

Traveling brake valve is composed of relief valve, counterbalance valve and check port A is connected with hydraulic pump and port B is connected with tank.

(1) In case of traveling

When the compressed oil, which is supplied along the inlet port, exceeds certain pressure, it pushes cap (509). And, it is supplied to one side of the casing (202).
It is trying to rotate the hydraulic motor.
At the same time, the compressed oil enters the chamber {a} along small hole {b} of main spool (501) and acts on the face of main spool (501). After increasing pressure of oil, when this pressure exceeds the spring elasticity force of main spool spring (505), main spool (501), which is held in neutral by the spring elasticity force, moves to the right.
The inlet side and outlet side that was blocked by main spool (501) during stop connect with each other. So, return oil returns to the oil tank, so the hydraulic motor rotates.
Furthermore as main spool (501) moves, the path of parking brake (port P) is connected.
When compressed pressure, which enter to (port P) , becomes brake release pressure, it operates brake piston (114) and parking brake is released.
If the direction of oil inlet is reversed, main spool (501) and check valve motion is reversed. Output rotation direction is also reversed.



559A2TM55

(2) In case of stop

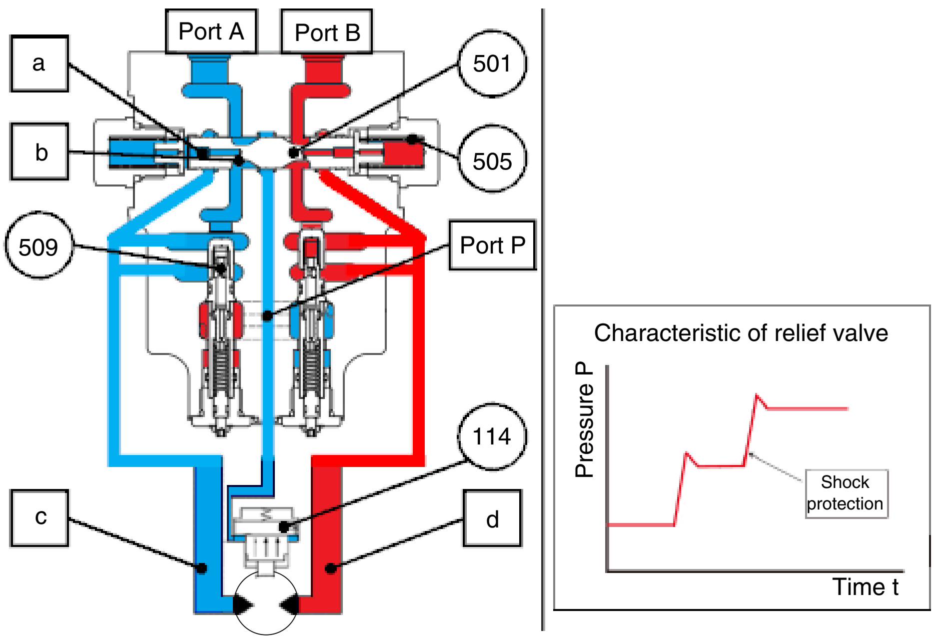
If the pressure supplied along the port to the inlet breaks while traveling, the pressure applied to the section of the main spool (501) is removed. Therefore, the main spool (501), which was pushed to the right, returns to neutral due to the spring elasticity force of the main spool spring (505).

The rotary part continues to rotate under inertia even if pressure is lost from the inlet side. As the main spool (501) returns to neutral, the connected inlet and outlet sides of the flow path are blocked. Since there is no escape location for the returned oil, the pressure of the exit side (D) is raised.

The returned oil with increased pressure enters the relief valve (30). if it exceeds the set pressure of the relief valve (30), operates the relief valve (30). The flow path from the outlet side {D} to the inlet side {C} is connected. And it controls the pressure on the outlet side.

At the same time it prevents cavitation on the inlet side.

It also relieves the shock during stop while controlling pressure on the outlet side with relief valve (30) in two stages, and apply soft braking to the hydraulic motor by applying an orifice and notch on the main spool (501).



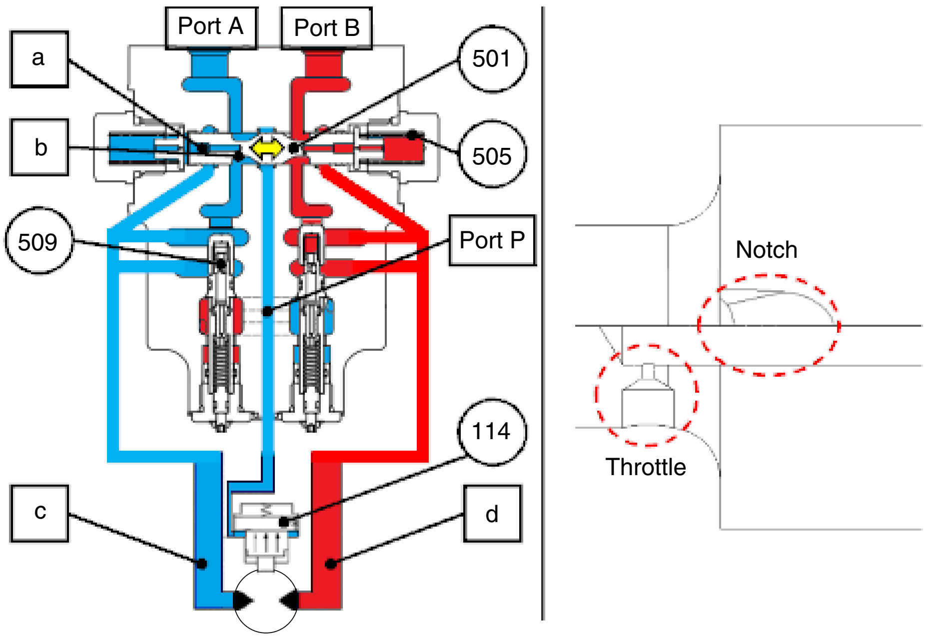
559A2TM56

(3) In case of overrun

Overrun is when the excavator's speed is increased by the it's gravity (inertia), such as when an excavator is going downhill, causing the hydraulic motor to rotate above the supply flow of the hydraulic pump.

In the case of overrun, the compressed oil on the inlet side is entered into the rotary and the pressure on the inlet side is reduced. Therefore, due to the spring elasticity force of the main spool spring (505), main spool (501) returns to neutral, as it stops.

At the same time, back pressure is generated due to the throttle (notch of main spool) between the outlet side (D) and the outlet port (port B) passage. The back pressure controls the return speed of the main spool (501) and hydraulic motor, which is about to be rotated by inertia forces, is decelerated. The operation of main spool (501) is controlled by the notch of main spool (501) and throttle. So motor smoothly moves according to the supply flow rate.



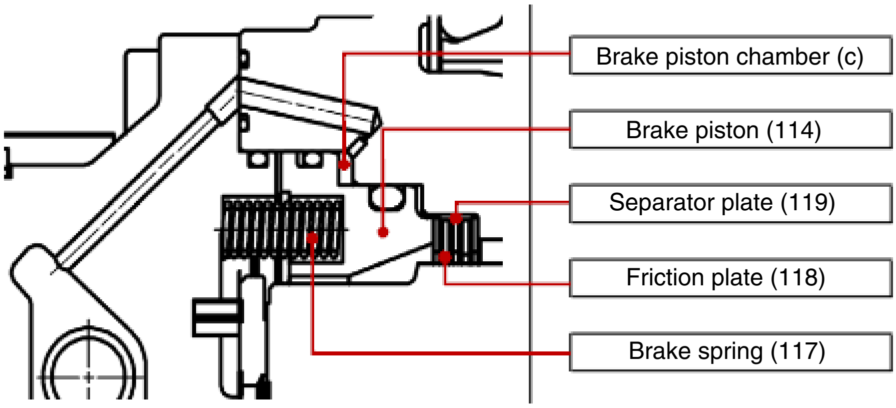
559A2TM57

3) PARKING BRAKE

The parking brake is wet-type multiple disk brakes. It is a negative brake system which is released when the brake release pressure enters the brake piston chamber.

The internal structure of parking brake is shown in figure. Friction plate (118) and separator plate (119) are alternately stacked, and acting on springs to produce brake torque with friction forces.

It prevents not only the braking of excavators but also overrun or slip during traveling and stopping on the slip.



559A2TM58

(1) In case traveling

The cylinder block (104) is connected to the drive shaft (103) with spline. In addition, the separator plate (119) is restrained from circumferentially-rotating by an arc groove cut on the casing (202).

The friction plate (118) which is connected to the arc groove cut on cylinder block (104), can be rotated along the cylinder block (104).

When pressurized oil is supplied from the inlet side during traveling operation, the blocked flow path is opened. so pressurized oil is supplied to the brake piston chamber (c) that is comprised inside brake piston (114) and casing (202).

If the hydraulic force F4 of the brake piston chamber (c) is greater than the spring elasticity force F3 of the brake spring (117), then brake piston (114) move to valve casing. (above brake release pressure)

F3 = k x n , k : Spring constant, x : Spring stroke, n : Number of spring brake

F4 = P × (A1 - A2), P : Main pressure of input, (A1 - A2) : Area difference of brake piston

The force that friction plate (118) and separator plate (119) pressurize the casing (202) disappears and the brake releases.

So, the hydraulic motor can rotate.

(2) In case of stop

If the pressurized oil supplied by the inlet is cut off during stop, the pressurized oil supplied to the brake piston chamber (c) will also be blocked. (below brake release pressure)

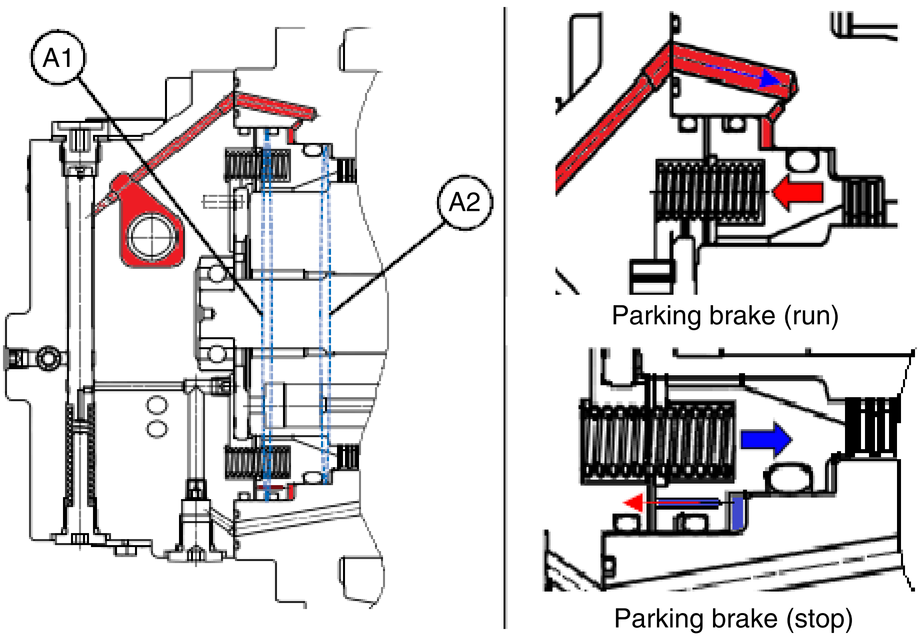
If the spring elasticity force F3 of the brake spring (117) is greater than the hydraulic force F4 of the brake piston chamber (c), then brake piston (114) move to casing by spring elasticity force. The hydraulic oil of the brake piston (114) is drained through the throttle. Therefore brake piston (114) smoothly operates.

$F3 < F4$

$F3 = k \, x \, n$, k : Spring constant, x : Spring stroke, n : Number of spring brake

$F4 = P \times (A1 - A2)$, P : Main pressure of input, (A1 - A2) : Area difference of brake piston

When the brake piston (114) pushes casing (202) by the brake spring (117), the frictional force appears between friction plate (118), casing (202), separator plate (119) and brake piston (114). parking brake appears by friction force and spring elasticity of the brake spring (117), the drive shaft (103) is constrained.



559A2TM59

4) 1/2 SPEED SWITCHING OPERATION (AUTOMATIC 1/2 SPEED CONTROL PART)

(1) Low speed traveling

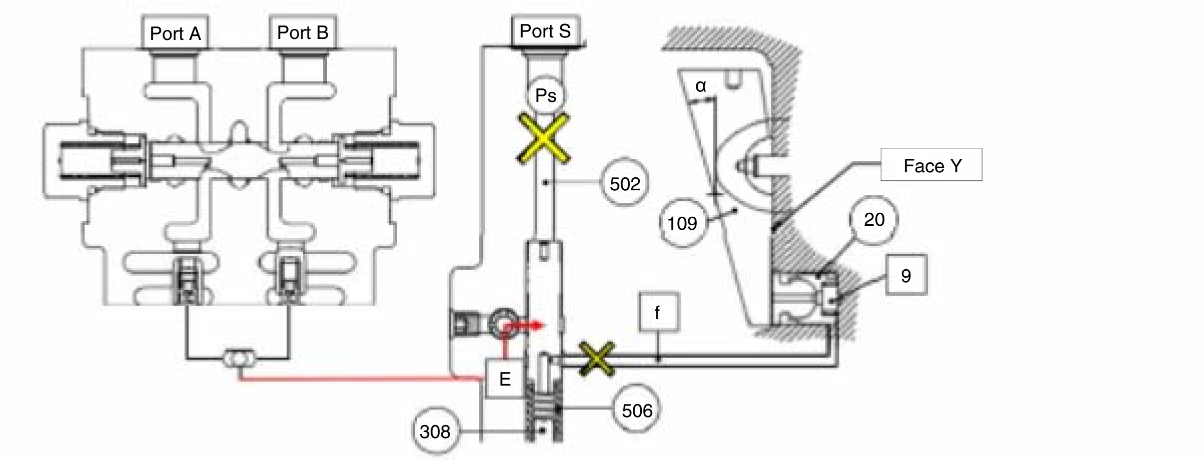
If pilot pressure is not supplied on pilot port (port S), 2 speed spool (502) is pushed in the direction of the port S by spring elasticity of 2 speed spool spring (506).

As a result, the compressed oil from the high pressure selection check valve (E) is not connected to the swash piston chamber (g).

The compressed oil of swash piston chamber{g} is drained through the flow path of 2 speed spool chamber (f).

So, the compressed oil from the high pressure selection check valve (E) is not connected to the swash piston chamber {g}. As a result, the swash plate (109) will be the maximum angle α and the stroke of the piston (101) will be long. So, a large amount of oil will be required for rotating the motor once.

Therefore the displacement of the hydraulic motor is maximized and rotated at low speed.



559A2TM60

(2) High speed traveling

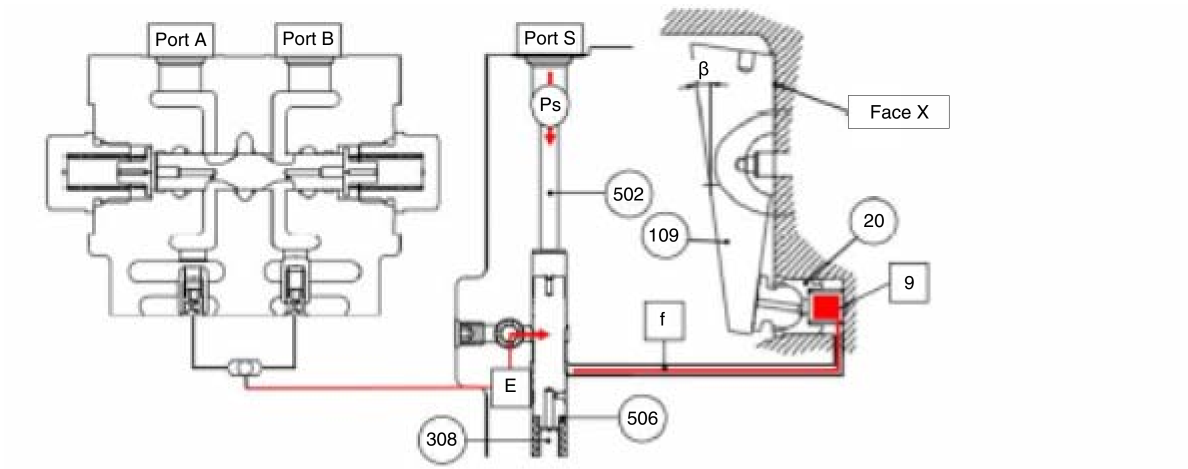
If the pilot pressure (20~50 kgf/cm^2) is supplied to the port (port S), the pilot pressure overcomes the oil pressure in the main port and the spring elasticity force of the 2 speed spool spring (506). and it pushes the 2 speed spool (502) to the 2 speed plug (308) direction.

This is why the pressure from the high pressure selection check valve (E) is connected to the flow path (f).

The pressurized oil flows into the {g} chamber along the flow path {f} and pushes swash piston (20) to contact the face 'X' of swash plate (109) with the wall of the casing (202).

As a result, the swash plate (109) is the minimum angle β. Because stroke of piston (101) is shortened, a small amount of oil is used for one revolution.

Therefore, the displacement of the hydraulic motor is minimized and is rotated at high speed.



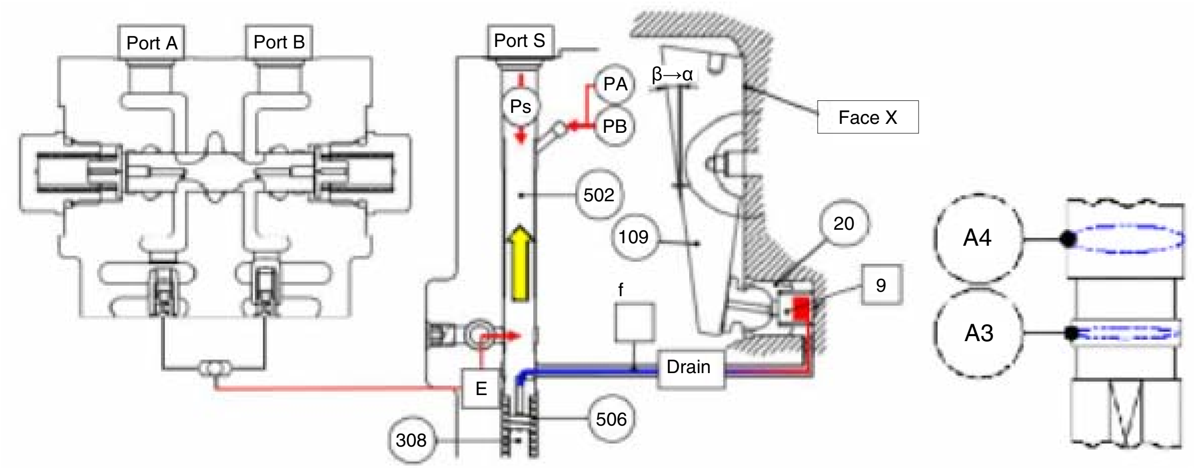
559A2TM61

(3) Automatic 1/2 speed control part

If the load is increased during the 2-speed driving, the hydraulic pressure on the main port is increased. The pressure ($\triangle P$) of main port and spring elasticity force of 2 speed spool spring (506) will overcome the pressure of pilot, 2 speed spool (502) is pushed in port S direction.

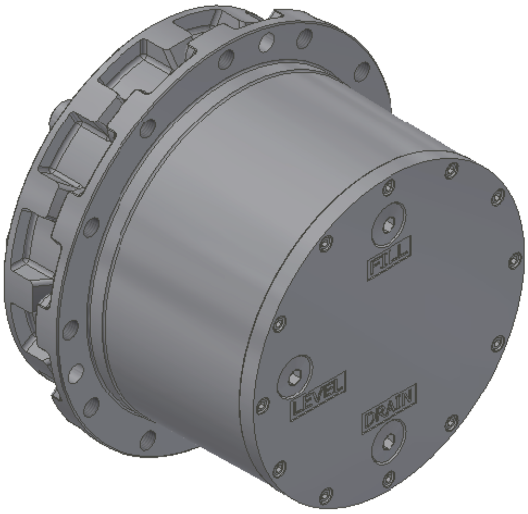
$F5 < [\{F6 \times (A4 - A3)\} + (Fspring)]$
$F5 = PS \times A3$, PS : Pilot pressure, A3 : 2 speed spool area
$F6 = (PA \text{ or } PB) \times (A4 - A3)$, (PA or PB) : Main pressure difference between inlet side and outlet side
$Fspring = K \times X$; K : Spring constant of 2 speed spool spring, X : Spring stroke

Therefore, flow path from the high pressure selection check valve (E) to (f) is blocked.
And the pressure of (g) is slowly drained to 2 speed spool chamber (f) through throttle and a notch of 2 speed spool.
The angle of swash plate (109) transfers from β to α, and the motor automatically switches from 2 speed to 1 speed to rotate at low speed.



559A2TM62

5) REDUCTION GEAR



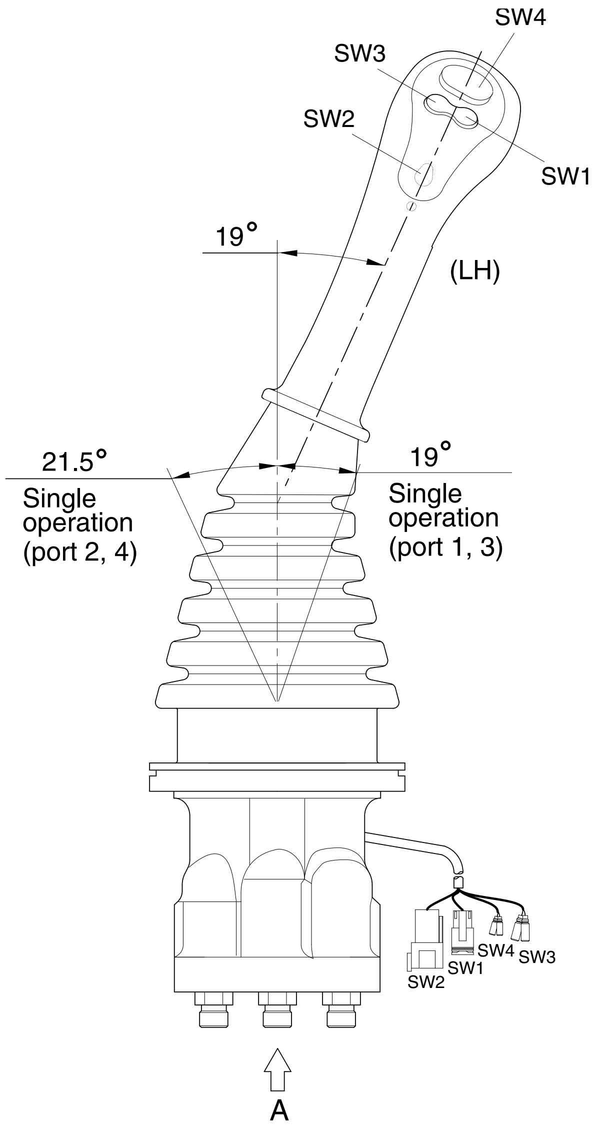
559A2TM63

(1) Refer to the section drawing for the basic construction.
(2) The reduction gear consists of two stage planetary gears.
(3) The reduction ratio is determined by the number of teeth of the gear, and the reduction ratio is 42.439.
    In other words, the number of revolutions of the hydraulic motor is transmitted to the output shaft at 1 / reduction ratio.
(4) The direction of rotation of the input and output shafts is opposite.

■ TYPE 1 (KPM, LH)

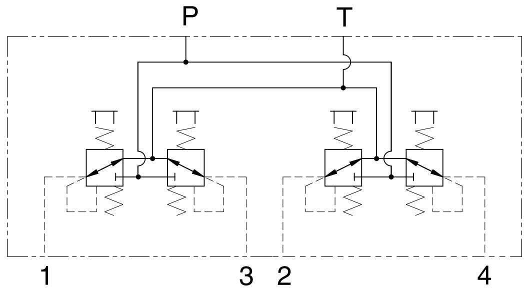
1. STRUCTURE

The casing has the oil inlet port P (primary pressure) and the oil outlet port T (tank). In addition the secondary pressure is taken out through ports 1,2,3 and 4 provided at the bottom face.



Switches

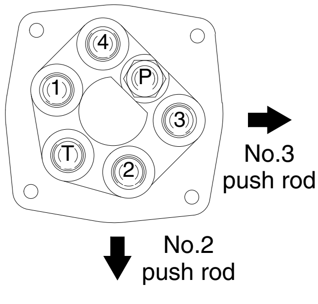
Switch no.	Color (LH)
SW1	Gray
SW2	Blue
SW3	Black
SW4	Red



Hydraulic circuit

55ACR2RL01

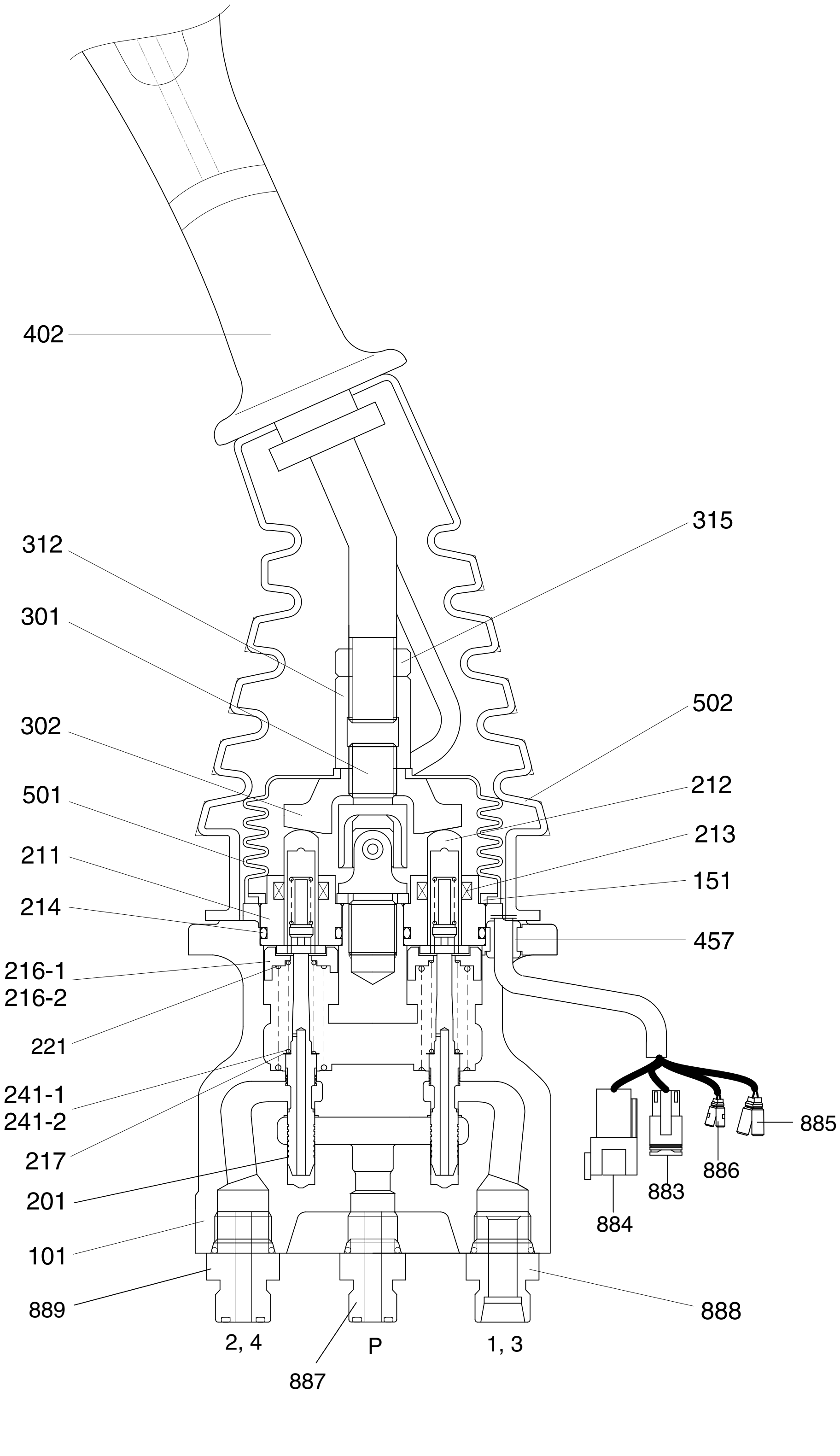
PF 1/4" : P port
PF 3/8" : T, 1, 2, 3, 4 port



VIEW A

Port	LH	Remark
P	Pilot oil inlet port	PF 1/4
T	Pilot oil return port	
1	Left swing port	
2	Arm out port	
3	Right swing port	
4	Arm in port	

CROSS SECTION



55ACR2RL02

CROSS SECTION

The construction of the pilot valve is shown in the attached cross section drawing. The casing has vertical holes in which reducing valves are assembled.

The pressure reducing section is composed of the spool (201), spring (221-1, 221-2) for setting secondary pressure, return spring (221), spring seat (216-1, 216-2) and spring seat (217). The spring for setting the secondary pressure has been generally so preset that the secondary pressure is 7.6 to 20.4 kgf/cm^2. The spool is pushed against the push rod (212) by the return spring.

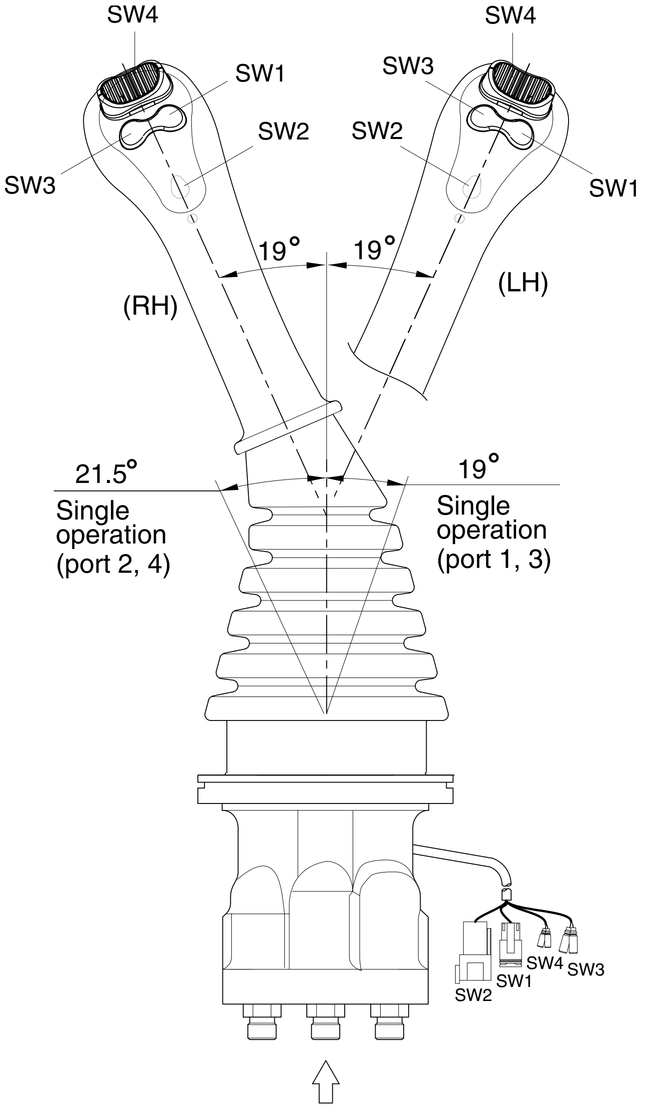
When the push rod is pushed down by tilting the handle, the spring seat comes down simultaneously and changes setting of the secondary pressure spring.

101	Case	221	Spring	501	Bellows
151	Plate	241-1	Spring (port 1, 3)	502	Bellows
201	Spool	241-2	Spring (port 2, 4)	883	Terminal
211	Plug	246-1	Spring (port 1, 3)	884	Terminal
212	Push rod	246-2	Spring (port 2, 4)	885	Connector
213	Oil seal	301	Joint	886	Connector
214	O-ring	302	Plate	887	Connector
216-1	Spring seat (port 1, 3)	312	Adjust nut	888	Connector
216-2	Spring seat (port 2, 4)	315	Lock nut	889	Connector
217	Washer	402	Handle		
218	Spring seat	457	Bushing		

■ TYPE 2 (KPM)

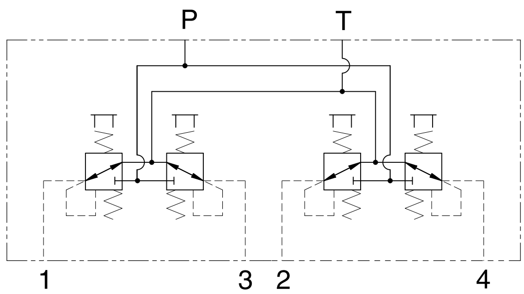
1. STRUCTURE

The casing has the oil inlet port P (primary pressure) and the oil outlet port T (tank). In addition the secondary pressure is taken out through ports 1, 2, 3 and 4 provided at the bottom face.



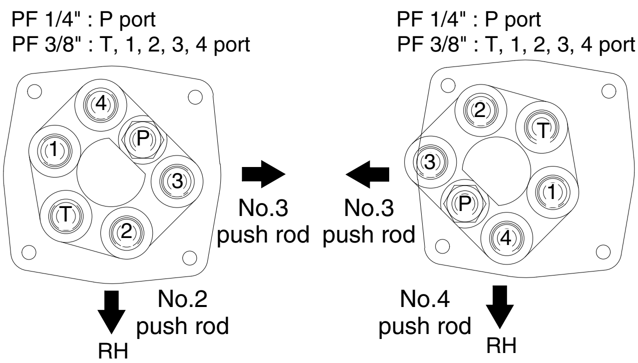
Switches

Switch no.	Color	Remark
SW1	Gray	
SW2	Blue	
SW3	Black	
SW4-A	Red	
SW4-B	Purple	
SW4-C	White	



Hydraulic circuit

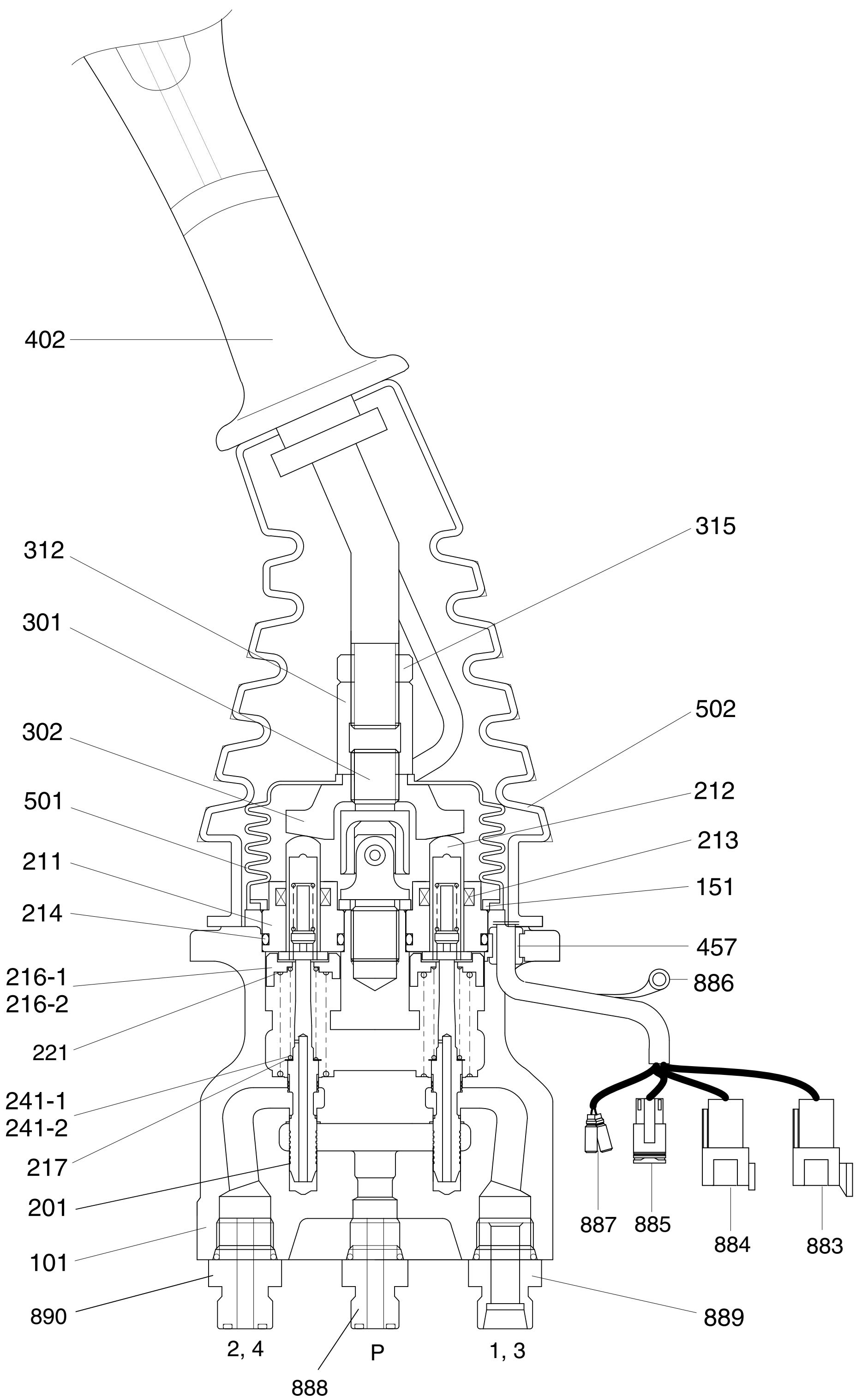
55ACR2RL03



VIEW A

Port	LH	RH	Remark
P	Pilot oil inlet port	Pilot oil inlet port	
T	Pilot oil return port	Pilot oil return port	
1	Left swing port	Bucket out port	
2	Arm in port	Boom down port	
3	Right swing port	Bucket in port	
4	Arm out port	Boom up port	

CROSS SECTION



101	Case
151	Plate
201	Spool
211	Plug
212	Push rod
213	Oil seal
214	O-ring
216-1	Spring seat (port 1, 3)
216-2	Spring seat (port 2, 4)
217	Washer
218	Spring seat
221	Spring
241-1	Spring (port 1, 3)
241-2	Spring (port 2, 4)
246-1	Spring (port 1, 3)
246-2	Spring (port 2, 4)
301	Joint
302	Plate
312	Adjust nut
315	Lock nut
402	Handle
457	Bushing
501	Bellows
502	Bellows
883	Connector
884	Connector
885	Connector
886	Terminal
887	Terminal
888	Connector
889	Connector
890	Connector

55ACR2RL04

The construction of the pilot valve is shown in the attached cross section drawing. The casing has vertical holes in which reducing valves are assembled.
The pressure reducing section is composed of the spool (201), spring (241-1, 241-2) for setting secondary pressure, return spring (221), spring seat (216-1, 216-2) and washer (217). The spring for setting the secondary pressure has been generally so preset that the secondary pressure is 7.6 to 20.4 kgf/cm^2. The spool is pushed against the push rod (212) by the return spring.
When the push rod is pushed down by tilting the handle, the spring seat comes down simultaneously and changes setting of the secondary pressure spring.

2. FUNCTIONS (KPM, Type 1 and 2)

1) FUNDAMENTAL FUNCTIONS

The pilot valve is a valve that controls the spool stroke, direction, etc of a main control valve. This function is carried out by providing the spring at one end of the main control valve spool and applying the output pressure (secondary pressure) of the pilot valve to the other end.

For this function to be carried out satisfactorily, the pilot valve is composed of the following elements.

(1) Inlet port (P) where oil is supplied from hydraulic pump.

(2) Output ports (1, 2, 3 & 4) to apply pressure supplied from inlet port to ends of control valve spools.

(3) Tank port (T) necessary to control the above output pressure.

(4) Spool to connect output port to inlet port or tank port.

(5) Mechanical means to control output pressure, including springs that work on the above spools.

2) FUNCTIONS OF MAJOR SECTIONS

The functions of the spool (11) are to receive the supply oil pressure from the hydraulic pump at its port P, and to change over oil paths to determine whether the pressure oil of port P is led to output ports 1, 2, 3 & 4 or the output port pressure oil to tank port T.

The spring (241-1) works on this spool to determine the output pressure.

The change the deflection of this spring, the push rod (212) is inserted and can slide in the plug (211).

For the purpose of changing the displacement of the push rod through the swash plate (302) and adjusting nut (312) are provided the handle (402) that can be tilted in any direction around the fulcrum of the universal joint (301) center.

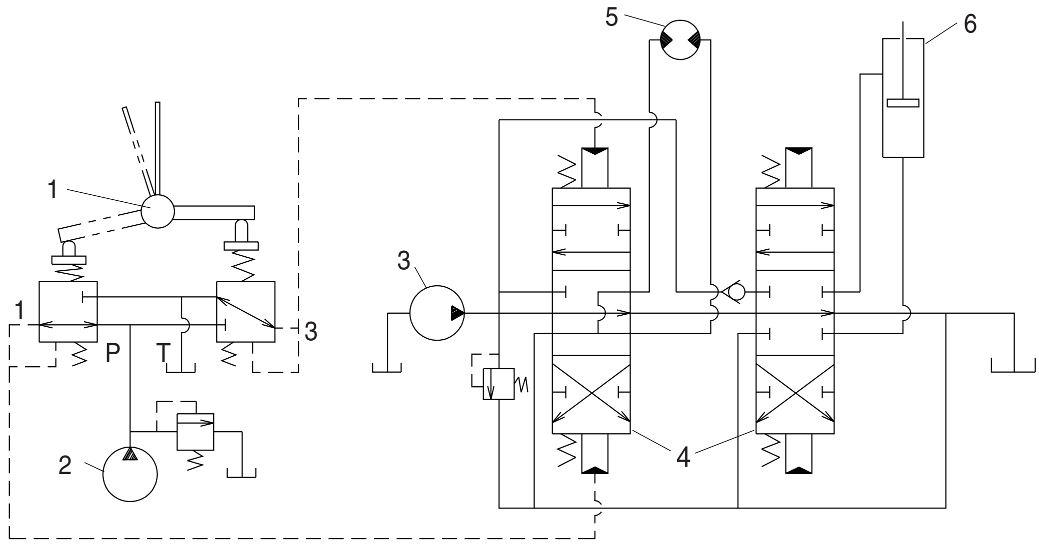
The spring (221) works on the case (101) and spring seat (216-1, 2) and tries to return the push rod (212) to the zero-displacement position irrespective of the output pressure, securing its resetting to the center position.

This also has the effect of a reaction spring to give appropriate control feeling to the operator.

3) OPERATION

The operation of the remote control valve will be described on the basis of the hydraulic circuit diagram shown below and the attached operation explanation drawing.

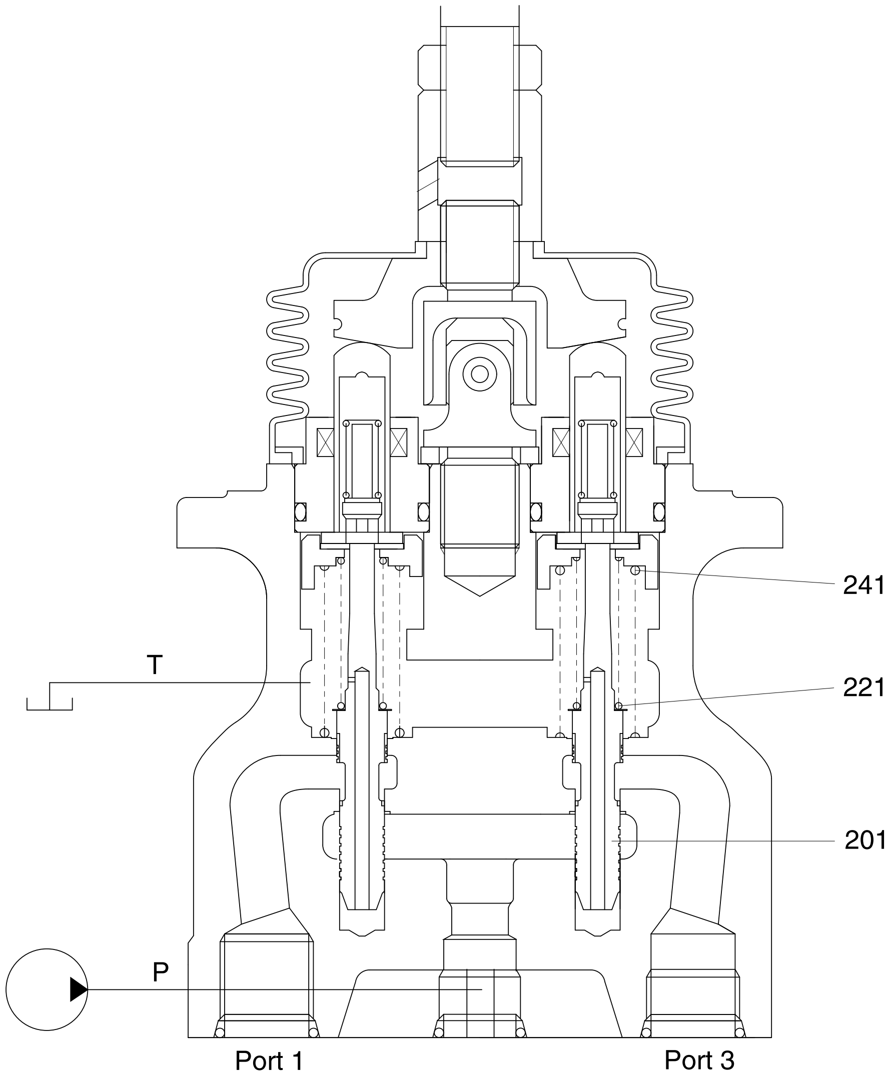
The diagram shown below is the typical application example of the pilot valve.



2-70 (140-7TIER)

1	Remote control valve	3	Main pump	5	Hydraulic motor
2	Pilot pump	4	Main control valve	6	Hydraulic cylinder

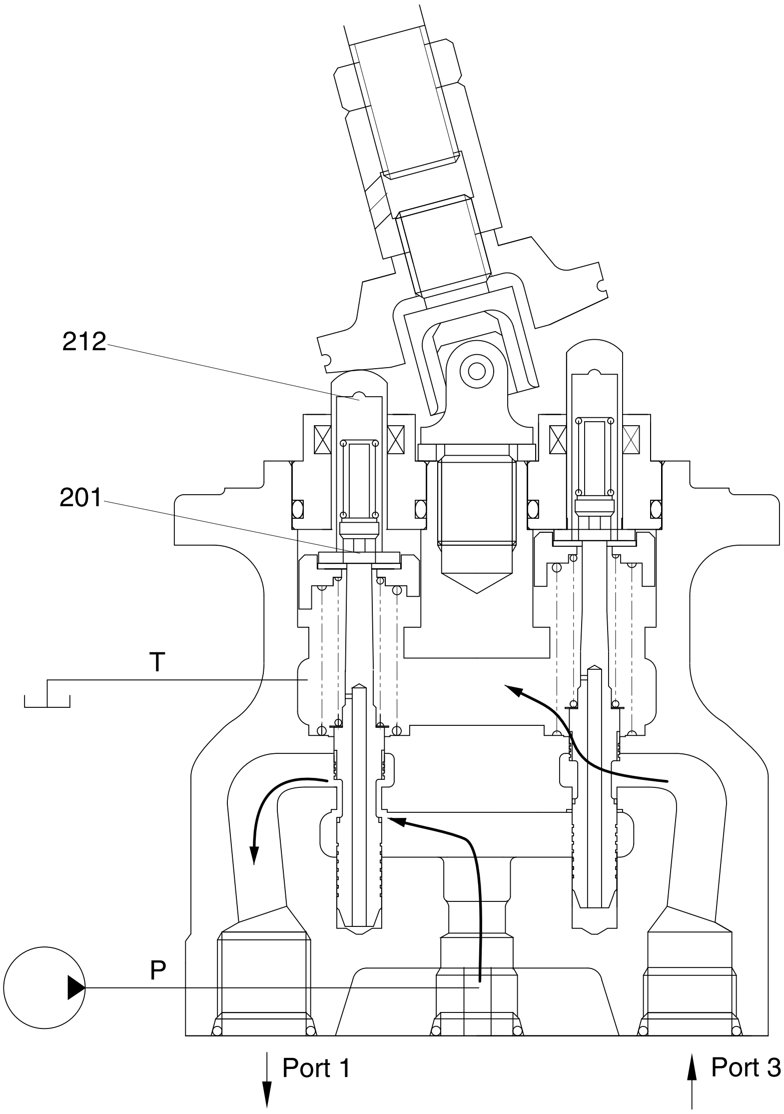
(1) Case where handle is in neutral position



55ACR2RL05

The force of the spring (241) that determines the output pressure of the pilot valve is not applied to the spool (201). Therefore, the spool is pushed up by the spring (221) to the position of port (1, 3) in the operation explanation drawing. Then, since the output port is connected to tank port T only, the output port pressure becomes equal to tank pressure.

(2) Case where handle is tilted

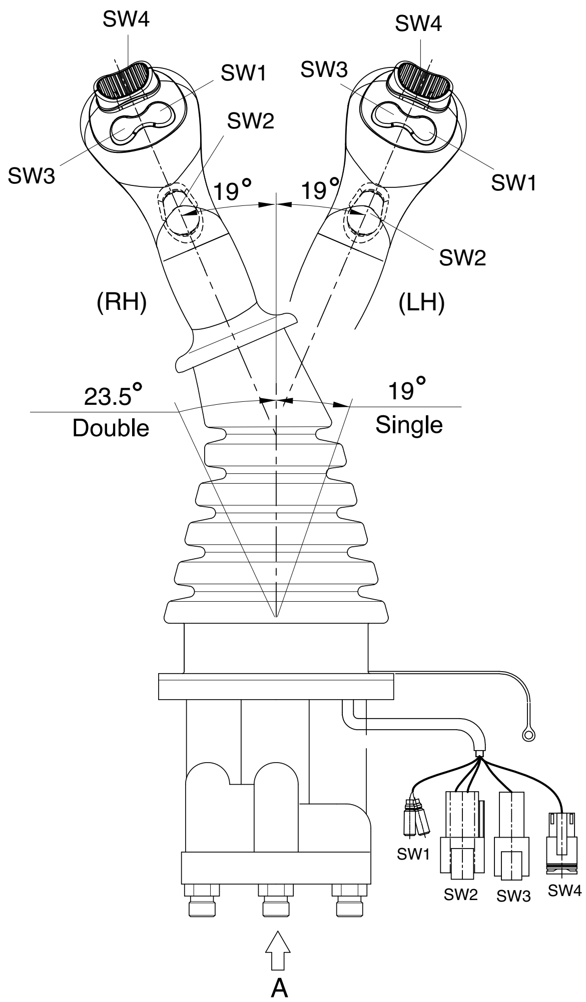


When the push rod (212) is stroked, the spool (201) moves downwards.
Then port P is connected with port (1) and the oil supplied from the pilot pump flows through port (1) to generate the pressure.
When the pressure at port (1) increases to the value corresponding to the spring force set by tilting the handle, the hydraulic pressure force balances with the spring force. If the pressure at port (1) increases higher than the set pressure, port P is disconnected from port (1) and port T is connected with port (1). If it decreases lower than the set pressure, port P is connected with port (1) and port T is disconnected from port 1.
In this manner the secondary pressure is kept at the constant value.

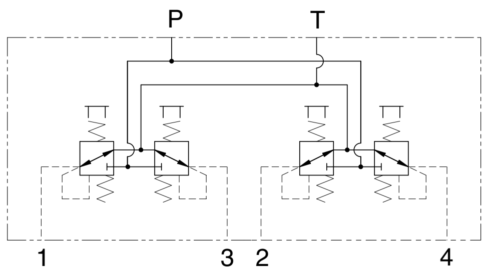
■ TYPE 3 (DANFOSS)

1. STRUCTURE

The casing has the oil inlet port P (primary pressure) and the oil outlet port T (tank). In addition the secondary pressure is taken out through ports 1, 2, 3 and 4 provided at the bottom face.

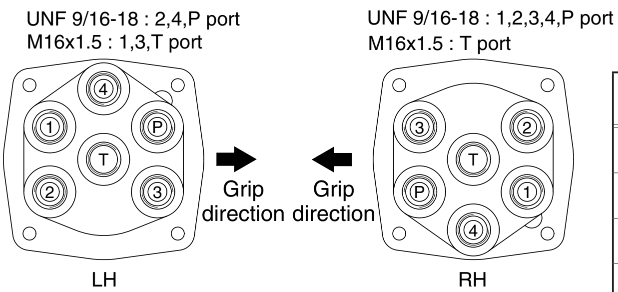


Switch	LH/RH	Remark
SW1	Gray	
SW2	Black	
SW3	Blue	
SW4-A	Red	
SW4-B	Purple	
SW4-C	White	



Hydraulic circuit

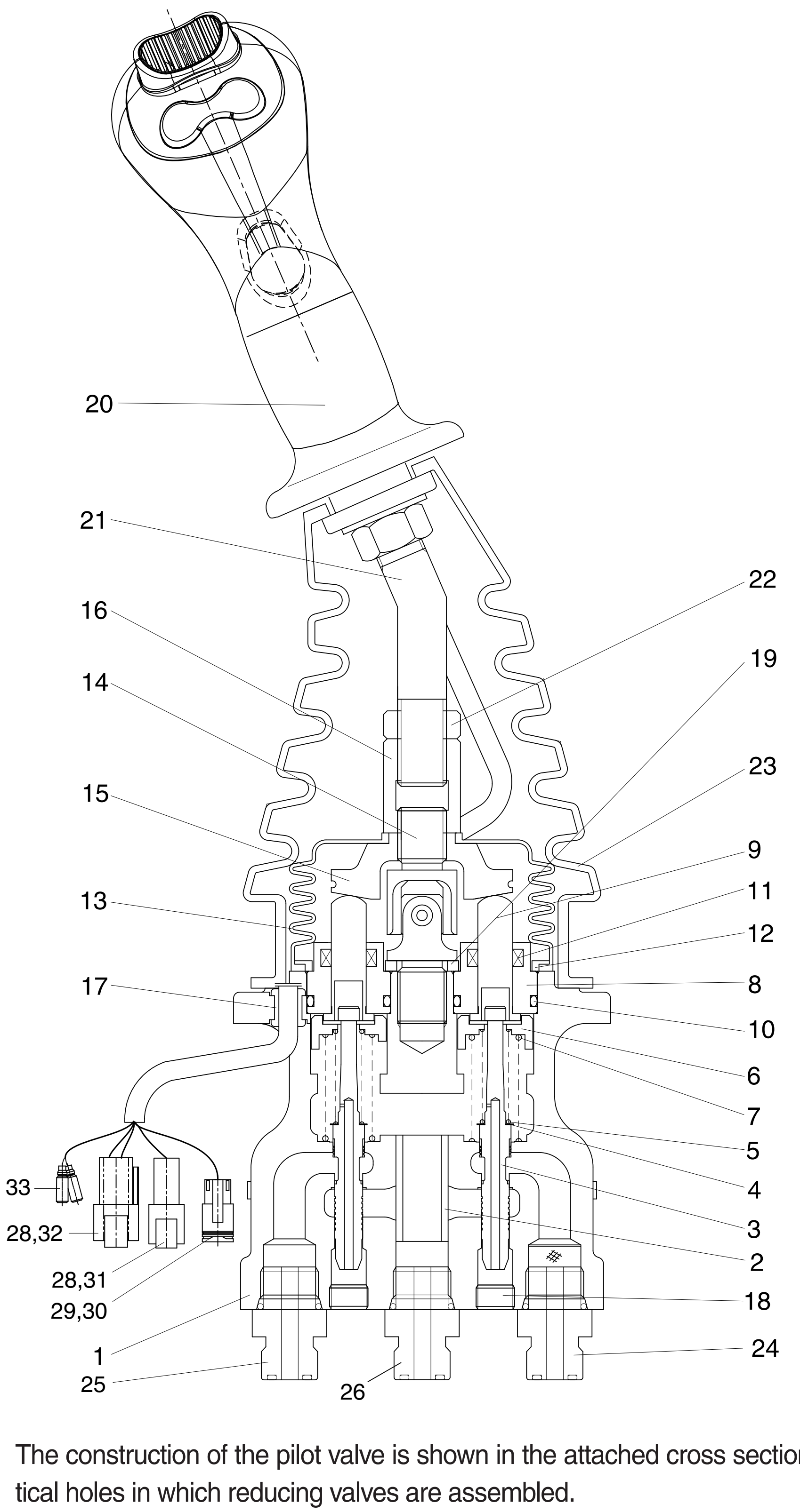
55ACR2RL07



VIEW A

Port	LH	RH	Remark
P	Pilot oil inlet port	Pilot oil inlet port	
T	Pilot oil return port	Pilot oil return port	
1	Left swing port	Bucket out port	
2	Arm in port	Boom down port	
3	Right swing port	Bucket in port	
4	Arm out port	Boom up port	

CROSS SECTION



1	Case
2	Bushing
3	Spool
4	Shim
5	Spring
6	Spring seat
7	Spring
8	Plug
9	Push rod
10	O-ring
11	Rod seal
12	Plate
13	Inner boot
14	Joint assembly
15	Swash plate
16	Adjusting nut
17	Bushing
18	Plug
19	Spacer
20	Handle assembly
21	Handle bar
22	Nut
23	Boots
24	Last guard filter (P)
25	Connector (LH, 2, 4)
25	Connector (RH, 1, 2, 3, 4)
26	Connector (LH, 1, 3, T)
26	Connector (RH, T)
28	Connector pin-male
29	Connector pin-female
30	Connector assy
31	Connector assy
32	Connector assy
33	Connector

55ACR2RL08

The construction of the pilot valve is shown in the attached cross section drawing. The casing has vertical holes in which reducing valves are assembled.
The pressure reducing section is composed of the spool (3), spring (5) for setting secondary pressure, return spring (7), spring seat (6) and shim (4). The spring for setting the secondary pressure has been generally so preset that the secondary pressure is 7.6 to 28.5 kgf/cm^2. The spool is pushed against the push rod (9) by the return spring.
When the push rod is pushed down by tilting the handle, the spring seat comes down simultaneously and changes setting of the secondary pressure spring.

2. FUNCTIONS

1) FUNDAMENTAL FUNCTIONS

The pilot valve is a valve that controls the spool stroke, direction, etc of a main control valve. This function is carried out by providing the spring at one end of the main control valve spool and applying the output pressure (secondary pressure) of the pilot valve to the other end.

For this function to be carried out satisfactorily, the pilot valve is composed of the following elements.

(1) Inlet port (P) where oil is supplied from hydraulic pump.

(2) Output ports (1, 2, 3 & 4) to apply pressure supplied from inlet port to ends of control valve spools.

(3) Tank port (T) necessary to control the above output pressure.

(4) Spool to connect output port to inlet port or tank port.

(5) Mechanical means to control output pressure, including springs that work on the above spools.

2) FUNCTIONS OF MAJOR SECTIONS

Item numbers are based on the type L1.

The functions of the spool (3) are to receive the supply oil pressure from the hydraulic pump at its port P, and to change over oil paths to determine whether the pressure oil of port P is led to output ports 1, 2, 3 & 4 or the output port pressure oil to tank port T.

The spring (5) works on this spool to determine the output pressure.

The change the deflection of this spring, the push rod (9) is inserted and can slide in the plug (8).

For the purpose of changing the displacement of the push rod through the swash plate (15) and adjusting nut (16) are provided the handle assy (20) that can be tilted in any direction around the fulcrum of the universal joint (14) center.

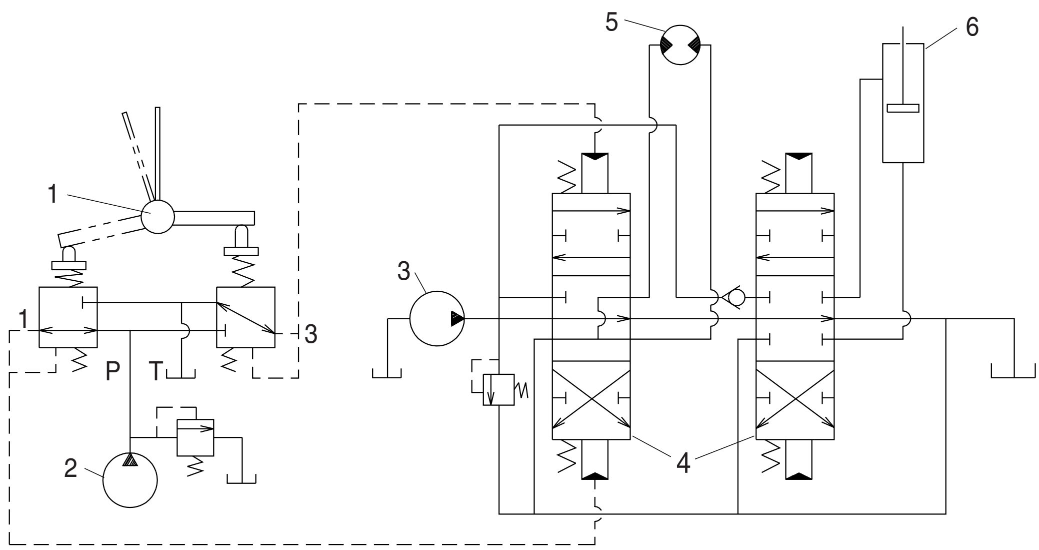
The spring (7) works on the case (1) and spring seat (6) and tries to return the push rod (9) to the zero-displacement position irrespective of the output pressure, securing its resetting to the center position.

This also has the effect of a reaction spring to give appropriate control feeling to the operator.

3) OPERATION

The operation of the pilot valve will be described on the basis of the hydraulic circuit diagram shown below and the attached operation explanation drawing.

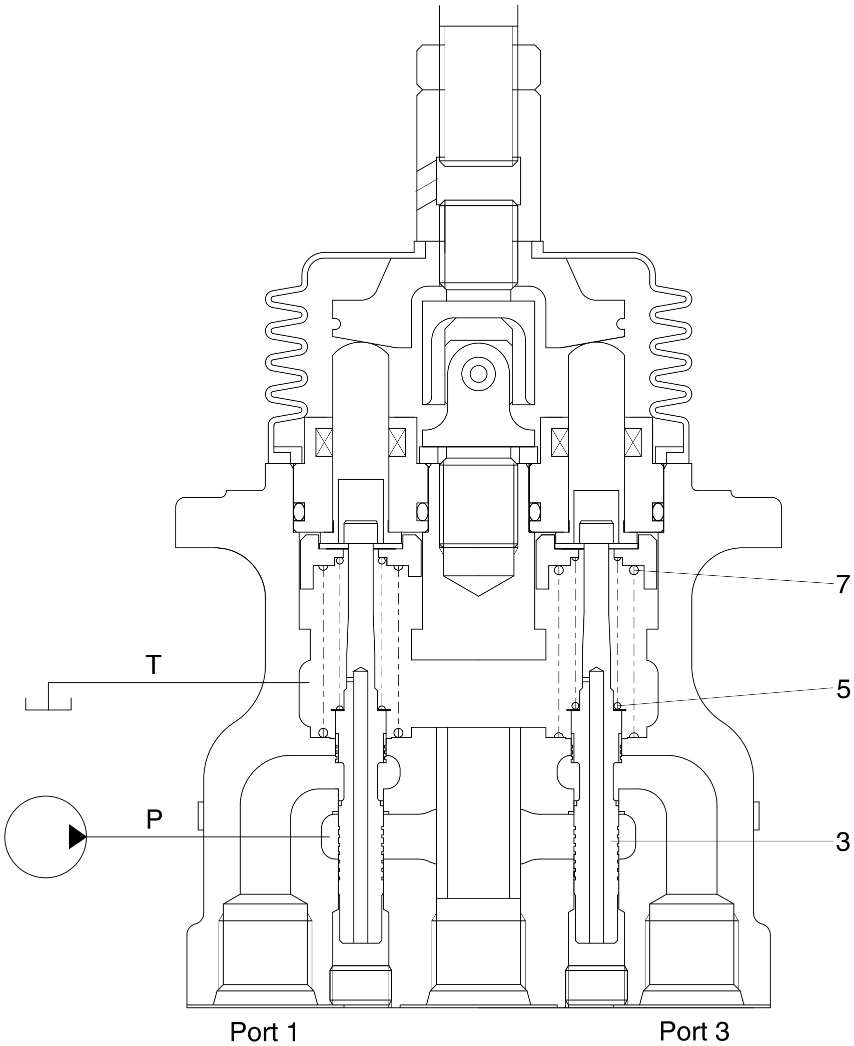
The diagram shown below is the typical application example of the pilot valve.



2-70

1	Pilot valve	3	Main pump	5	Hydraulic motor
2	Pilot pump	4	Main control valve	6	Hydraulic cylinder

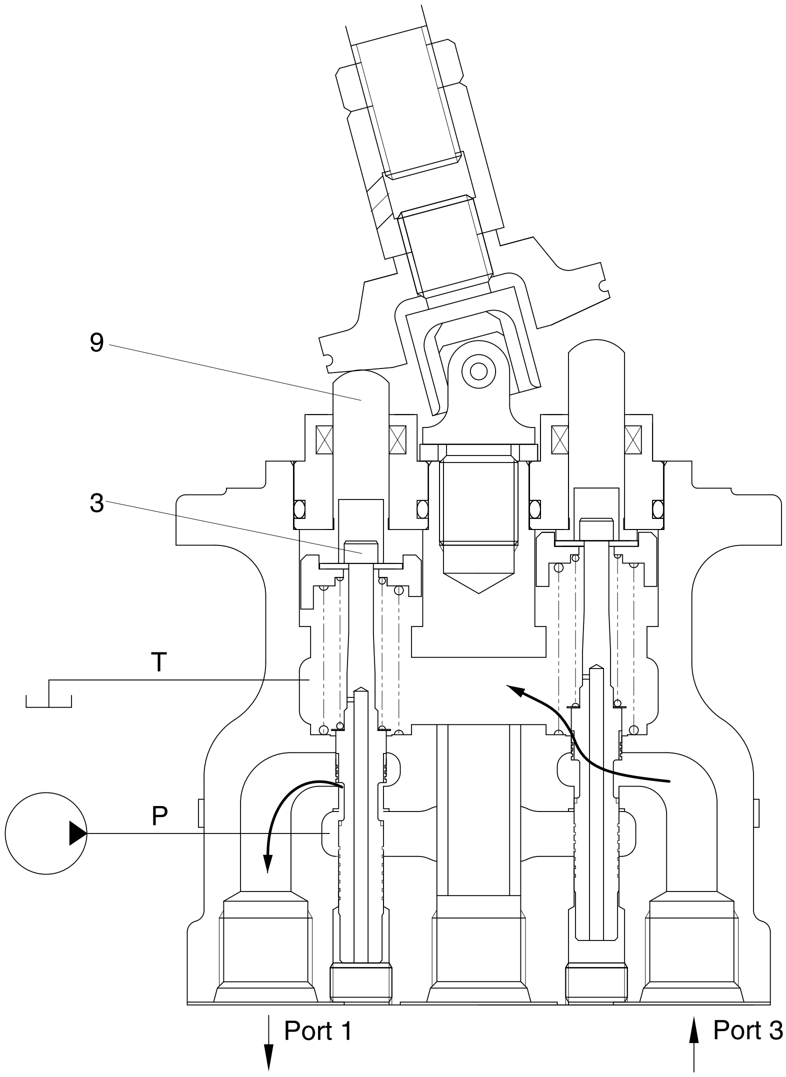
(1) Case where handle is in neutral position



300L2RL03

The force of the spring (5) that determines the output pressure of the pilot valve is not applied to the spool (3). Therefore, the spool is pushed up by the spring (7) to the position of port (1, 3) in the operation explanation drawing. Then, since the output port is connected to tank port T only, the output port pressure becomes equal to tank pressure.

(2) Case where handle is tilted



300L2RL04

When the push rod (9) is stroked, the spool (3) moves downwards.

Then port P is connected with port (1) and the oil supplied from the pilot pump flows through port (1) to generate the pressure.

When the pressure at port (1) increases to the value corresponding to the spring force set by tilting the handle, the hydraulic pressure force balances with the spring force. If the pressure at port (1) increases higher than the set pressure, port P is disconnected from port (1) and port T is connected with port (1). If it decreases lower than the set pressure, port P is connected with port (1) and port T is disconnected from port 1.

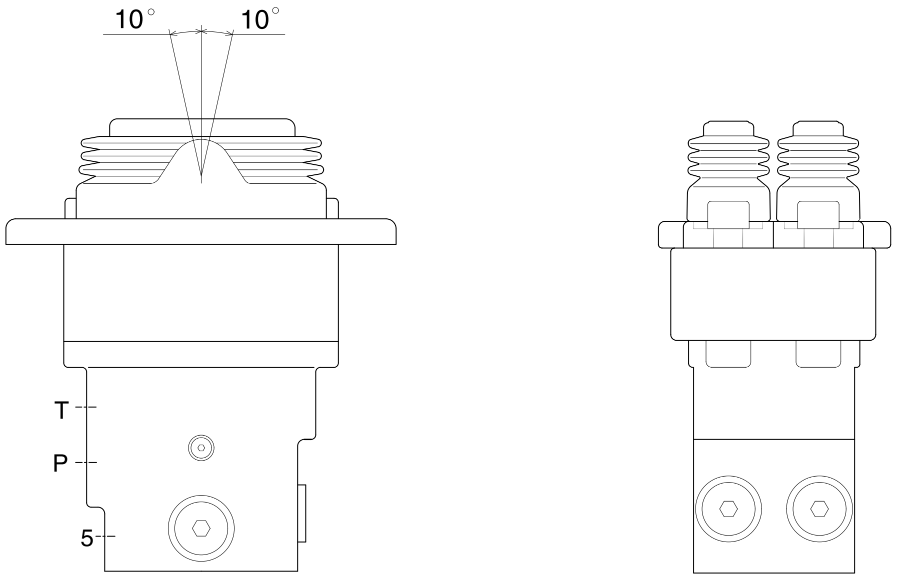
In this manner the secondary pressure is kept at the constant value.

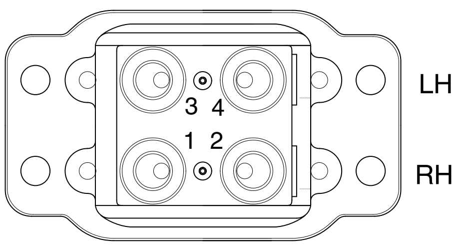
Besides, in some type, when the handle is tilted more than a certain angle, the upper end of the spool contacts with the inside bottom of the push rod and the output pressure is left to be connected with port P.

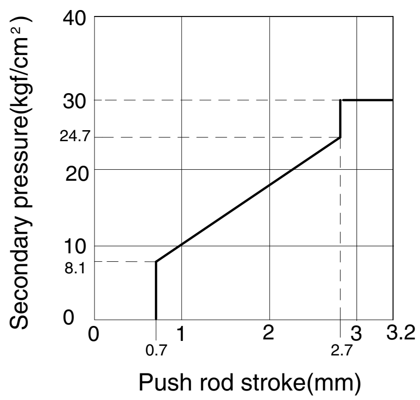
GROUP 6 RCV PEDAL

1. STRUCTURE

The casing has the oil inlet port P (primary pressure), and the oil outlet port T (tank). In addition the secondary pressure is taken out through ports 1, 2, 3 and 4 provided at the bottom face.







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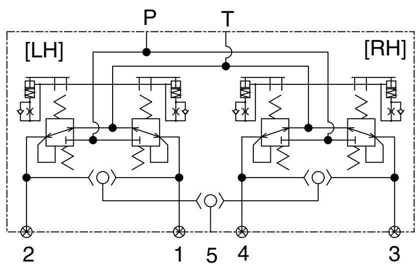


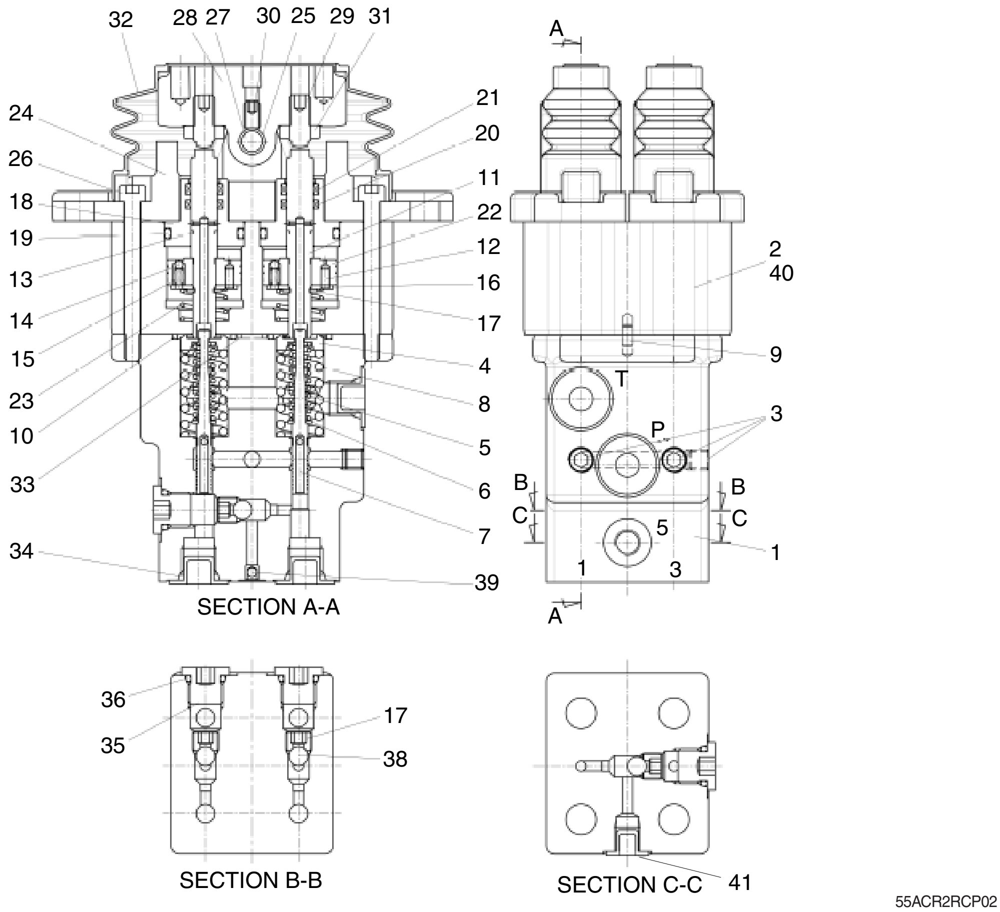
Port	Port name	Port size
P	Pilot oil inlet port	PF 1/4
T	Pilot oil return port	
1	Travel (LH, backward)	
2	Travel (LH, forward)	
3	Travel (RH, backward)	
4	Travel (RH, forward)	
5	Travel alarm	PT 1/8

CROSS SECTION

The construction of the RCV pedal is shown in the below drawing. The casing has vertical holes in which reducing valves are assembled.

The pressure reducing section is composed of the spool (7), spring (5) for setting secondary pressure, return spring (8), spring seat (4) and washer (6). The spring for setting the secondary pressure has been generally so preset that the secondary pressure is 8.1 to 24.5 kgf/cm^2 (depending on the type). The spool is pushed against the push rod (11) by the return spring.

When the push rod is pushed down by tilting pedal, the spring seat comes down simultaneously and changes setting of the secondary pressure spring.



1	Body 1	15	Spring	29	Set screw
2	Body 2	16	Plate	30	Set screw
3	Plug	17	Snap ring	31	Hex nut
4	Spring seat	18	Plug	32	Bellows
5	Spring	19	O-ring	33	O-ring
6	Washer	20	Rod seal	34	Cap
7	Spool	21	Dust seal	35	Plug
8	Spring	22	Piston	36	O-ring
9	Spring pin	23	Spring	37	Check seat
10	O-ring	24	Cover	38	Steel ball
11	Push rod	25	Bushing	39	Expander
12	Spring pin	26	Wrench bolt	40	Name plate
13	Seal	27	Cam assy	41	Cap
14	Steel ball	28	Cam shaft		

2. FUNCTION

1) FUNDAMENTAL FUNCTIONS

The pilot valve is a valve controls the spool stroke, direction, etc of a main control valve. This function is carried out by providing the spring at one end of the main control valve spool and applying the output pressure (secondary pressure) of the pilot valve to the other end.

For this function to be carried out satisfactorily, the pilot valve is composed of the following elements.

(1) Inlet port (P) where oil is supplied from hydraulic pump.

(2) Output port (1, 2, 3 & 4) to apply pressure supplied from inlet port to ends of control valve spools.

(3) Tank port (T) necessary to control the above output pressure.

(4) Spool to connect output port to inlet port tank port.

(5) Mechanical means to control output pressure, including springs that work on the above spools.

2) FUNCTIONS OF MAJOR SECTIONS

The functions of the spool (7) are to receive the supply oil pressure from the hydraulic pump at its port P, and to change over oil paths to determine whether the pressure oil of port P is led to output ports 1, 2, 3 & 4 or the output spool to determine the output pressure.

The spring (5) works on this spool to determine the output pressure.

The change the deflection of this spring, the push rod (11) is inserted and can slide in the plug (18).

For the purpose of changing th displacement of the push rod through the cam (27) and steel ball (28) are provided the pedal that can be tilted in any direction around the fulcrum of the cam (27) center.

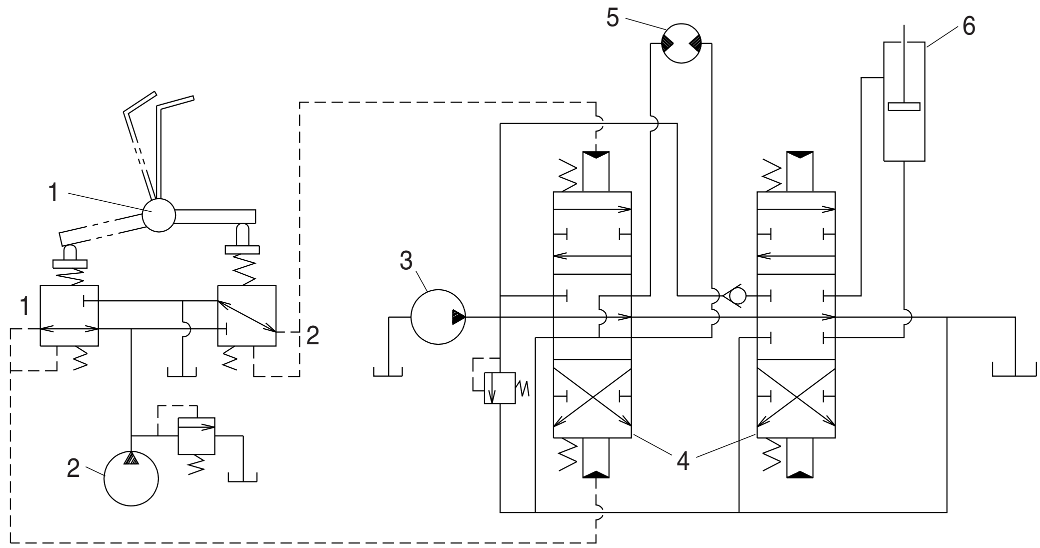
The spring (8) works on the casing (1) and washer (6) and tries to return the push rod (11) to the zero-displacement position irrespective of the output pressure, securing its resetting to the center position.

This also has the effect of a reaction spring to give appropriate control feeling to the operator.

3) OPERATION

The operation of the pilot valve will be described on the basis of the hydraulic circuit diagram shown below ant the attached operation explanation drawing.

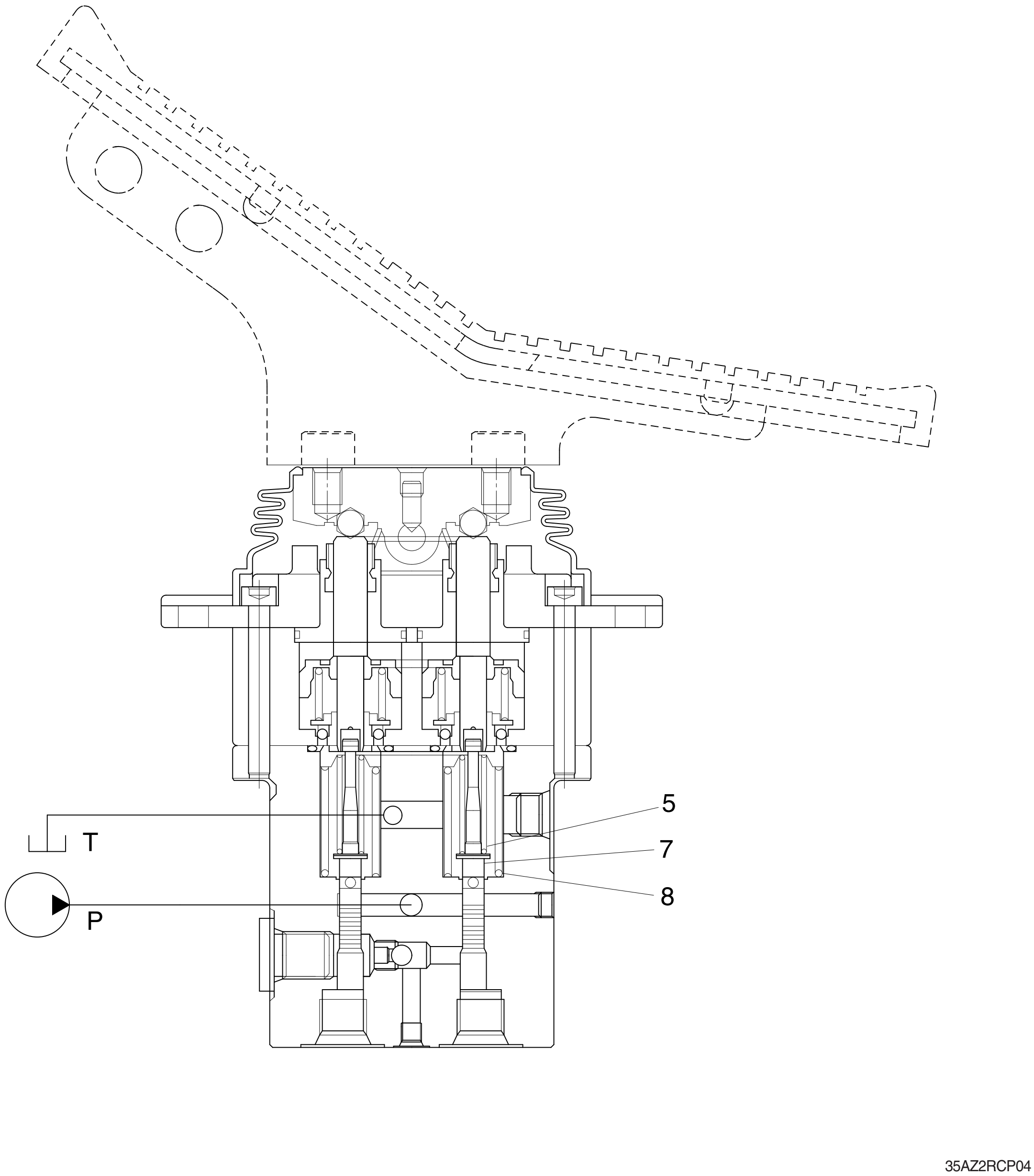
The diagram shown below is the typical application example of the pilot valve.



140LC-7 기타2-76

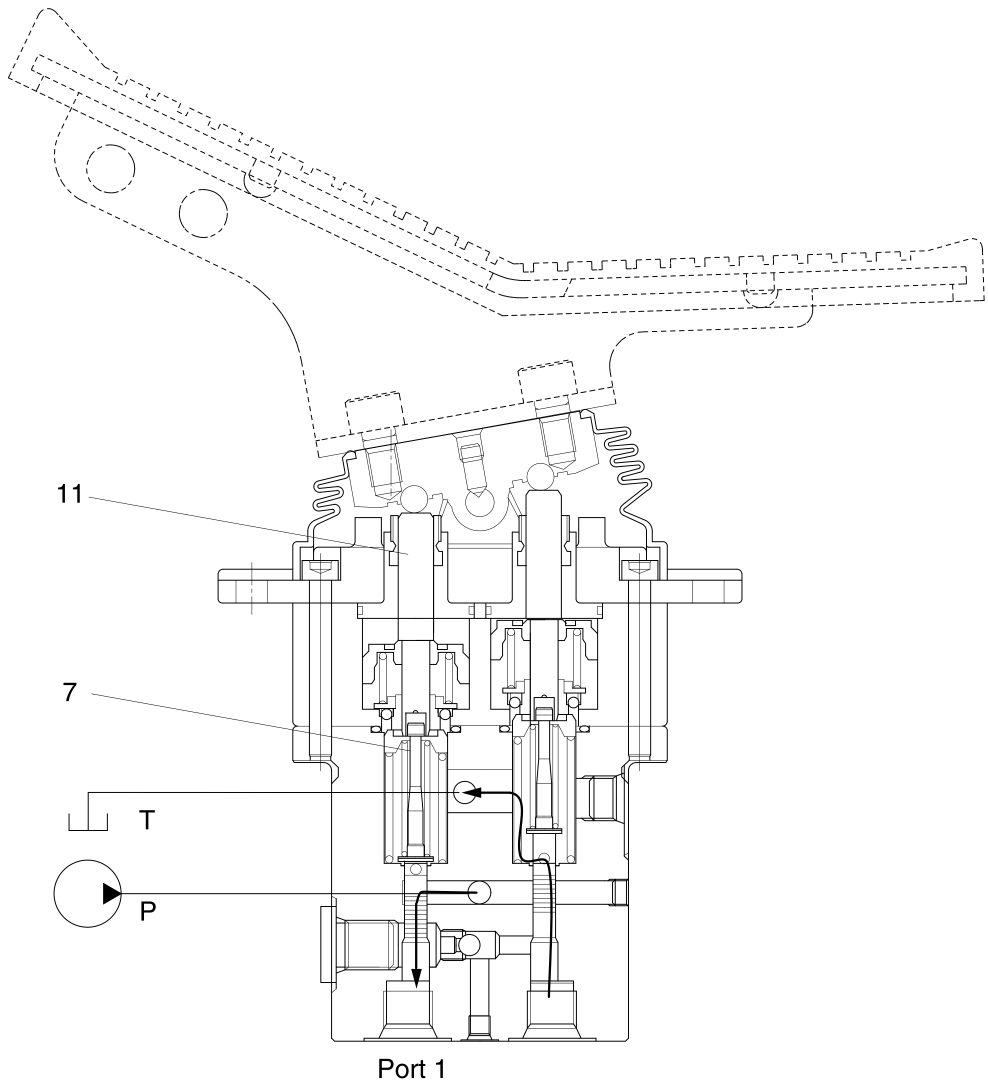
1	Pilot valve	3	Main pump	5	Hydraulic motor
2	Pilot pump	4	Main control valve	6	Hydraulic cylinder

(1) Case where pedal is in neutral position



The force of the spring (5) that determines the output pressure of the pilot valve is not applied to the spool (7). Therefore, the spool is pushed up by the spring (8) to the position of port 2 in the operation explanation drawing. Then, since the output port is connected to tank port T only, the output port pressure becomes equal to tank pressure.

(2) Case where pedal is tilted



35AZ2RCP05

When the push rod (11) is stroked, the spool (7) moves downwards.

Then port P is connected with port 1, and the oil supplied from the pilot pump flows through port 1 to generate the pressure.

When the pressure at port 1 increases to the value corresponding to the spring force set by tilting the handle, the hydraulic pressure force balances with the spring force. If the pressure at port 1 increases higher than the set pressure, port P is disconnected from port 1 and port T is connected with port 1. If it decreases lower than the set pressure, port P is connected with port 1 and port T is disconnected from port 1.

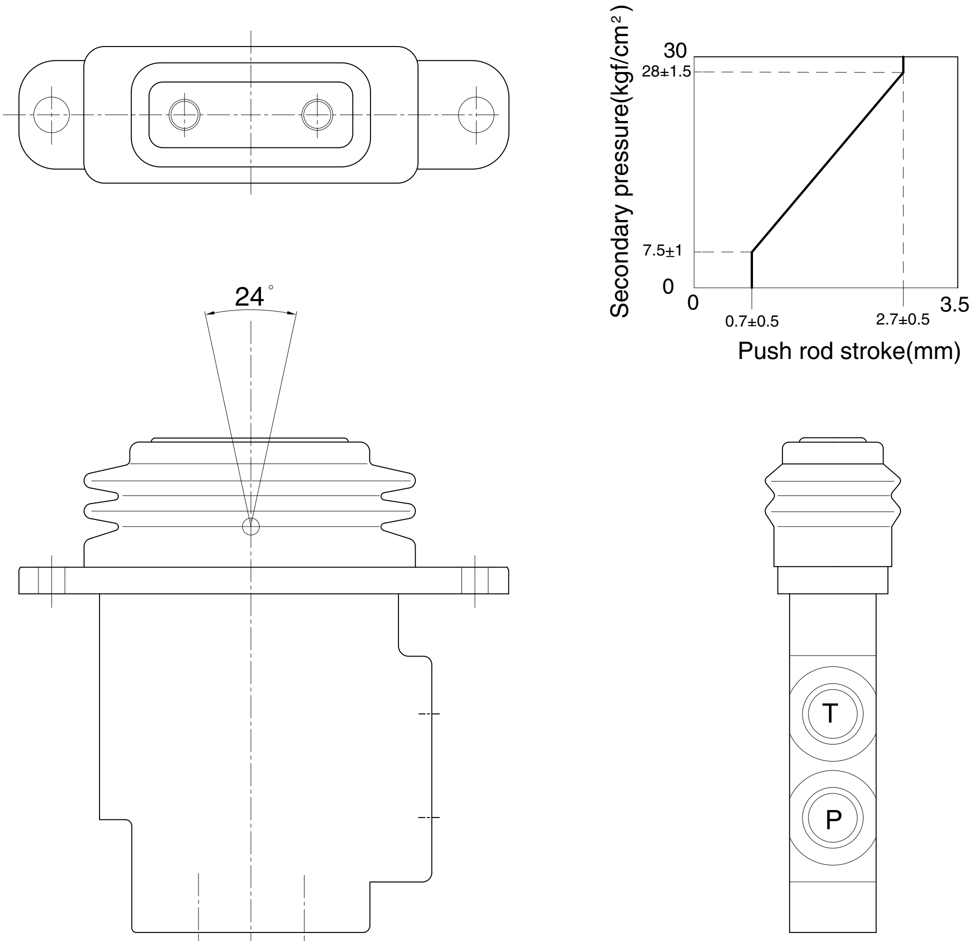
In this manner the secondary pressure is kept at the constant value.

3. BOOM SWING PEDAL

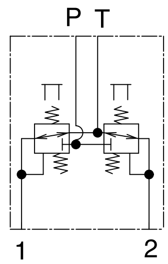
1) STRUCTURE

The casing has the oil inlet P (primary pressure) and the oil return port (tank).

In addition the secondary pressure is taken out through port 1 and port 2 provided at the housing bottom face.



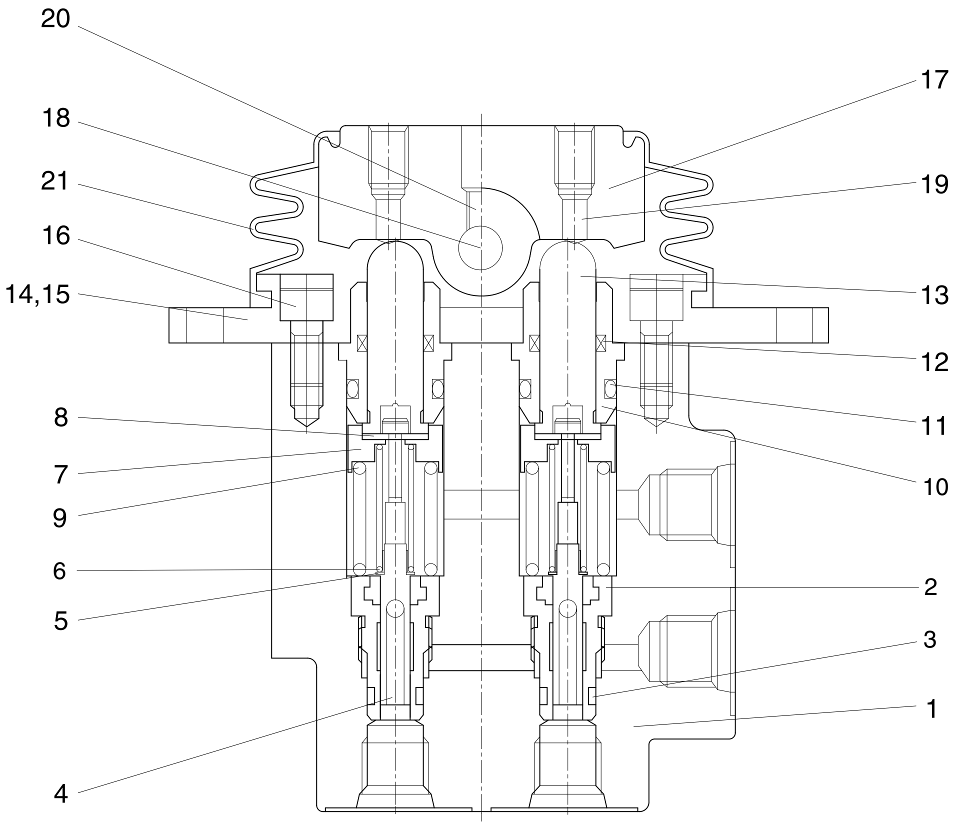
55ACR2BS01



Hydraulic circuit

Port	Port name	Port size
P	Pilot oil inlet port	PF 1/4
T	Pilot oil return port	
1	Boom swing (LH)	
2	Boom swing (RH)	

2) COMPONENT



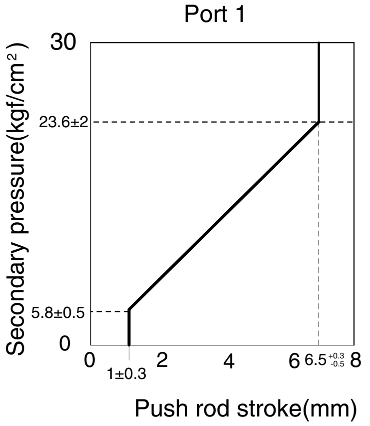
31MT-20050A

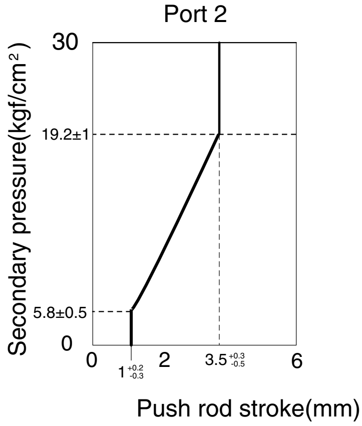
1	Body	8	Stopper	15	DU bush
2	Plug	9	Spring	16	Wrench bolt
3	O-ring	10	Plug	17	Cam
4	Spool	11	O-ring	18	Pin
5	Spring seat	12	Rod seal	19	Adjust screw
6	Spring	13	Push rod	20	Socket bolt
7	Spring seat	14	Cover	21	Bellows

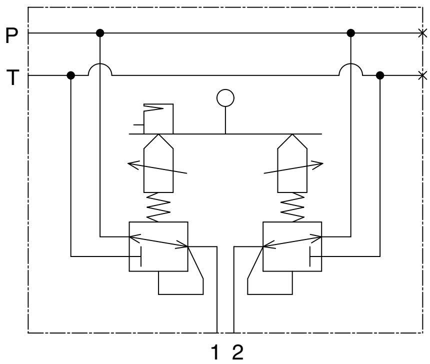
4. DOZER LEVER

1) STRUCTURE

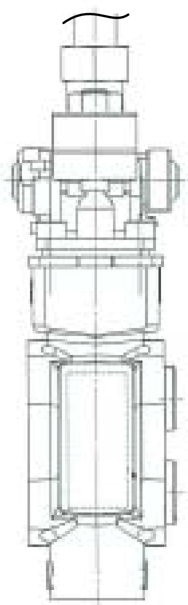
The casing has the oil inlet P (primary pressure) and the oil return port (tank).
In addition the secondary pressure is taken out through port 1 and port 2 provided at the housing bottom face.

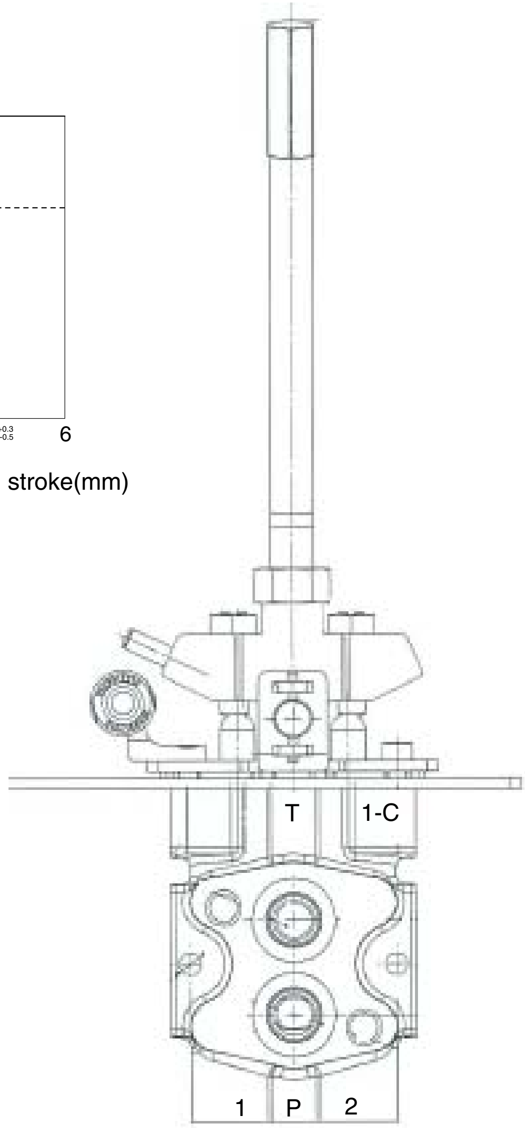


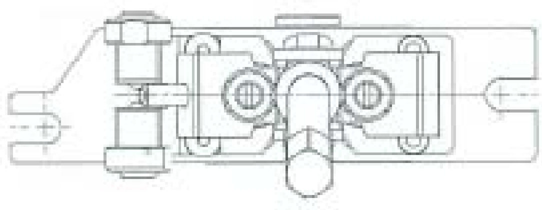




Hydraulic circuit



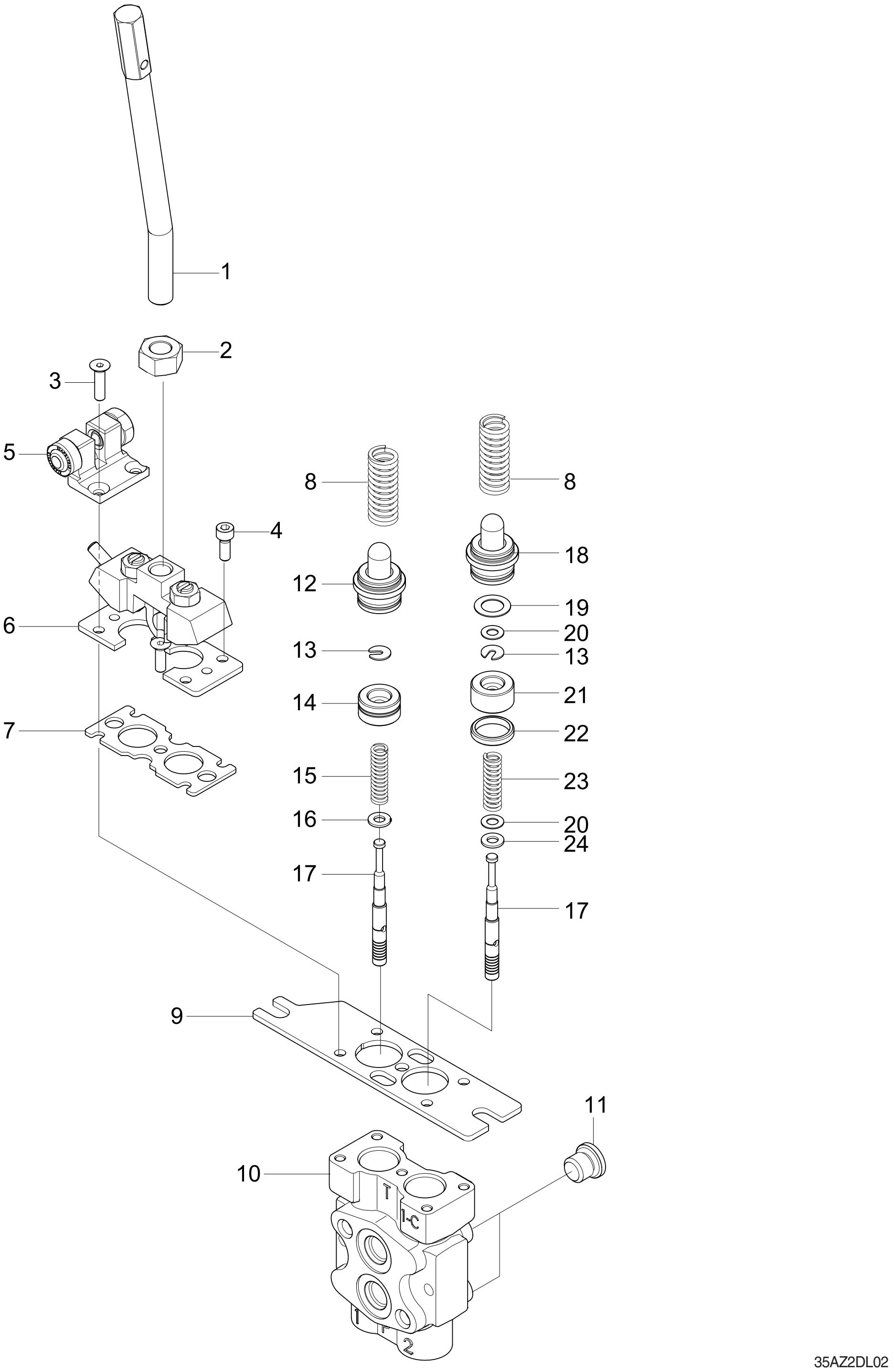




Port	Port	Port size
P	Pilot oil inlet port	PF 1/4
T	Pilot oil return port	PF 1/4
1	Dozer blade up port	PF 1/4
2	Dozer blade down port	PF 1/4

55ACR2DL01

2) COMPONENT

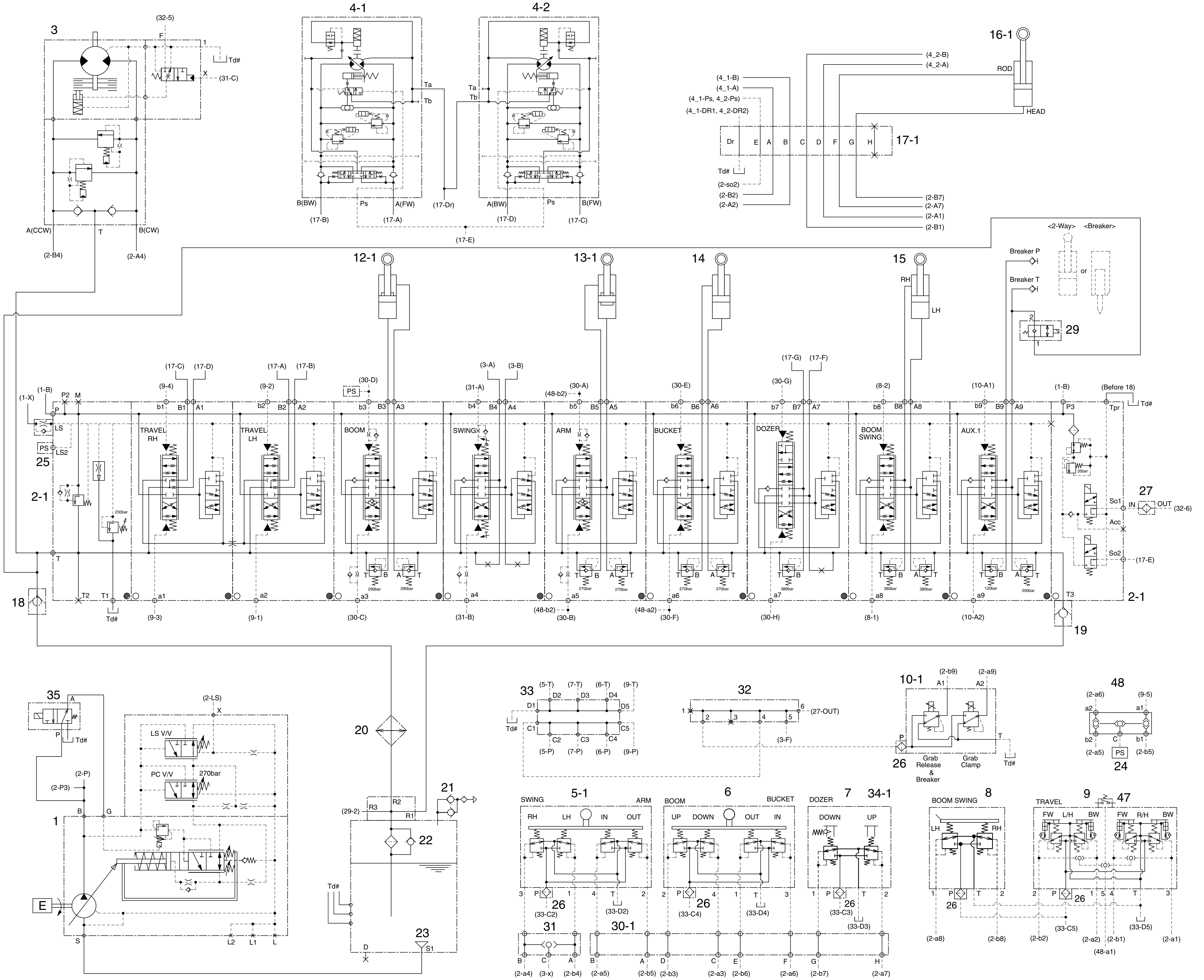


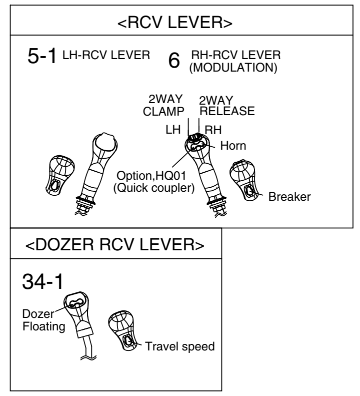
1	RCV lever	9	Lower plate	17	Rod
2	Lever nut	10	Lower body	18	Plunger
3	Screw	11	Plug	19	Spacer
4	Screw	12	Plunger	20	Spacer
5	Bracket	13	Retainer	21	Bushing
6	Upper body	14	Bushing	22	Spacer
7	Upper plate	15	Spring	23	Spring
8	Spring	16	Seal washer	24	Gasket

SECTION 3 HYDRAULIC SYSTEM

Group 1 Hydraulic Circuit ········· 3-1
Group 2 Main Circuit ········· 3-4
Group 3 Pilot Circuit ········· 3-7
Group 4 Single Operation ········· 3-13
Group 5 Combined Operation ········· 3-25

1. HYDRAULIC CIRCUIT (1/3)



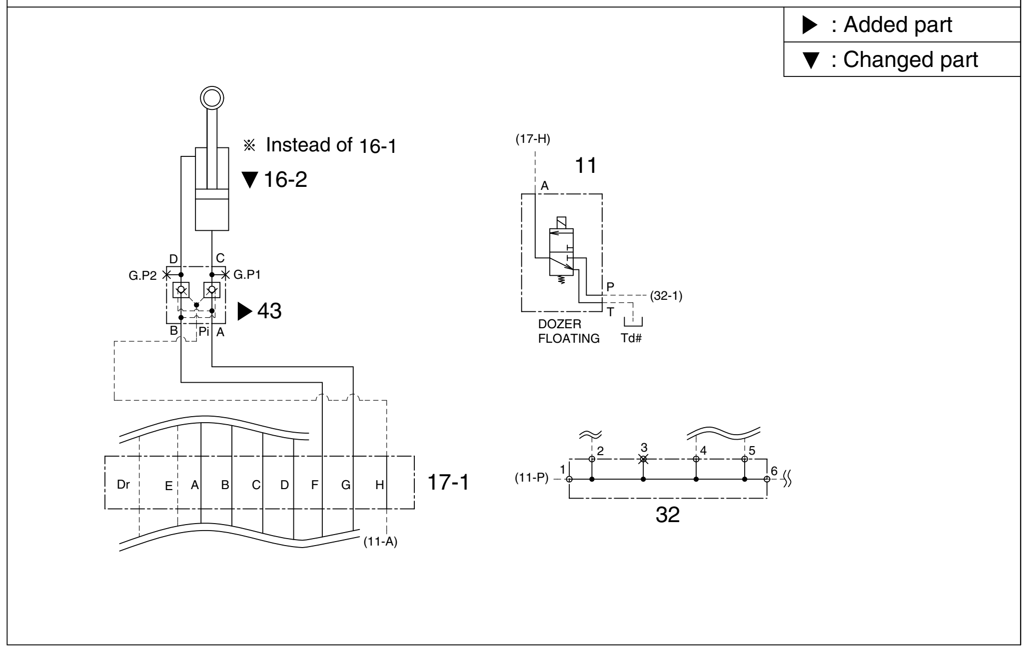


1 Main pump
2-1 Main control valve
3 Swing motor
4 Travel motor
5-1 RCV lever (LH)
6 RCV lever (RH)
7 RCV lever-dozer
8 OPT pedal
9 Travel pedal
10-1 EPPR valve
12-1 Boom cylinder
13-1 Arm cylinder
14 Bucket cylinder
15 Boom swing cylinder
16-1 Dozer cylinder
17-1 Turning joint
18 Return check valve
19 Return check valve
20 Radiator total
21 Air breather
22 Return filter
23 Suction strainer
24 Pressure sensor
25 Pressure sensor
26 Last guard filter
27 Pilot filter
29 Pilot selector sol valve
30-1 Terminal
31 Shuttle valve
32 Block
33 Block (B)
34-1 Dozer handle
35 Solenoid valve
47 Pressure switch
48 Shuttle valve

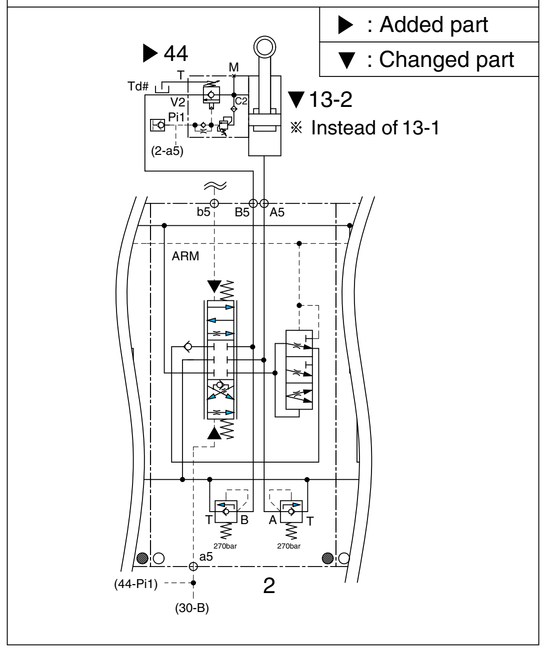
30MP-00010-03 1OF3

2. HYDRAULIC CIRCUIT (2/3)

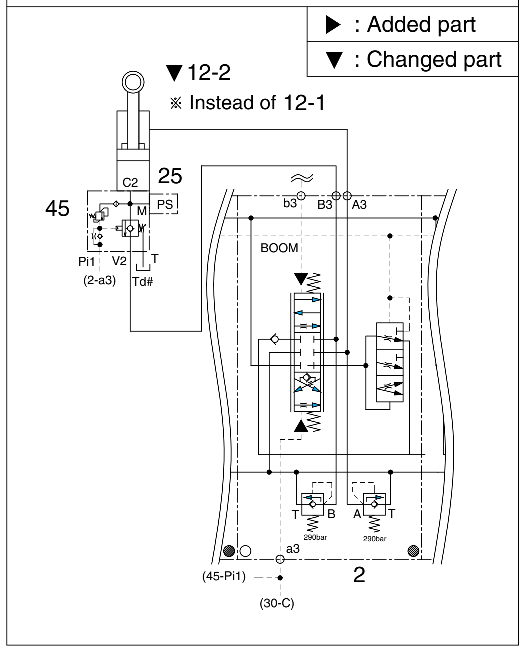
Dozer D.P.C. V/V(DV01)



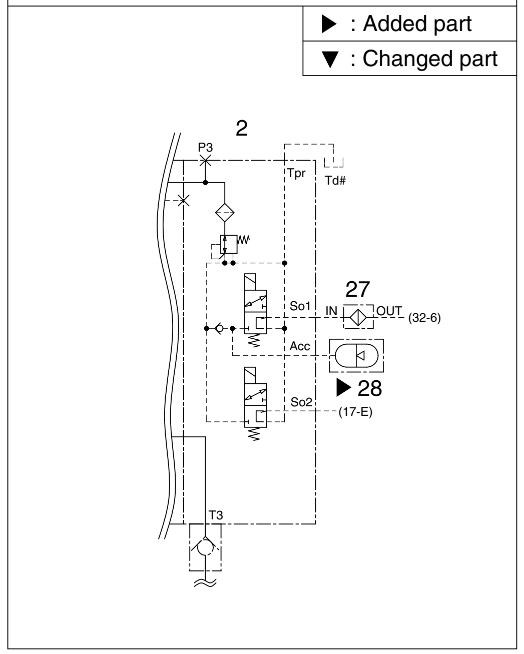
Arm Safety Lock Valve(AS01)



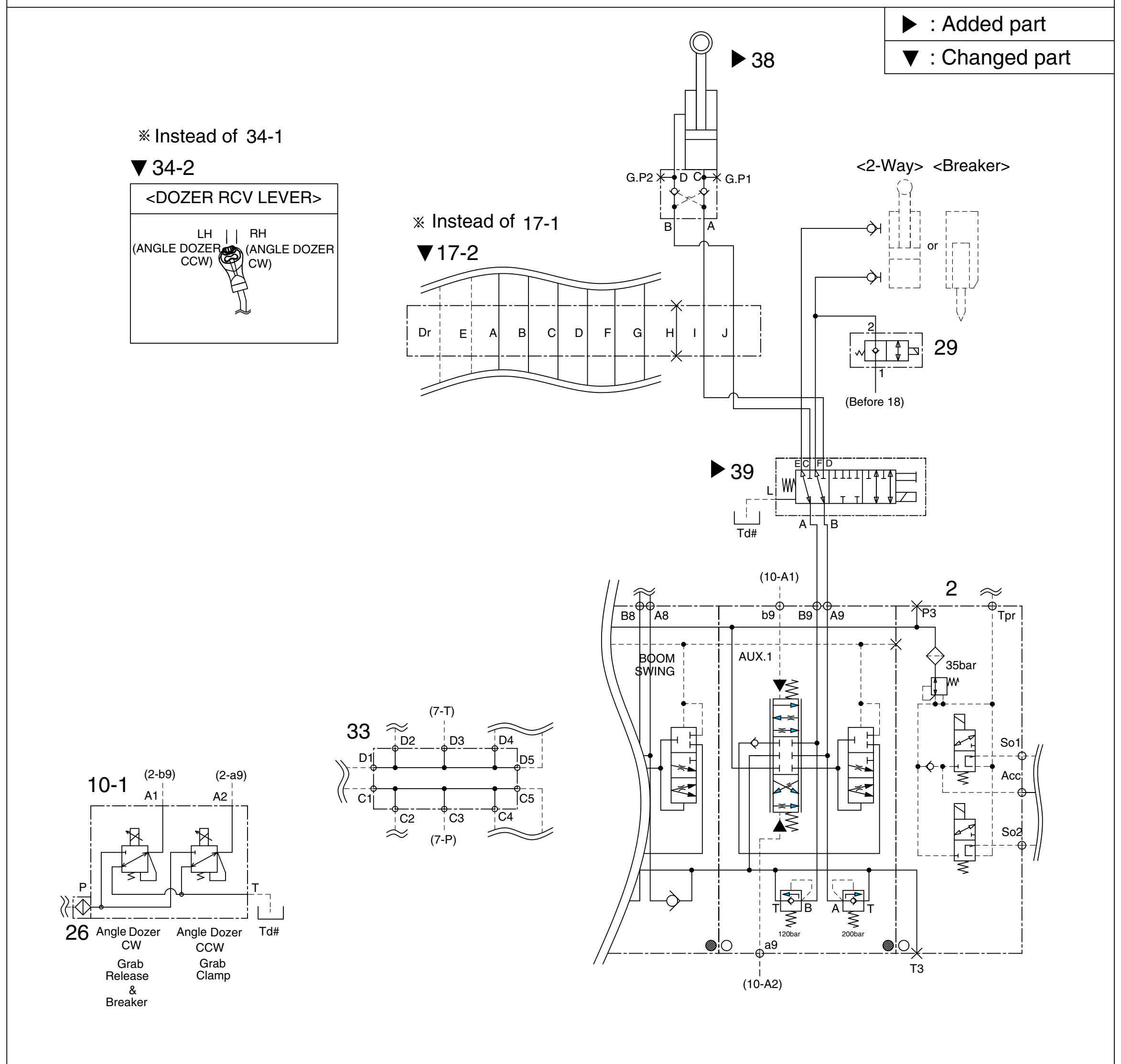
Boom Safety Lock Valve(BS01)



Accumulator (HA01)



Angle Dozer(BR12)



2-2 Main control valve
11 Solenoid valve
12-2 Boom cylinder
13-2 Arm cylinder
16-2 Dozer cylinder
17-2 Turning joint
25 Pressure sensor
26 Last guard filter
28 Accumulator
34-2 Dozer handle
38 Angle dozer cylinder
39 Solenoid valve
43 Double pilot check
44 Safety lock valve
45 Safety lock valve

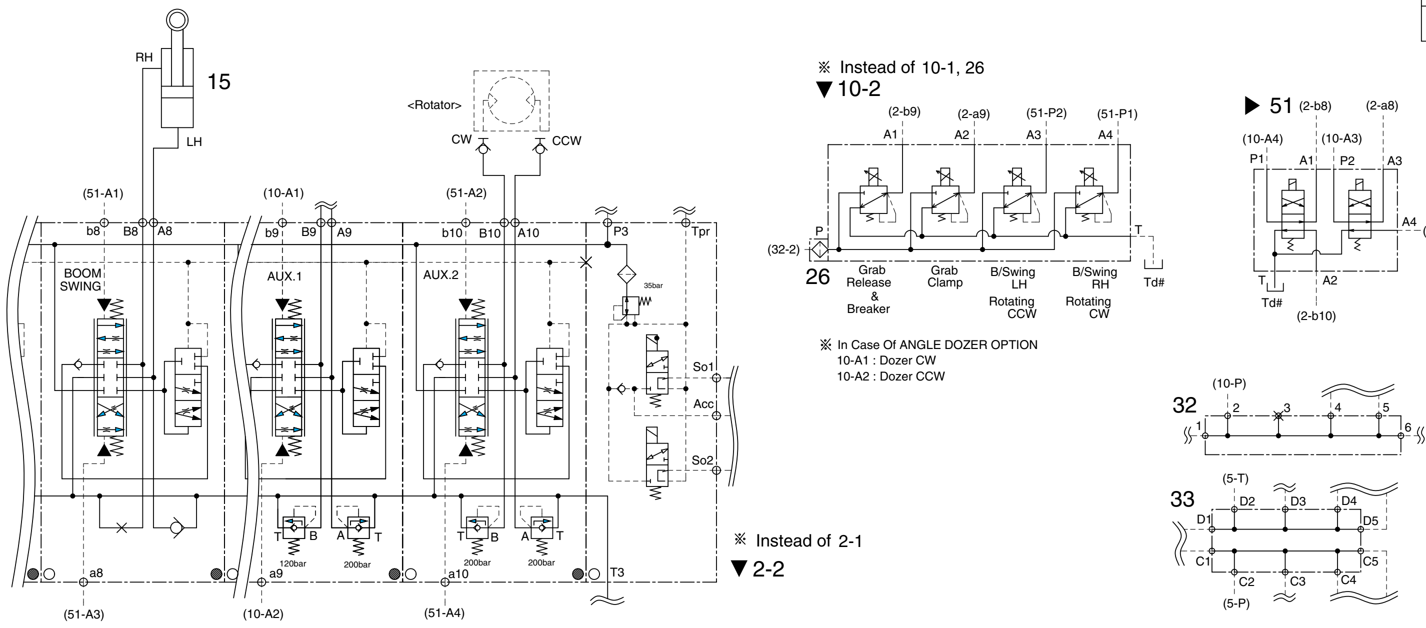
30MP-00010-03 2OF3

3. HYDRAULIC CIRCUIT (3/3)

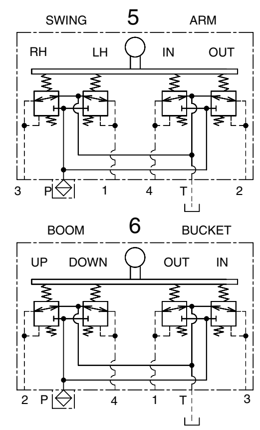
B/Swing Modulation with Rotating(BO02, HR02)

▶ : Added part

▼ : Changed part



RCV LEVER(LH/RH) OPTION

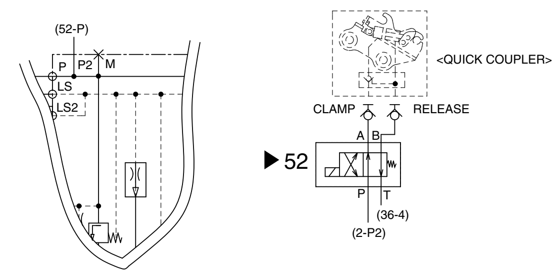


PART NO (5 :LH / 6 : RH)				OPTION CODE	PRODUCER
5-1	31MQ-21130	6-1	31MQ-21120	BO01 JA01	EATON
5-2	31MQ-21110			BO02 JA01	
5-3	31MQ-21410	6-2	31MQ-21440	BO01 JA21	KPM
5-4	31MQ-21430			BO02 JA21	

Quick Coupler Type 1 (HQ01)

▶ : Added part

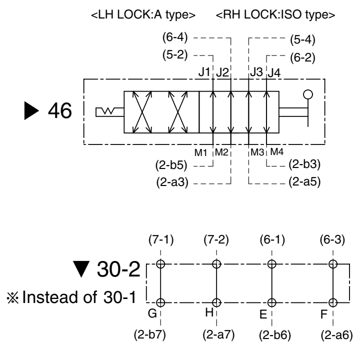
▼ : Changed part



Pattern Change(PV01)

▶ : Added part

▼ : Changed part

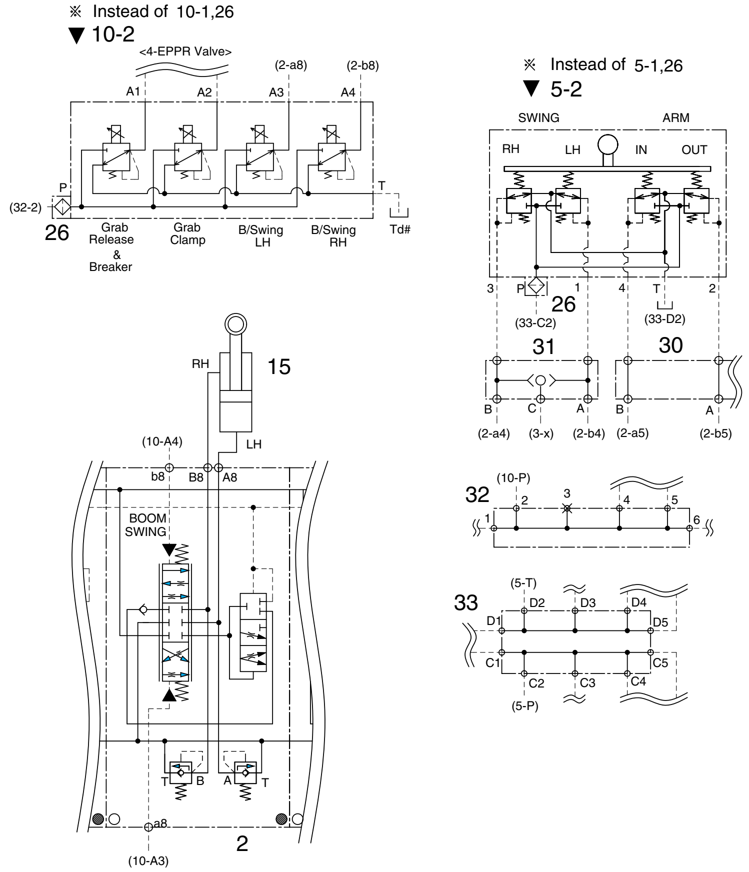


	LH RCV	RH RCV
ISO type	ARM OUT (J1-M1), SWING CCW, SWING CW, ARM IN (J3-M3)	BOOM DOWN (J2-M2), BUCKET IN, BUCKET OUT, BOOM UP (J4-M4)
A type	BOOM DOWN (J1-M2), SWING CCW, SWING CW, BOOM UP (J3-M4)	ARM OUT (J2-M1), BUCKET IN, BUCKET OUT, ARM IN (J4-M3)

B/Swing Modulation(BO02)

▶ : Added part

▼ : Changed part



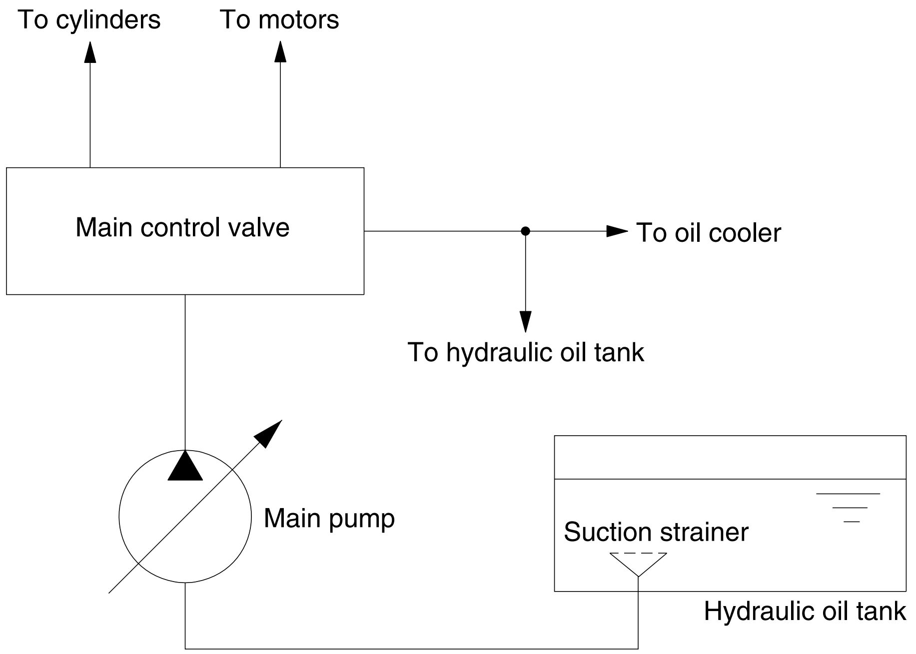
- 2-2 Main control valve
- 5-2 RCV lever-LH
- 5-4 RCV lever-LH
- 10-2 4-EPPR valve
- 15 Boom swing cylinder
- 26 Last guard filter
- 30-2 Terminal
- 46 Pattern change valve
- 51 Solenoid valve
- 52 Solenoid valve

30MP-00010-03 3OF3

GROUP 2 MAIN CIRCUIT

The main hydraulic circuit consists of suction circuit, delivery circuit, return circuit and drain circuit.
The hydraulic system consists of one main pump, one control valve, one swing motor, four cylinders and two travel motors.
The swash plate type variable displacement axial piston pump is used as the main pump and is driven by the engine at ratio 1.0 of engine speed.

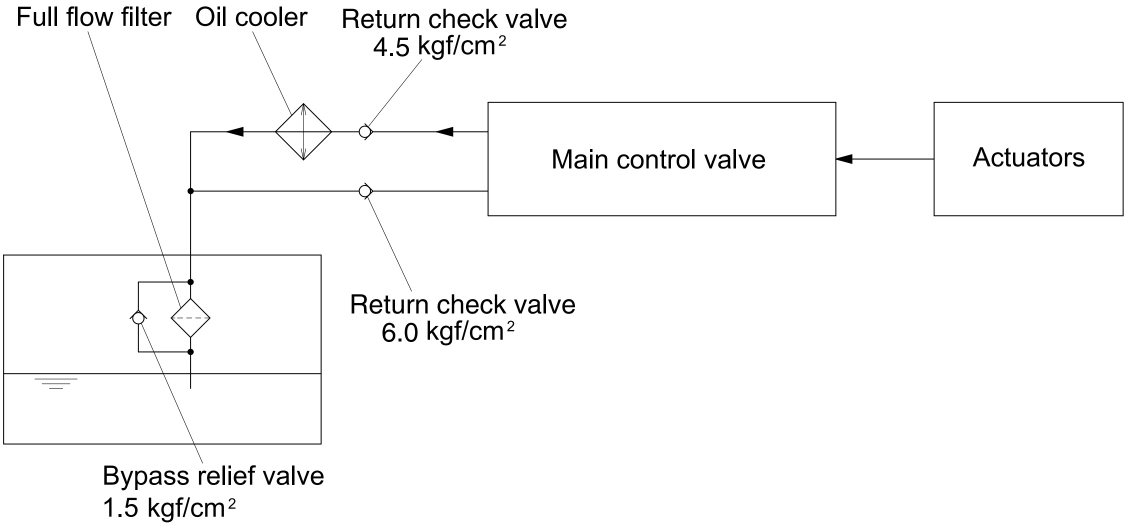
1. SUCTION AND DELIVERY CIRCUIT



140L3CI01

The pumps receive oil from the hydraulic tank through a suction strainer. The discharged oil from the pump flows into the main control valve and goes out the tank ports.
The oil discharged from the main pump flows to the actuators through the main control valve.
The main control valve controls the hydraulic functions.
The return oil from the actuators flows to the hydraulic tank through the main control valve and the oil cooler.

2. RETURN CIRCUIT



48AZ3CI02

All oil returned from each actuator returns to the hydraulic tank through the control valve.

The bypass check valves are provided in the return circuit.

The setting pressure of bypass check valves are 4.5 kgf/cm^2 (64.0 psi) and 6 kgf/cm^2 (85.3 psi). Usually, oil returns to the hydraulic tank from the left side of control valve through oil cooler.

When oil temperature is low, viscosity becomes higher and flow resistance increases when passing through the oil cooler. When the oil pressure exceeds 6 kgf/cm^2 (85.3 psi), the oil returns directly to the hydraulic tank, resulting in the oil temperature being raised quickly at an appropriate level.

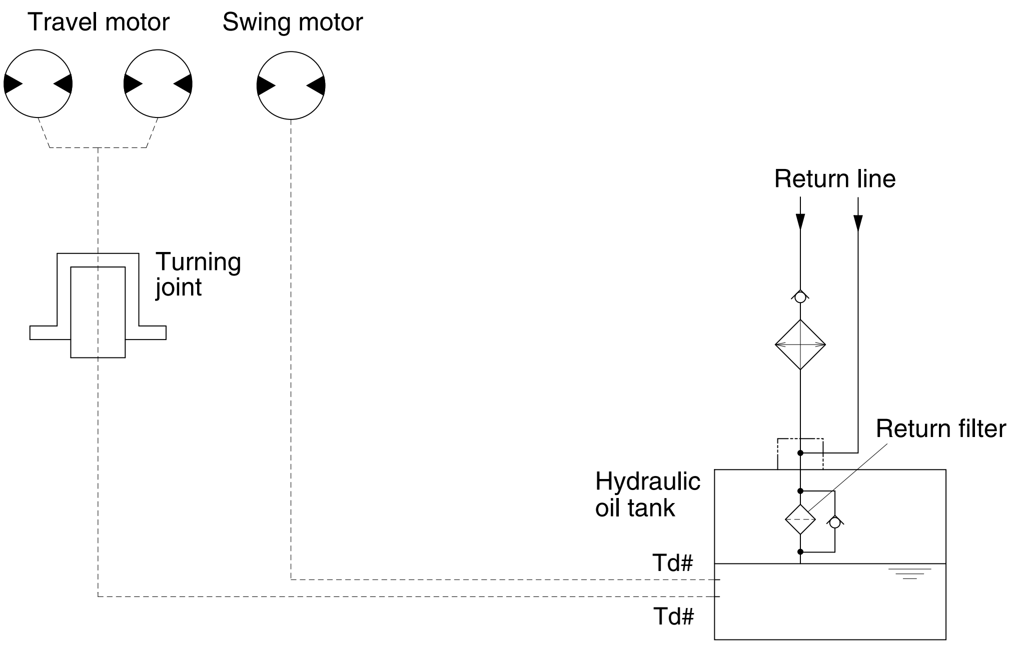
When the oil cooler is clogged, the oil returns directly to the hydraulic tank through bypass check valve (1).

The full-flow filter and bypass relief valve are provided in the hydraulic tank.

The oil returned from right and left side of control valve is combined and filtered by the full-flow filter. A bypass relief valve is provided in the full-flow filter.

When the filter element is clogged, the bypass relief valve opens at 1.5 kgf/cm^2 (21 psi) differential pressure.

3. DRAIN CIRCUIT



55ACR3CI03

Besides internal leaks from the motors and main pump, the oil for lubrication circulates.

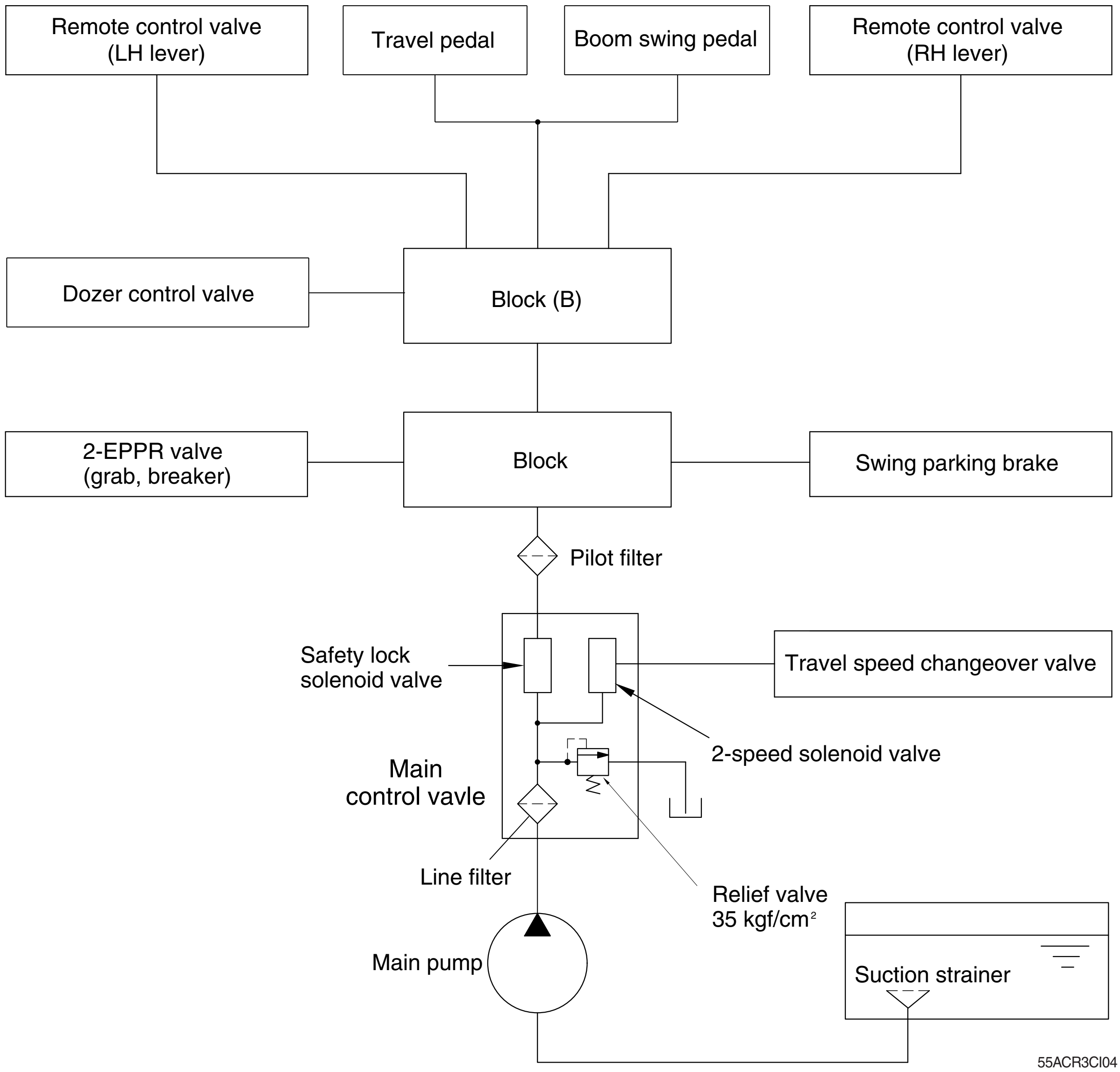
1) TRAVEL MOTOR DRAIN CIRCUIT

Oil leaked from the right and left travel motors comes out of the drain ports provided in the respective motor casing and join with each other. These oils pass through the turning joint and return to the hydraulic oil tank.

2) SWING MOTOR DRAIN CIRCUIT

Oil leaked from the swing motor returns to the hydraulic tank passing through return filter.

GROUP 3 PILOT CIRCUIT



The pilot circuit consists of suction circuit, delivery circuit and return circuit.

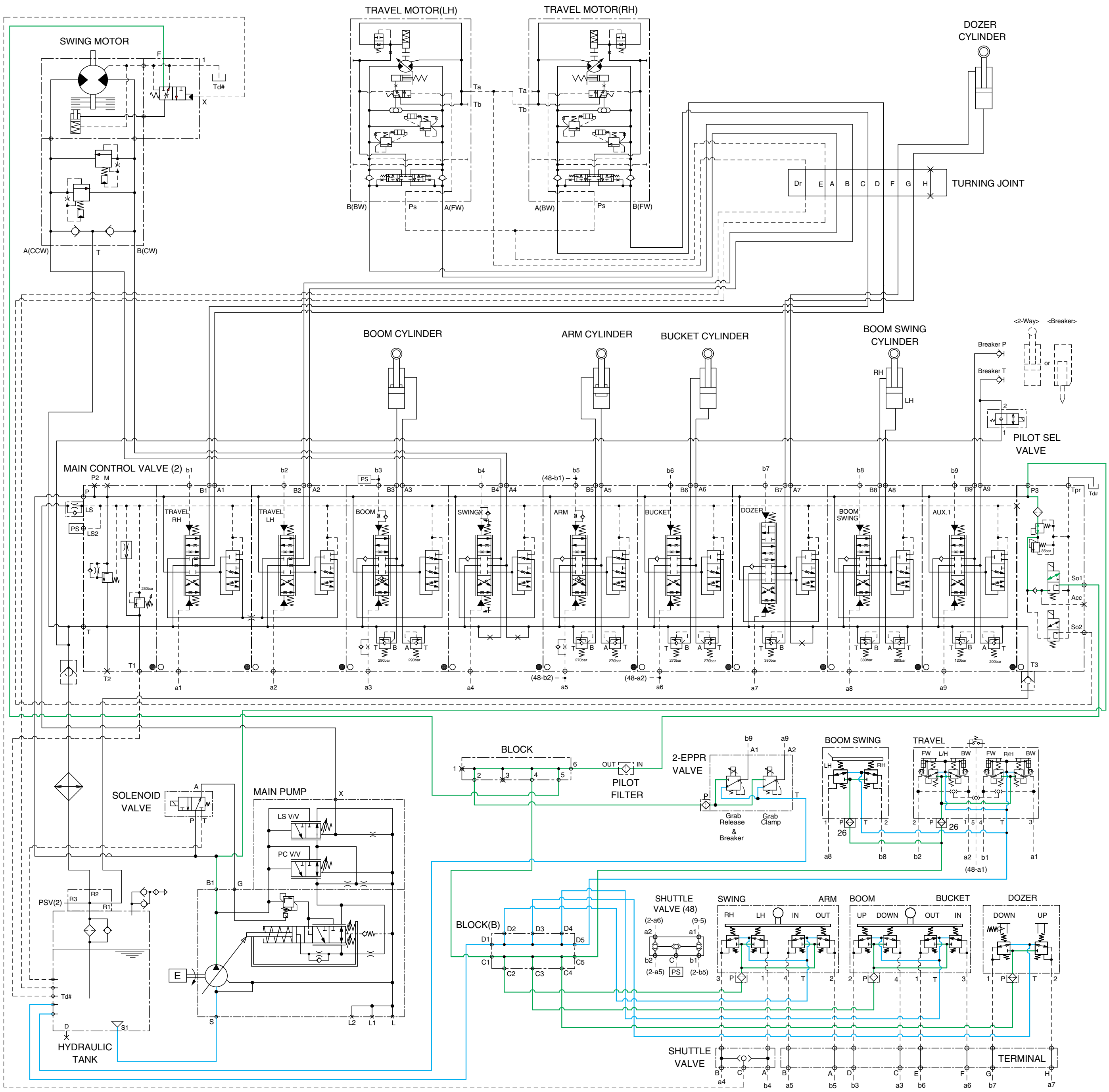
Some of the main pump discharged oil is used the pilot line oil and the pilot line is provided with the relief valve.

The pilot oil is supplied each control valve and pedal through the line filter and safety lock solenoid valve in the main control valve as below.

- The pilot oil flows to the remote control valve (LH, RH), travel pedal, boom swing pedal and dozer lever through the pilot filter, block and block (B).
- The pilot oil flows to the swing parking brake and 2-EPPR valve (grab, breaker) through the pilot filter and block.

Also, the pilot oil flows to the travel speed solenoid valve through the line filter in the main control valve.

1. SUCTION, DELIVERY AND RETURN CIRCUIT



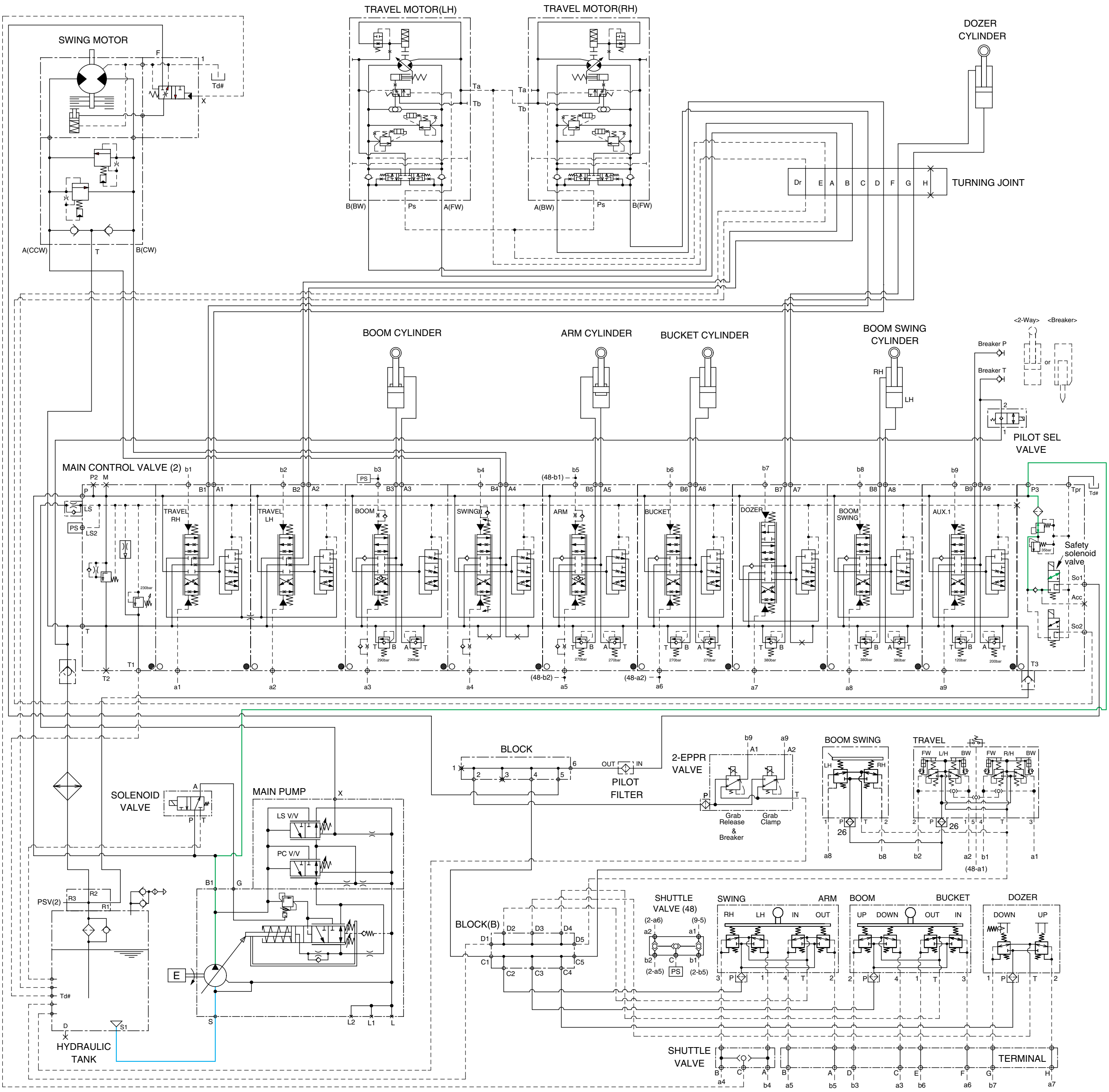
55ACR3HC02

The main pump receive oil from the hydraulic tank. The discharged oil from the main pump flows to the safety solenoid valve through the line filter. The oil is filtered by the line filter. The pilot relief valve is provided in the main control valve for limiting the pilot circuit pressure.

The oil filtered by pilot filter flows remote control valve through safety solenoid valve.

The return oil flow into the hydraulic tank through block (B).

2. SAFETY VALVE (SAFETY LEVER)

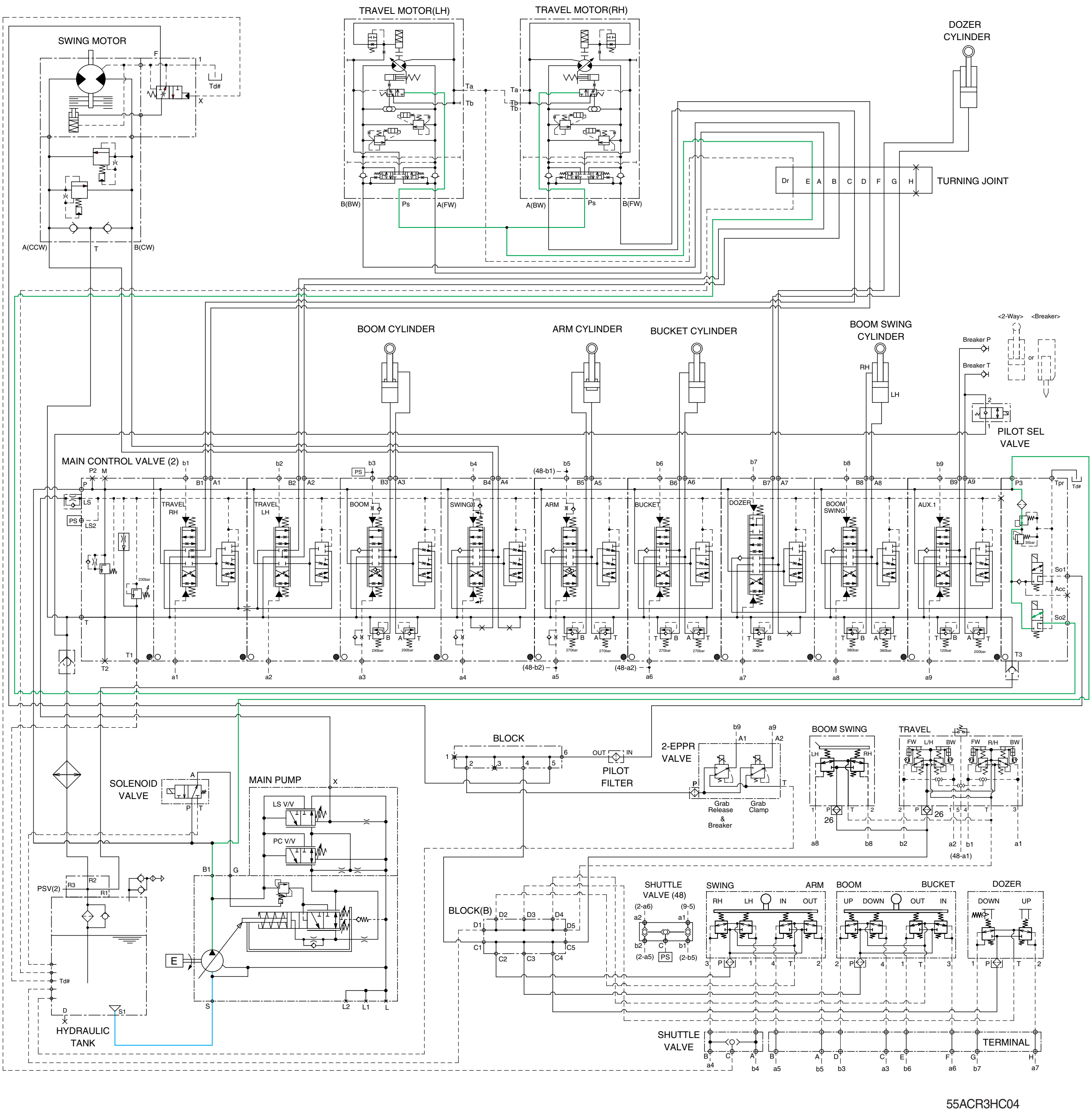


55ACR3HC03

When the lever of the safety solenoid valve is moved downward, oil flows into the remote control valve through solenoid valve and line filter in the main control valve.

When the lever of the safety solenoid valve is moved upward, oil does not flow into the remote control valve, because of the blocked port.

3. TRAVEL SPEED CONTROL SYSTEM



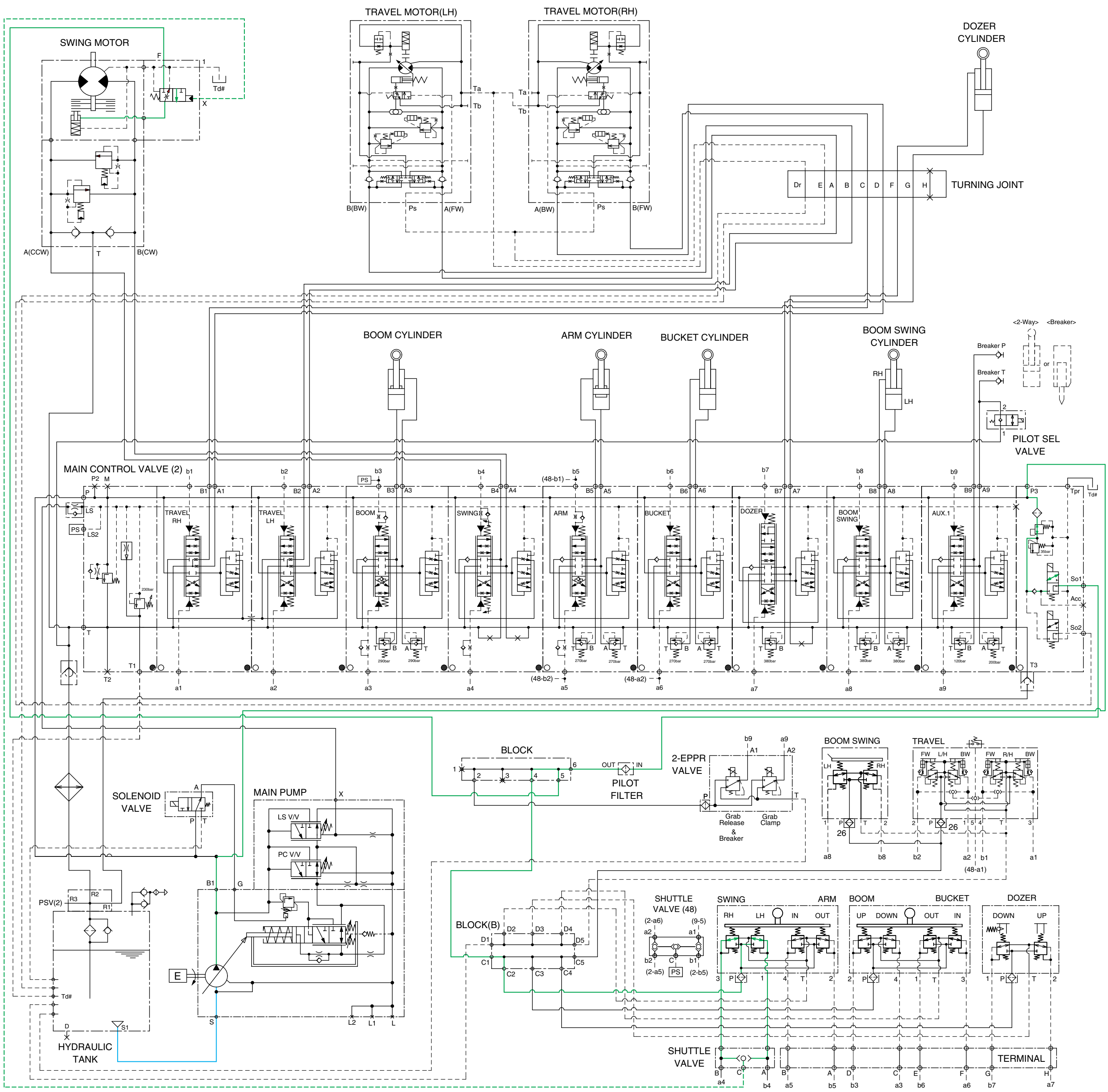
When the travel speed switch is pushed, the travel speed solenoid valve is actuated and the discharged oil from the pilot pump flows to the Ps port of pilot valve in the travel motors.

As a result, the control piston is pushed by the main oil flow, thus the displacement is minimized.

When the travel speed switch is pushed once more, the travel speed solenoid valve is return to original position by the force of spring, the hydraulic oil of Ps port returns to the hydraulic tank.

As a result, the control piston is returned by the main oil flow, thus the displacement is maximized.

4. SWING PARKING BRAKE RELEASE



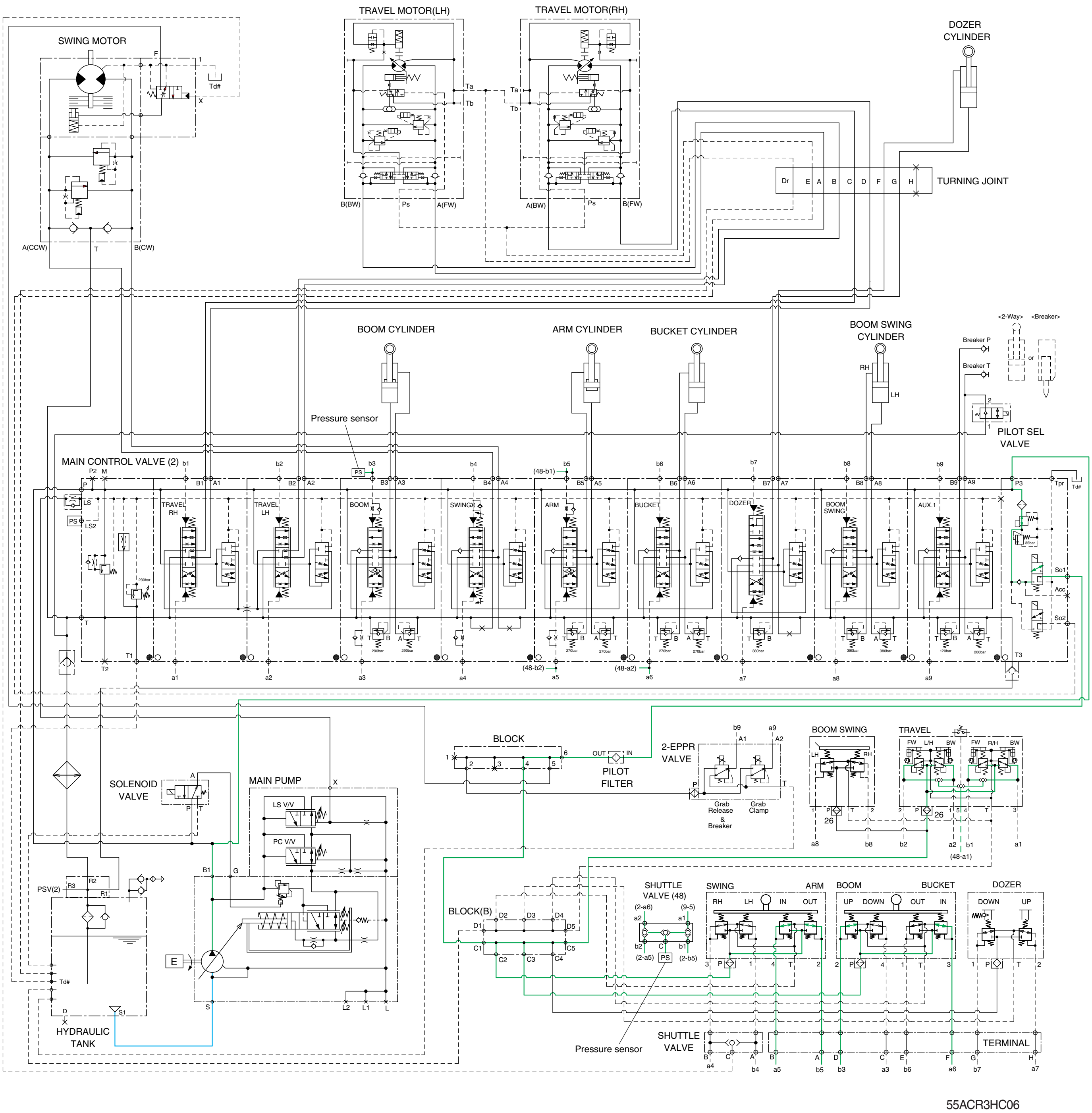
55ACR3HC05

When the swing control lever is tilted, the pilot oil flow into X port of shuttle valve through the valve and shuttle valve, this pressure move spool so, discharged oil from pilot valve flow into F port.

This pressure is applied to swing motor disc, thus the brake is released.

When the swing control lever is set in the neutral position, oil in the swing motor disc cylinder is drained, thus the brake is applied.

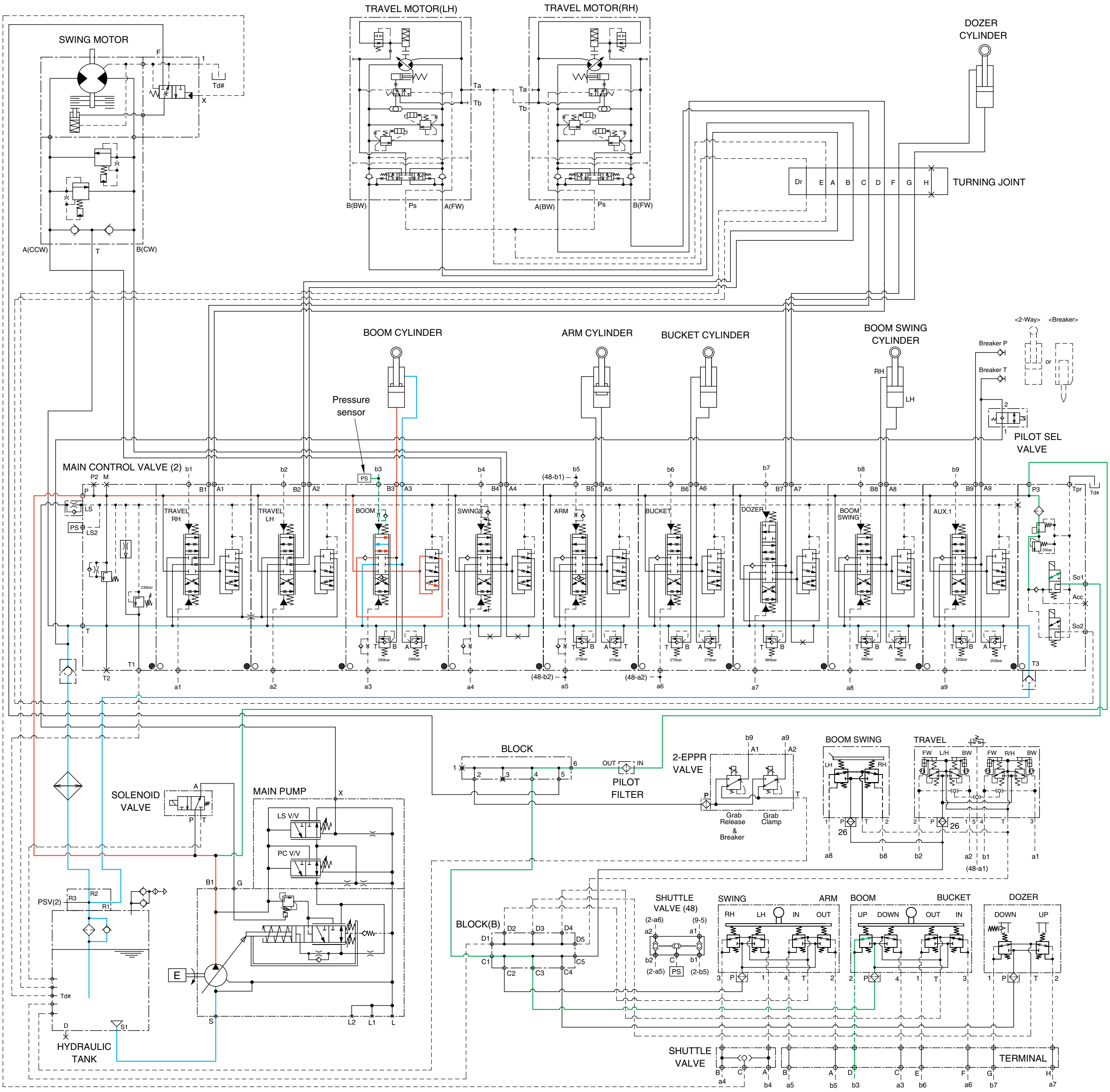
5. VARIABLE HORSEPOWER SYSTEM



When operating the boom up, arm in, arm out, bucket in or travel, the pressure sensors detect the pilot pressure and transmit it to the machine controller, which increases the pump rotation speed by 200 rpm than the selected power mode to improve performance.

GROUP 4 SINGLE OPERATION

1. BOOM UP OPERATION



55ACR3HC10

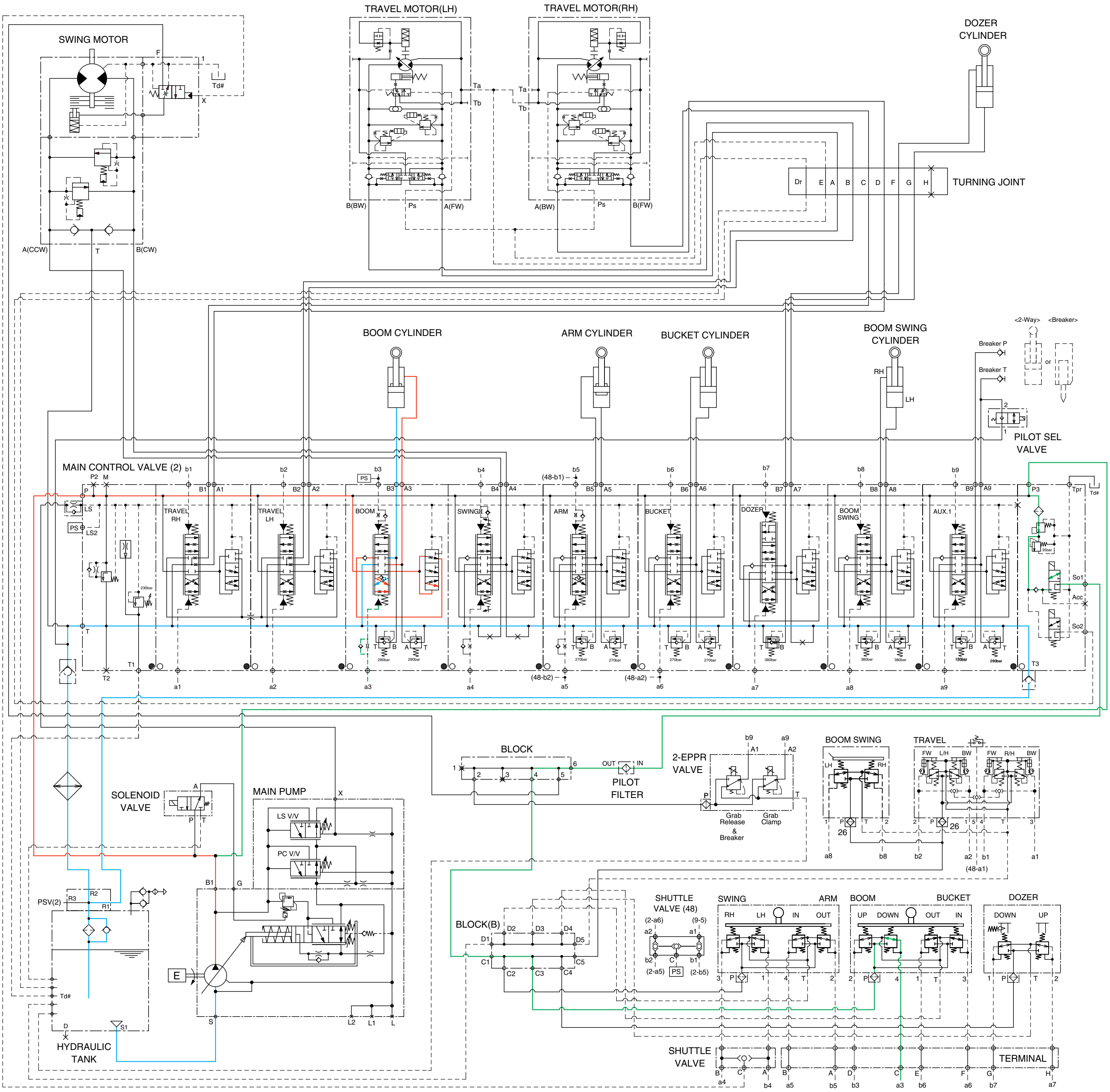
When the right control lever is pulled back, the boom spool in the main control valve is moved to the up position by the pilot oil pressure (b3) from the remote control valve.

The oil from the main pump flows into the main control valve and then goes to the large chamber of boom cylinder. At the same time, the oil from the small chamber of boom cylinder returns to the hydraulic oil tank through the boom spool in the main control valve. When this happens, the boom goes up. The excessive pressure in the boom cylinder bottom end circuit is prevented by relief valve.

When the boom is up and the control lever is returned to neutral position, the circuit for the holding pressure at the bottom end of the boom cylinder is closed by the boom holding valve. This prevents the hydraulic drift of boom cylinder.

Also, the pressure sensor detects the boom up pilot pressure and transmit it to the machine controller, which increases the pump rotation speed by 200 rpm than the selected power mode to improve performance.

2. BOOM DOWN OPERATION



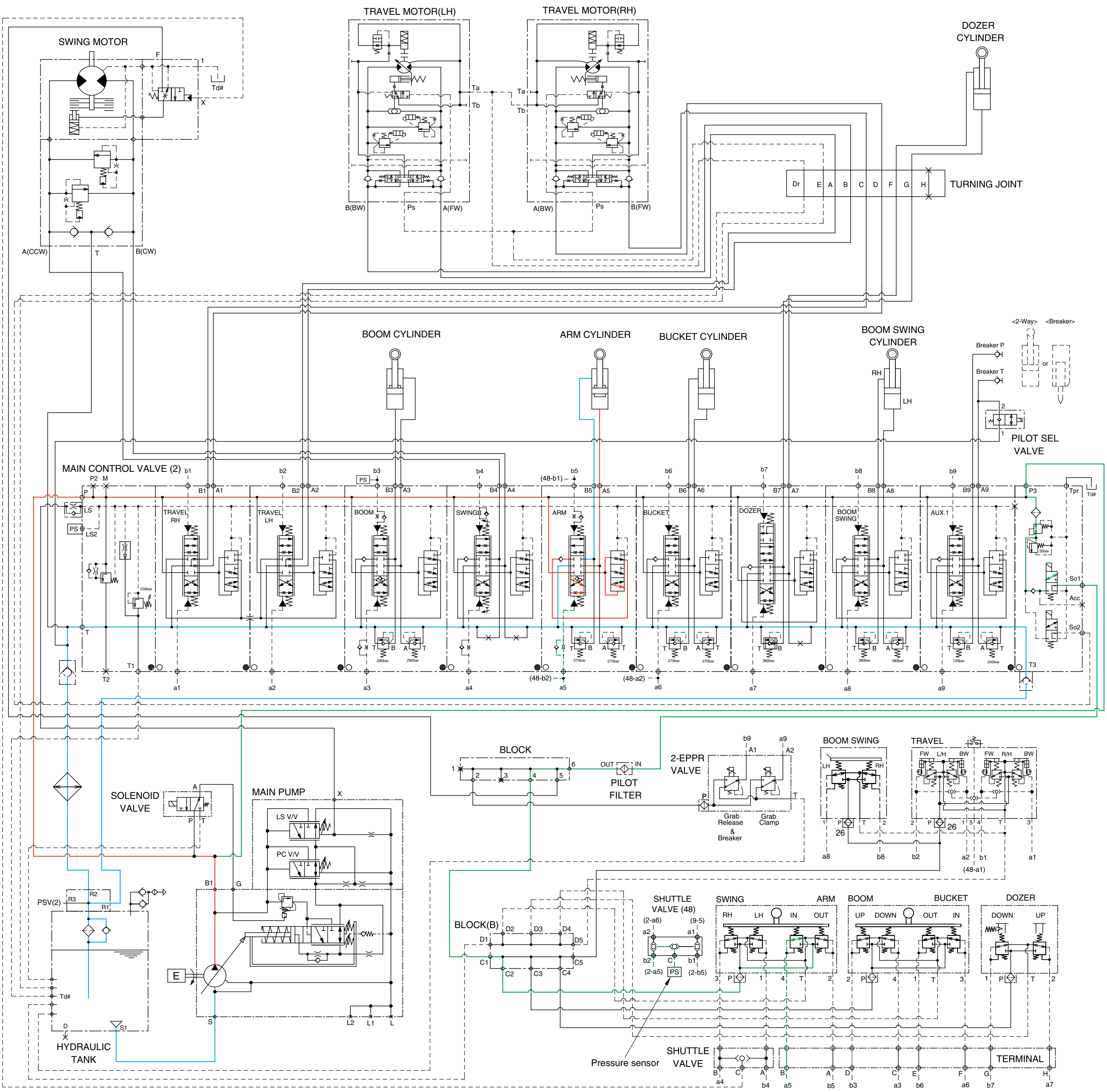
55ACR3HC11

When the right control lever is pushed forward, the boom spool in the main control valve is moved to the down position by the pilot oil pressure (a3) from the remote control valve.

The oil from the main pump flows into the main control valve and then goes to the small chamber of boom cylinder. At the same time, the oil from the large chamber of boom cylinder returns to the hydraulic tank through the boom spool in the main control valve.

The excessive pressure in the boom cylinder rod end circuit is prevented by the relief valve.

3. ARM ROLL IN OPERATION



55ACR3HC12

When the left control lever is pulled back, the arm spool in the main control valve is moved the to roll in position by the pilot oil pressure (a5) from the remote control valve.

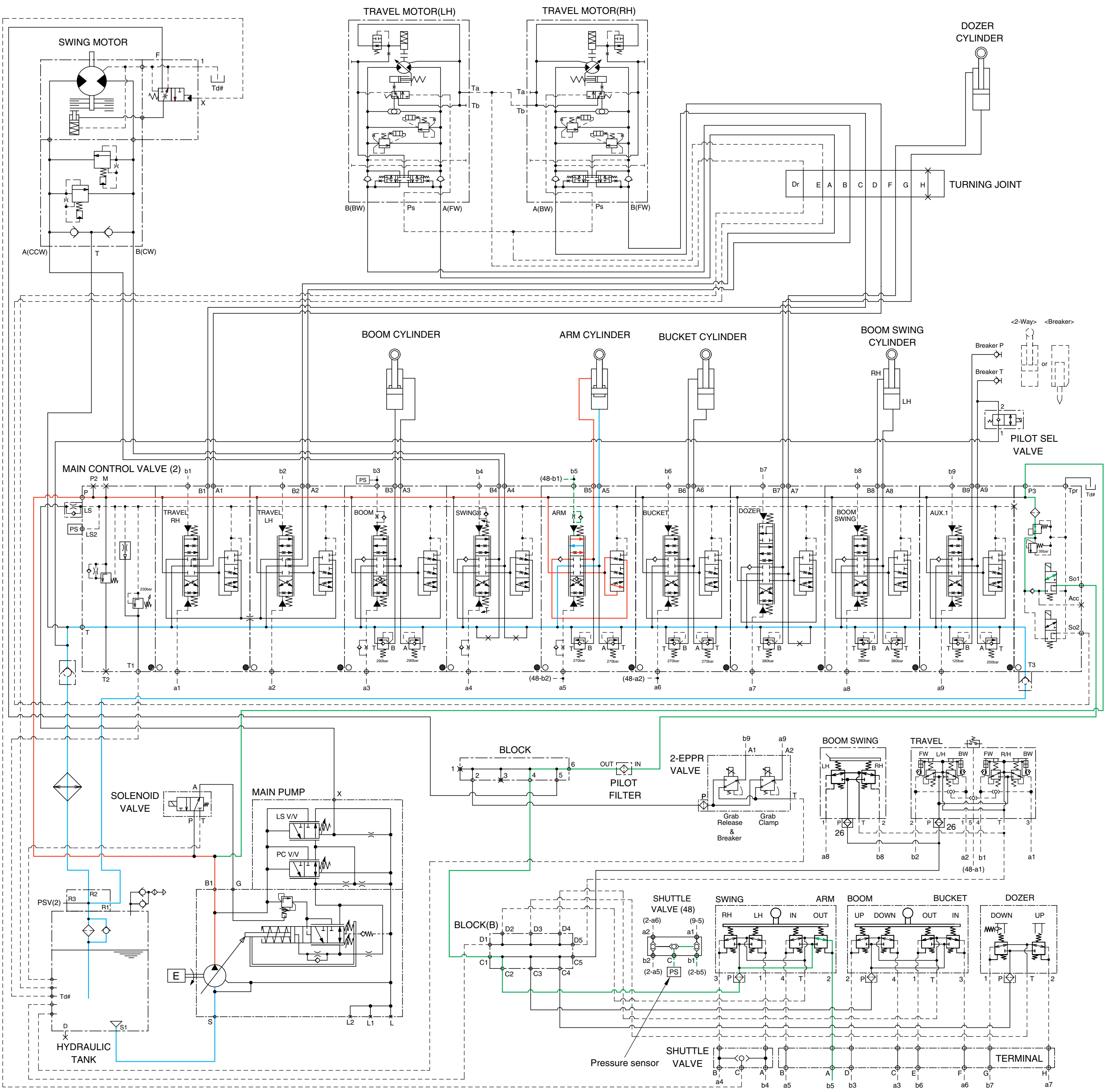
The oil from the main pump flows into the main control valve and then goes to the large chamber of arm cylinder.

At the same time, the oil from small chamber of arm cylinder returns to the hydraulic oil tank through the arm spool in the main control valve. When this happens, the arm rolls in.

The cavitation which will happen to the bottom of the arm cylinder is also prevented by the make-up valve in the main control valve.

Also, the pressure sensor detects the arm in pilot pressure through the shuttle valve (48) and transmit it to the machine controller, which increases the pump rotation speed by 200 rpm than the selected power mode to improve performance.

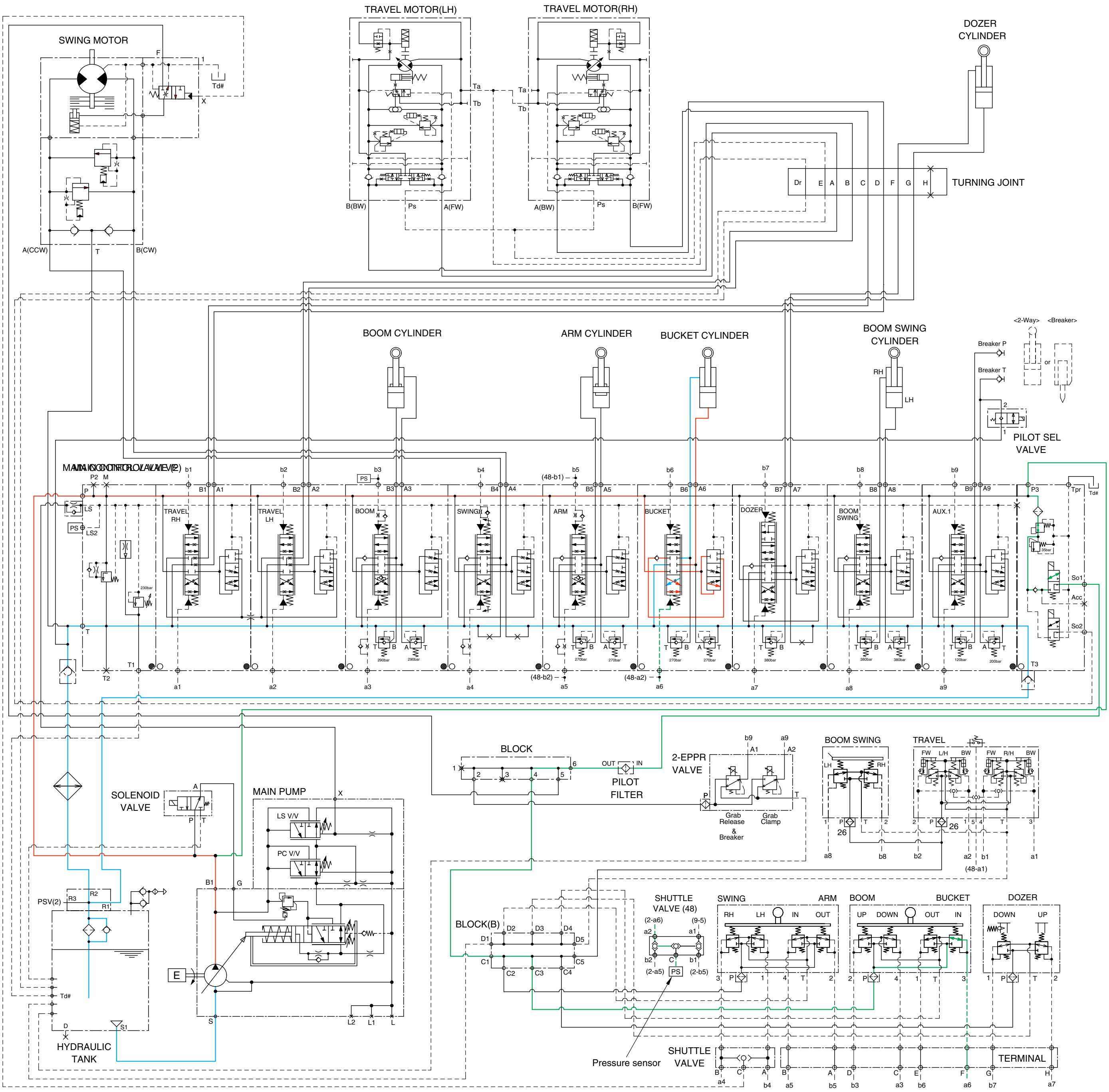
4. ARM ROLL OUT OPERATION



55ACR3HC13

When the left control lever is pushed forward, the arm spool in the main control valve is moved to the roll out position by the pilot oil pressure (b5) from the remote control valve.
The oil from the main pump flows into the main control valve and then goes to the small chamber of arm cylinder.
At the same time, the oil from the large chamber of arm cylinder returns to the hydraulic oil tank through the arm spool in the main control valve. When this happens, the arm rolls out.
The cavitation which will happen to the rod of the arm cylinder is also prevented by the make-up valve in the main control valve.
Also, the pressure sensor detects the arm out pilot pressure through the shuttle valve (48) and transmit it to the machine controller, which increases the pump rotation speed by 200 rpm than the selected power mode to improve performance.

5. BUCKET ROLL IN OPERATION



55ACR3HC14

When the right control lever is pulled left, the bucket spool in the main control valve is moved to the roll in position by the pilot oil pressure (a6) from the remote control valve.

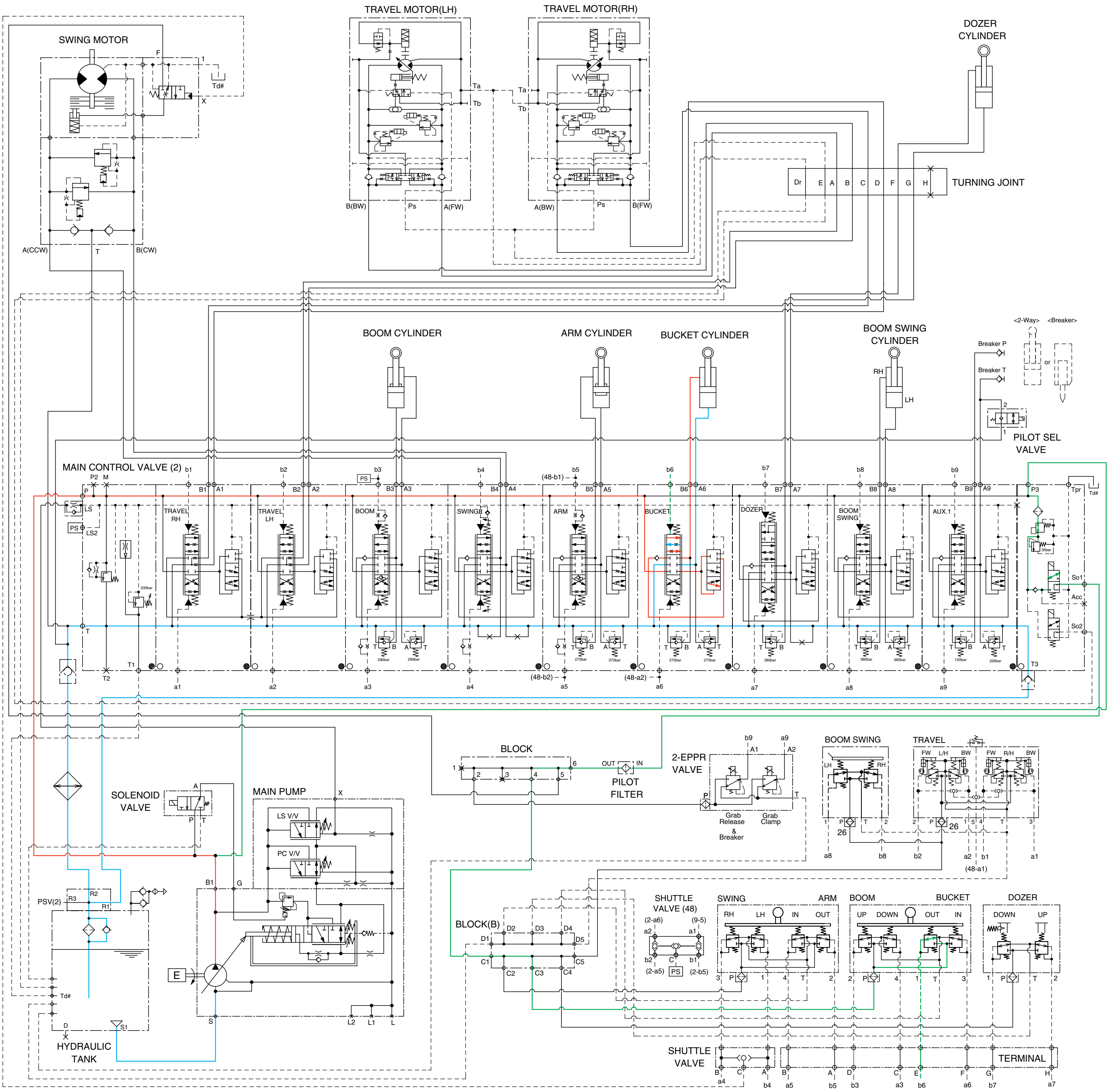
The oil from the main pump flows into the main control valve and then goes to the large chamber of bucket cylinder.

At the same time, the oil from the small chamber of bucket cylinder returns to the hydraulic oil tank through the bucket spool in the main control valve. When this happens, the bucket rolls in.

The cavitation which will happen to the bottom of the bucket cylinder is also prevented by the make-up valve in the main control valve.

Also, the pressure sensor detects the bucket in pilot pressure through the shuttle valve (48) and transmit it to the machine controller, which increases the pump rotation speed by 200 rpm than the selected power mode to improve performance.

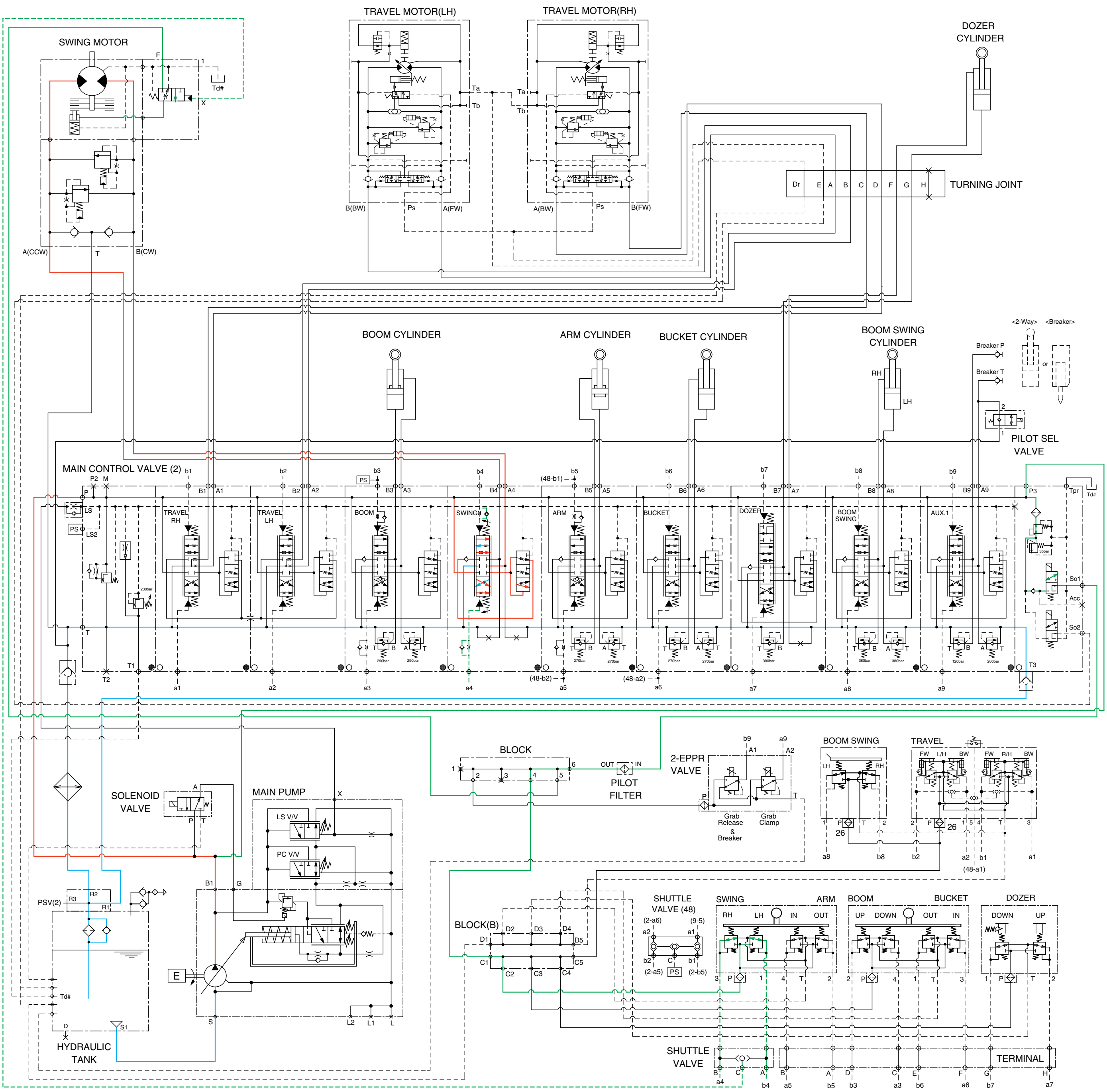
6. BUCKET ROLL OUT OPERATION



55ACR3HC15

When the right control lever is pushed right, the bucket spool in the main control valve is moved to the roll out position by the pilot oil pressure (b6) from the remote control valve.
The oil from the main pump flows into the main control valve and then goes to the small chamber of bucket cylinder.
At the same time, the oil from the large chamber of bucket cylinder returns to the hydraulic oil tank through the bucket spool in the main control valve. When this happens, the bucket rolls out.
The cavitation which will happen to the rod of the bucket cylinder is also prevented by the make-up valve in the main control valve.

7. SWING OPERATION



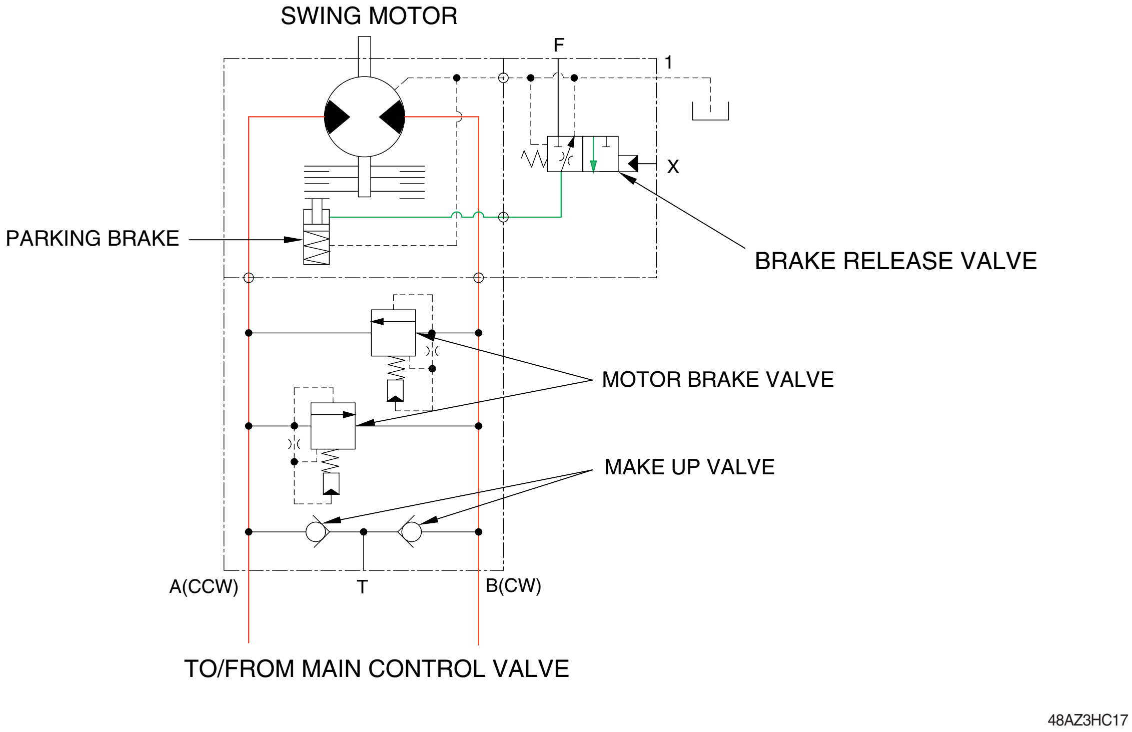
55ACR3HC16

When the left control lever is pushed left or right, the swing spool in the main control valve is moved to the left or right swing position by the pilot oil pressure (a4, b4) from the remote control valve.

The oil from the main pump flows into the main control valve and then goes to the swing motor.

At the same time, the return oil from the swing motor returns to the hydraulic oil tank through the swing spool in the main control valve. When this happens, the superstructure swings to the left or right. The swing parking brake, make up valve and the overload relief valve are provided in the swing motors. The cavitation which will happen to the swing motor is also prevented by the make up valve in the swing motor itself.

SWING CIRCUIT OPERATION



1) MOTOR BRAKE VALVE

Motor brake valve for the swing motor limits to cushion the starting and stopping pressure of swing operation.

2) MAKE UP VALVE

The make up valves prevent cavitation by supplying return oil to the vacuum side of the motor.

3) PARKING BRAKE

In case that the parking, of the machine at slope is required during operation, there is the danger of involuntary swing caused by the self weight of the machine. The brake is connected to prevent this involuntary swing.

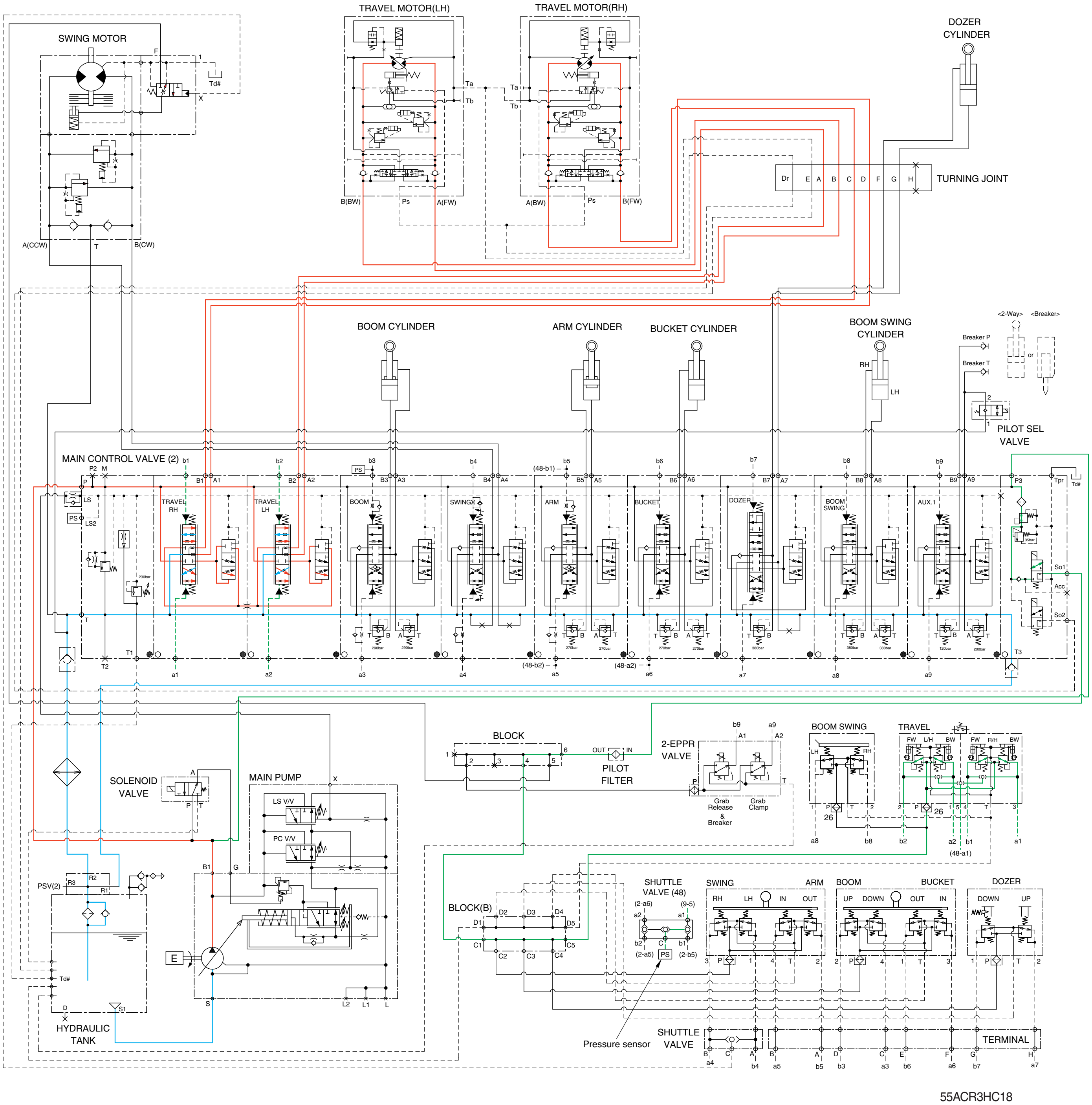
PARKING BRAKE "OFF" OPERATION

The parking brake is released by the pilot pressure oil from the main pump.
When the left control lever placed in the swing position, the pilot pressure (X) at the shuttle valve is transferred to the brake release valve and the brake release valve is change over. Then the pilot pressure (F) lift the brake piston and release the parking brake.

PARKING BRAKE "ON" OPERATION

When the control lever placed in the neutral position, the pressure of the pilot oil passage down.
Then the brake release valve returned to the neutral position and the oil is returned from the brake piston to the tank. And the brake is set to 'ON".

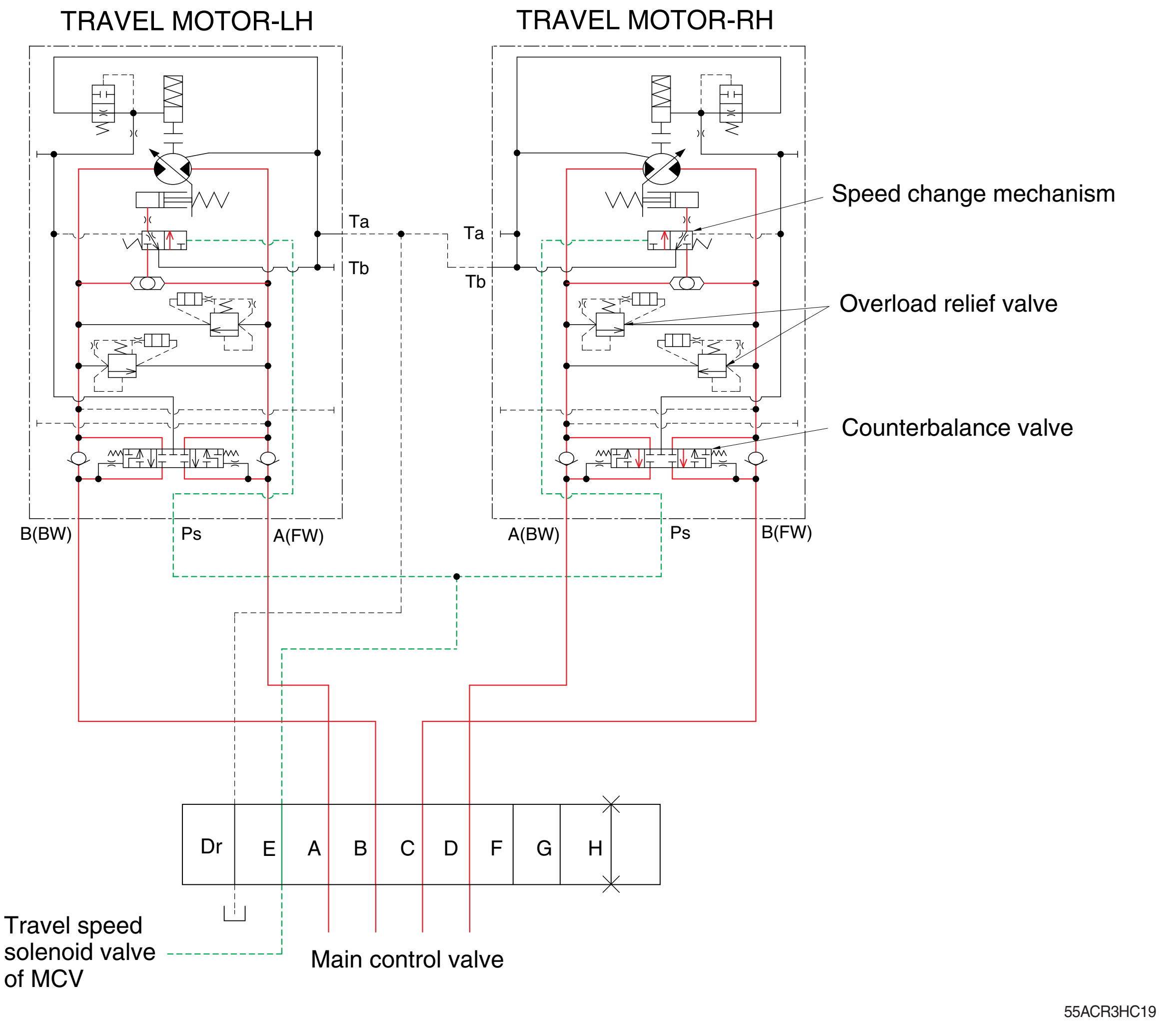
8. TRAVEL FORWARD AND REVERSE OPERATION



When the travel levers are pushed forward or reverse position, the travel spools in the main control valve are moved to the forward or reverse travel position by the pilot oil pressure (a1,b1, a2, b2) from the travel control valve. The oil from the main pump flows into the main control valve and then goes to the both travel motors through the turning joint. The return oil from both travel motors returns to the hydraulic oil tank through the turning joint and the travel spools in the main control valve. When this happens, the machine moves to the forward or reverse.

Also, the pressure sensor detects the travel forward or reverse pilot pressure through the shuttle valve (48) and transmit it to the machine controller, which increases the pump rotation speed by 200 rpm than the selected power mode to improve performance.

TRAVEL CIRCUIT OPERATION



Valves are provided on travel motors to offer the following functions.

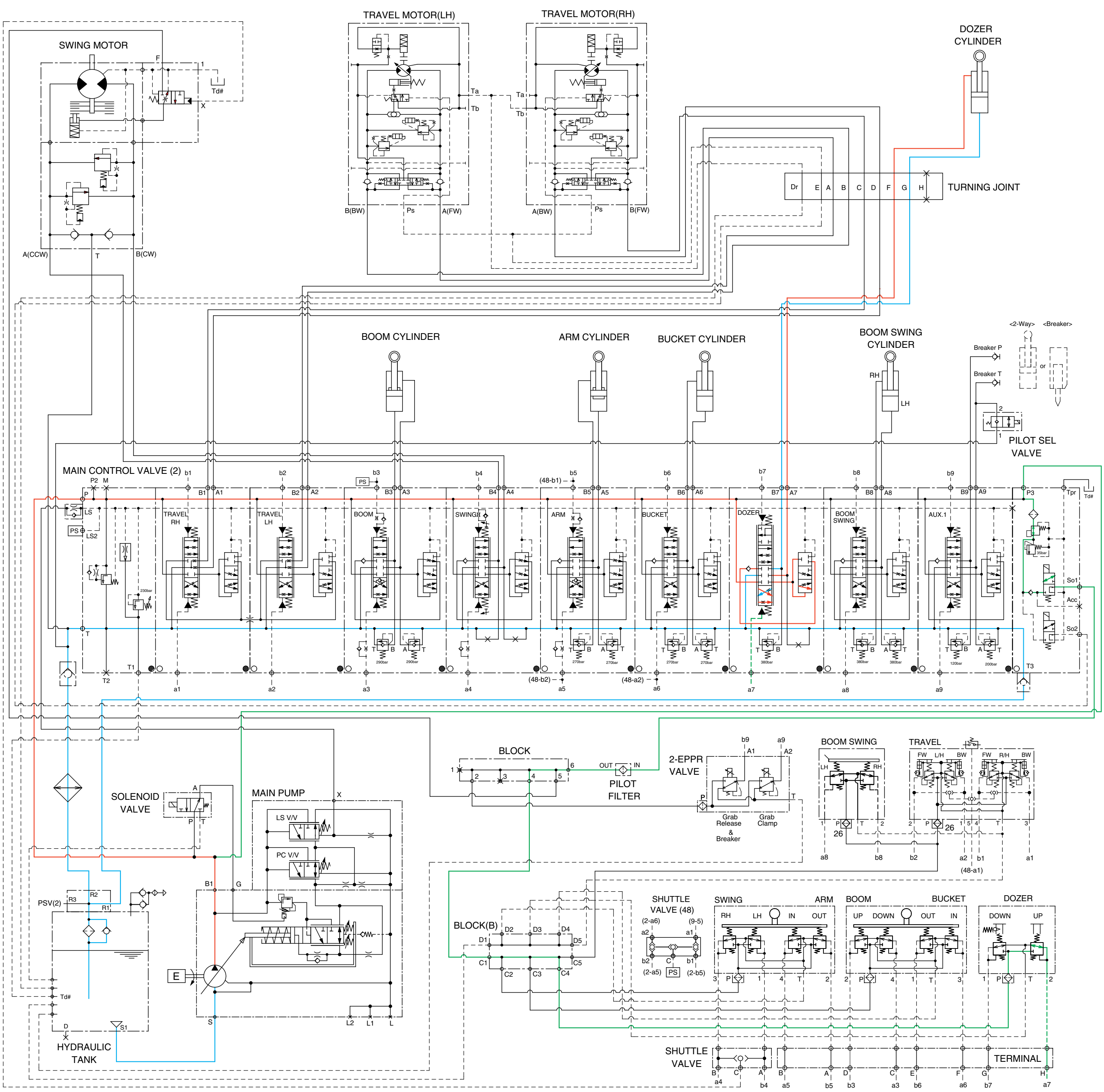
1) COUNTER BALANCE VALVE

When stopping the motor of slope descending, this valve to prevent the motor over run.

2) OVERLOAD RELIEF VALVE

Relief valve limit the circuit pressure below 285 kgf/cm² (4060 psi) to prevent high pressure generated at at time of stopping the machine. Stopping the motor, this valve sucks the oil from lower pressure passage for preventing the negative pressure and the cavitation of the motor.

9. DOZER UP OPERATION



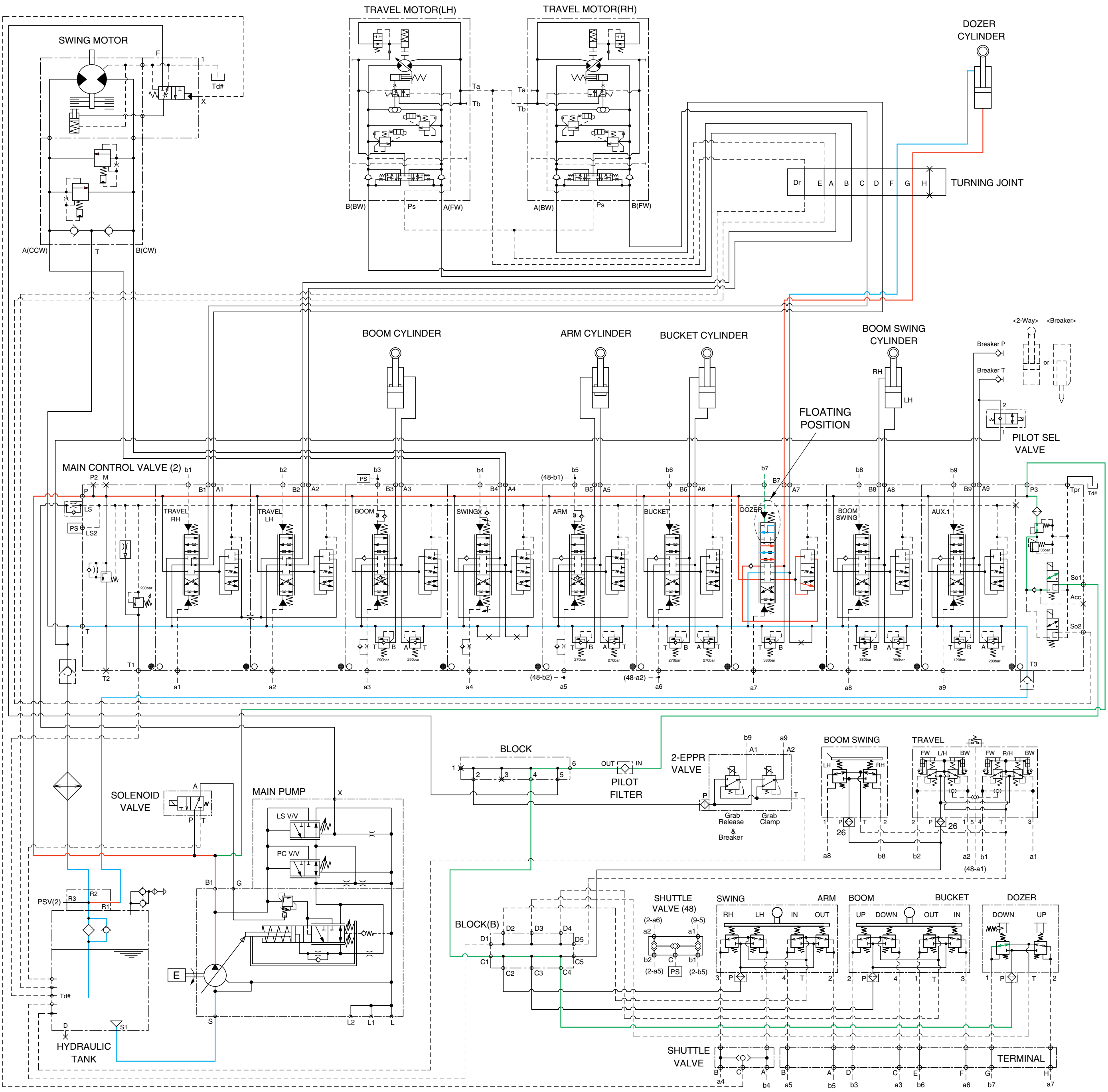
55ACR3HC20

When the dozer control lever is pulled back, the dozer spool in the main control valve is moved to the dozer up position by the pilot oil pressure (a7) from the remote control valve.

The oil from the main pump flows into the main control valve and then goes to the small chamber of dozer cylinders through the turning joint.

At the same time, the oil from the large chamber of dozer cylinders returns to the hydraulic oil tank through the turning joint and dozer spool in the main control valve. When this happens, the dozer goes up.

10. DOZER DOWN OPERATION



55ACR3HC21

When the dozer control lever is pushed forward, the dozer spool in the main control valve is moved to the dozer down position by the pilot oil pressure (b7) from the remote control valve.

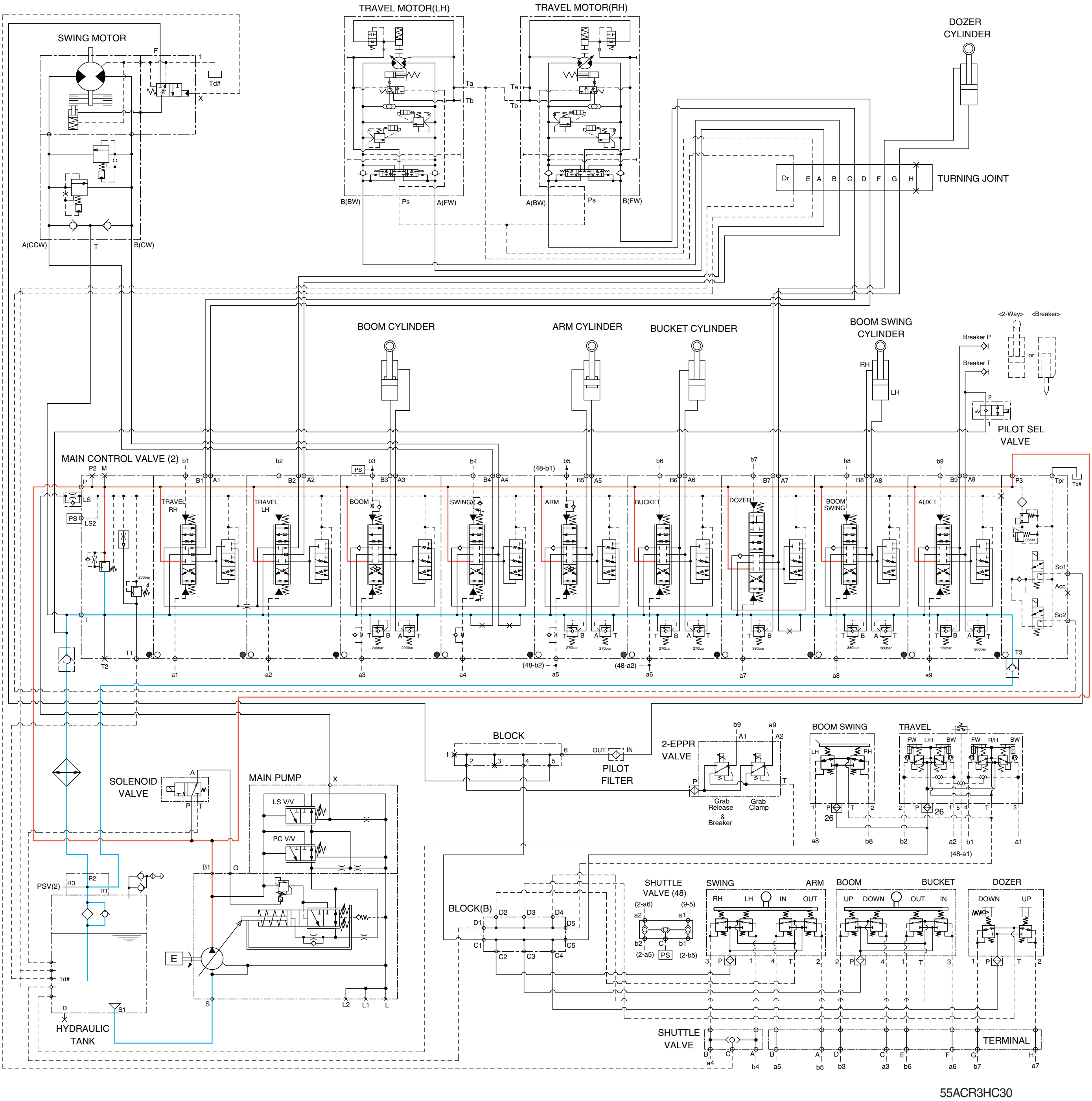
The oil from the main pump flows into the main control valve and then goes to the large chamber of dozer cylinders through the turning joint.

At the same time, the oil from the small chamber of dozer cylinders returns to the hydraulic oil tank through the turning joint and dozer spool in the main control valve. When this happens, the dozer blade is down.

Press the dozer floating button and push the dozer control lever until the end, the dozer spool is moved to the floating position. Then the hydraulic oil of the rod and head goes to tank, and floating is accomplished. Refer to the operator's manual page 3-33.

GROUP 5 COMBINED OPERATION

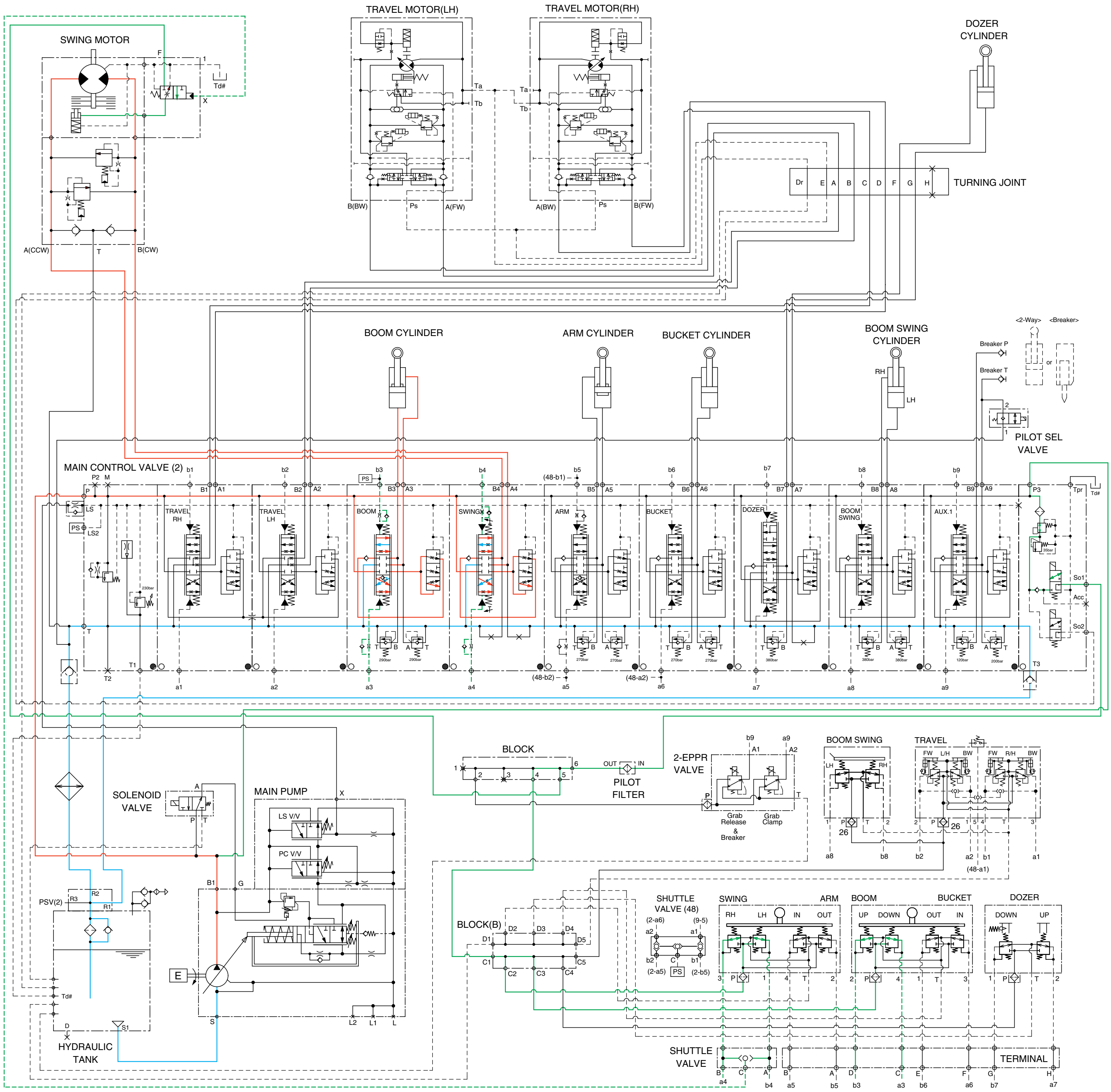
1. OUTLINE



55ACR3HC30

The oil from the main pump flows through the parallel oil passage in the main control valve. Then the oil goes to each actuator and operates them. Check valves and orifices are located on these oil passage in the main control valve. These control the oil from the main pumps so as to correspond to the operation of each actuator and smooth the combined operation.

2. COMBINED SWING AND BOOM OPERATION



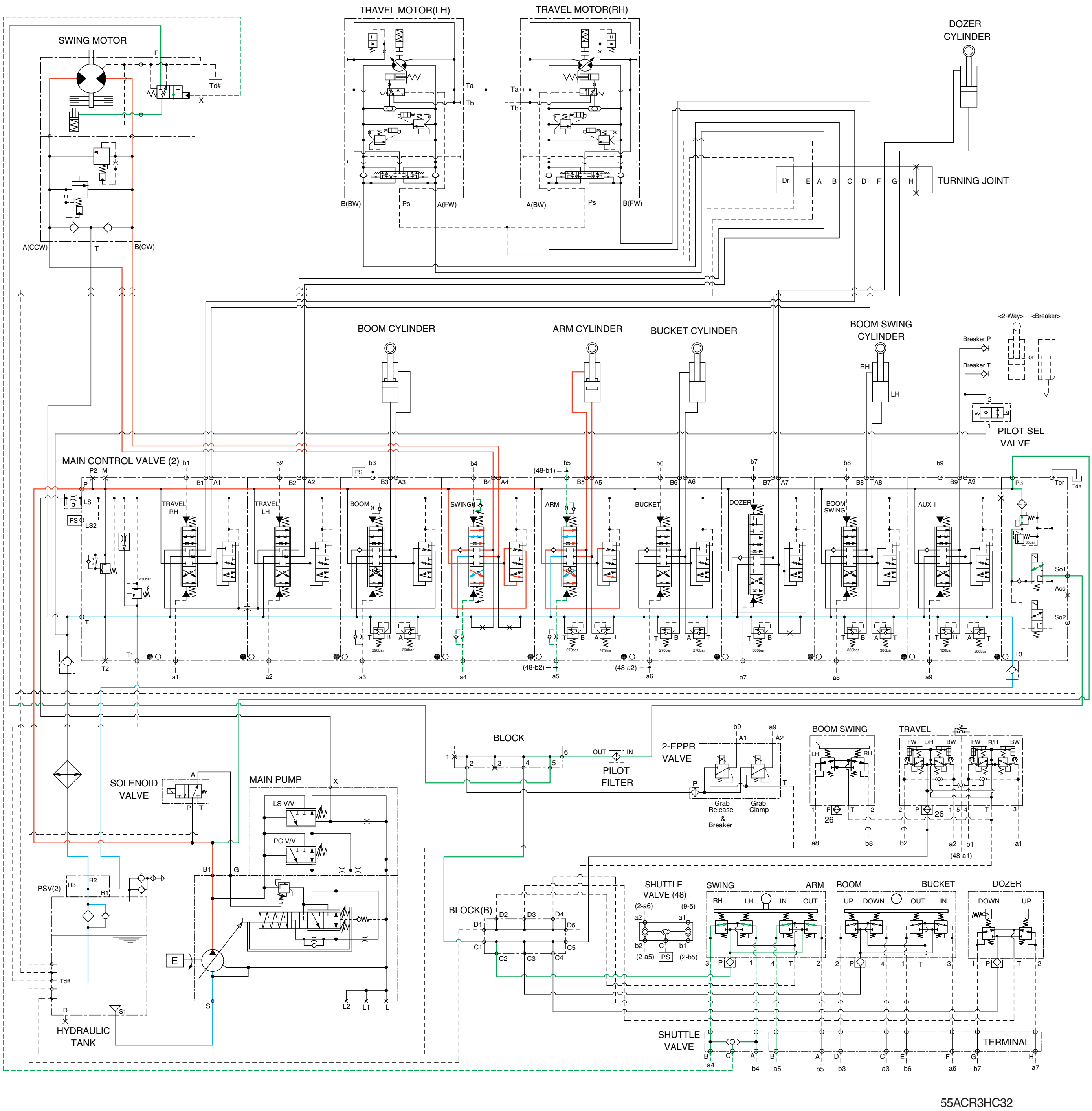
55ACR3HC31

When the swing and boom functions are operated, simultaneously the swing spool and boom spool in the main control valve are moved to the functional position by the pilot oil pressure (a4, b4, a3, b3) from the remote control valve.

The oil from the main pump flows into the boom cylinder through boom spool and flows into the swing motor through the swing spool via the parallel passage.

The superstructure swings and the boom is operated.

3. COMBINED SWING AND ARM OPERATION

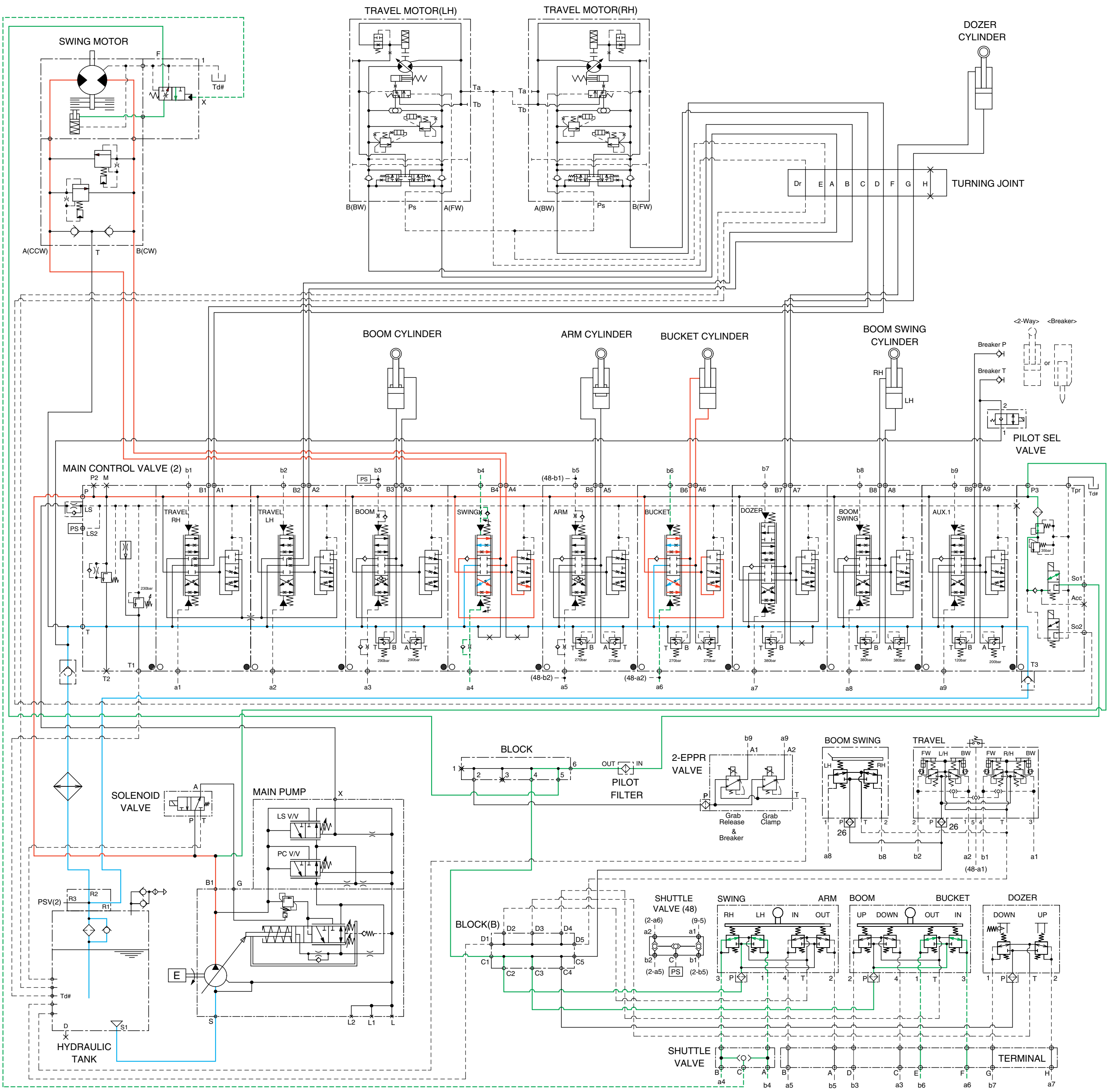


When the swing and arm functions are operated, simultaneously the swing spool and arm spool in the main control valve are moved to the functional position by the pilot oil pressure (a4, b4, a5, b5) from the remote control valve.

The oil from the main pump flows into the swing motor through swing spool via the parallel passage and flows into the arm cylinder through the arm spool.

The superstructure swings and the arm is operated.

4. COMBINED SWING AND BUCKET OPERATION



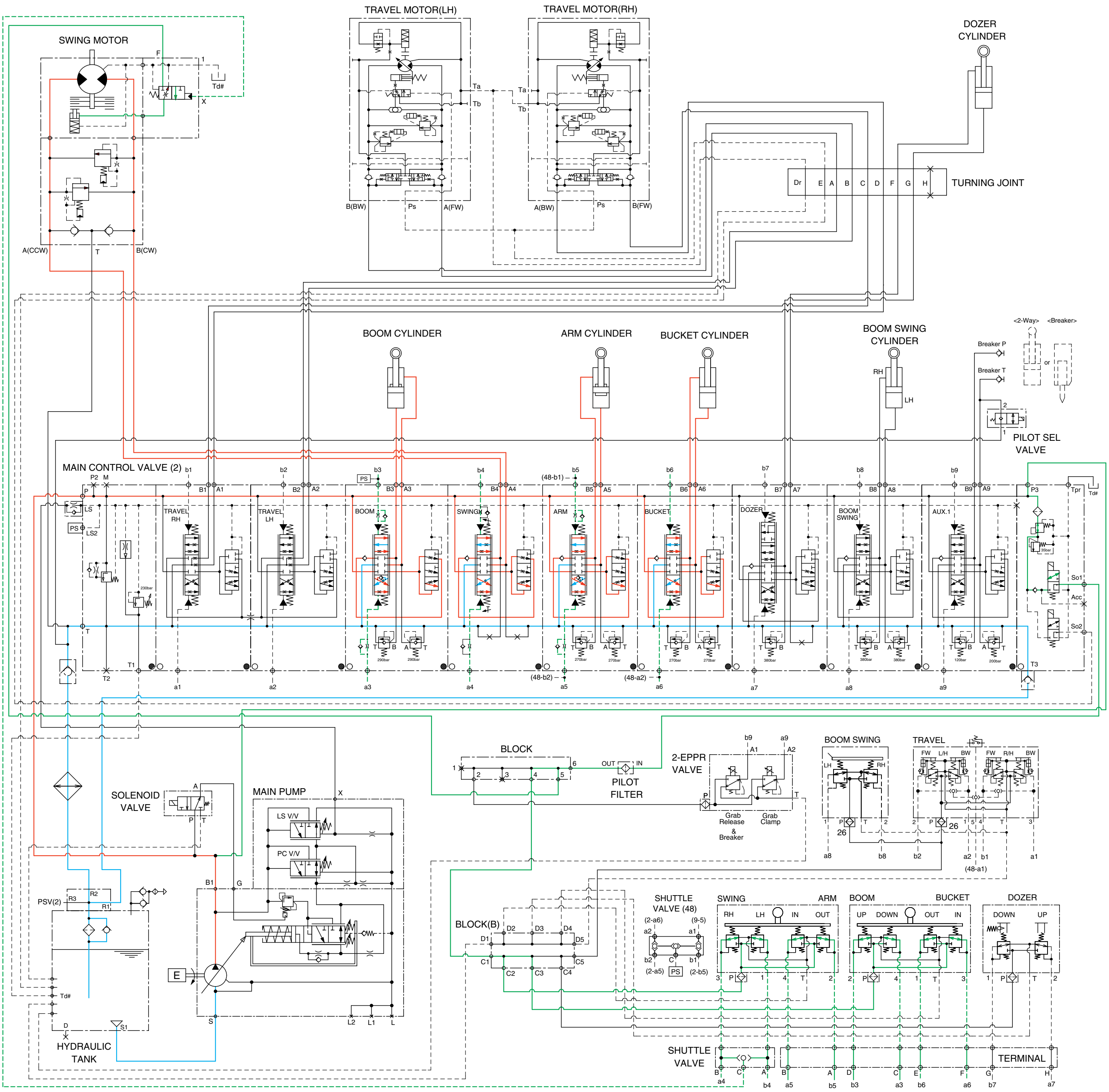
55ACR3HC33

When the swing and bucket functions are operated, simultaneously the swing spool and bucket spool in the main control valve are moved to the functional position by the pilot oil pressure (a4, b4, a6, b6) from the remote control valve.

The oil from the main pump flows into the swing motor through the swing spool via the parallel passage and flows into the bucket cylinder through the bucket spool.

The superstructure swings and the bucket is operated.

5. COMBINED SWING, BOOM, ARM AND BUCKET OPERATION



55ACR3HC34

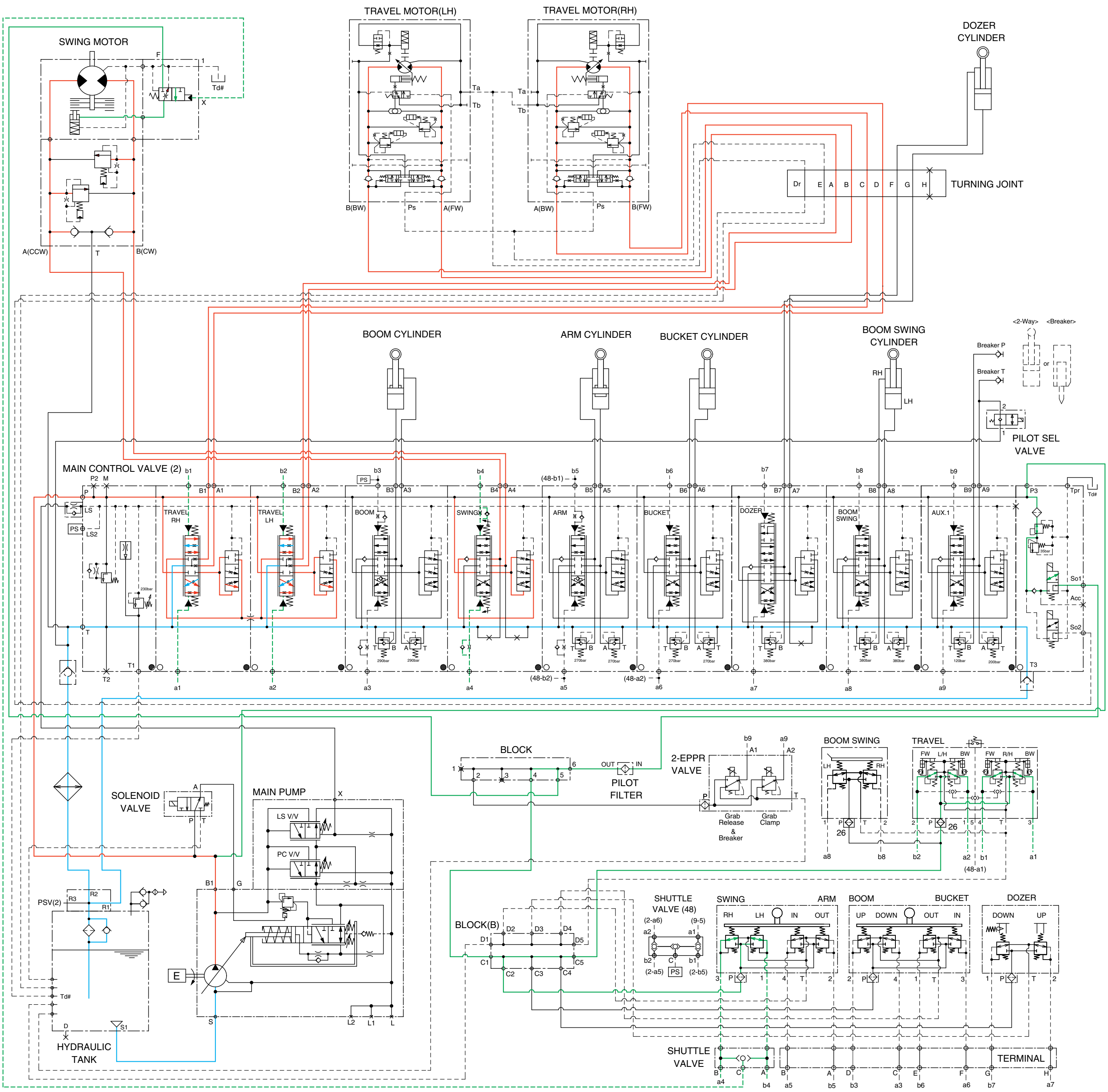
When the swing, boom, arm and bucket functions are operated, simultaneously each spool in the main control valve is moved to the functional position by the pilot oil pressure (a4, b4, a3, b3, a5, b5. a6, b6) from the remote control valve.

The oil from the main pump flows into the boom cylinder, arm cylinder and bucket cylinder through the boom spool, arm spool, bucket spool by the parallel passage.

Also, the oil flows into the swing motor through the swing spool via the parallel passage.

The superstructure swings and the boom, arm and bucket are operated.

6. COMBINED SWING AND TRAVEL OPERATION



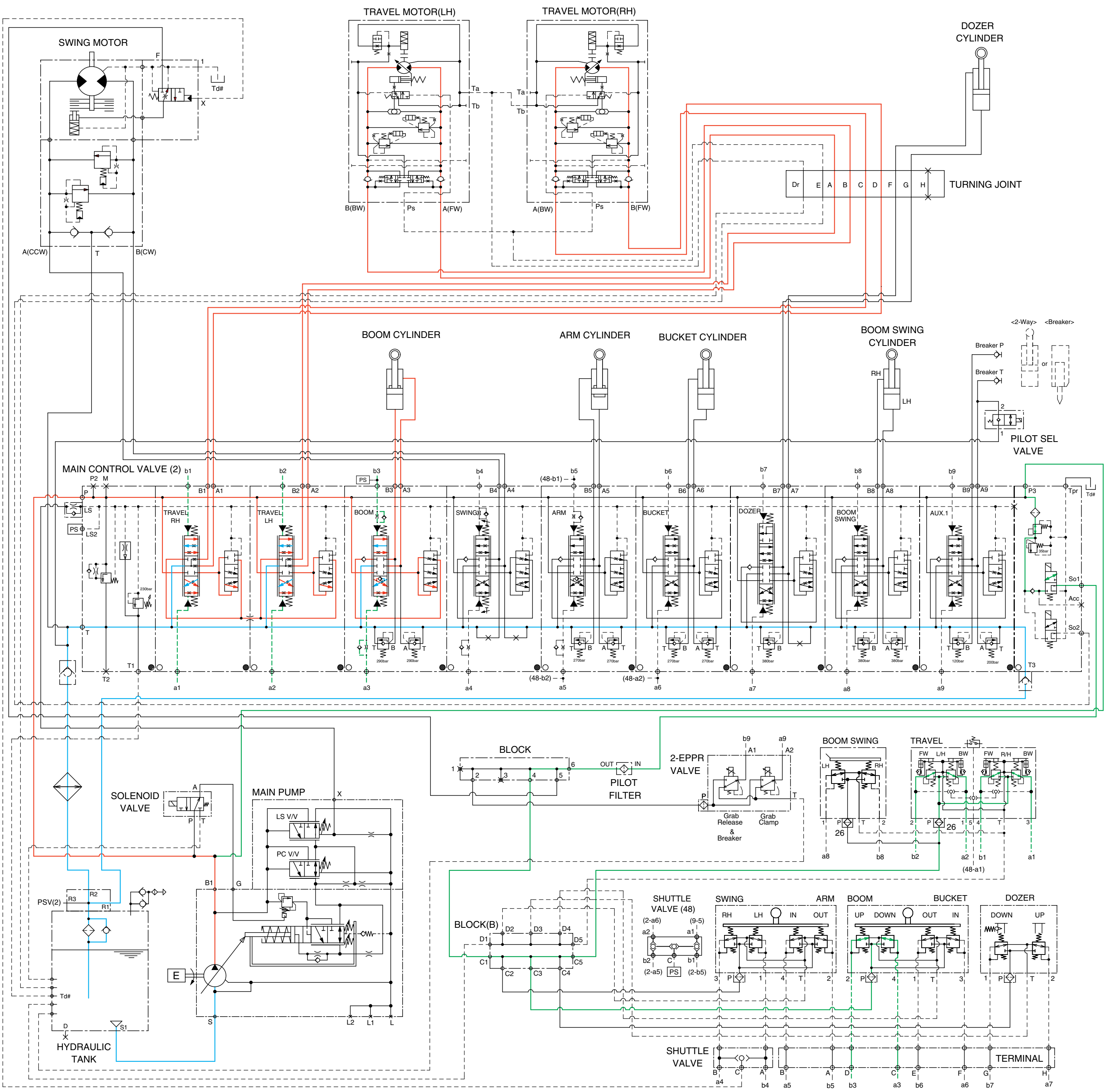
55ACR3HC35

When the swing and travel functions are operated, simultaneously the swing spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (a4, b4, a1, b1, a2, b2) from the remote control valve.

The oil from the main pump flows into the swing motor and LH and RH travel motors through the swing spool and both travel spools via the parallel passage.

The superstructure swings and the machine travels straight.

7. COMBINED BOOM AND TRAVEL OPERATION



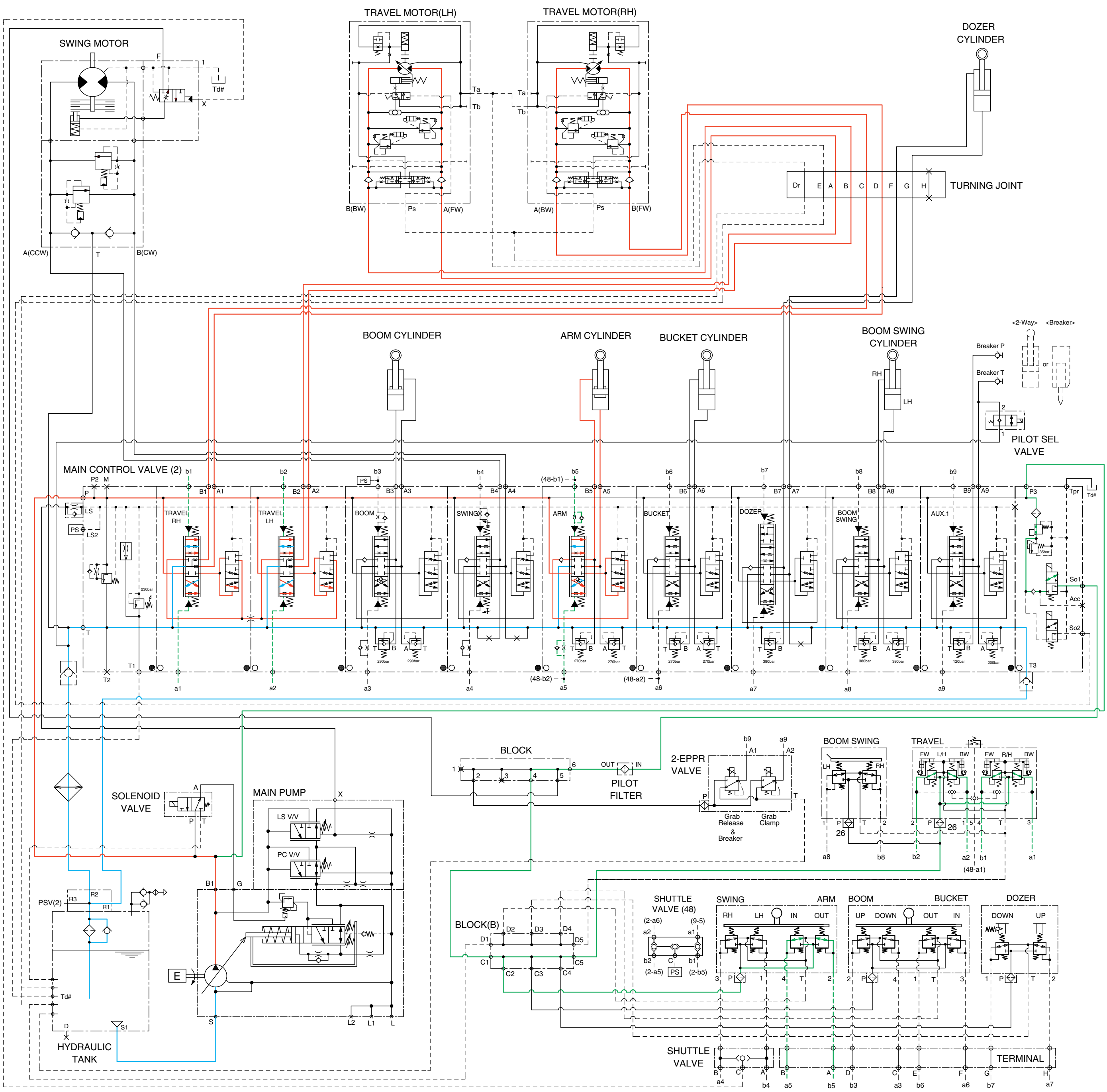
55ACR3HC36

When the boom and travel functions are operated, simultaneously the boom spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (a3, b3, a1,b1, a2, b2) from the remote control valve.

The oil from the main pump flows into the boom cylinder and the travel motors through boom, travel LH and travel RH spools via the parallel passage.

The boom is operated and the machine travels straight.

8. COMBINED ARM AND TRAVEL OPERATION



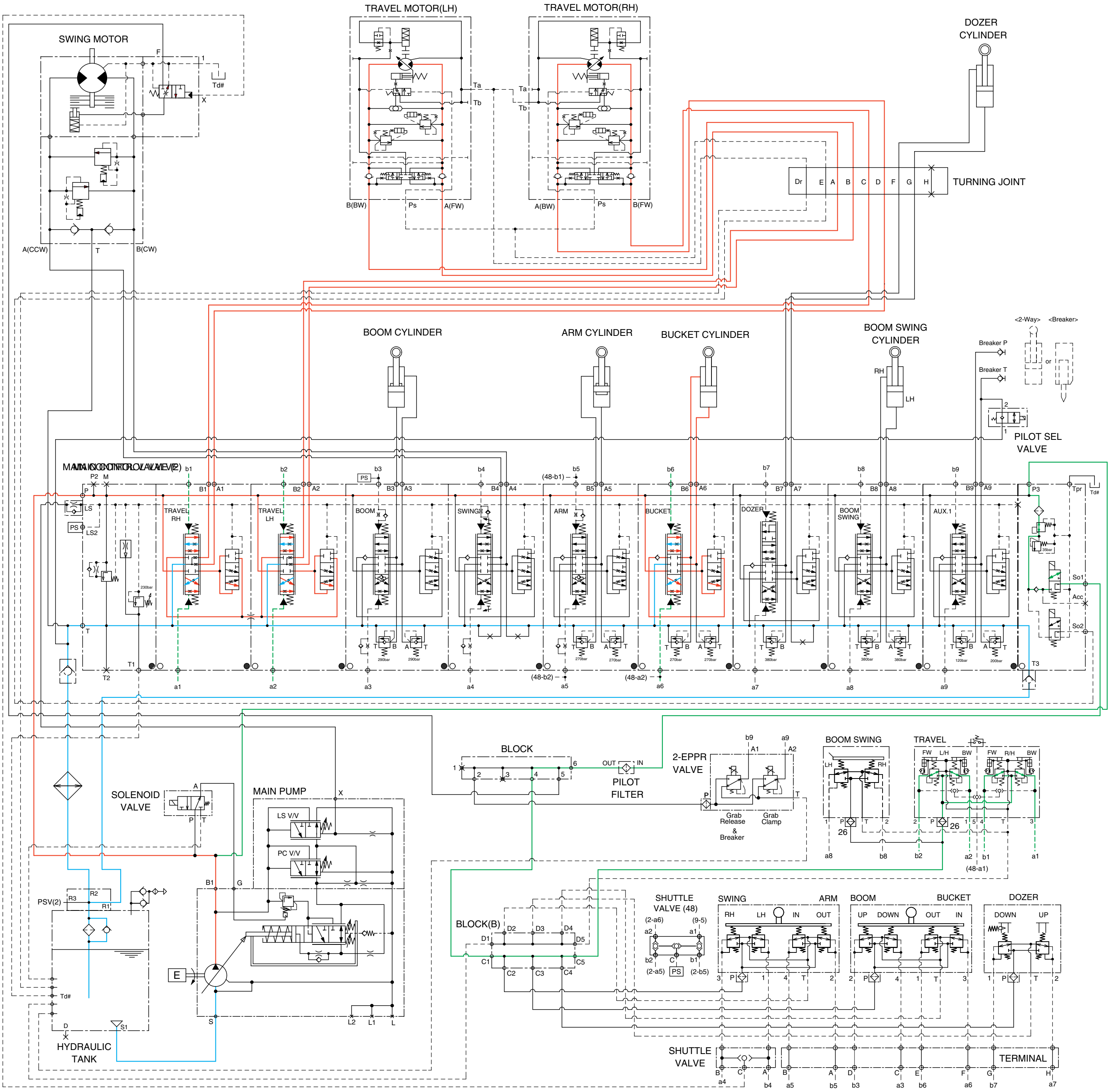
55ACR3HC37

When the arm and travel functions are operated, simultaneously the arm spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (a5, b5, a1, b1, a2, b2) from the remote control valve.

The oil from the main pump flows into the travel motors and the arm cylinder through travel spools and arm spools via the parallel passage.

The arm is operated and the machine travels straight.

9. COMBINED BUCKET AND TRAVEL OPERATION



55ACR3HC38

When the bucket and travel functions are operated, simultaneously the bucket spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (a6, b6, a1, b1, a2, b2) from the remote control valve. The oil from the main pump flows into the travel motors and the bucket cylinder through the travel spools and the bucket spool via the parallel passage.

The bucket is operated and the machine travels straight.

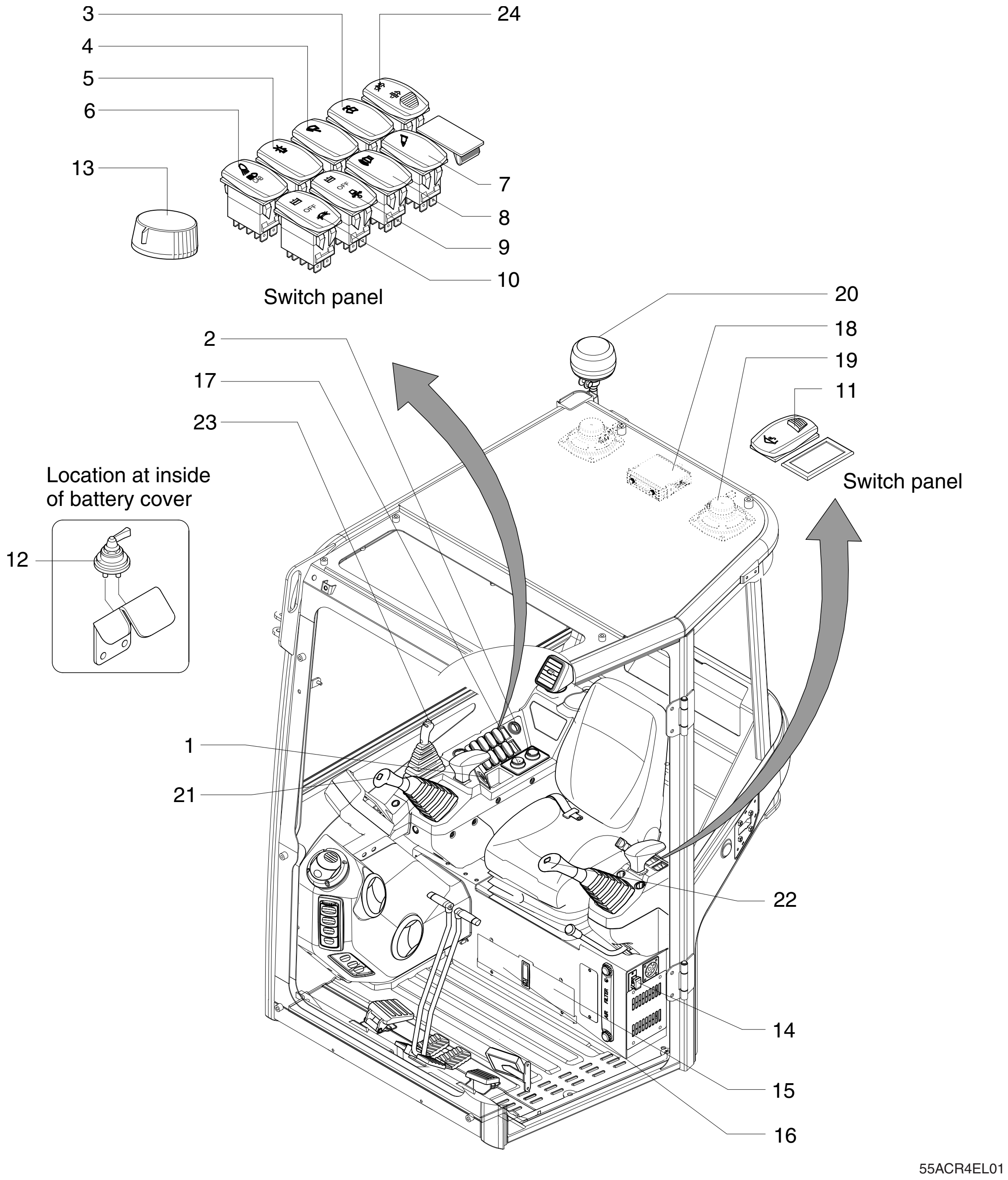
SECTION 4 ELECTRICAL SYSTEM

Group 1 Component Location ········· 4-1
Group 2 Monitoring system ········· 4-3
Group 3 Electrical Circuit ········· 4-32
Group 4 Electrical Component Specification ········· 4-50
Group 5 Connectors ········· 4-59

SECTION 4 ELECTRICAL SYSTEM

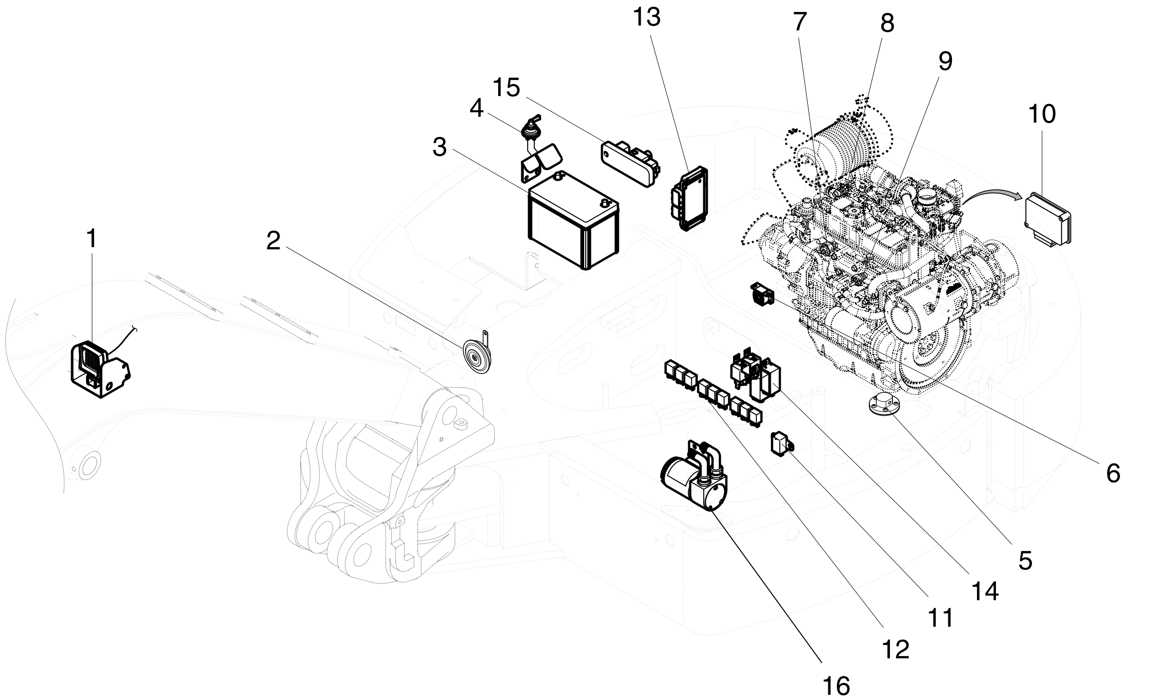
GROUP 1 COMPONENT LOCATION

1. LOCATION 1



1	Start switch	10	Aux 1 switch	19	Speaker
2	Power socket	11	Quick coupler switch	20	Beacon lamp
3	Washer switch	12	Master switch	21	RH control lever switch (horn, quick coupler, breaker, 2-way)
4	Wiper switch	13	Accel dial		
5	Beacon lamp switch	14	Emergency stop switch	22	LH control lever switch (rotating, proportional on/off)
6	Work light switch	15	Relay box		
7	Breaker select switch	16	Fuse box	23	Dozer control switch (dozer floating, angle dozer, 2-speed travel)
8	Travel alarm switch	17	Air conditioner switch		
9	Aux 2 switch	18	New cassette radio	24	DPF swittch

2. LOCATION 2



55ACR4EL02

1	Work lamp	7	Engine oil pressure switch	13	Hydraulic control unit
2	Low horn	8	Air cleaner pressure switch	14	Power relay
3	Battery	9	Water temperature sender	15	Battery power relay
4	Master switch	10	ECU	16	Fuel filler pump
5	Fuel sender	11	Inlet wiper relay		
6	Travel alarm buzzer	12	Micro 12V relay		

GROUP 2 MONITORING SYSTEM

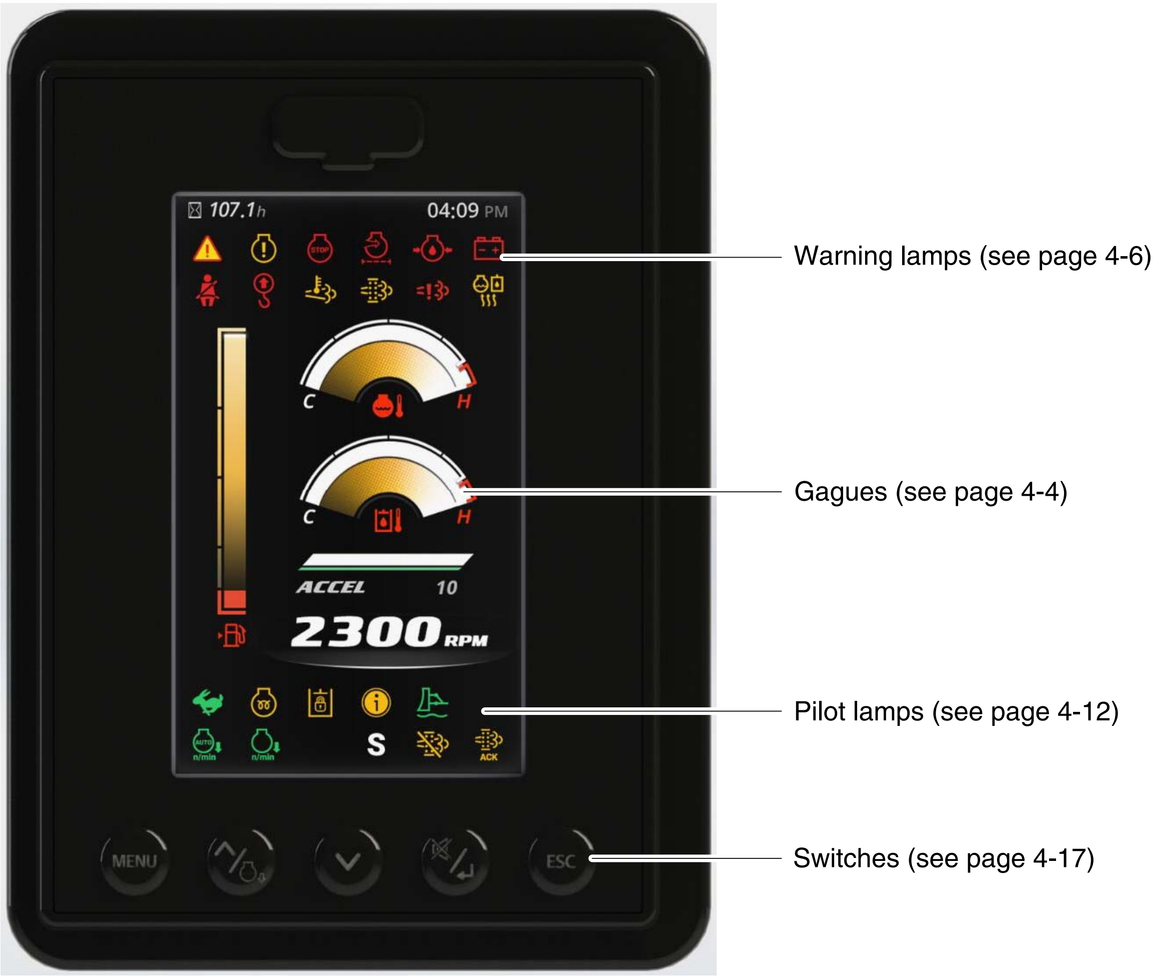
1) CLUSTER

The cluster consists of LCD and switches as shown below. The LCD is to warn the operator in case of abnormal machine operation or conditions for the appropriate operation and inspection.

The LCD is to display for monitoring, manage and display set with the switches.

※ The cluster installed on this machine does not entirely guarantee the condition of the machine. Daily inspection should be performed according to the operator's manual chapter 6, Maintenance.

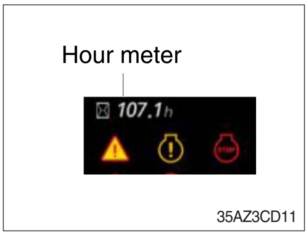
※ When the cluster provides a warning, immediately check the problem and perform the required action.



48AZ4CD05

2) GAUGES AND DISPLAYS

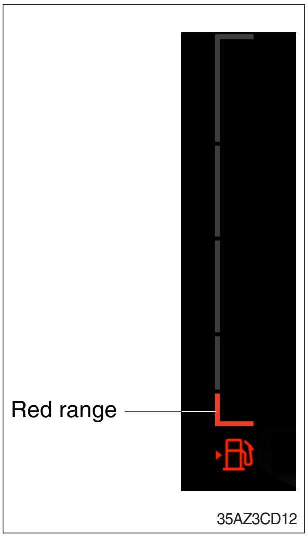
(1) Hour meter



① This meter shows the total operation hours of the machine.

② Always ensure the operating condition of the meter during the machine operation.
Inspect and service the machine based on hours as indicated in chapter 6, maintenance.

(2) Fuel gauge

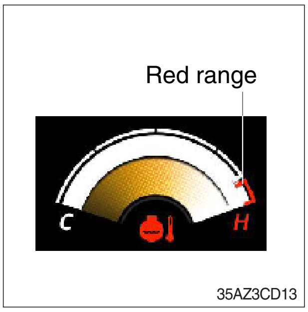


① This gauge indicates the amount of fuel in the fuel tank.

② Fill the fuel when in the red range or warning lamp ON.

※ **If the gauge illuminates the red range or warning lamp ON even though the machine is in the normal condition range, check the electric device as this can be caused by poor connection of sensor.**

(3) Engine coolant temperature gauge



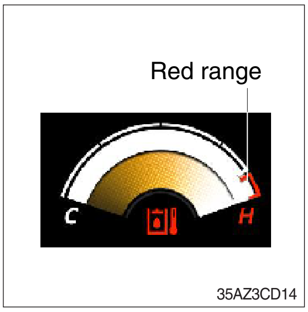
① This indicates the temperature of coolant.
 · Red range : Above 110°C (230°F)

② When the red range pointed or warning lamp ON, engine do not abruptly stop but run it at medium speed to allow it to cool gradually, then stop it.
Check the radiator and engine.

※ **If the engine is stopped without cooled down running, the temperature of engine parts will rise suddenly, this could cause severe engine trouble.**

※ **If the gauge indicates the red range or warning lamp ON in red even though the machine is in the normal condition range, check the electric device as this can be caused by poor connection of sensor.**

(4) Hydraulic oil temperature gauge



① This gauge indicates the temperature of hydraulic oil.

· Red range : Above 105°C (221°F)

② If the indicator is in the red range or lamp ON in red, reduce the load on the system. If the gauge stays in the red range, stop the machine and check the cause of the problem.

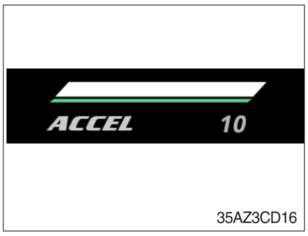
※ If the gauge indicates the red range or warning lamp ON in red even though the machine is in the normal condition range, check the electric device as this can be caused by poor connection of sensor.

(5) Engine rpm gauge and clinometer

① This displays the engine speed.

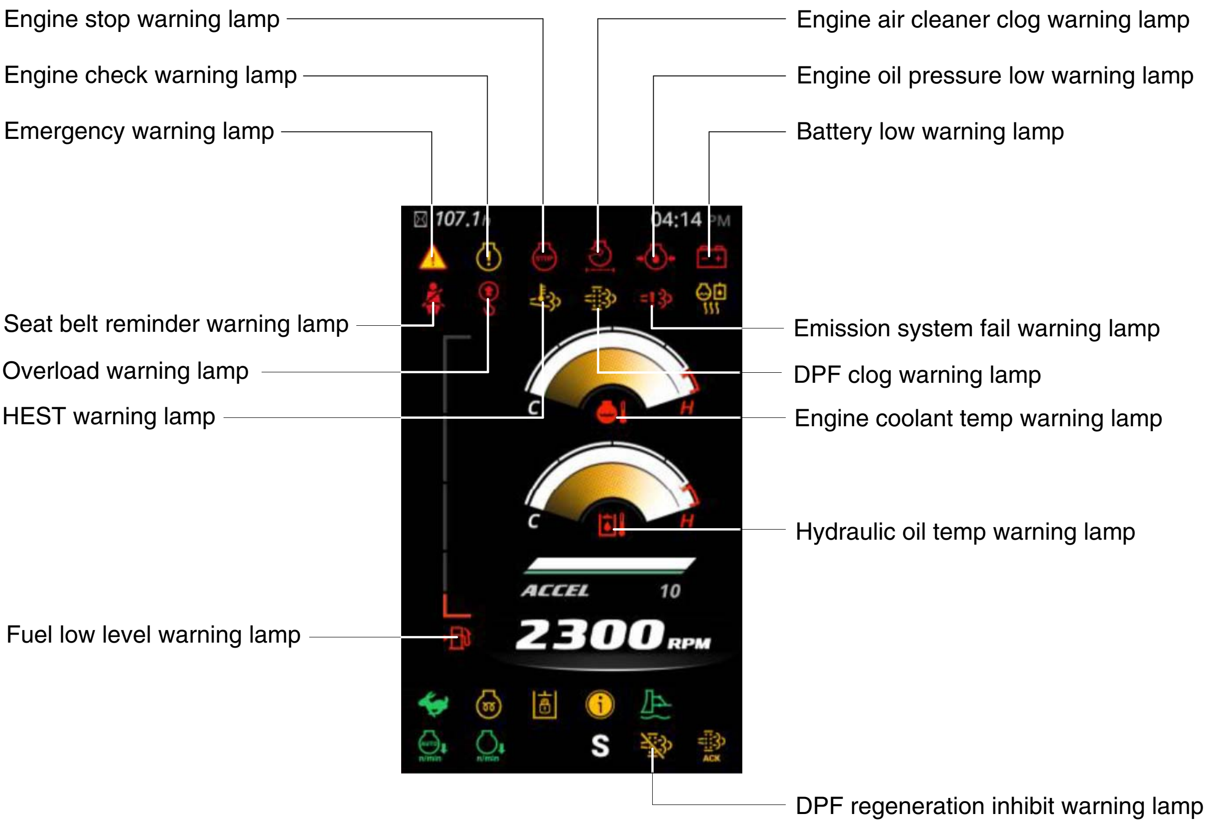
② This displays the tilt of machine.

(6) Accel dial gauge



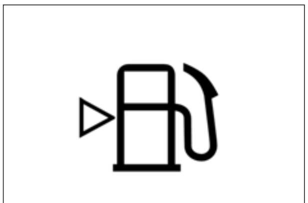
① This gauge indicates the level of accel dial from 0 to 10 step.

3) WARNING LAMPS



48AZ3CD20

(1) Fuel low level warning lamp

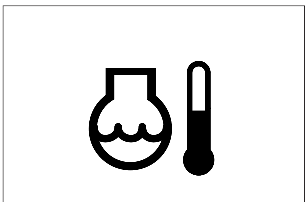


35AZ3CD21

① This lamp lights up and buzzer sounds when the level of fuel is below 18.9 ℓ (5.0 U.S. gal).

② Fill the fuel immediately when the lamp ON.

(2) Engine coolant temperature warning lamp

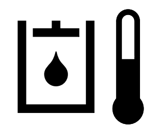


35AZ3CD22

① This lamp lights up and buzzer sounds when the temperature of coolant is over the normal temperature 115°C (239°F).

② Check the cooling system when the lamp ON.

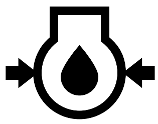
(3) Hydraulic temperature warning lamp



35AZ3CD23

① This lamp lights up and buzzer sounds when the temperature of coolant is over the normal temperature 105°C (221°F).
② Check the cooling system when the lamp ON.

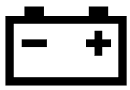
(4) Engine oil pressure low warning lamp



R5573CD13

① This lamp lights up and buzzer sounds after starting the engine because of the low oil pressure.
② If the lamp ON during engine operation, shut OFF engine immediately. Check oil level.

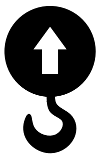
(5) Battery low warning lamp



R5573CD16

① This lamp lights up and buzzer sounds when the starting switch is ON, it is turned OFF after starting the engine.
② Check the battery charging circuit when this lamp blinks during engine operation.

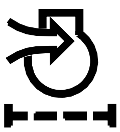
(6) Overload warning lamp



R25Z9AK3CD24

① When the machine is overloaded, this lamp blinks and buzzer sounds.
② Reduce the machine load.

(7) Air cleaner clog warning lamp



R25Z9AK3CD20

① This lamp lights up and buzzer sounds when the element of the air cleaner is clogged.
② Check, clean or replace element.

(8) Emergency warning lamp

290F3CD64

① This lamp pops up and the buzzer sounds when each of the below warnings occurs.
- Hydraulic oil temperature high warning lamp ON
- Engine coolant temperature high warning lamp ON
- Communication error with ECU

※ **The pop-up warning lamp moves to the original position and lights up when the buzzer stop switch is pushed or pop-up is touched. The buzzer will stop. This is same as following warning lamps.**

② When this warning lamp lights up, machine must be checked and serviced immediately.

(9) Check engine warning lamp

290F3CD66

① This warning lamp lights up and buzzer sounds when the engine must be checked.

※ **When the warning lamp lights up, stop the machine and find the cause for repair.**

(10) Engine stop warning lamp

290F3CD252

① If this warning lamp lights up and buzzer sounds, stop the engine immediately and check the engine.

② Check the fault codes on the monitor.

※ **Please contact your Hyundai service center or local dealer.**

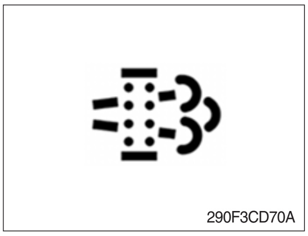
(11) Seat belt reminder warning lamp

300A3CD25

① When operator does not fasten the operator's the seat belt, the seat belt reminder warning lamp pops up and buzzer sounds.

② Fasten the seat belt.

(12) DPF clog warning lamp



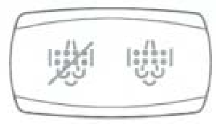
① This warning lamp lights up and the buzzer sounds when the regeneration is needed.
② For details, please refer to the after-treatment system below.

※ DPF : Diesel Particulate Filter

※ After-treatment system
The after-treatment system uses DOG and DPF to satisfy the exhaust regulations.
The oxidation catalyst of DOG reduces the emission of hydrocarbon and carbon monoxide through the catalyst, and the particle materials (PM) discharged from the engine are collected.
DPF regeneration is composed of "forced regeneration" during driving and "manual regeneration" performed by the driver.
When the regeneration is not performed successfully according to the procedure, warning lamp relevant to the each operating condition is turned ON.
When the warning lamp is turned ON, park the machine on a safe place, and perform the regeneration process manually according to the following procedure.
The warning lamp is turned OFF when the regeneration process is performed successfully.

⚠ Engine power can be reduced when the regeneration process is not performed manually after the warning lamp is turned ON.

※ Manual (Forced) DPF regeneration method


HW65A3CD24K

DPF regeneration procedure is activated manually by the driver when the driver selects to initiate the regeneration procedure.

Because the operating condition is inappropriate for the hot engine exhaust temperature (Ex.: Work near the inflammable materials), manual regeneration may be required if the driver prohibited the active regeneration procedure for long period.

① Manual regeneration condition

- Coolant (Engine oil) temperature : 40°C or more
- Engine RPM : Low-speed idle run
- Parking brake must be applied (Only relevant to the wheel-type machine)
- When the soot concentration is accumulated to 20% or more

② Manual (Forced) regeneration procedure

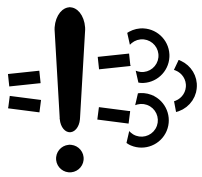
Park the machine on a well-ventilated area, and keep away from inflammable materials to set the machine as shown below.

- Operate the machine until the engine coolant and oil temperature becomes 40°C or more.
- Engine speed is set to low speed.
- Put the gear lever on neutral, and apply the parking brake. (Only relevant to wheel-type machine)
- Safety lever is placed on the locking position.
- When the regeneration mode is in "Prohibit", DPF switch is pressed to the manual regeneration position.

③ Regeneration switch is activated to initiate the regeneration procedure.

※ Refer to the operator's manual page 3-35 for the DPF switch.

(13) Exhaust system failure warning lamp

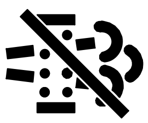


HW60A3CD53A

① This warning lamp is turned ON in 3 cases such as when the quantitative distribution is stopped, poor reagent quality and monitoring malfunction, etc.
② Please refer to the exhaust gas control system below.

※ Exhaust gas control system
This machine is equipped with the engine exhaust gas emission control system that satisfies the exhaust gas emission regulations. The owner/driver has the responsibility of proper operation and maintenance on the exhaust control system provided in the guaranteed provisions related to emission.
The engine exhaust system is mounted on the DPF. DPF is a emission reduction device that reduces the diesel particulate matter or soot from the exhaust gas of the diesel engine. DPF is stored until the particulate matter is combusted. The process of combustion and elimination of the stored particulate matter is referred to as "Regeneration". After the regeneration process is completed, residue is remaining, and it must be removed from the DPF regularly.

(14) DPF regeneration inhibit warning lamp



85A3CD107

① This warning lamp indicates, the DPF switch is pushed to the inhibit position, therefore automatic and manual regeneration can not occur.

※ Refer to page the operator's manual 3-35 for the DPF switch.

(15) HEST (High exhaust system temperature) warning lamp

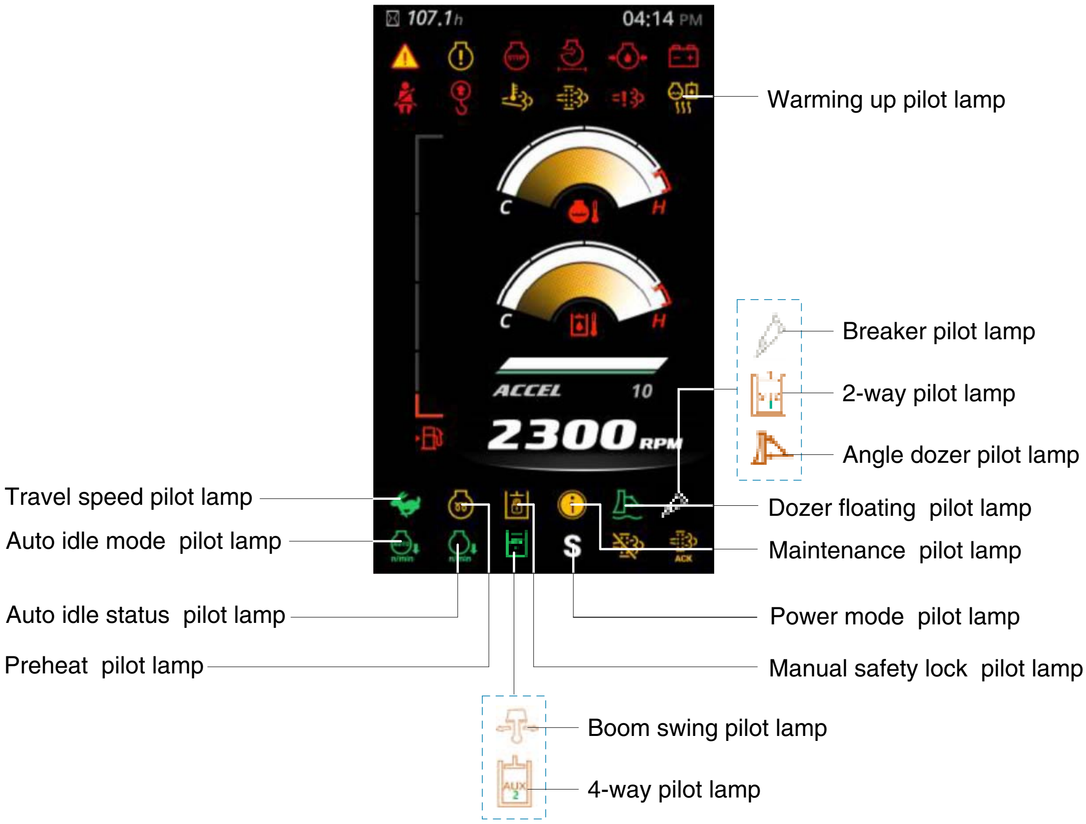
85A3CD109

① This warning lamp indicates, when illuminated, that exhaust temperatures are high due to regeneration of the DPF.
② The lamp will also illuminate during a manual regeneration.
③ When this lamp is illuminated, be sure the exhaust pipe outlet is not directed at any surface or material that can melt, burn, or explode.

⚠ When this lamp is illuminated, the exhaust gas temperature could reach 600°C [1112°F], which is hot enough to ignite or melt common materials, and to burn people.

※ The lamp does not signify the need for any kind of equipment or engine service; It merely alerts the equipment operator to high exhaust temperatures. It is common for the lamp to illuminate on and off during normal equipment operation as the engine completes regeneration cycles.

4) PILOT LAMP

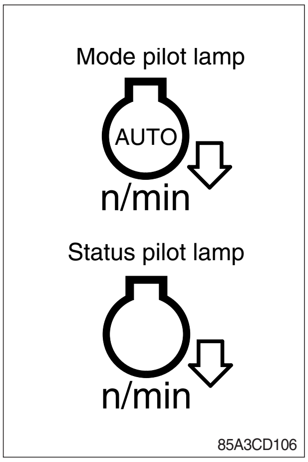


35AZ3CD30

(1) Power mode pilot lamp

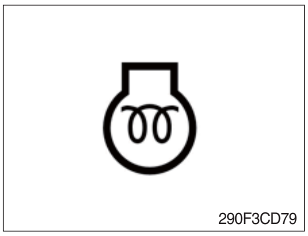
No	Mode	Pilot lamp	Selected mode
1	Power mode	P S	Heavy duty power mode (2000 rpm) Standard power mode (1750 rpm)
2	Travel mode	 	Low speed traveling High speed traveling

(2) Auto idle status/ mode pilot lamp



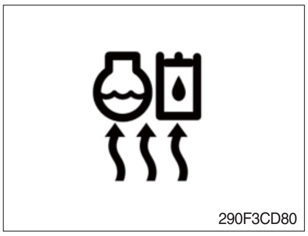
① The auto idle mode pilot lamp will light up when the idle mode is selected.
② The auto idle status pilot lamp will light up when all levers and pedals are at neutral position and the auto idle mode is selected.
③ One of the lever or pedal is operated, the status lamp will go off and the engine speed returns to the previous conditions.

(3) Preheat pilot lamp



① Turning the start key switch to the ON position starts preheating in cold weather.
② Start the engine after this lamp goes OFF.
※ Refer to the operator's manual page 4-4 for details.

(4) Warming up pilot lamp



① This lamp lights up when the coolant temperature is below 30°C (86°F).
② The automatic warming up is cancelled when the engine coolant temperature is above 30°C (86°F), or when 10 minutes have passed since starting the engine.

(5) Maintenance pilot lamp

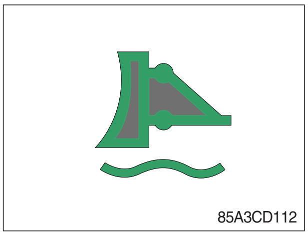
① This lamp lights up when consumable parts are in need of replacement. It means that the change or replacement interval of parts is 30 hours from the required change interval.
② Check the message in maintenance information of main menu. Also, this lamp lights up for 3 minutes when the start switch is switched to the ON position.

(6) Manual safety lock pilot lamp

① This lamp lights up when the safety lever is set to the LOCK position.

※ Refer to the operator's manual page 3-35 for the safety lever.

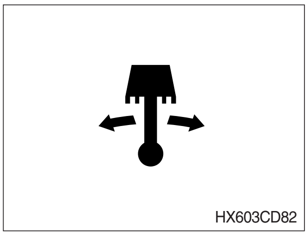
(7) Dozer floating pilot lamp



① This lamp will be light up when the dozer floating lever is pressed.

※ Refer to the operator's manual page 3-37.

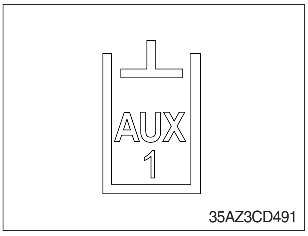
(8) Boom swing pilot lamp



① This lamp lights up when the boom offset switch is pressed.

※ Refer to the operator's manual page 3-35.

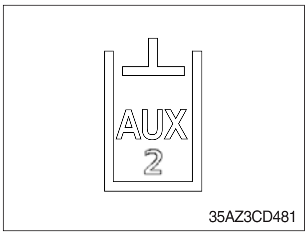
(9) 2-way pilot lamp



① This lamp lights up when the option flow control function is activated in the cluster.

※ Refer to the page 4-28.

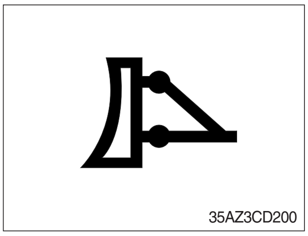
(10) 4-way (rotating) pilot lamp



① This lamp lights up when the boom swing selection switch is set to the rotator (not used boom swing) and the 4-way operation switch on the LH control lever is pressed.

※ Refer to the page 4-28.

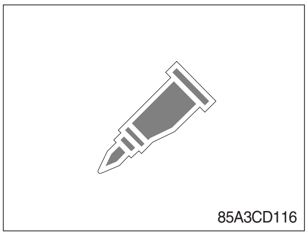
(11) Angle dozer pilot lamp



① This lamp will be light up when the AUX 1 switch is pressed to ANGLE DOZER positions.

※ Refer to the operator's manual page 3-35.

(12) Breaker pilot lamp



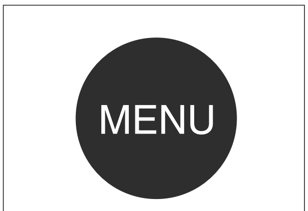
① This lamp will be light up when the breaker select switch is pressed.

※ Refer to the operator's manual page 3-34.

5) SWITCHES

Sound short beep when each button is pressed.

(1) Menu button



35AZ3CD35

① Go into the menu screen.

※ Please refer to page 4-17.

(2) Left/up/(+) and auto idle button

35AZ3CD36

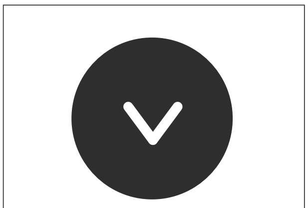
① Move left in sub menu.

② Move up in menu list

③ Increase input value in menu

④ Auto idle ON or OFF in the operation screen

(3) Right/down/(-) button



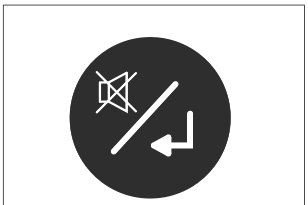
35AZ3CD37

① Move right in sub menu.

② Move down in menu list

③ Decrease input value in menu

(4) Enter and buzzer stop button

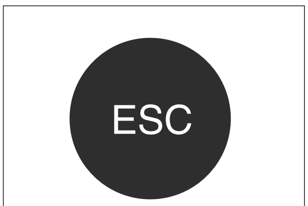


35AZ3CD38

① Select menu (enter).

② Stop buzzer sound when press this button more than 1.7 sec.

(5) ESC/ rear camera button

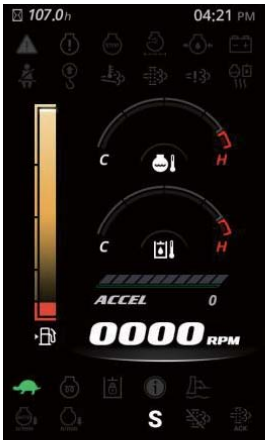
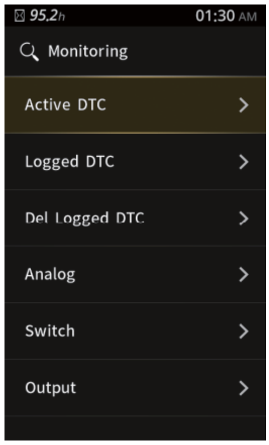


35AZ3CD39

① Escape in the menu.

② Rear camera ON or OFF in the operation screen

6) MAIN MENU

Operation screen		Main menu screen		Sub menu screen
 35AZ3CD100	press MENU button MENU →	 35AZ3CD106	→	 35AZ3CD107

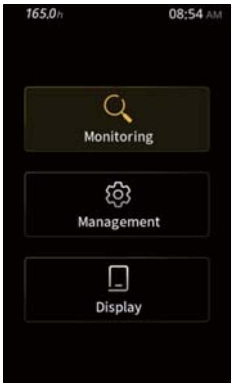
※ Please refer to the switches, page 4-16 for selection and change of menus and input values.
※ In the operation screen, press the menu button to access the sub-menu screen.

(1) Structure

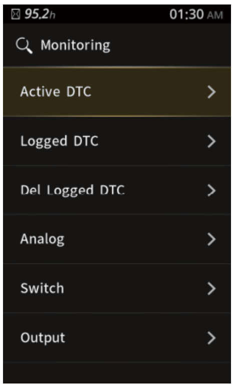
No	Main menu	Sub menu	Description
1	 Monitoring 35AZ3CD103	Active DTC Logged DTC Del logged DTC Analog Switch Output	Machine, Engine Machine, Engine Machine, Engine Hyd oil temp, Coolant temp, Battery volt Engine speed, Accel dial volt Safety lever, Dozer floating, Seat belt, Travel speed Travel speed sol, Dozer floating sol, Start limit relay, Buzzer
2	 Manage 35AZ3CD104	Operating hours Maintenance ESL mode setting Warning setting Password change Machine information Contact Aux. flow	Operating hours Elapsed time, Change interval, Replacement etc. Disabled, Enable (Always), Enable (Interval) Overload on/off Password change Machine, Engine, CMCU A/S phone number, A/S phone number change Aux. flow
3	 Display set 35AZ3CD105	Clock Brightness Unit Language	12 Hour, 24 Hour Manual, Auto Temperature, Pressure Korean, English, Turkish

(2) Monitoring

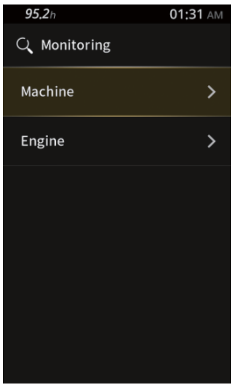
① Active DTC



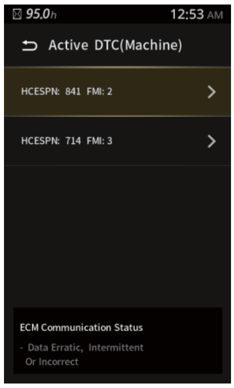
35AZ3CD106



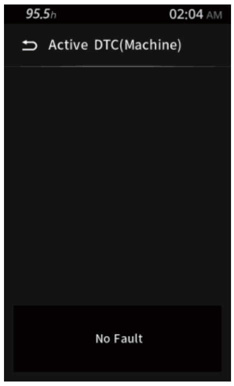
35AZ3CD107



35AZ3CD108



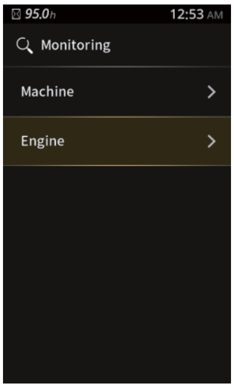
35AZ3CD110



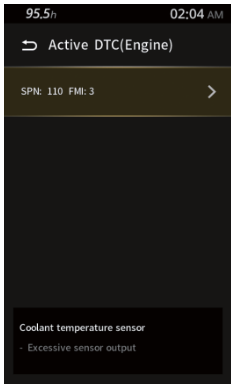
35AZ3CD135

- The active DTC of the machine and engine can be checked by this menu.

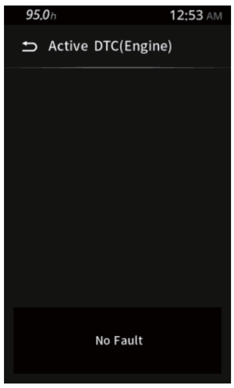
※ DTC : Diagnostic Trouble Code



35AZ3CD109

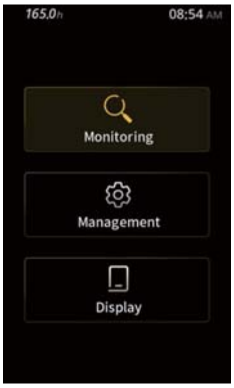


35AZ3CD111

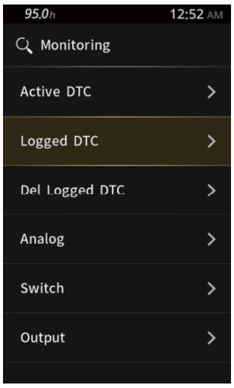


35AZ3CD136

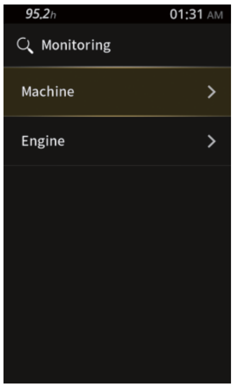
② Logged DTC



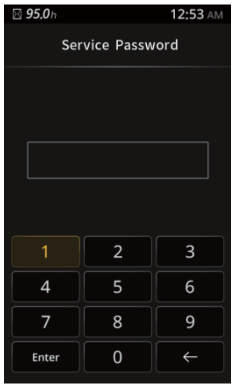
35AZ3CD106



35AZ3CD112

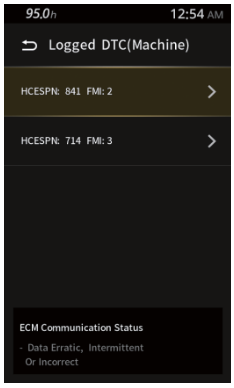


35AZ3CD108

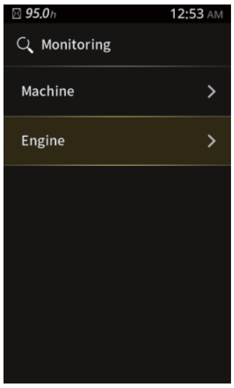


35AZ3CD113

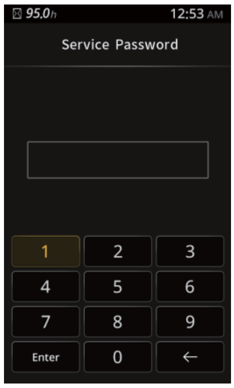
- The logged DTC of the machine and engine can be checked by this menu.
- · This menu can be used only HCE service man.



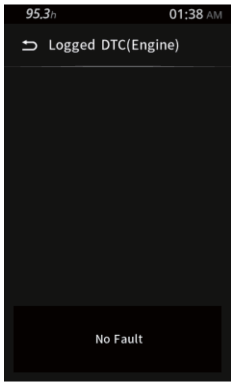
35AZ3CD114



35AZ3CD109

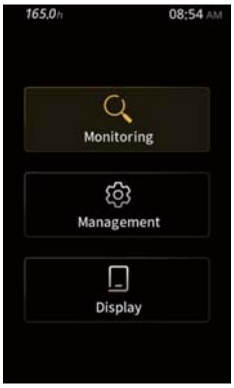


35AZ3CD113

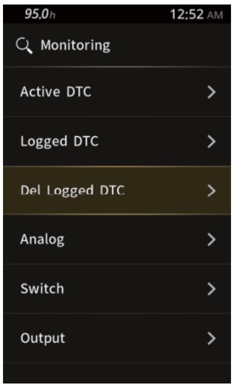


35AZ3CD137

③ Delete logged DTC



35AZ3CD106

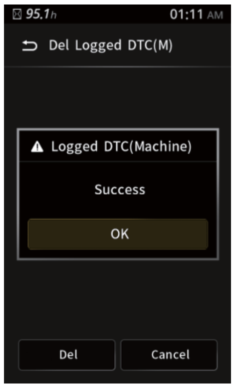


35AZ3CD116

Success

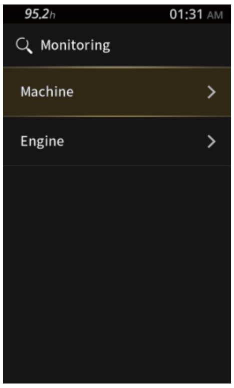
35AZ3CD119

Failure

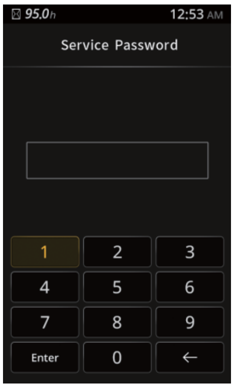


35AZ3CD118

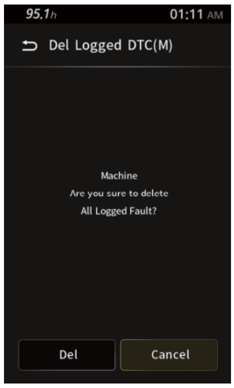
- The logged DTC of the machine and engine can be deleted by this menu.
  (It is possible under the engine stop conditions)



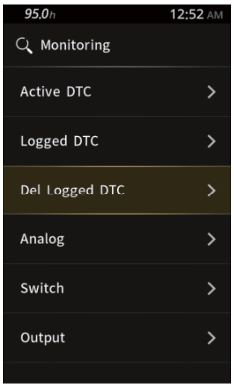
35AZ3CD108



35AZ3CD113



35AZ3CD117



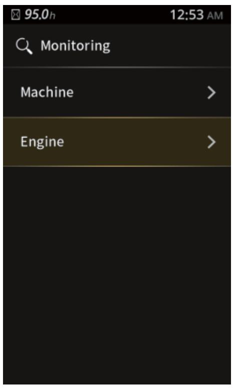
35AZ3CD116

Failure

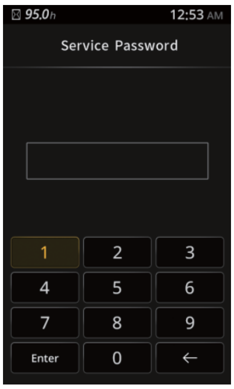
35AZ3CD122

Success

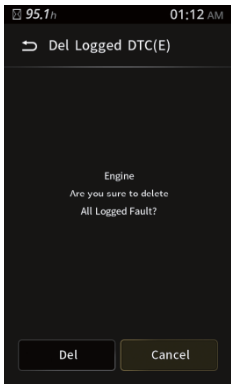
35AZ3CD123



35AZ3CD109

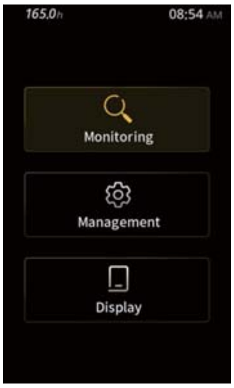


35AZ3CD113

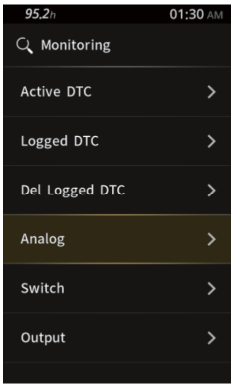


35AZ3CD124

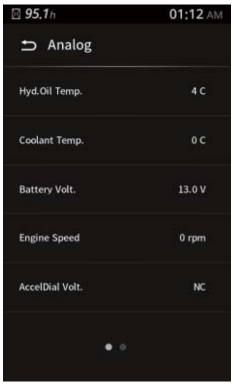
④ Analog



35AZ3CD106

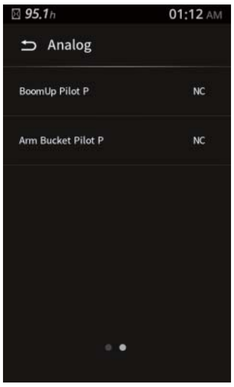


35AZ3CD125



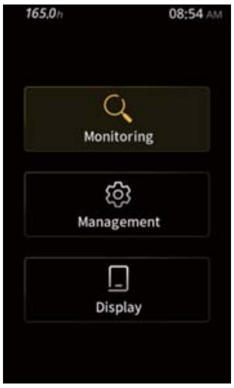
35AZ3CD126

- The machine status such as the engine rpm, oil temperature, voltage and pressure etc. can be checked by this menu.

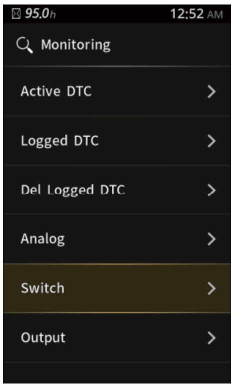


35AZ3CD127

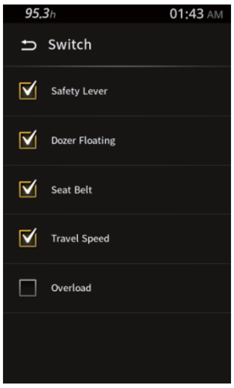
⑤ Switch



35AZ3CD106



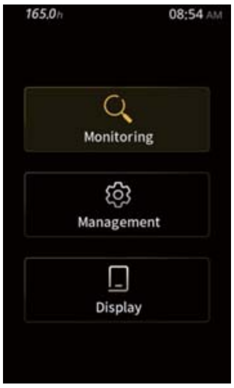
35AZ3CD128



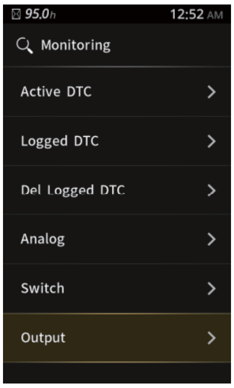
35AZ3CD129

- You can select to display the lamps of the switches on the cluster by this menu.

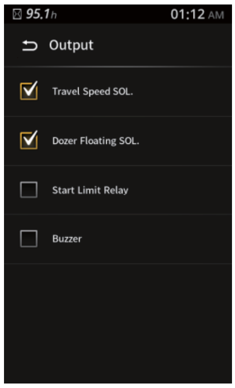
⑥ Output



35AZ3CD106



35AZ3CD130

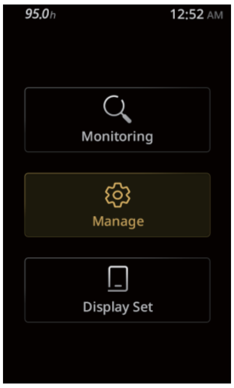


35AZ3CD131

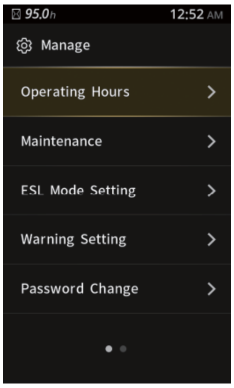
- The output status can be confirmed by this menu.

(3) Manage

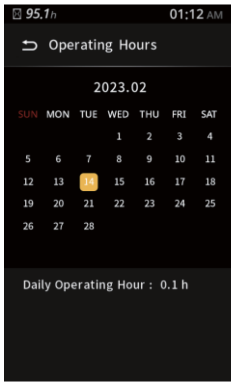
① Operating hours



35AZ3CD140



35AZ3CD141

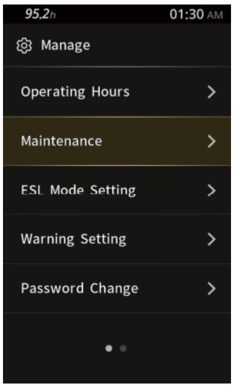


35AZ3CD142

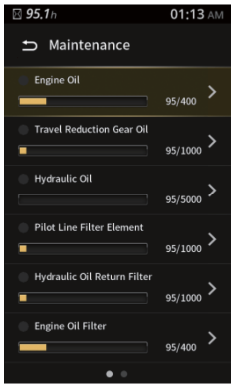
- You can check the operating hours by this menu.

② Maintenance

35AZ3CD140



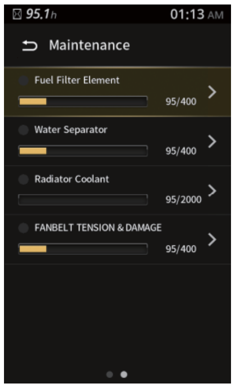
35AZ3CD143



35AZ3CD144

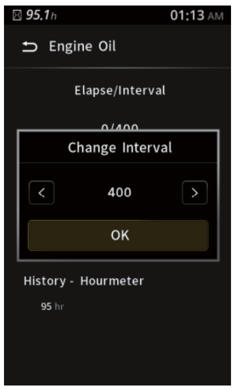
- Elapse : Maintenance elapsed time.
- Interval : The change intervals can be changed in hour increments of 50.
- History-Hourmeter : Display elapsed time.
- Replacement : The elapsed time will be reset to zero (0).

※ Refer to section, Maintenance chart for further information of maintenance interval.



35AZ3CD145

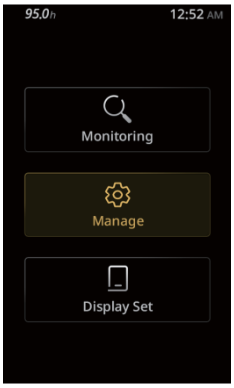
35AZ3CD146



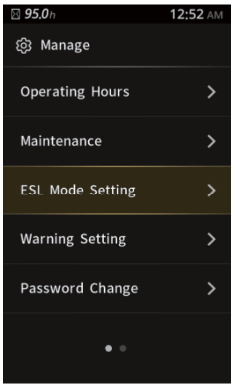
35AZ3CD147

35AZ3CD148

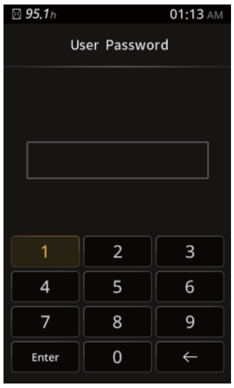
③ ESL mode



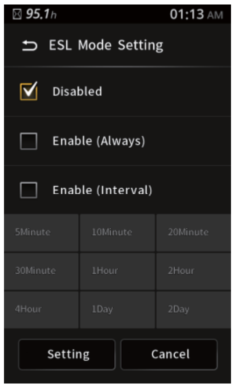
35AZ3CD140



35AZ3CD150



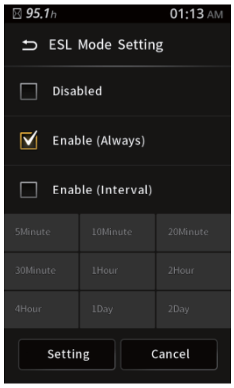
35AZ3CD151



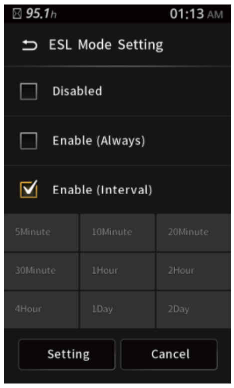
35AZ3CD152

ESL mode setting
- ESL mode is designed to be a theft deterrent or will prevent the unauthorized operation of the machine.
- When you Enable the ESL mode, the password will be required when the starting switch is turned to the on position.
- Machine security
  - · Disable : ESL function is disabled and password is not required to start engine.
  - · Enable (Always) : The password is required whenever the operator starts engine.
  - · Enable (Interval) : The password is required when the operator starts engine first. But the operator can restart the engine within the interval time without inputting the password. The interval time can be set to a maximum 2 days.

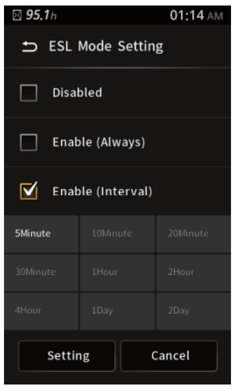
※ ESL : Engine Starting Limit



35AZ3CD153



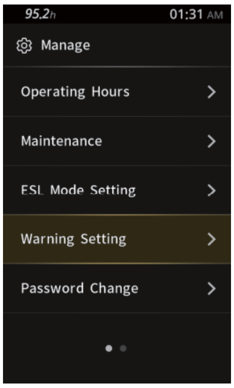
35AZ3CD154



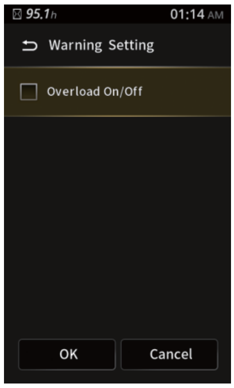
35AZ3CD155

④ Warning setting

35AZ3CD140



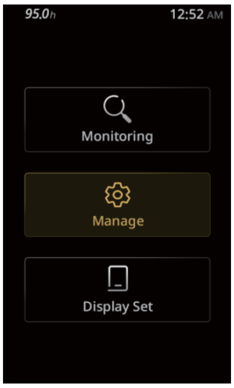
35AZ3CD156



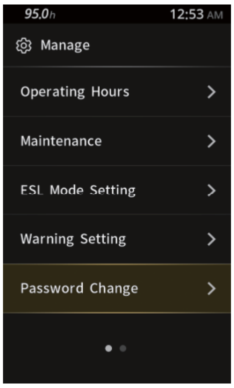
35AZ3CD157

- You can set the warning items by this menu.

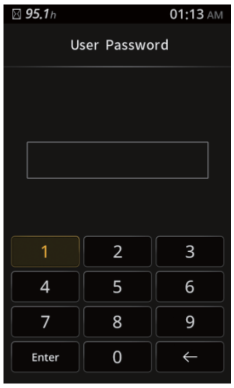
⑤ Password change



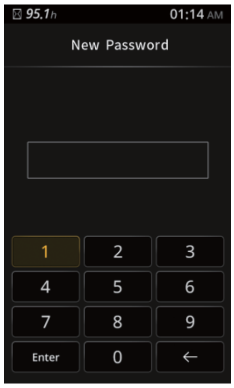
35AZ3CD140



35AZ3CD158



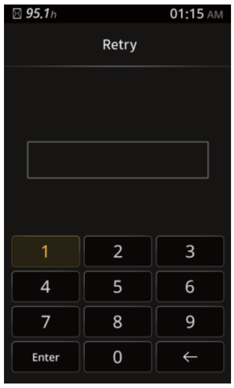
35AZ3CD151



35AZ3CD159

- The password is 5~10 digits.

※ Before first use, please set user password and owner password in advance for machine security.

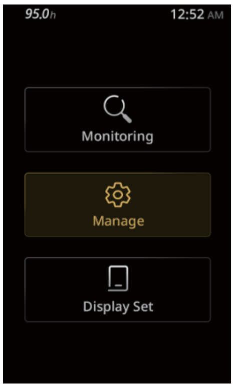


35AZ3CD160

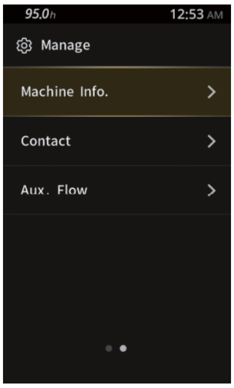
35AZ3CD162

35AZ3CD161

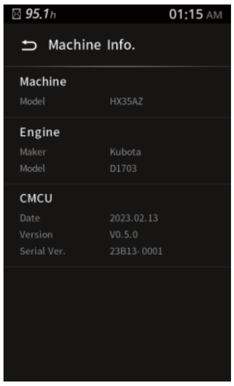
⑥ Machine information



35AZ3CD140



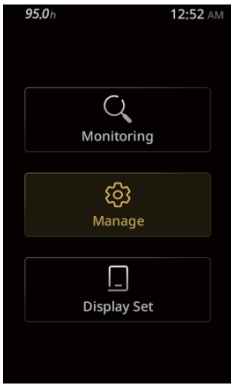
35AZ3CD163



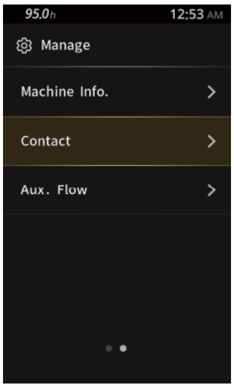
35AZ3CD164

- This can confirm the identification of the machine, engine and cluster.

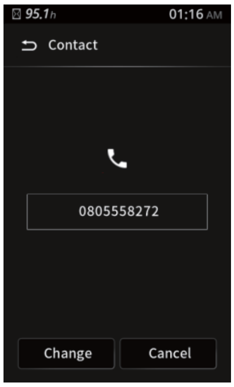
⑦ Contact



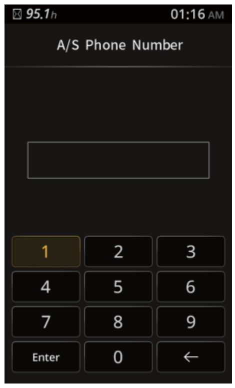
35AZ3CD140



35AZ3CD165



35AZ3CD166

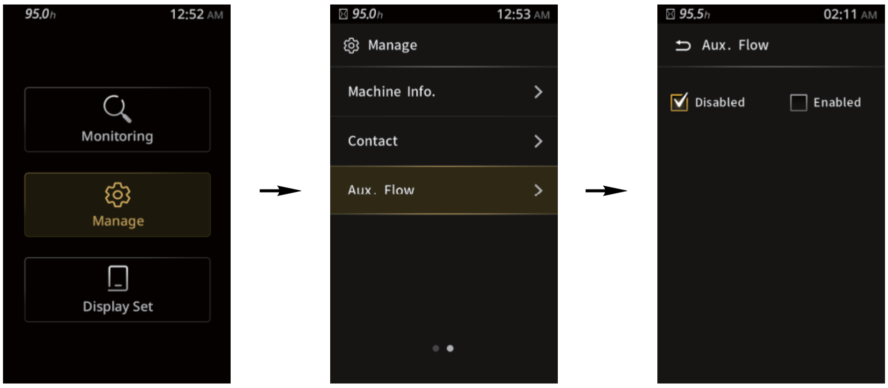


35AZ3CD167

- The A/S phone number can be checked and changed.

⑧ Aux. Flow

- 3 kinds of option attachment can be selected by this menu.
  a. Rotary grapple (4-way)
  b. Grapple (2-way)
  c. Auger (2-way)
- There are two user modes (type A or B) in each option attachment.



35AZ3CD140 35AZ3CD170 35AZ3CD171

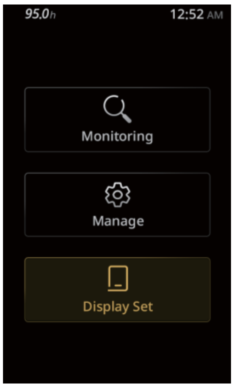
35AZ3CD177 35AZ3CD176 35AZ3CD172 35AZ3CD173

35AZ3CD179 35AZ3CD178 35AZ3CD174

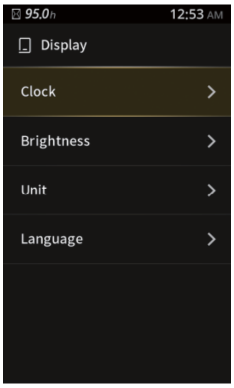
35AZ3CD181 35AZ3CD180 35AZ3CD175

(4) Display set

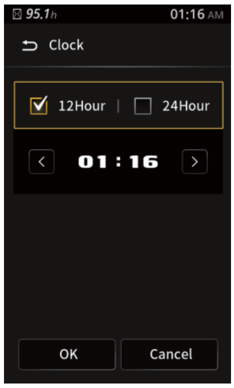
① Clock



35AZ3CD185



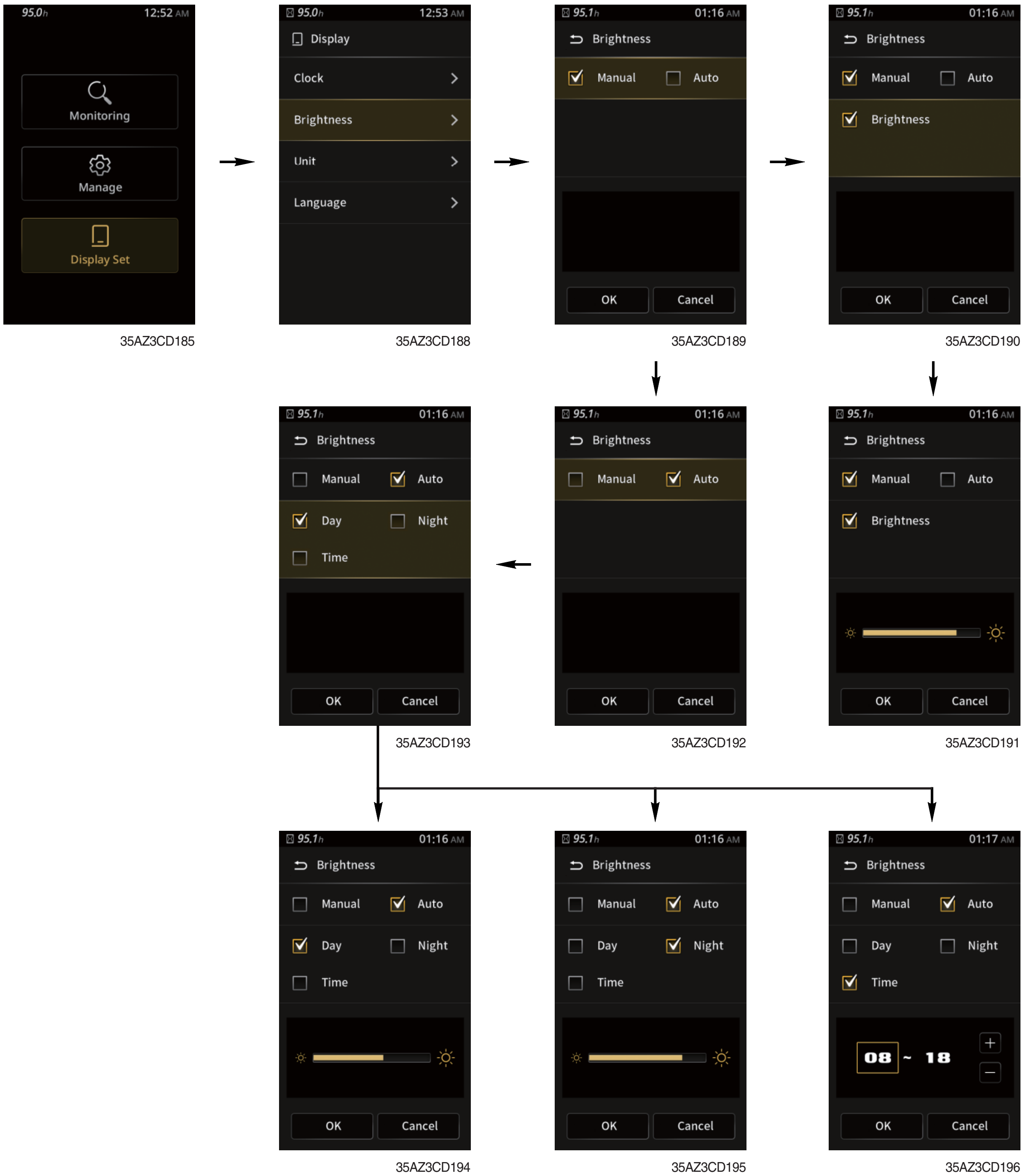
35AZ3CD186



35AZ3CD187

- Set the time (12 hours or 24 hours)

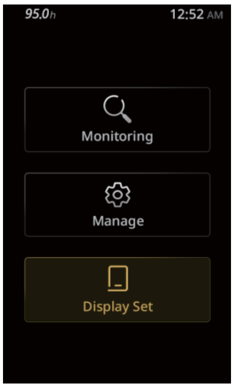
② Brightness



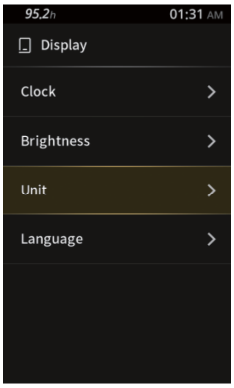
- Manual : Manual setting for LCD brightness.
- Automatic : Automatic control of LCD brightness as set level of Day/Night.
- Setting day time : Set the time for daylight.

(in figure, black area represents night time while orange shows day time)

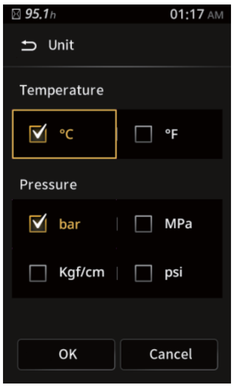
③ Unit



35AZ3CD185



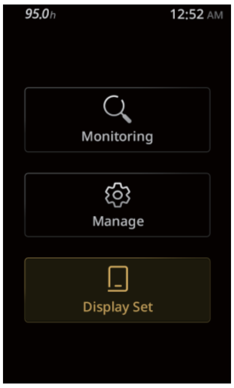
35AZ3CD197



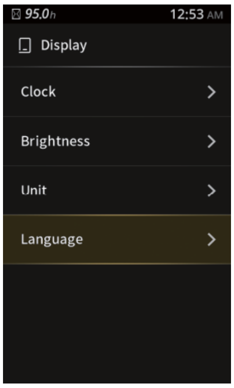
35AZ3CD198

- Temperature : °C ↔ °F
- Pressure : bar ↔ MPa ↔ kgf/cm^2 ↔ psi

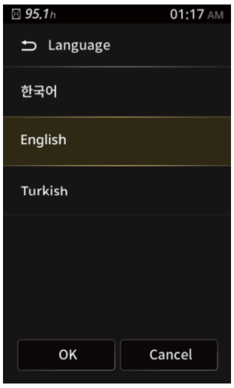
④ Language



35AZ3CD185



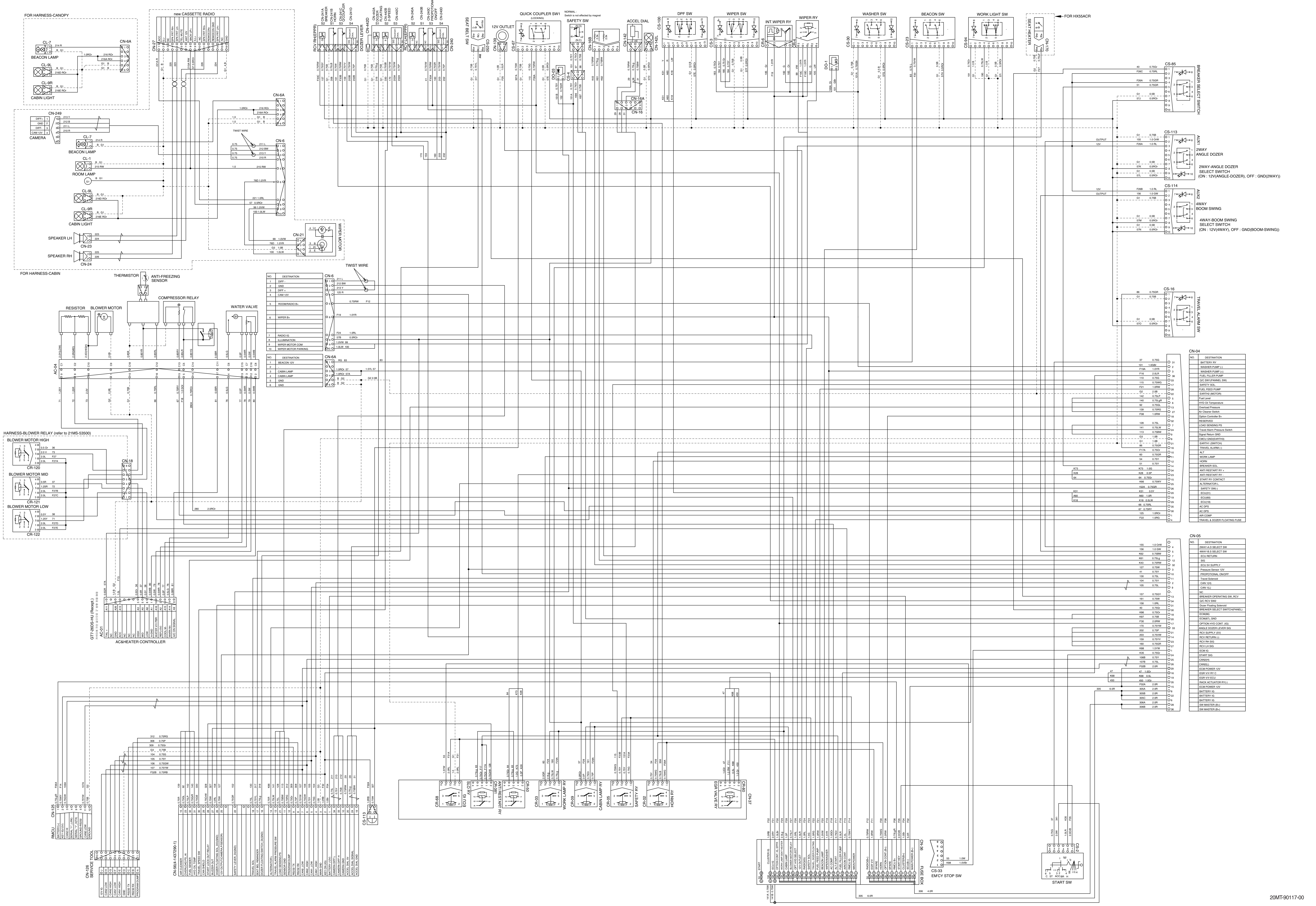
35AZ3CD199



35AZ3CD184

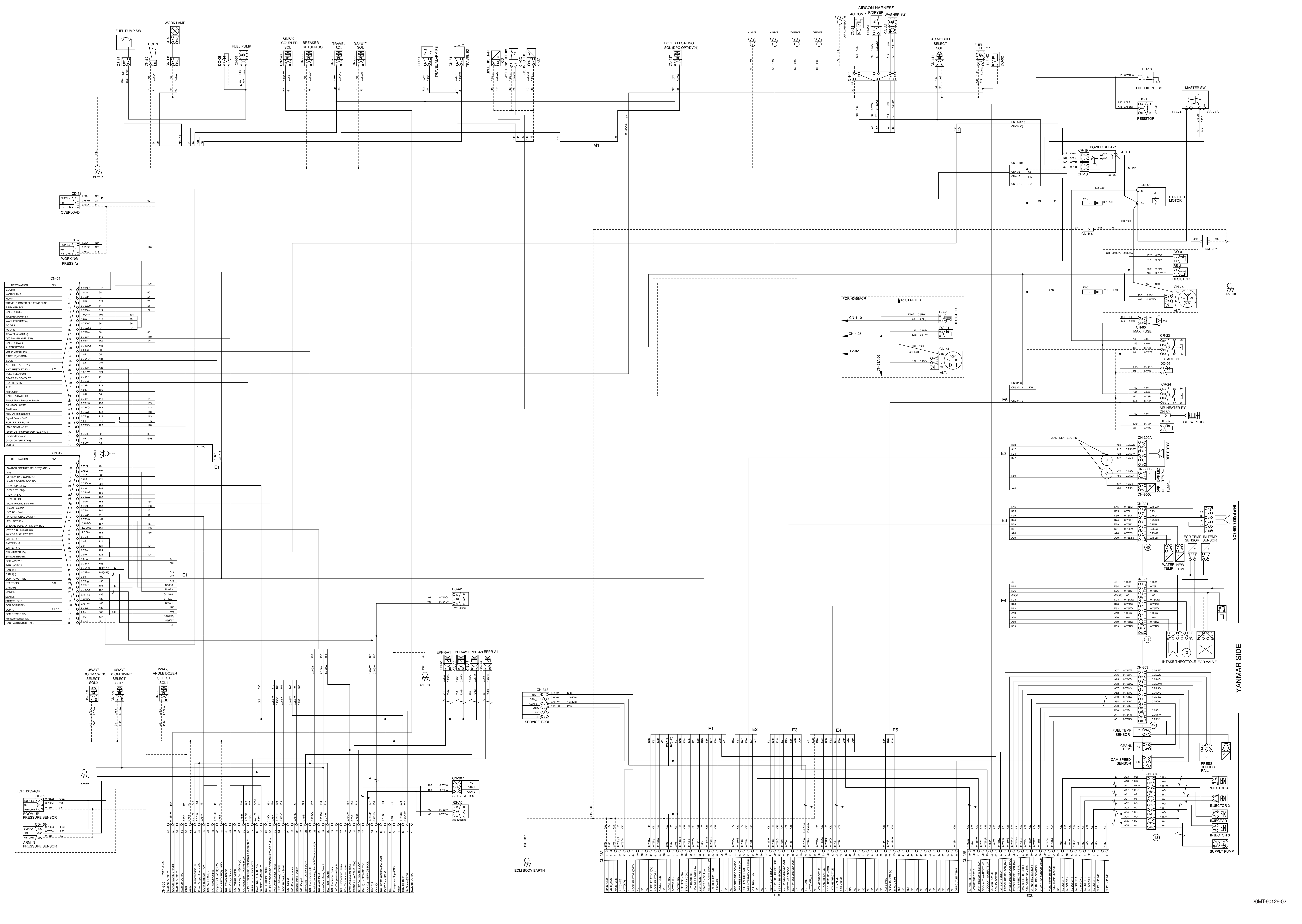
- User can select preferable language and all displays are changed to the selected language (한국어, English or Turkish).

· ELECTRICAL CIRCUIT (1/2)



20MT-90117-00

· ELECTRICAL CIRCUIT (2/2)



MEMORANDUM

1. POWER CIRCUIT

The negative terminal of battery is grounded to the machine chassis.

When the start switch is in the OFF position, the current flows from the positive battery terminal as shown below.

1) OPERATING FLOW

Battery → Master switch [CS-74L] → Starter motor [CN-45 (B+)]
- → Alternator [CN-74 (B+)]
- → Power relay 1 [CR-1R] → Maxi fuse [CN-60] → Start relay [CR-23 (30)]
  - → Glow heater relay [CR-24 (30)]
  - → Power relay 1 [CR-1P (1)] → I/conn [CN-05 (28, 36)]
- → Fuse box [No.4] → I/conn [CN-05 (15, 29)] → ECU [CN-93A (1, 3, 5)]
- → Fuse box [No.5] → Cluster [CN-56 (1)]
- → Fuse box [No.6] → Start switch [CS-2 (1)]
- → Fuse box [No.7] → RMCU [CN-125 (1)]
- → Fuse box [No.9] → I/conn [CN-04 (18)] → EPPR controller [CN-305 (20, 49, 50)]
- → Fuse box [No.10] → Horn relay [CR-02 (1, 3)]
- → Fuse box [No.12] → EGR valve relay [CR-80 (3)]
- → Fuse box [No.13] → I/conn [CN-6 (5)] → New cassette radio [CN-27 (8)]
  - → Room lamp [CL-1 (2)]

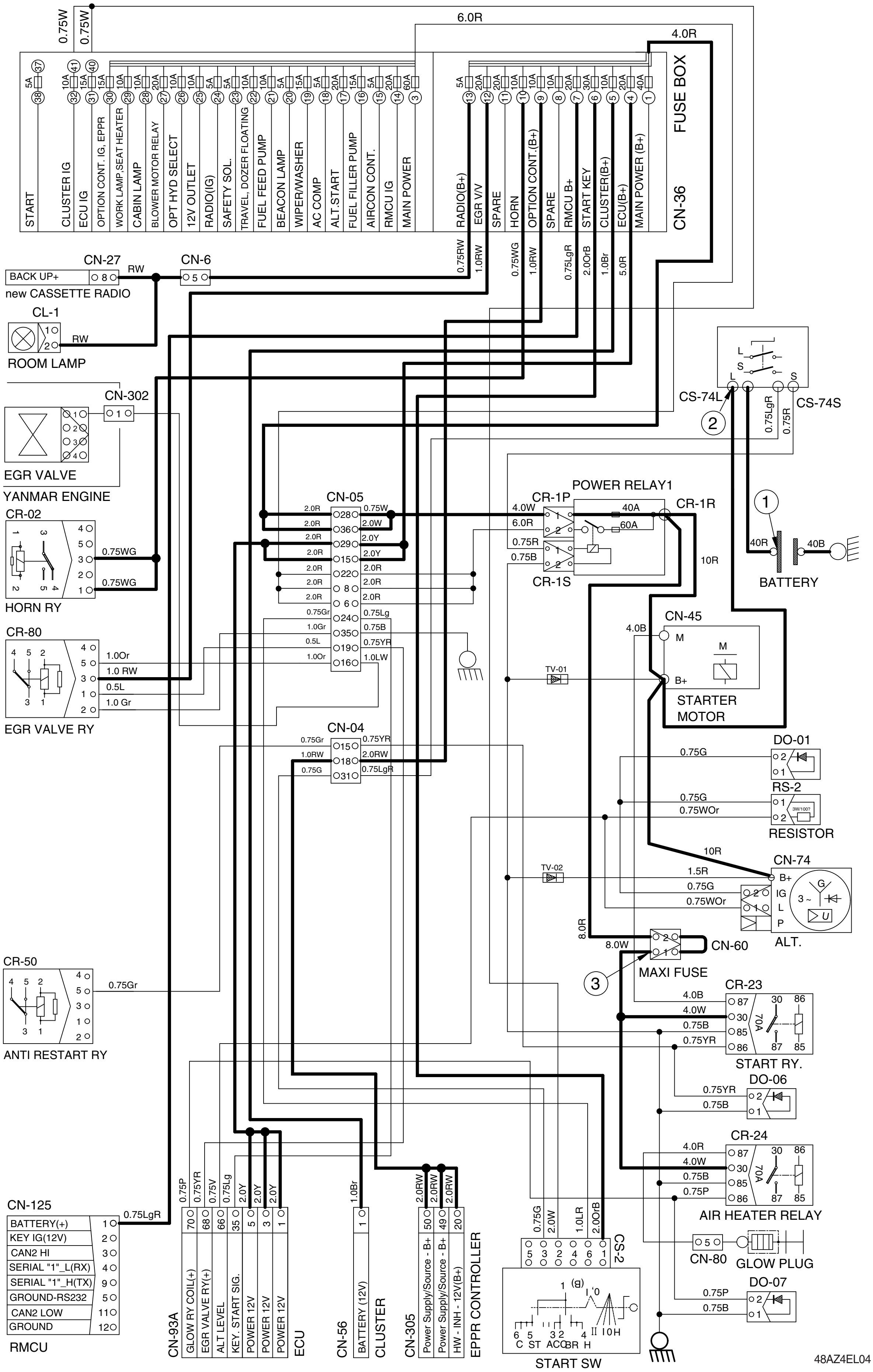
※ I/conn : Intermediate connector

2) CHECK POINT

Engine	Start switch	Check point	Voltage
STOP	OFF	① - GND (battery) ② - GND (master switch) ③ - GND (maxi fuse)	10~12.5 V

※ GND : Ground

POWER CIRCUIT



2. STARTING CIRCUIT

1) OPERATING FLOW

Battery (+) terminal → Master switch [CS-74L] → Starter motor [CN-45 (B+)] → Power relay 1 [CR-1P (1)] → I/conn [CN-05 (28, 36)] → Fuse box No.5 → Start switch [CS-2 (1)]

(1) Start switch : ON

Start switch ON [CS-2 (2)] → Fuse box [No. 40 → 31] → ECU IG relay [CR-68 (1, 3) → (5)]
→ Emergency stop switch [CS-33 (2) → (1)] → I/conn [CN-05 (1)]
→ ECU [CN-93A (88)]
→ Fuse box [No. 41 → 32] → Cluster [CN-56 (2)]

Start switch ON [CS-2 (3)] → I/conn [CN-04 (31)] → Master switch [CS-74S] → Power relay 1 [CR-1S (1)]
→ Power relay 1 [CR-1P (2)] → I/conn [CN-05 (6, 8, 22)]
→ Fuse box [No.23] → Safety relay [CR-05 (1, 3)]
→ Fuse box [No.17] → SLO relay [CR-381 (1, 3) → (2)] → Cluster [CS-56 (2)]

(2) Start switch : START

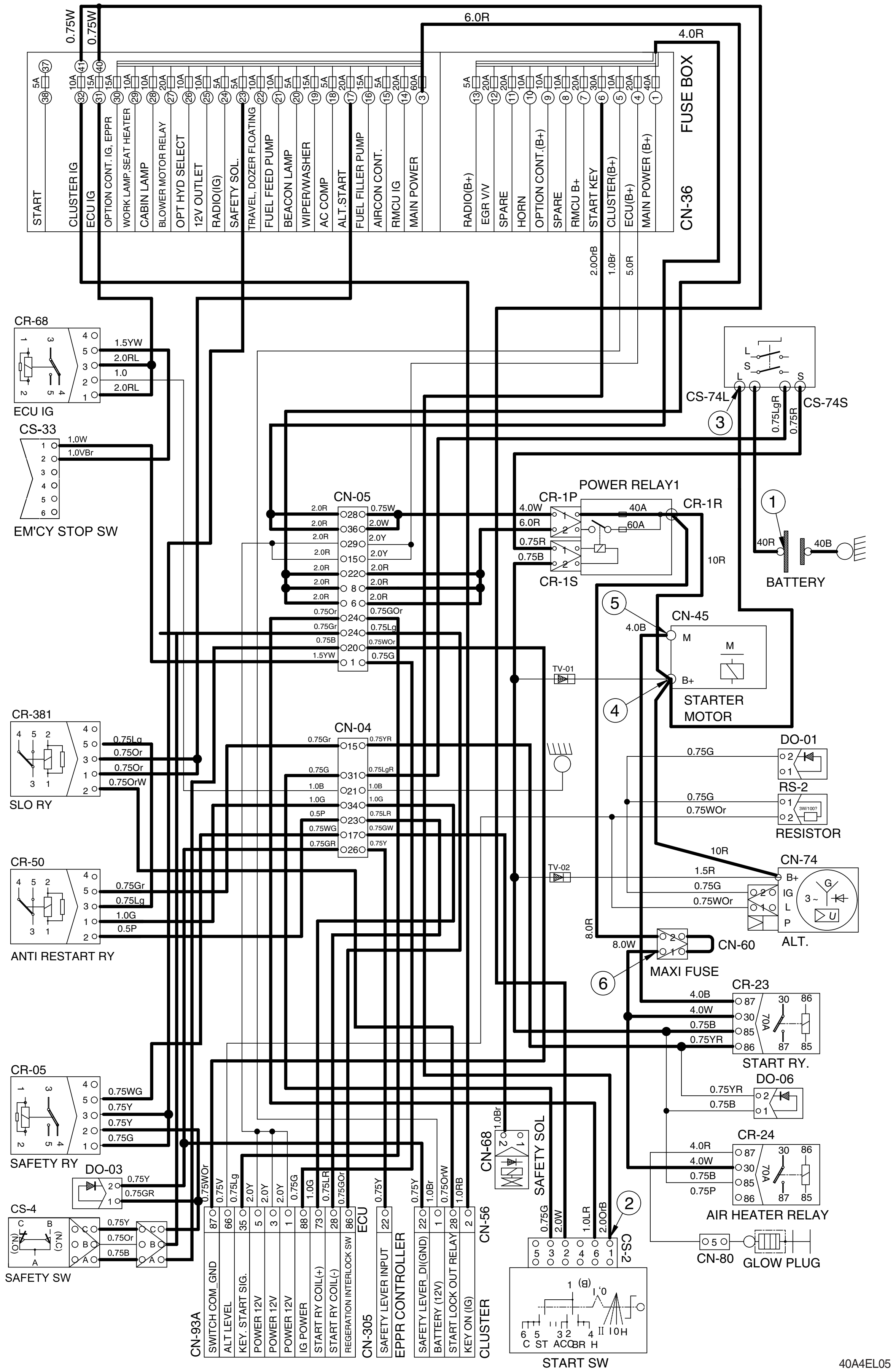
Start switch START [CS-2 (6)] → I/conn [CN-05 (24)] → ECU [CN-93A (35) → (73, 88)]
→ I/conn [CN-05 (23, 34)] → Anti restart relay [CR-50 (1, 2) → (5)] → I/conn [CN-04 (15)]
→ Start relay [CR-23 (86) → (87)] → Start motor [CN-45 (M)] → Starter operating

2) CHECK POINT

Engine	Start switch	Check point	Voltage
Operating	START	① - GND (battery) ② - GND (start key) ③ - GND (master switch) ④ - GND (starter B+) ⑤ - GND (starter M) ⑥ - GND (maxi fuse)	10~12.5 V

※ GND : Ground

STARTING CIRCUIT



3. CHARGING CIRCUIT

When the starter is activated and the engine is started, the operator releases the start switch to the ON position.

Charging current generated by operating the alternator flows into the battery through the master switch (CS-74).

The current also flows from alternator to each electrical component and controller through the fuse box.

1) OPERATING FLOW

(1) Warning flow

Alternator [CN-74 (1)] → I/conn [CN-04 (25)] → Cluster [CN-56 (14)] → Cluster warning lamp
→ ECU [CN-93A (66)]

(2) Charging flow

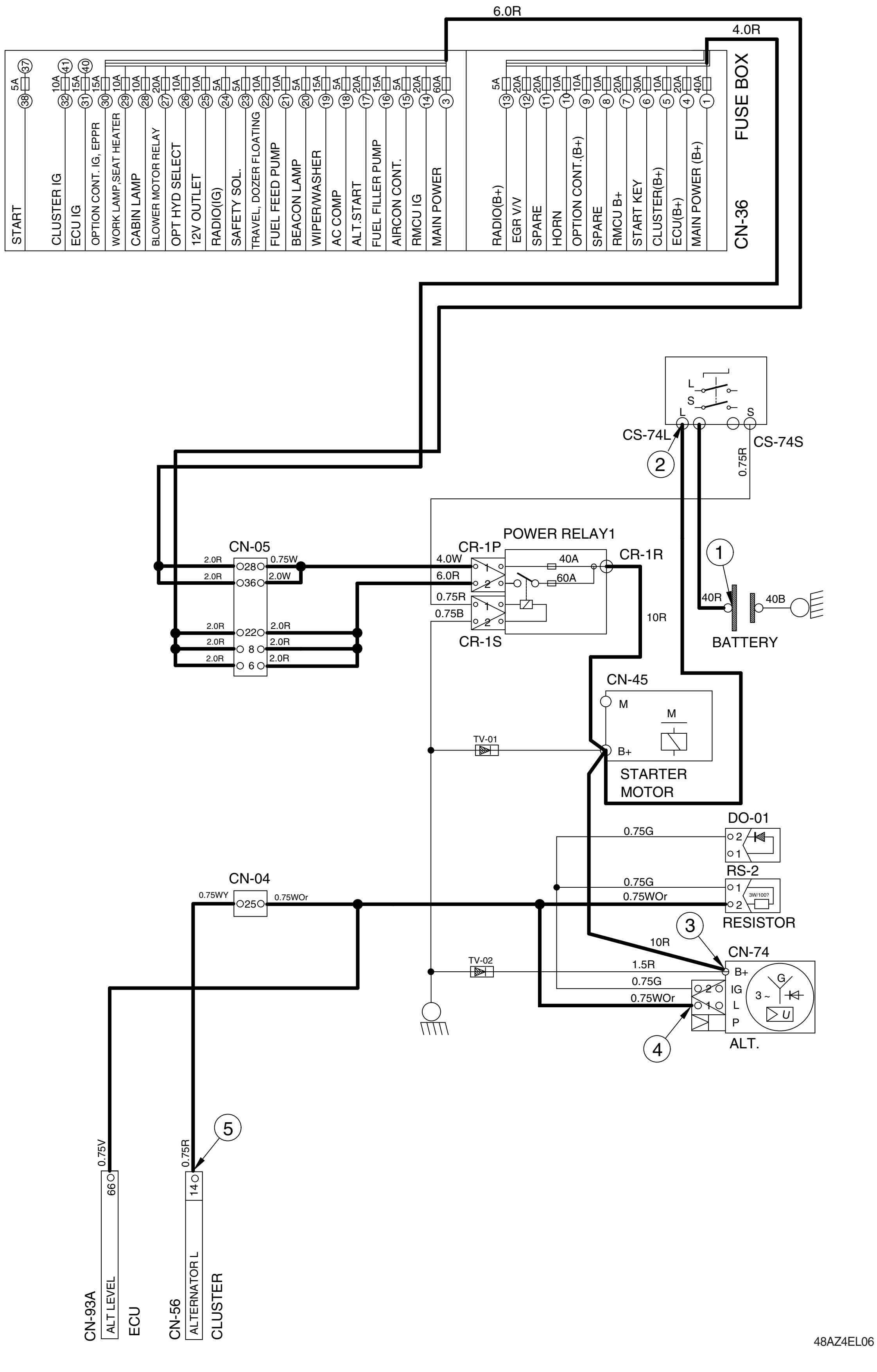
Alternator [CN-74 (B+)] → Start motor [CN-45 (B+)]
→ Master switch [CS-74L] → Battery (+) terminal → Battery charging
→ Power relay 1 [CR-1P (1)] → I/conn [CN-05 (28, 36)] → Fuse box [No.1, 4~13]
→ Power relay 1 [CR-1P (2)] → I/conn [CN-05 (6, 8, 22)] → Fuse box [No.3, 14~30]

2) CHECK POINT

Engine	Start switch	Check point	Voltage
Operating	START	① - GND (battery voltage) ② - GND (master switch) ③ - GND (alternator B^+ terminal) ④ - GND (alternator 1 terminal) ⑤ - GND (cluster)	10~12.5 V

※ GND : Ground

CHARGING CIRCUIT



4. CABIN AND WORK LAMP CIRCUIT

1) OPERATING FLOW

Fuse box (No.28) → Cabin lamp relay [CR-09 (1, 3)]
Fuse box (No.29) → Work lamp relay [CR-03 (1, 3)

(1) Work lamp switch ON : 1st step

Work lamp switch ON [CS-94 (1)] → Cabin lamp relay [CR-09 (2) → (5)]
- → I/conn [CN-6A (3, 4)]
  - → LH cabin lamp ON [CL-9L (2)]
  - → RH cabin lamp ON [CL-9R (2)]
- → I/conn [CN-6 (8)] → New cassette radio illumination lamp ON [CN-27 (9)]
- → AC/Heater controller illumination lamp ON [AC-01 (16)]
- → Quick coupler switch illumination lamp ON [CS-67 (8)]
- → Wiper switch illumination lamp ON [CS-3 (8)]
- → Washer switch illumination lamp ON [CS-30 (8)]
- → Travel alarm switch illumination lamp ON [CS-16 (8)]
- → Work lamp switch illumination lamp ON [CS-94 (8)]
- → Breaker select switch illumination lamp ON [CS-85 (8)]
- → Aux 1 switch illumination lamp ON [CS-113 (8, 10)]
- → Aux 2 switch illumination lamp ON [CS-114 (8, 10)]
- → Beacon lamp switch illumination lamp ON [CS-23 (8)]
- → Accel dial illumination lamp [CN-142L (2)]
- → DPF switch illumination lamp [CS-100 (8)]

(2) Work lamp switch ON : 2st step

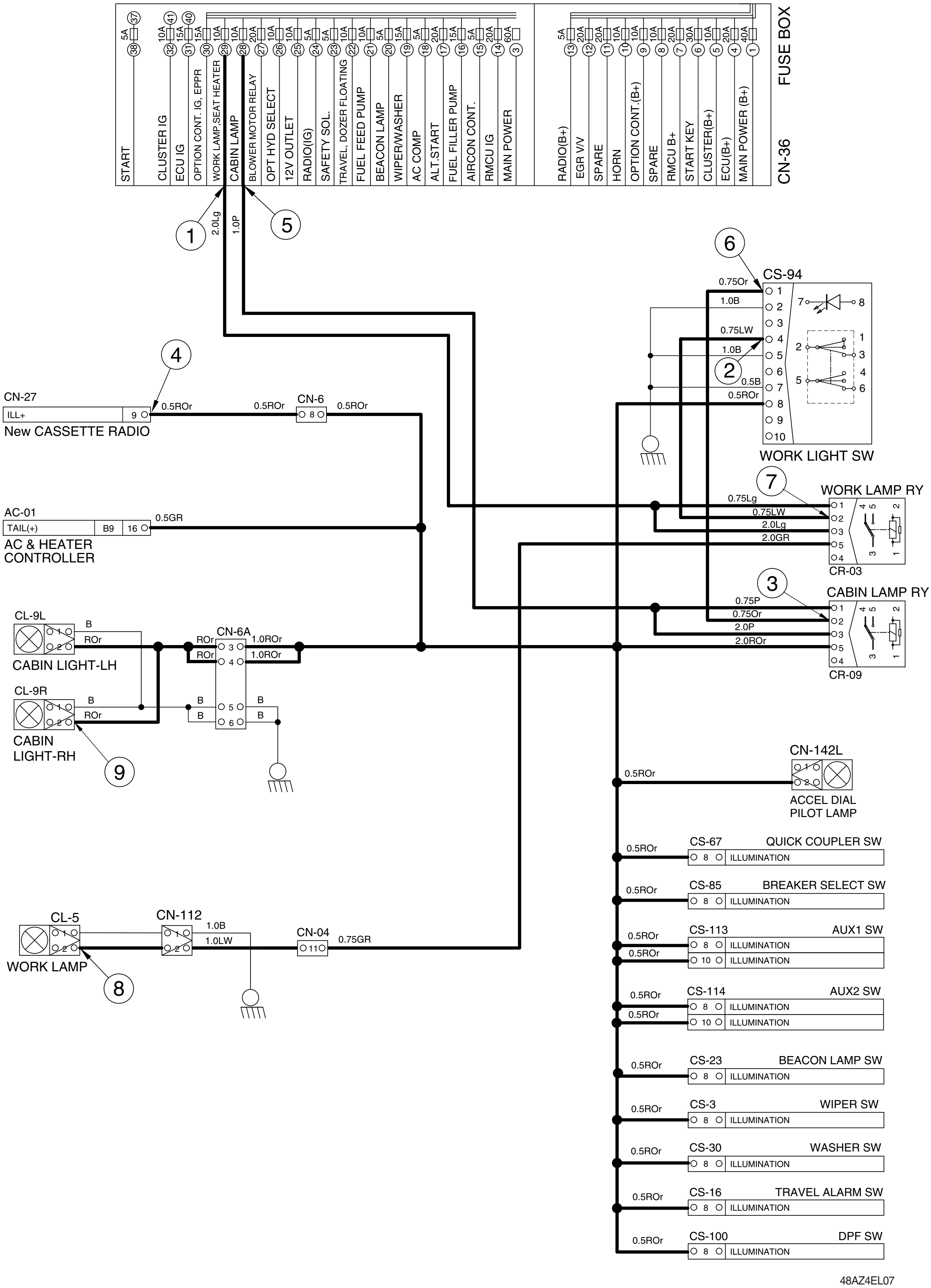
Work lamp switch ON [CS-94 (4)] → Work lamp relay [CR-03 (1) → (5)] → I/conn [CN-04 (11)]
→ I/conn [CN-112 (2)] → Work lamp ON [CL-5 (2)]

2) CHECK POINT

Engine	Start switch	Check point	Voltage
STOP	ON	① - GND (fuse box) ② - GND (switch power input) ③ - GND (switch power output) ④ - GND (illumination lamp) ⑤ - GND (fuse box) ⑥ - GND (switch power input) ⑦- GND (switch power output) ⑧ - GND (work light) ⑨ - GND (cabin light)	10~12.5 V

※ GND : Ground

CABIN AND WORK LAMP CIRCUIT



5. BEACON LAMP CIRCUIT

1) OPERATING FLOW

Fuse box (No.20) → Beacon lamp switch [CS-23 (2)]

(1) Beacon lamp switch ON

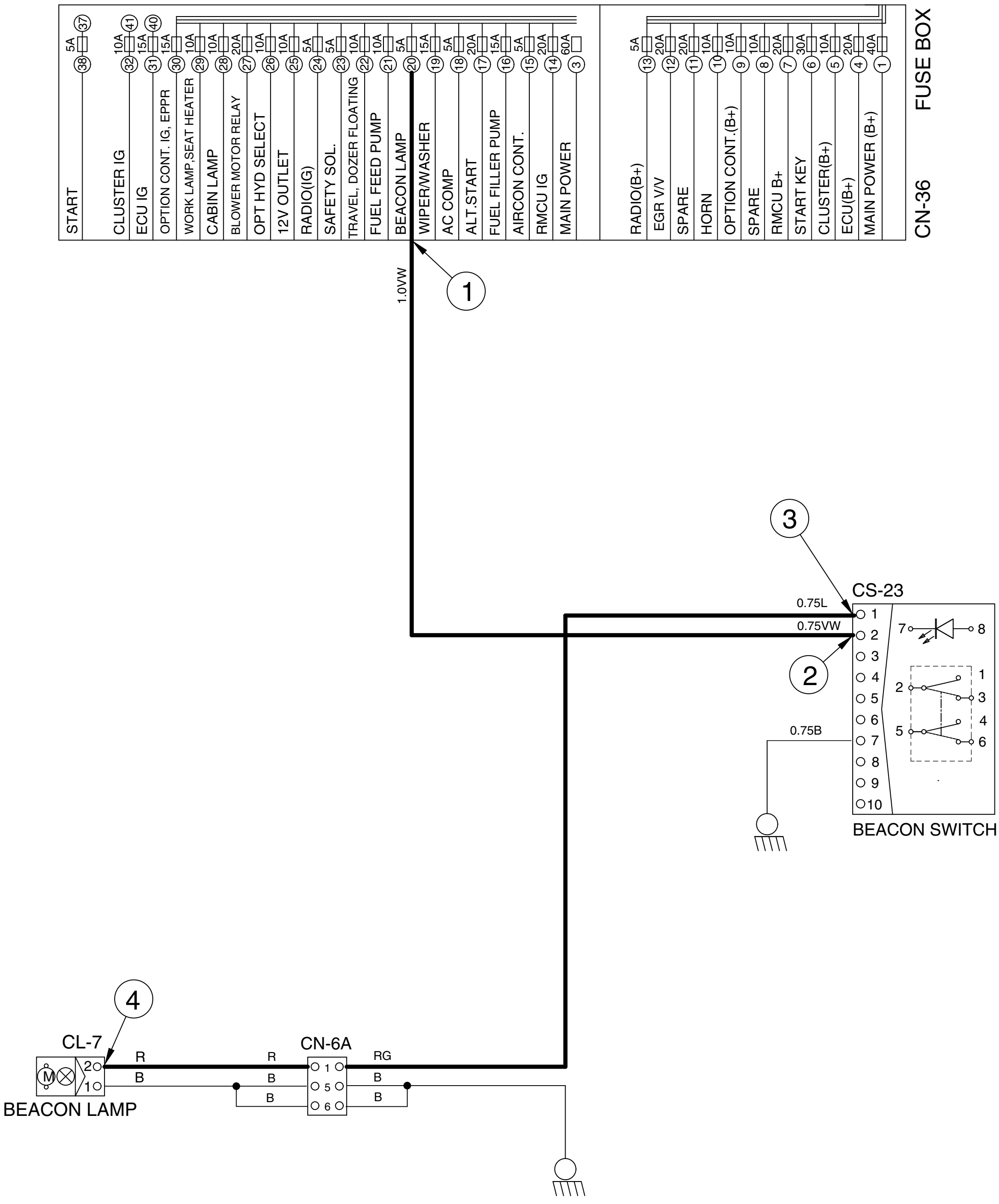
Beacon lamp switch ON [CS-23 (1)] → I/conn [CN-6A (1)] → Beacon lamp ON [CL-7 (2)]

2) CHECK POINT

Engine	Start switch	Check point	Voltage
STOP	ON	① - GND (fuse box) ② - GND (switch power input) ③ - GND (switch power output) ④ - GND (beacon lamp)	10~12.5 V

※ GND : Ground

BEACON LAMP CIRCUIT



6. WIPER AND WASHER CIRCUIT

1) OPERATING FLOW

(1) Start switch ON

Fuse box (No.19) → Wiper relay [CR-4 (1, 5)]
→ Int wiper relay [CR-6 (3)]
→ I/conn [CN-6 (6)] → Wiper motor [CN-21 (3)]

(2) Wiper switch ON : 1st step (low speed)

Wiper switch ON [CS-3 (3)] → Int wiper relay [CR-6 (4) → (2)]
→ Wiper relay [CR-4 (2) → (3)] → I/conn [CN-6 (9)]
→ Washer motor operating [CN-21 (4)]

(3) Wiper switch ON : 2nd step (washer)

Wiper switch ON [CS-3 (4)] → Int wiper relay [CR-6 (1)]
→ Washer switch [CS-30 (2)]
→ Wiper relay [CR-4 (2) → (4)] → I/conn [CN-6 (10)] → Wiper motor operating [CN-21 (1)]
Washer switch ON [CS-30 (2)] → I/conn [CN-04 (2)] → Washer pump operating [CN-22 (1)]
→ I/conn [CN-11 (6)]

(4) Auto parking (when switch OFF)

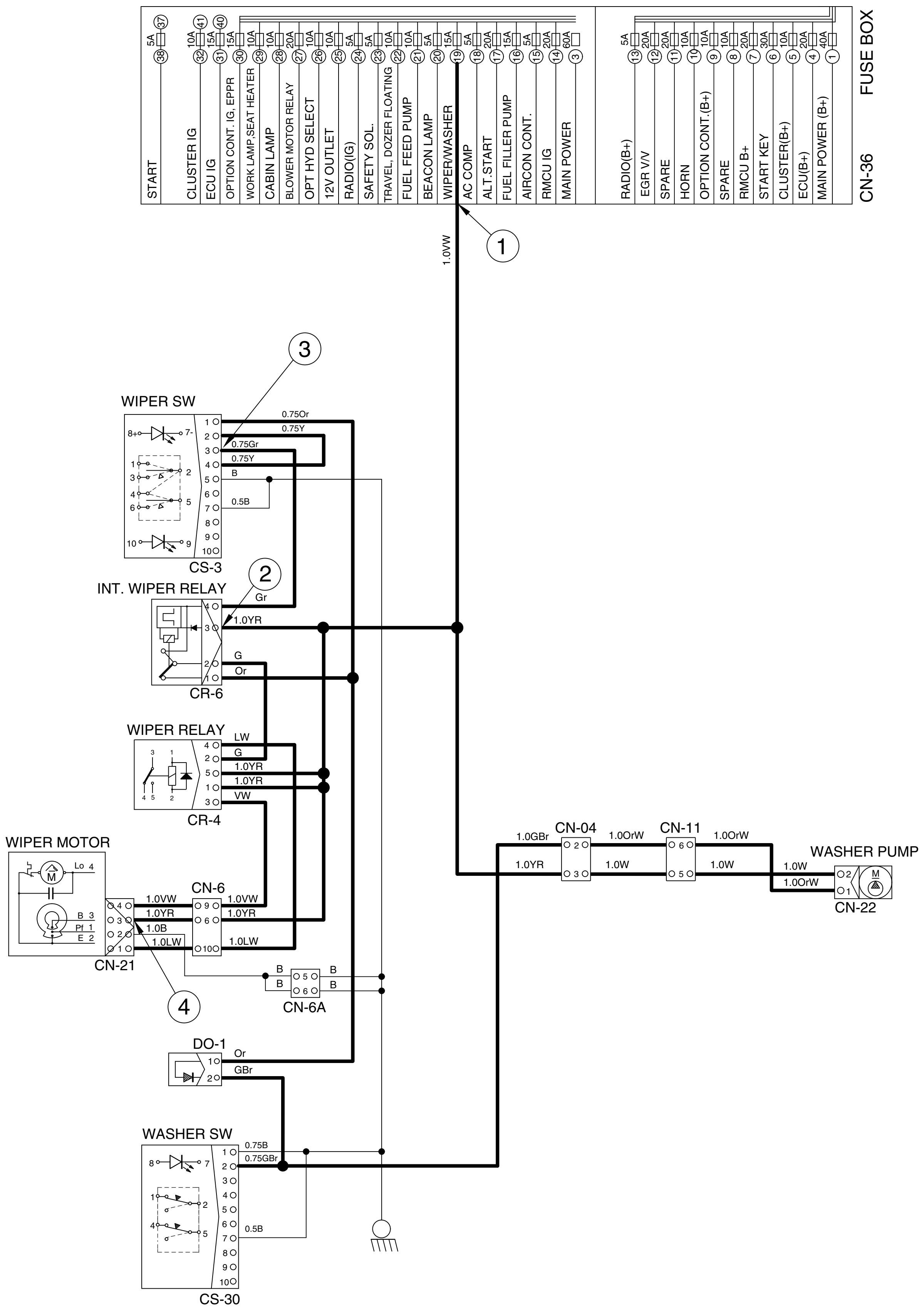
Switch OFF → Wiper relay [CN-21 (1)] → Wiper switch [CS-3]
→ Int wiper relay [CR-6 (4) → (2)] → Wiper relay [CR-4 (2) → (3)] → I/conn [CN-6 (9)]
→ Wiper motor [CN-21 (4)] → Wiper motor parking position by wiper motor controller

2) CHECK POINT

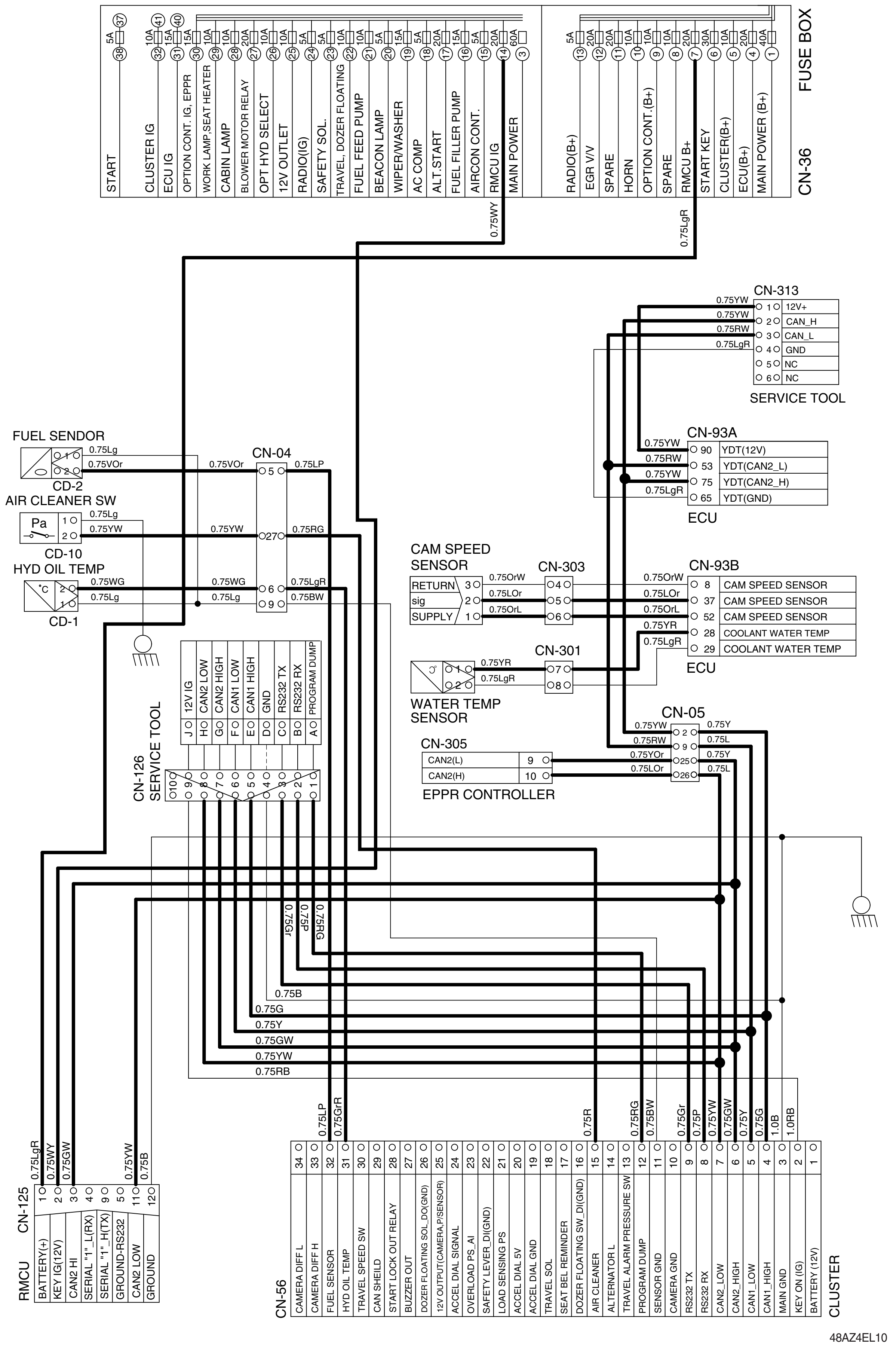
Engine	Start switch	Check point	Voltage
STOP	ON	① - GND (fuse box) ② - GND (int relay power input) ③ - GND (switch power output) ④ - GND (wiper motor)	10~12.5 V

※ GND : Ground

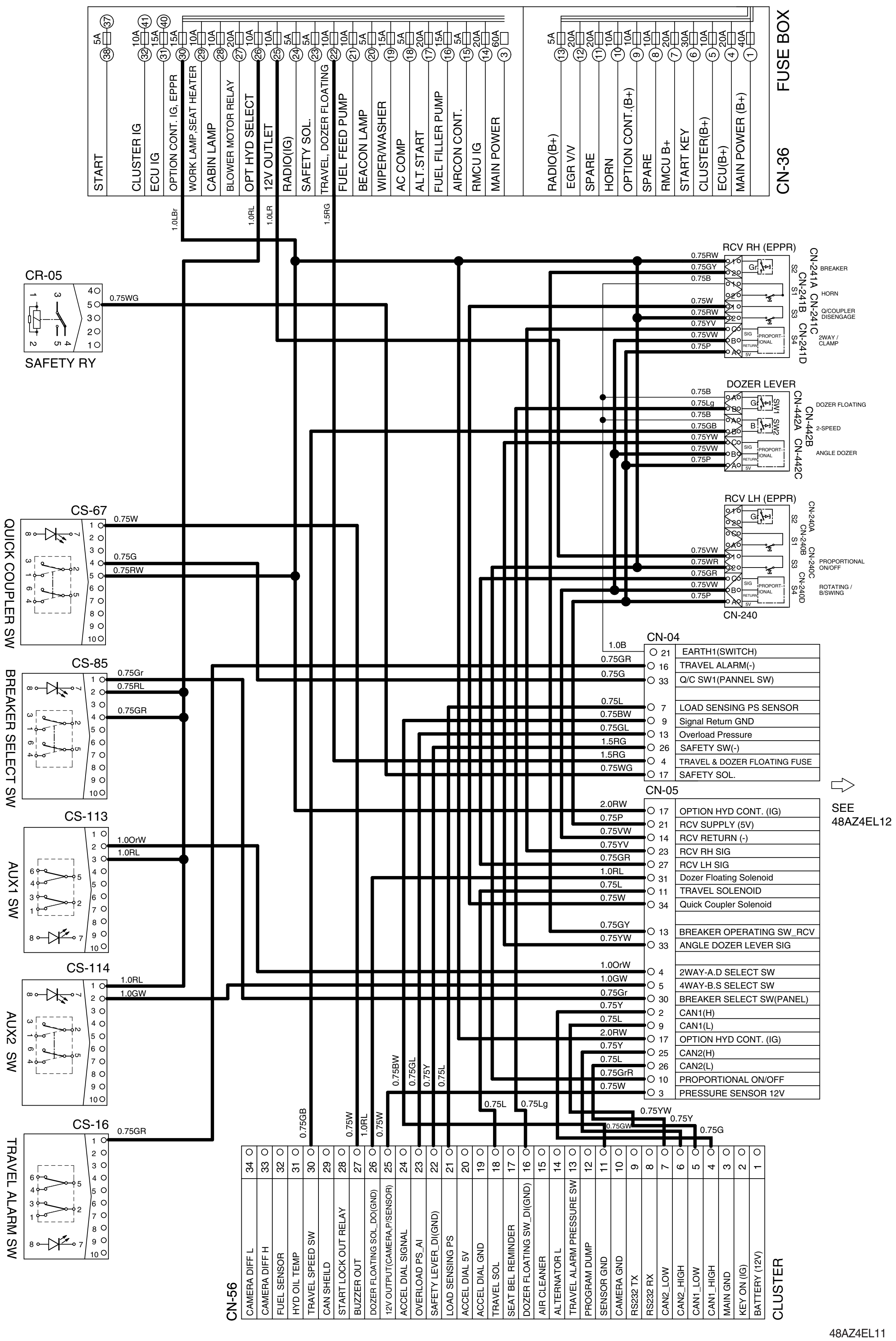
WIPER AND WASHER CIRCUIT



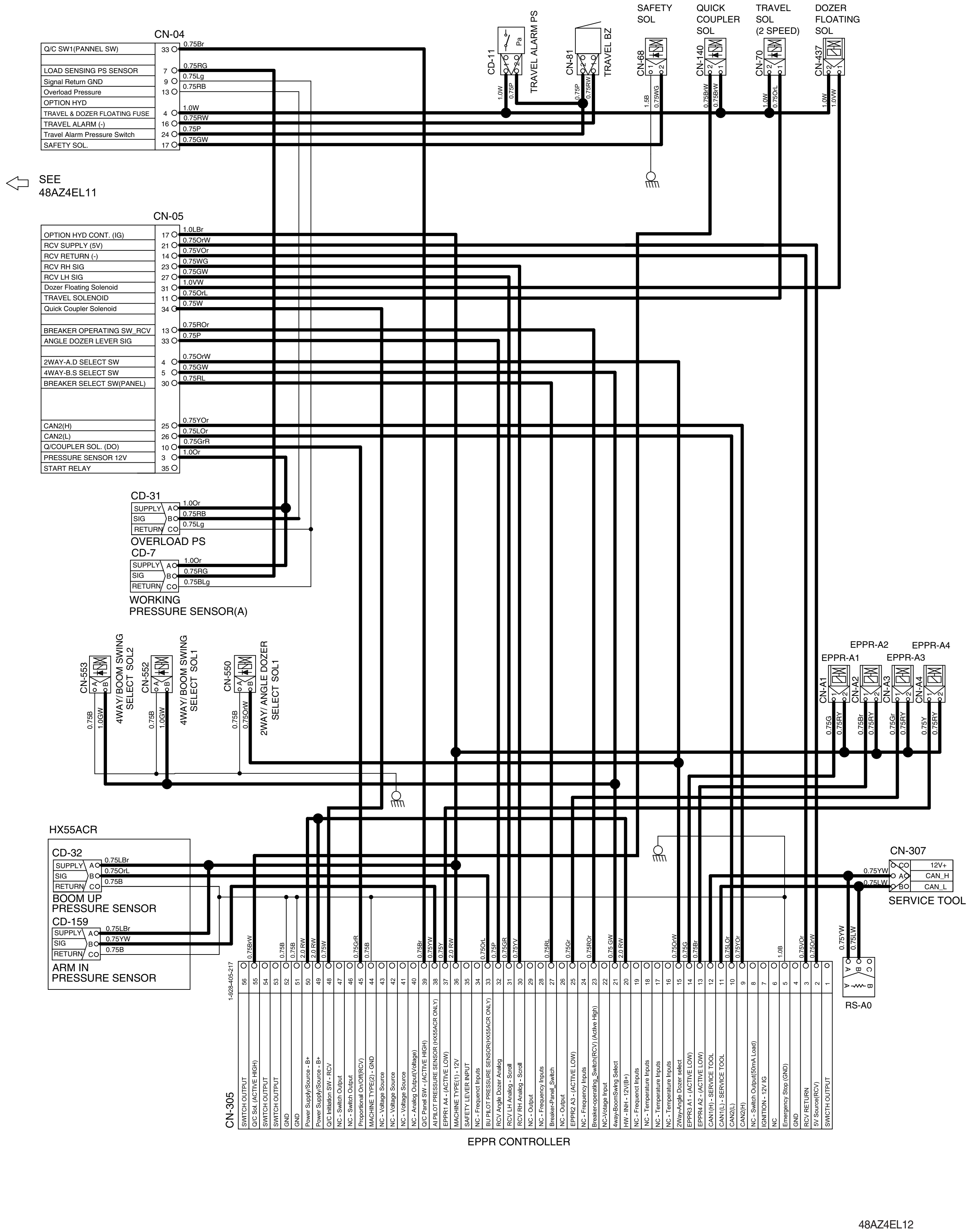
MONITORING CIRCUIT



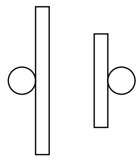
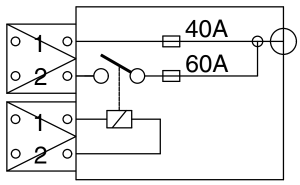
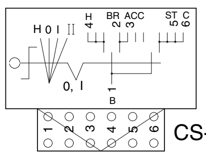
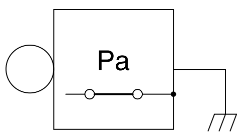
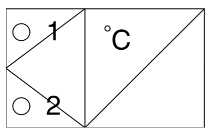
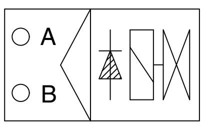
ELECTRIC CIRCUIT FOR HYDRAULIC (1/2)

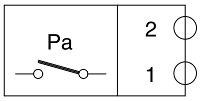
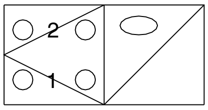
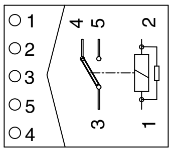
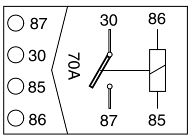
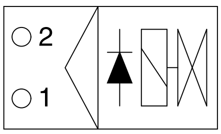
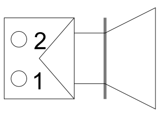


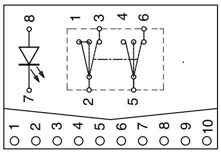
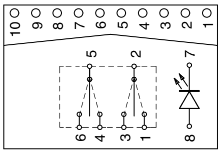
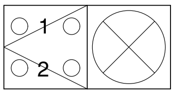
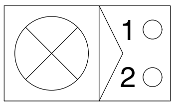
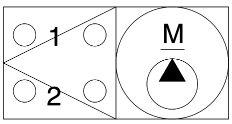
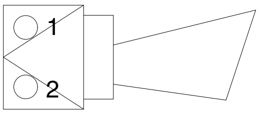
ELECTRIC CIRCUIT FOR HYDRAULIC (2/2)

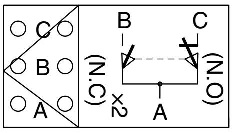
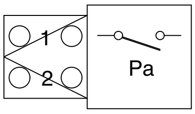
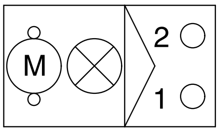
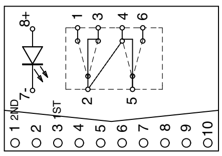
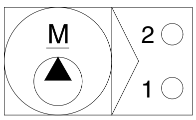
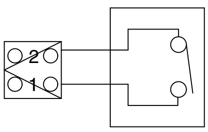


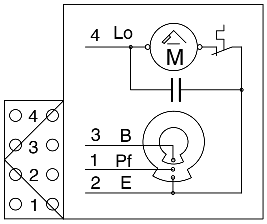
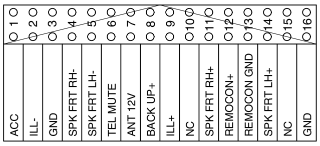
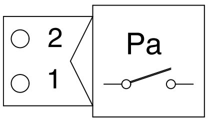
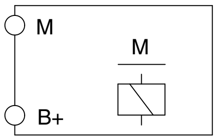
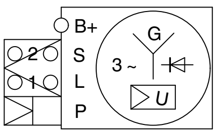
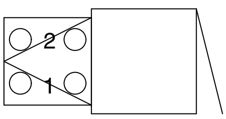
GROUP 4 ELECTRICAL COMPONENT SPECIFICATION

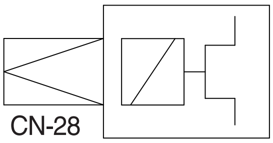
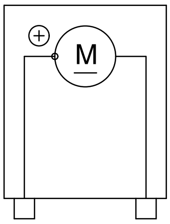
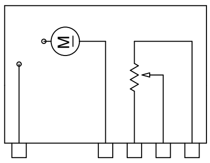
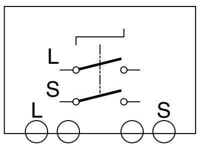
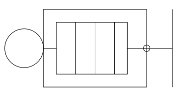
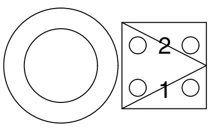
Part name	Symbol	Specification	Check
Battery		12V × 100Ah	※ Check specific gravity 1.280 over : over charged 1.280 ~ 1.250 : normal 1.250 below : recharging
Power relay 1	 CR-1	Rated load : 12V 100A (continuity) 1000A (30 second)	※ Check coil resistance Normal : about 12Ω ※ Check contact Normal : ∞Ω
Start switch	 CS-2	12V	※Check contact OFF : ∞Ω (for each terminal) ON : 0Ω (for terminal 1-3 and 1-2) START : 0Ω (for terminal 1-6)
Pressure switch (for engine oil)	 CD-18	0.5 kgf/cm^2 (N.C TYPE)	※ Check resistance Normal : 0Ω (CLOSE)
Hydraulic oil temperature sensor	 CD-1	0.5 kgf/cm^2 (N.C TYPE)	※ Check resistance 50˚C : 804Ω 80˚C : 310Ω 100˚C : 180Ω
Solenoid valve	 CN-550 CN-552 CN-553	12V 1A	※ Check resistance Normal : 15~25Ω (for terminal 1-2)

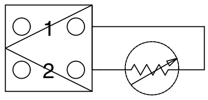
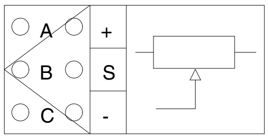
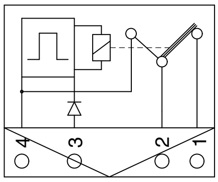
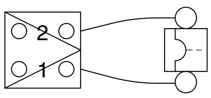
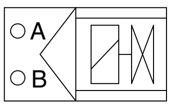
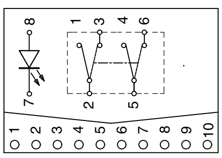
Part name	Symbol	Specification	Check
Air cleaner pressure switch	 CD-10	Pressure: 635mmH_2O (N.O TYPE)	※ Check contact Normal : ∞Ω (for terminal 1-2)
Fuel sender	 CD-2	-	※ Check resistance Full : 100Ω Low : 500Ω Empty warning :700Ω
Relay	 CR-02 CR-03 CR-04 CR-05 CR-09 CR-50 CR-68 CR-80 CR-120 CR-121 CR-122 CR-381	12V 20A	※ Check resistance Normal : about 200Ω (for terminal 2-4) : 0Ω (for terminal 1-5) : ∞Ω (for terminal 1-3)
Relay	 CR-23 CR-24	12V 60A	※ Rated coil current 1.2±0.3A
Solenoid valve	 CN-66 CN-68 CN-70 CN-140 CN-437 CN-441	12V 1A	※ Check resistance Normal : 15~25Ω (for terminal 1-2)
Speaker	 CN-23(LH) CN-24(RH)	4Ω 20W	※Check resistance Normal : 4Ω

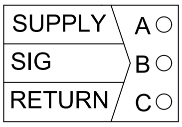
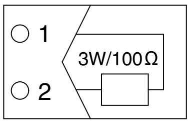
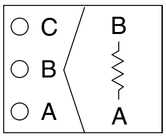
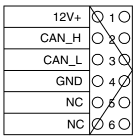
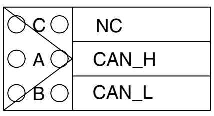
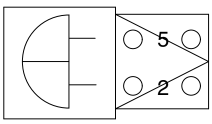
Part name	Symbol	Specification	Check
Work lamp switch	 CS-94	12V 16A	※ Check contact Normal OFF - ∞Ω (for terminal 2-1, 5-4) - 0Ω (for terminal 2-3, 5-6)
Quick coupler switch 1	 CS-67	12V 16A	※ Check contact Normal OFF - ∞Ω (for terminal 2-3, 5-6)
Lamp	 CL-5 CL-9L CL-9R	12V LED	※ Check disconnection Normal : 1.2Ω
Room lamp	 CL-1	12V 10W	※ Check disconnection Normal : a few Ω
Fuel filler pump	 CN-61	12V 35 ℓ/min	※Check operation Supply power (for terminal 1-2) : 12V
Horn	 CN-20 CN-25	12V	132±5dB

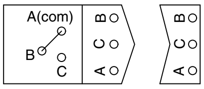
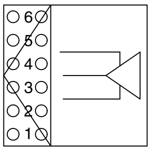
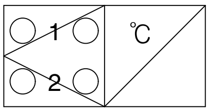
Part name	Symbol	Specification	Check
Safety switch	 CS-4	Micro	※ Check contact Normal : 0Ω (for terminal A-B) : ∞Ω (for terminal A-C) Operating : ∞Ω (for terminal A-B) : 0Ω (for terminal A-C)
Pressure switch	 CD-11	10bar (N.C type)	※ Check contact Normal : 0.1Ω
Beacon lamp	 CL-7	12V LED (Strobe type)	※ Check disconnection Normal : a few Ω
Wiper switch	 CS-3	12V 16A	※Check contact Normal : ∞Ω (for terminal 2-1, 5-6)
Washer pump	 CN-22	12V 3.8A	※Check contact Normal : 3Ω (for terminal 1-2)
Fuel pump switch	 CS-16	12V	-

Part name	Symbol	Specification	Check
Wiper motor	 CN-21	12V 3A	※Check contact Normal : 6Ω (for terminal 2-4)
Radio & USB player	 CN-27	12V 2A	※ Check voltage 10 ~ 12.5V (for terminal 1-3, 3-8)
Receiver dryer	 CN-29	12V	※ Check contact Normal : 0Ω
Starter	 CN-45	12V 2.3kW	※ Check contact Normal : 0.1Ω
Alternator	 CN-74	12V 55A	※ Check contact Normal : 10 ~ 12.5V
Travel buzzer	 CN-81	12V 600mA	※ Check contact Normal : 5.2Ω

Part name	Symbol	Specification	Check
Compressor		12V 79W	-
Blower motor		12V 9.5A	※ Check resistance 2.5Ω (for terminal 1-2)
Water valve		12V	-
Master switch		12V 1000A	-
Preheater		12V 42A 500W	-
12V outlet		12V 120W	-

Part name	Symbol	Specification	Check
Anti-freezing		-	-
Accel dial	 CN-142	-	※ Check resistance Normal : about 5kΩ (for terminal A-C) ※ Check voltage Normal : about 5V (for terminal A-C) : 2~4.5V (for terminal C-B)
Int wiper relay		12V 12A	-
Maxi fuse	 CN-60	12V 80A	-
EPPR valve	 CN-A1 CN-A2 CN-A3 CN-A4	-	-
Switch	 CS-16 CS-23 CS-30 CS-85 CS-113 CS-114	-	※ Check contact Normal OFF - ∞Ω (for terminal 2-1, 5-4) 0Ω (for terminal 2-3, 5-6)

Part name	Symbol	Specification	Check
Pressure sensor	 CD-7 CD-31 CD-32 CD-159	12V	-
Resistor	 RS-2	3W 100Ω	-
Resistor	 RS-A0 RS-1 RS-A2	3W 120Ω	-
Service tool	 CN-313	-	-
Service tool	 CN-307	-	-
Buzzer	 CS-113	12V	-

Part name	Symbol	Specification	Check
Seat belt switch	 CS-250	12V	-
DPF press switch	 CN-300A	-	-
DPF temp sensor	 CN-300B CN-300C	-	-

GROUP 5 CONNECTORS

1. CONNECTOR DESTINATION

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-04	AMP	36	Main harness - Seat base harness	1743059-2	1743062-2
CN-05	AMP	36	Main harness - Seat base harness	1743632-2	1743636-2
CN-6	AMP	10	Seat base harness - Cab harness	174655-2	174657-2
CN-6A	AMP	6	Seat base harness	174262-2	174264-2
CN-11	AMP	6	Main harness-A/C harness	174262-2	174264-2
CN-16	AMP	6	Accel dial	-	174264-2
CN-16A	AMP	6	Accel dial	174262-2	-
CN-16B	AMP	6	Emergency rpm dial connector	174262-2	21NB-10710
CN-18	AMP/KET	8	Blower relay harness	178982-2	178984-2
CN-21	KET	4	Wiper motor	MG610047	-
CN-22	KET	2	Washer tank	MG640650	-
CN-23	YAZAKI	2	Speaker-LH	7123-1520	-
CN-24	YAZAKI	2	Speaker-RH	7123-1520	-
CN-25	DEUTSCH	2	Horn	DT06-2S-EP06	-
CN-27	-	16	New cassette radio	PK145-16017	-
CN-28	YAZAKI	1	Air conditioner compressor	1723-2815	-
CN-28	KET	2	Washer pump	MG640605	-
CN-29	KET	2	Receiver dryer	MG640795	-
CN-36	-	-	Fuse box	21HN-55010	-
CN-37	-	-	Relay box	21HN-55110	-
CN-45B+	RING TERM	-	Start motor B+	JOCP25-8-2	-
CN-45M	RING TERM	-	Start motor M	S820-304000	-
CN-56	AMP	34	Cluster	4-1437290-0	-
CN-60	MTA	-	Maxi fuse	03. 01080	-
CN-61	DEUTSCH	2	Fuel filler pump	DT06-2S-EP06	DT04-2P-E005
CN-66	DEUTSCH	2	Breaker return solenoid	DT06-2S-EP06	-
CN-68	DEUTSCH	2	Safety solenoid	DT06-2S-EP06	-
CN-70	DEUTSCH	2	Travel solenoid	DT06-2S-EP06	-
CN-74	YAZAKI	2	Alternator	7223-6224-40	-
CN-74	RING TERM	-	Alternator B+	S820-108000	-
CN-80	YAZAKI	1	Glow plug	7323-3010	-
CN-81	KET	2	Buzzer	MG610320	-
CN-93A	AMP	94	ECU	3-1355136-3	-
CN-93B	AMP	60	ECU	1897635-2	-
CN-100	KET	1	ECU earth	MG640944-5	-
CN-112	DEUTSCH	2	Main harness-Boom harness	DT06-2S-EP06	DT04-2P-E003

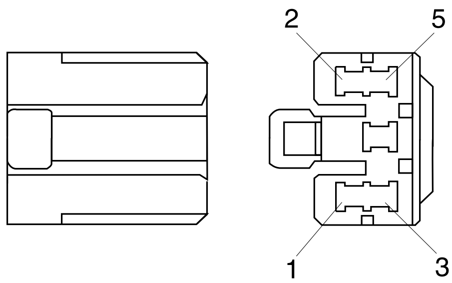
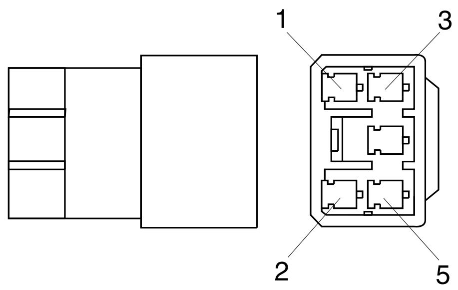
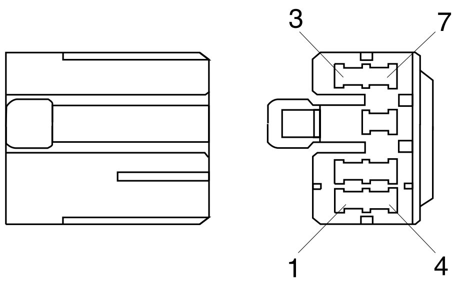
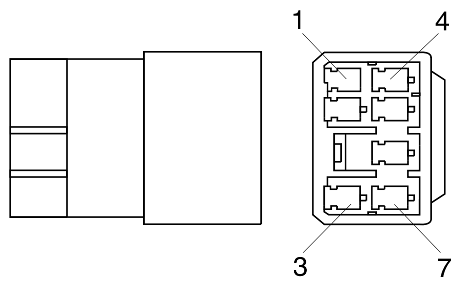
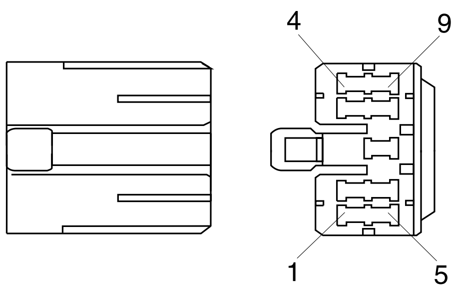
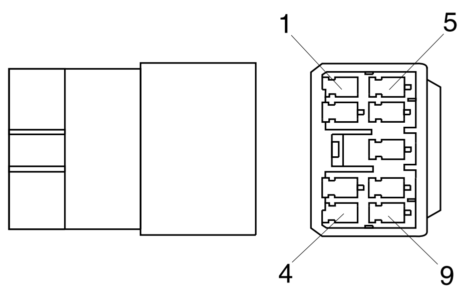
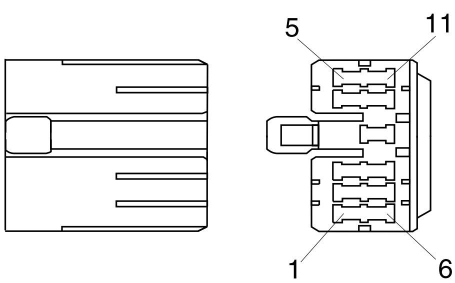
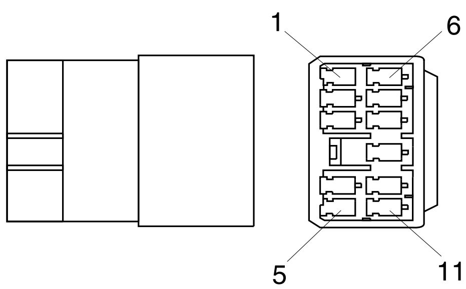
Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-113	KET	6	Buzzer	MG614354	-
CN-125	DEUTSCH	12	RMCU	DT06-12S-BE02	DT04-12P-BE02
CN-126	DEUTSCH	9	Service tool	-	HD10-9-96P
CN-126	AMP	10	Service tool	174655-2	S816-110002
CN-126	AMP	10	Service tool	174655-2	-
CN-139	AMP	2	Power socket	172434-2	-
CN-140	DEUTSCH	2	Quick coupler solenoid	DT06-2S-EP06	DT04-2P-E005
CN-142	DEUTSCH	3	Accel dial	DT06-3S-EP06	-
CN-142L	AMP	2	Accel dial pilot lamp	174352-2	-
CN-145	YAZAKI	2	Fuel feed pump	7123-6423-30	-
CN-170	DELPHI	2	Seat heater	12052641	-
CN-240C	-	1	Proportional ON/OFF	-	CA104
CN-240D	DEUTSCH	3	LH RCV EPPR	DT06-3S-EP06	-
CN-241A	DEUTSCH	2	Breaker sw	DT06-2S-EP06	-
CN-241B	DEUTSCH	2	Horn sw	-	DT04-2P-E005
CN-241C	-	1	Quick coupler sw	-	CA104
CN-241D	DEUTSCH	3	EPPR sw	DT06-3S-EP06	-
CN-249	DEUTSCH	6	Rear camera	DT06-6S-EP06	DT04-6P-E005
CN-250	DEUTSCH	3	Seat belt warning	DT06-3S-EP06	-
CN-300A	AMP	6	DPF pressure switch	1438153-5	-
CN-300B	FCI	2	DPF mid temp sensor	54200206	-
CN-300C	FCI	2	DPF inlet temp sensor	50200208	-
CN-301	AMP	8	EGR sensor	776532-1	-
CN-302	AMP	12	EGR valve	776533-1	-
CN-303	AMP	12	E/sensor	776533-2	-
CN-304	AMP	12	C/rail	776533-3	-
CN-305	REXROTH	56	EPPR controller	1-928-405-161	-
CN-307	DEUTSCH	3	EPPR service tool	DT06-3S-E006	DT04-3P-E005
CN-313	DEUTSCH	6	Service tool	DTM06-6S	DTM04-6P
CN-437	DEUTSCH	2	Dozer float switch	DT06-2S-EP06	DT04-2P-E005
CN-441	DEUTSCH	2	AC mode solenoid	DT06-2S-EP06	DT04-2P-E005
CN-442A	DEUTSCH	2	Dozer floating switch	DT06-2S-EP06	-
CN-442B	DEUTSCH	2	2-speed switch	-	DT04-2P-E005
CN-442C	DEUTSCH	3	Angle dozer	DT06-3S-EP06	DT04-3P-E005
CN-442D	-	1	GND	CB104	-
CN-550	DEUTSCH	2	Option solenoid 1 (2way/angle dozer sel)	DT06-2S-EP06	DT04-2P-E005
CN-552	DEUTSCH	2	Option solenoid 1 (4way/boom swing)	DT06-2S-EP06	DT04-2P-E005
CN-553	DEUTSCH	2	Option solenoid 2 (4way/boom swing)	DT06-2S-EP06	DT04-2P-E005

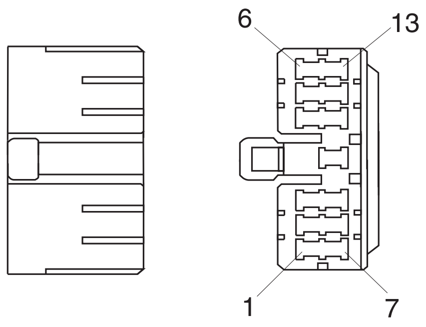
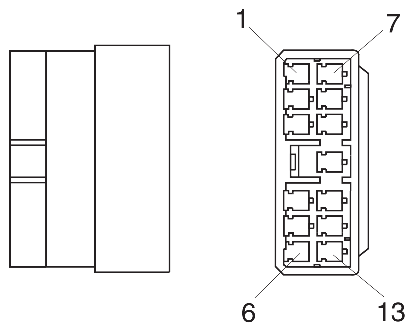
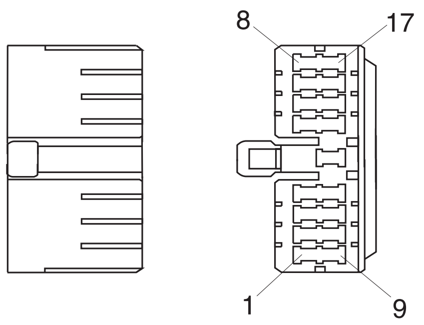
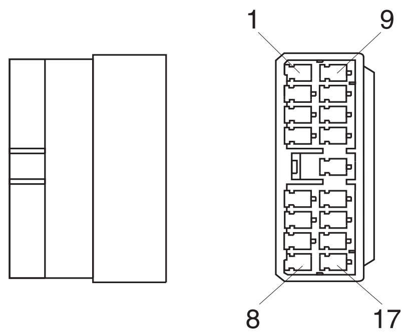
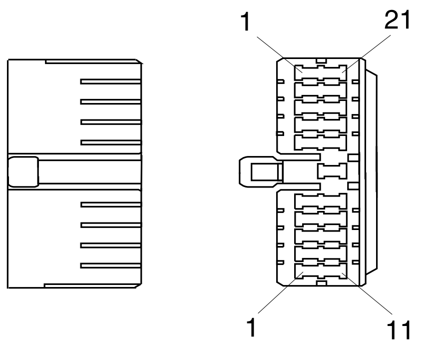
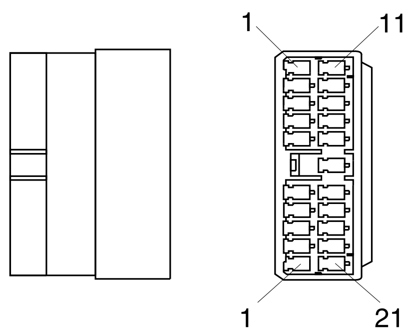
Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-A1	DEUTSCH	2	EPPR-A1	DT06-2S-EP06	-
CN-A2	DEUTSCH	2	EPPR-A2	DT06-2S-EP06	-
CN-A3	DEUTSCH	2	EPPR-A3	DT06-2S-EP06	-
CN-A4	DEUTSCH	2	EPPR-A4	DT06-2S-EP06	-
AC-01	KET	16	HAVC controller	MG655666	-
AC-04	AMP	18	HAVC unit	936204-1	-
· LAMP					
CL-1	KET	2	Room lamp	MG610392	-
CL-5	DEUTSCH	2	Work lamp	DT06-2S-E003	-
CL-7	DEUTSCH	2	Beacon lamp	DT06-2S-EP06	DT04-2P-E005
CL-9L	DEUTSCH	2	Work lamp - LH	DT06-2S-EP06	DT04-2P-E005
CL-9R	DEUTSCH	2	Work lamp - RH	DT06-2S-EP06	DT04-2P-E005
· RELAY					
CR-1R	RING TERM	-	Power relay 1	S820-025008	-
CR-1P	-	2	Power relay 1	32004-A2	-
CR-1S	-	2	Power relay 1	282080-1	-
CR-02	RELAY SOC	5	Horn relay	VCFM-1002	-
CR-03	RELAY SOC	5	Work lamp relay	VCFM-1002	-
CR-04	RELAY SOC	5	Wiper motor relay	VCFM-1002	-
CR-05	RELAY SOC	5	Safety relay	VCFM-1002	-
CR-06	KET	6	Wiper int relay	MG652999	-
CR-09	RELAY SOC	5	Cab lamp relay	VCFM-1002	-
CR-23	KET	4	Start relay	MG612017-5	-
CR-24	KET	4	Air heater relay	MG612017-5	-
CR-50	RELAY SOC	5	Anti restart relay	VCFM-1002	-
CR-68	RELAY SOC	5	ECU IG relay	VCFM-1002	-
CR-80	RELAY SOC	5	EGR valve relay	VCFM-1002	-
CR-120	RELAY SOC	5	Blower motor high relay	VCFM-1002	-
CR-121	RELAY SOC	5	Blower motor mid relay	VCFM-1002	-
CR-122	RELAY SOC	5	Blower motor low relay	VCFM-1002	-
CR-381	RELAY SOC	5	SLO relay	VCFM-1002	-
· SENSOR					
CD-1	AMP	2	Hydraulic temp sender	85202-1	-
CD-2	DEUTSCH	2	Fuel sender	DT06-2S-E006	-
CD-7	DEUTSCH	3	Working pressure sensor	DT06-3S-E006	-
CD-10	AMP	2	Air cleaner switch	85202-1	-
CD-11	KET	2	Travel pressure switch	MG640795	-
CD-18	YAZAKI	1	Engine oil pressure switch	7123-5014	-

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CD-31	DEUTSCH	3	Overload pressure sensor	DT06-3S-EP06	DT04-3P-E005
CD-32	DEUTSCH	3	Boom up pressure sensor	DT06-3S-E006	DT04-3P-E005
CD-159	DEUTSCH	3	Arm in pressure sensor	DT06-3S-E006	DT04-3P-E005
DO-01	-	2	Diode	21EA-50550	-
DO-02	-	2	Diode	174352-2	21EA-50550
DO-06	-	2	Diode	174352-2	21EA-50550
DO-07	-	2	Diode	174352-2	21EA-50550
· SWITCH					
CS-2	KET	6	Start switch	MG610335	-
CS-3	CARLING	10	Wiper switch	21HN-56300	-
CS-4	DEUTSCH	3	Safety switch	DT06-3S-EP06	-
CS-16	CARLING	10	Travel alarm switch	21NH-56300	-
CS-16	-	2	Fuel filler pump switch	174352-2	-
CS-23	CARLING	10	Beacon switch	21HN-56300	-
CS-30	CARLING	10	Washer switch	21HN-56300	-
CS-33	AMP	6	Emergency stop switch	174262-2	-
CS-67	CARLING	10	Quick coupler switch	21HN-56300	-
CS-74L	RING TERM	-	Master switch L	S820-606000	-
CS-74S	RING TERM	-	Master switch S	S820-606000	-
CS-85	CARLING	10	Breaker select switch	21HN-56300	-
CS-94	CARLING	10	Work lamp switch	21HN-56300	-
CS-100	CARLING	10	DPF switch	21HN-56300	-
CS-113	CARLING	10	Aux 1 switch	21HN-56300	-
CS-114	CARLING	10	Aux 2 switch	21HN-56300	-
CS-250	DEUTSCH	3	Seat belt warning	DT06-3S-EP06	DT04-3P-E005

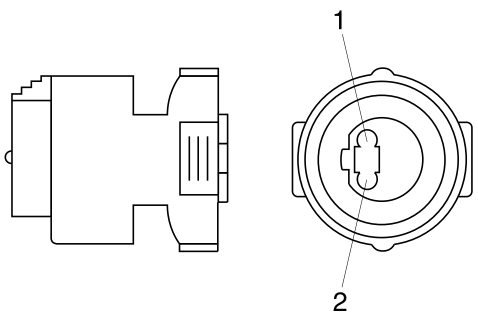
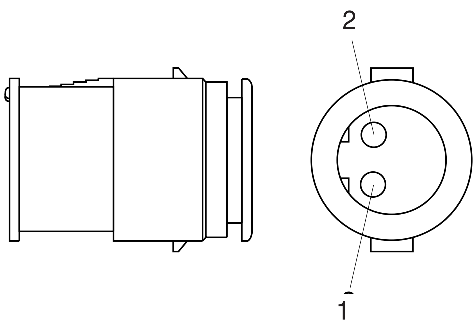
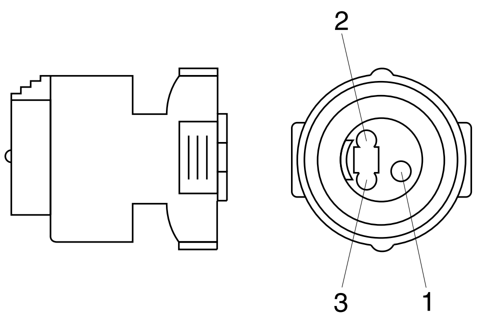
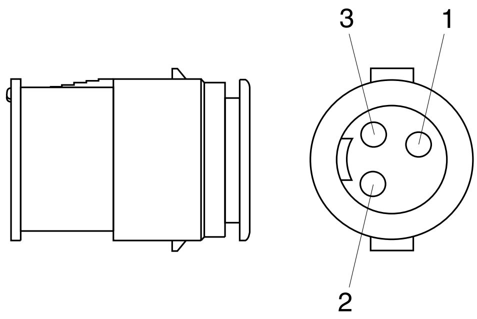
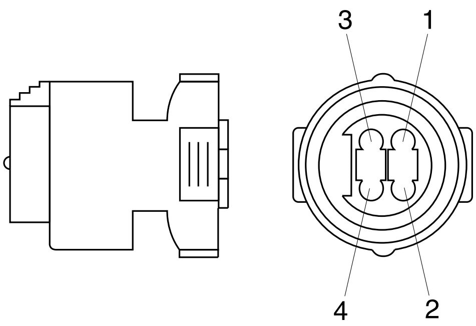
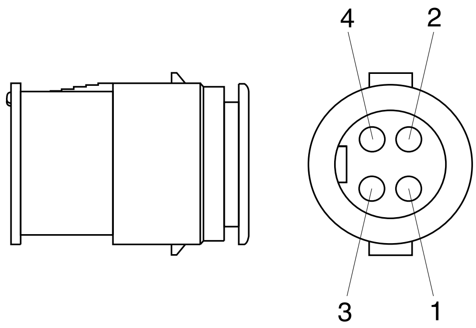
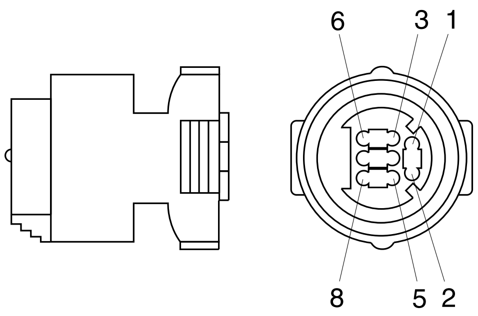
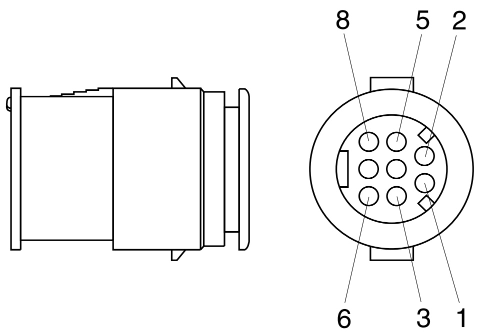
2. CONNECTION TABLE FOR CONNECTORS

1) PA TYPE CONNECTOR

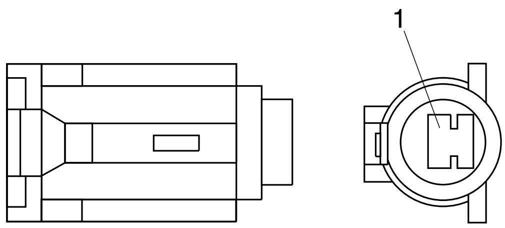
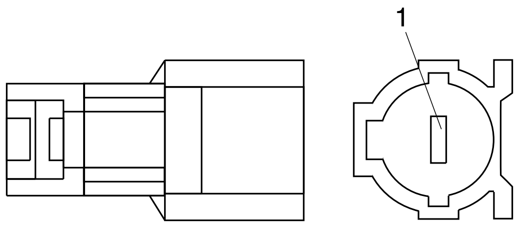
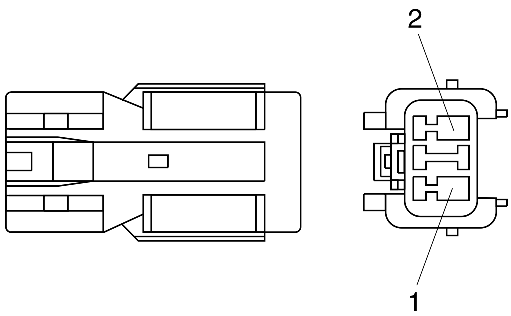
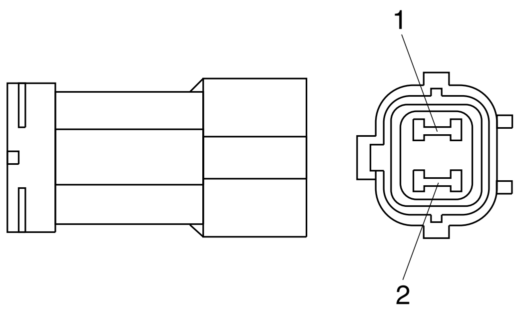
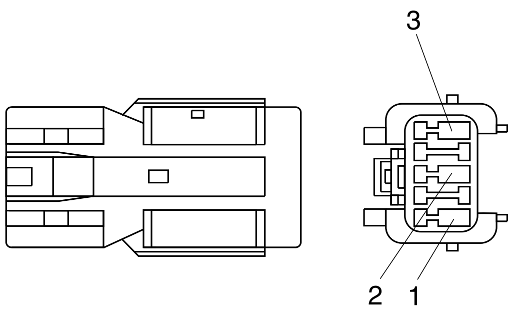
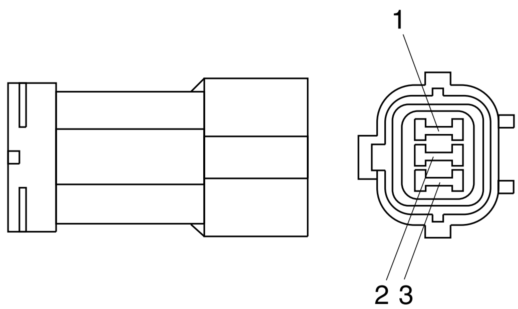
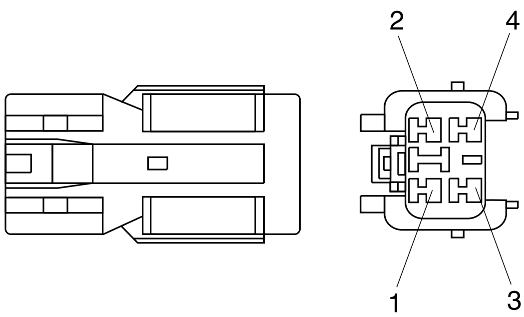
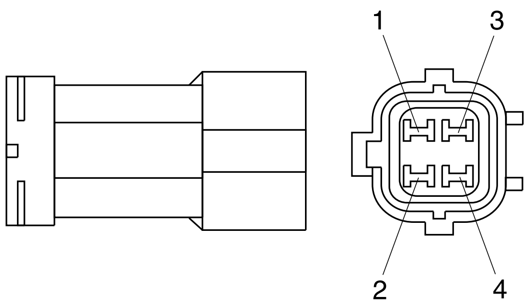
No. of pin	Receptacle connector (female)	Plug connector (male)
5	 S811-005002	 S811-105002
7	 S811-007002	 S811-107002
9	 S811-009002	 3S811-109002
11	 S811-011002	 S811-111002

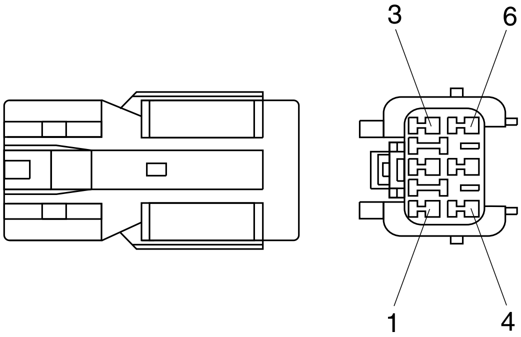
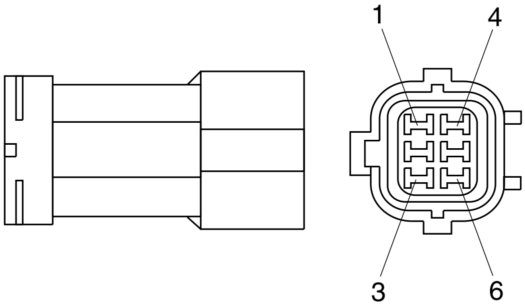
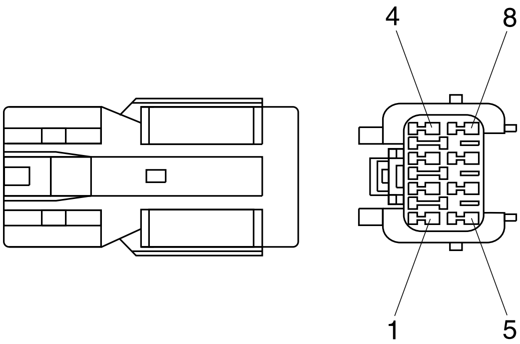
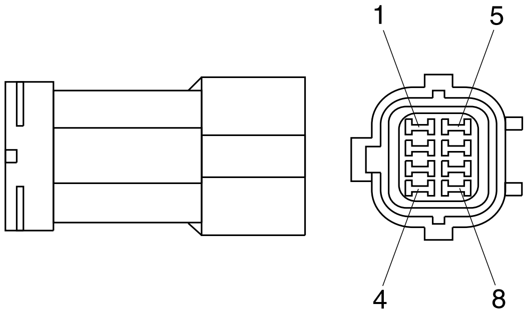
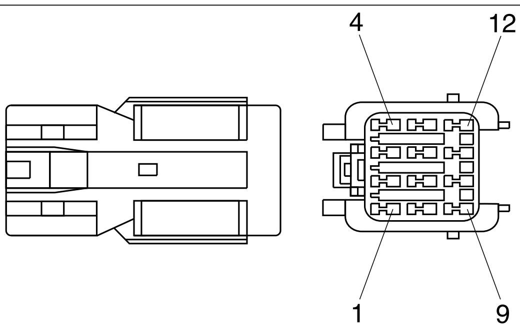
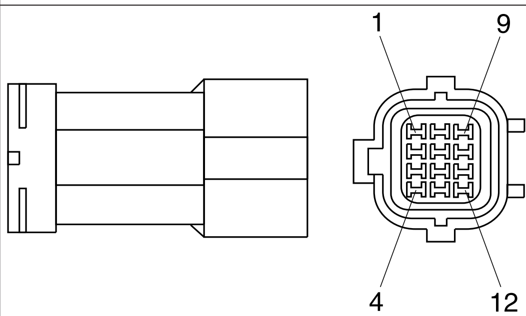
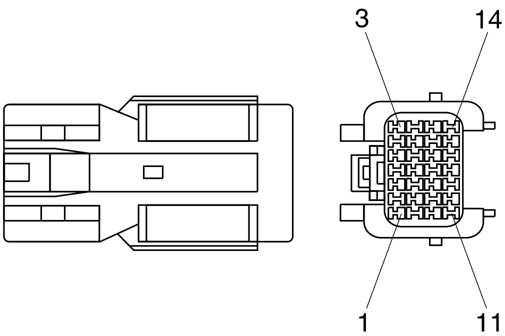
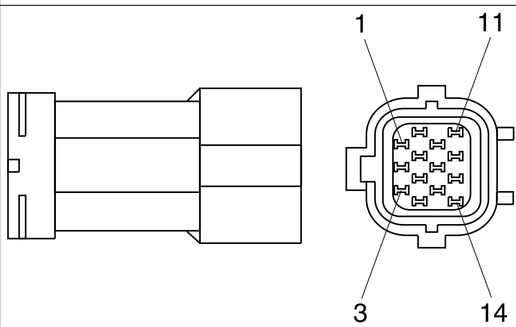
No. of pin	Receptacle connector (female)	Plug connector (male)
13	 S811-013002	 S811-113002
17	 S811-017002	 S811-117002
21	 S811-021002	 S811-121002

2) J TYPE CONNECTOR

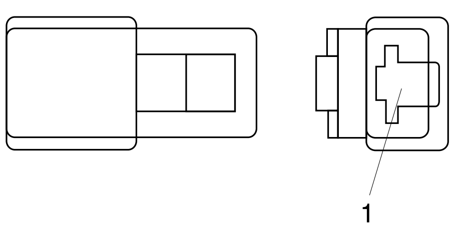
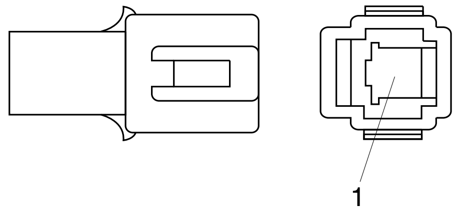
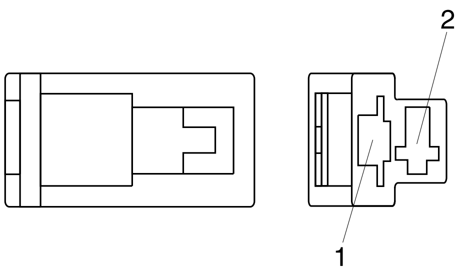
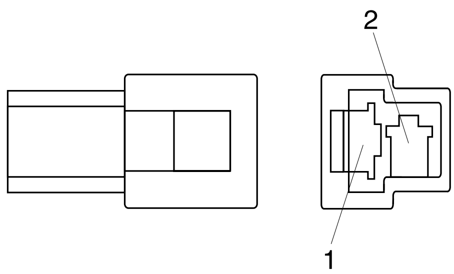
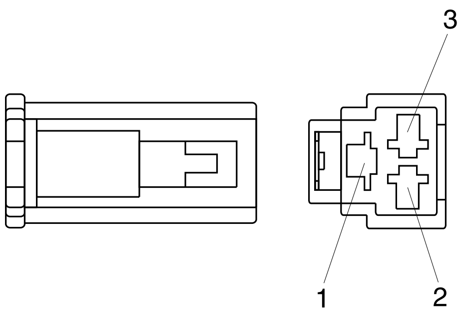
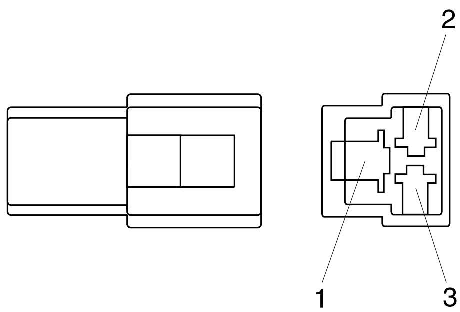
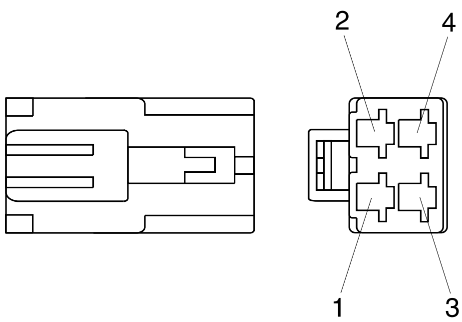
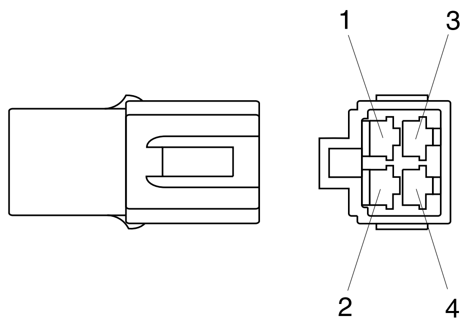
No. of pin	Receptacle connector (female)	Plug connector (male)
2	 S816-002001	 S816-102001
3	 S816-003001	 S816-103001
4	 S816-004001	 S816-104001
8	 S816-008001	 S816-108001

3) SWP TYPE CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
1	 S814-001000	 S814-101000
2	 S814-002000	 S814-102000
3	 S814-003000	 S814-103000
4	 S814-004000	 S814-104000

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 S814-006000	 S814-106000
8	 S814-008000	 S814-108000
12	 S814-012000	 S814-112000
14	 S814-014000	 S814-114000

4) CN TYPE CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
1	 S810-001202	 S810-101202
2	 S810-002202	 S810-102202
3	 S810-003202	 S810-103202
4	 S810-004202	 S810-104202

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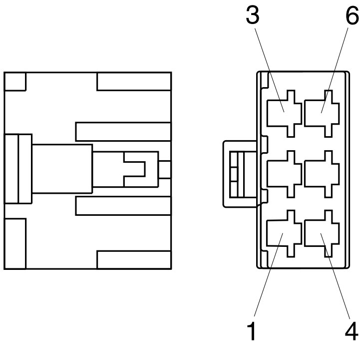
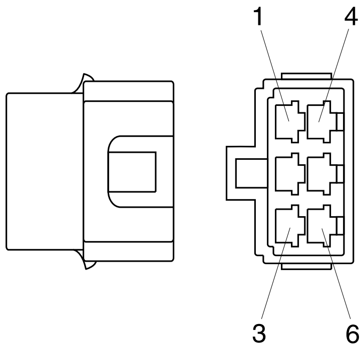
<tr><th>No. of pin</th><th>Receptacle connector (female)</th><th>Plug connector (male)</th></tr>
<tr><td>6</td><td>
S810-006202</td><td>
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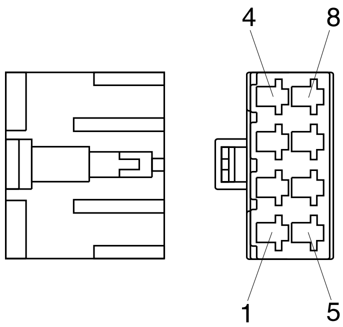
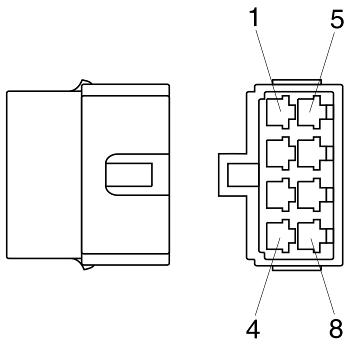
<tr><td>8</td><td>
S810-008202</td><td>
S810-108202</td></tr>
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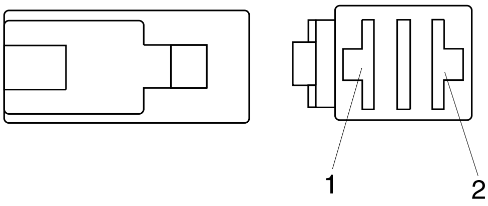
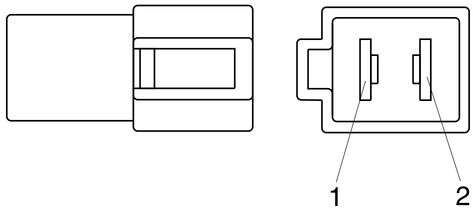
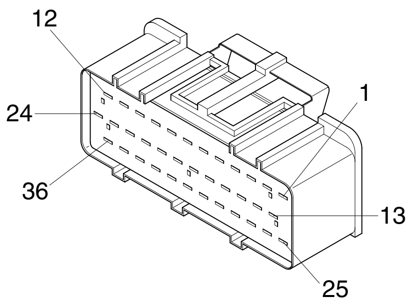
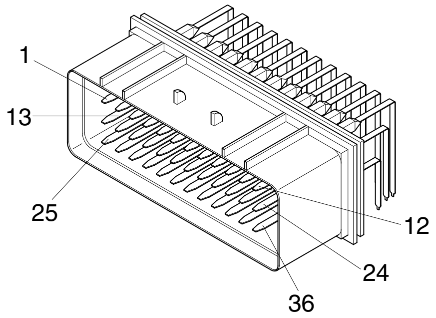
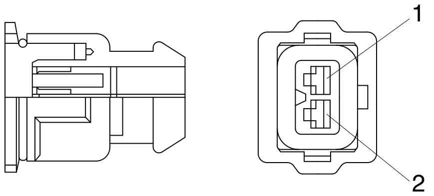
5) 375 FASTEN TYPE CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 S810-002402	 S810-102402

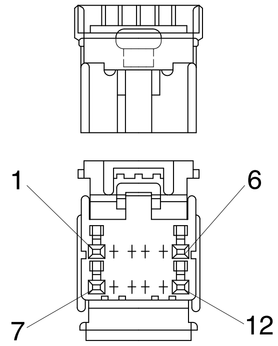
6) AMP ECONOSEAL CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
36	 344111-1	 344108-1

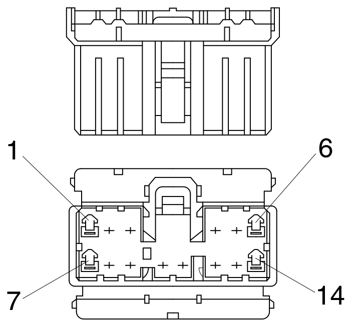
7) AMP TIMER CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 85202-1	

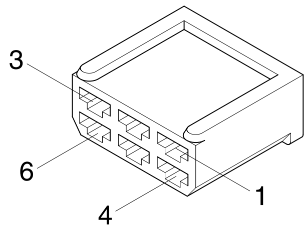
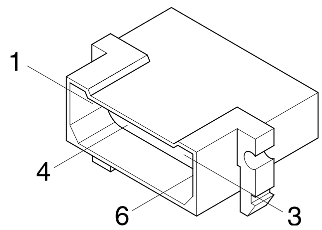
8) AMP 040 MULTILOCK CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
12	 174045-2	

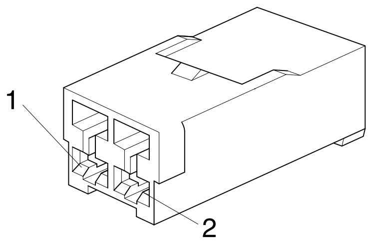
9) AMP 070 MULTILOCK CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
14	 173852	

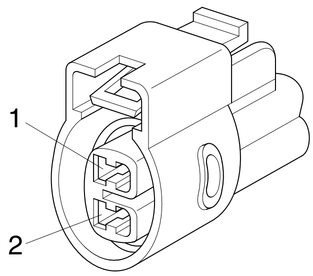
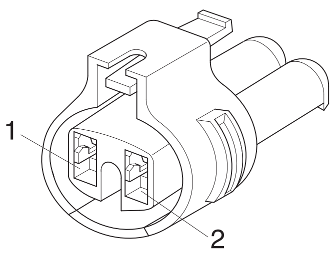
10) AMP FASTIN - FASTON CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 925276-0	 480003-9

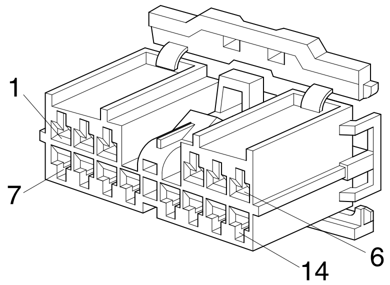
11) KET 090 CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 MG610070	

12) KET 090 WP CONNECTORS

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 MG640605	
2	 MG640795	

13) KET SDL CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
14	 MG610406	

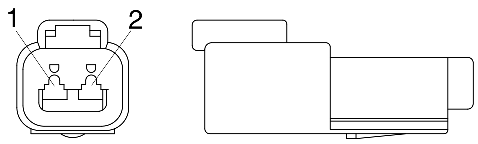
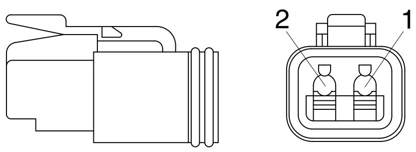
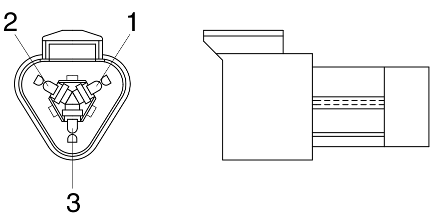
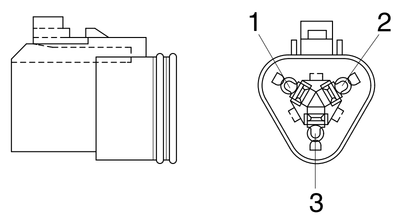
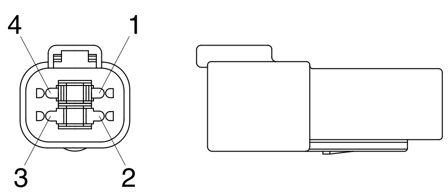
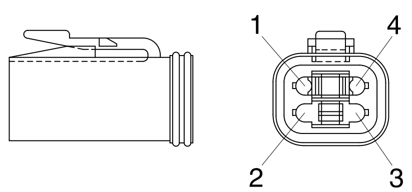
14) DEUTSCH DT CONNECTORS

DT 06 - 3S - ★★★★

- ★★★★ : Modifications (See below)
- 3S : Number of contacts (P : Pin, S : Socket)
- 06 : 04 : Receptacle, 06 : Plug
- DT : Deutsch connectors

※ Modification

E003 : Standard end cap - gray
E004 : Color of connector to be black
E005 : Combination - E004 & E003
EP04 : End cap
EP06 : Combination P012 & EP04
P012 : Front seal enhancement - connectors color to black for 2, 3, 4 & 6pin

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 DT06-2S	 DT04-2P
3	 DT06-3S	 DT04-3P
4	 DT06-4S	 DT04-4P

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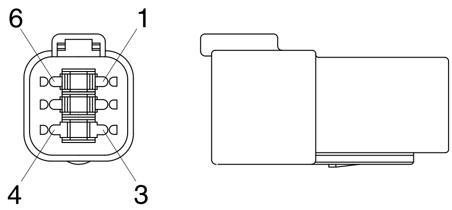
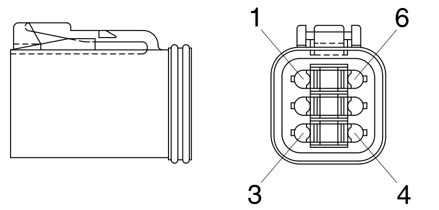
<tr><td>6</td><td>

DT06-6S</td><td>

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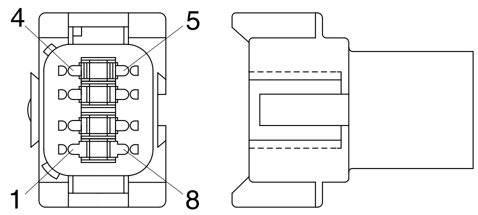
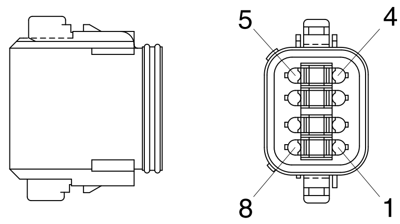
<tr><td>8</td><td>

DT06-8S</td><td>

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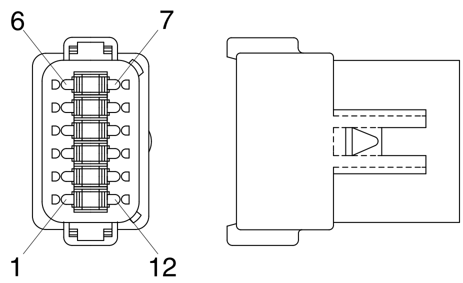
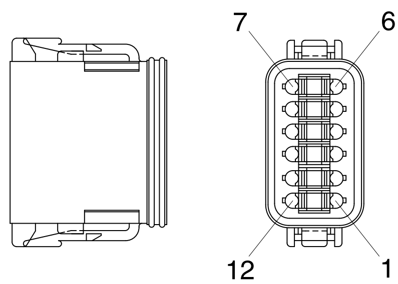
<tr><td>12</td><td>

DT06-12S</td><td>

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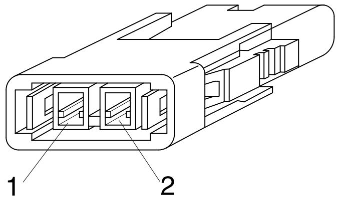
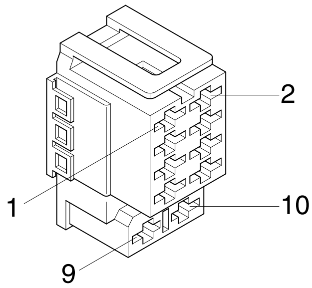
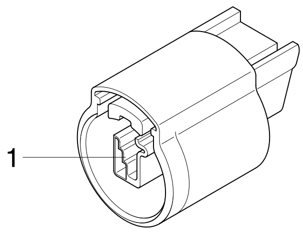
15) MOLEX 2CKTS CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 35215-0200	

16) ITT SWF CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
10	 SWF593757	

17) MWP NMWP CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
1	 NMWP01F-B	

SECTION 5 TROUBLESHOOTING

Group 1 Before Troubleshooting ········ 5-1
Group 2 Hydraulic and Mechanical System ········ 5-4
Group 3 Electrical System ········ 5-24

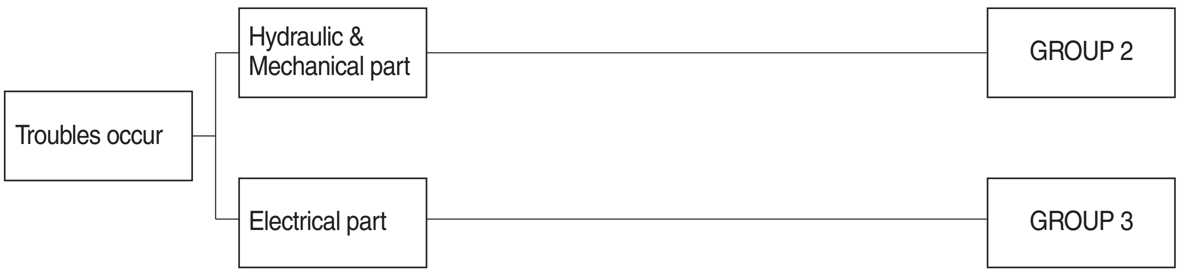
GROUP 1 BEFORE TROUBLESHOOTING

1. INTRODUCTION

When a trouble is occurred in the machine, this section will help an operator to maintain the machine with easy.

The trouble of machine is parted Hydraulic & Mechanical system and Electrical system.

At each system part, an operator can check the machine according to the troubleshooting process diagram.

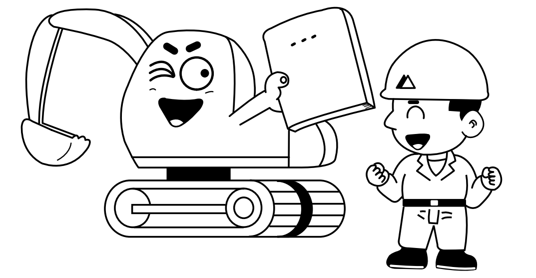


2. DIAGNOSING PROCEDURE

To carry out troubleshooting efficiently, the following steps must be observed.

STEP 1. Study the machine system

Study and know how the machine is operating, how the system is composing, what kinds of function are installed in the machine and what are specifications of the system components by the machine service manual.
Especially, deepen the knowledge for the related parts of the trouble.

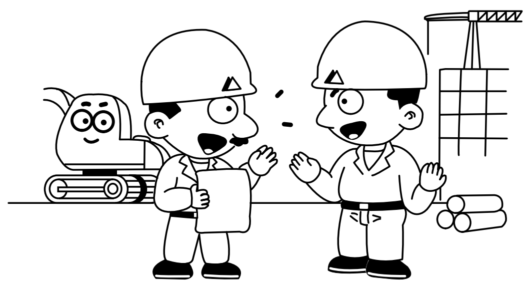


13031SH02

STEP 2. Ask the operator

Before inspecting, get the full story of malfunctions from a witness --- the operator.

1) How the machine is used and when it is serviced?
2) When the trouble was noticed and what work the machine was doing at that time?
3) What is the phenomenon of the trouble? Was the trouble getting worse, or did it come out suddenly for the first time?
4) Did the machine have any troubles previously? If so, which parts were repaired before.

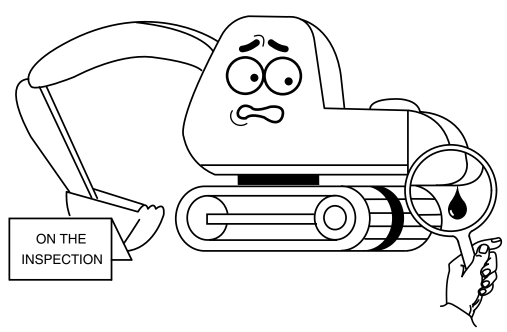


13031SH03

STEP 3. Inspect the machine

Before starting troubleshooting, check the machine for the daily maintenance points as shown in the operator's manual.

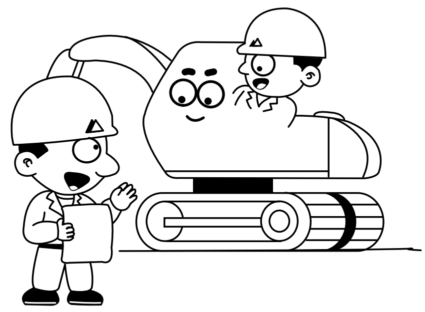
And also check the electrical system including batteries, as the troubles in the electrical system such as low battery voltage, loose connections and blown out fuses will result in malfunction of the controllers causing total operational failures of the machine.



6-2(3) 140-7

STEP 4. Inspect the trouble actually on the machine

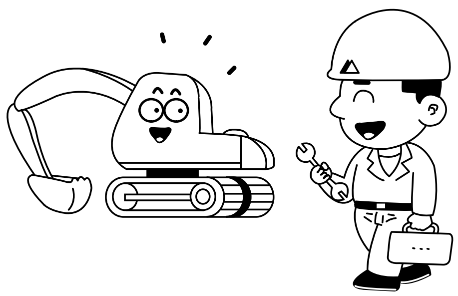
In case that some trouble cannot be confirmed, obtain the details of the malfunction from the operator.
Also, check if there are any in complete connections of the wire harnesses are or not.



6-3(1) 140-7

STEP 5. Perform troubleshooting

According to where the trouble parts are located, hydraulic & mechanical system part or electrical system part or mechatronics system part, perform troubleshooting the machine refer to the each system part's troubleshooting process diagram.

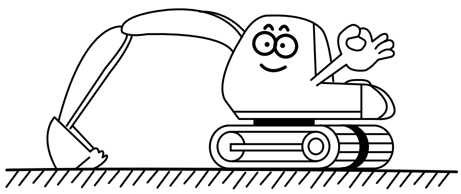


13031SH05

STEP 6. Trace a cause

Before reaching a conclusion, check the most suspectible causes again. Try to trace what the real cause of the trouble is.

Make a plan of the appropriate repairing procedure to avoid consequential malfunctions.



6-3(3) 140-7

GROUP 2 HYDRAULIC AND MECHANICAL SYSTEM

1. INTRODUCTION

1) MACHINE IN GENERAL

(1) If even a minor fault is left intact and operation is continued, a fatal failure may be caused, entailing a large sum of expenses and long hours of restoration.
Therefore when even a small trouble occurs, do not rely on your intuition and experience, but look for the cause based on the troubleshooting principle and perform maintenance and adjustment to prevent major failure from occurring. Keep in mind that a fault results from a combination of different causes.

(2) The following lists up commonly occurring faults and possible causes with this machine. For the troubleshooting of the engine, refer to the coming troubleshooting and repair.

(3) When carrying out troubleshooting, do not hurry to disassemble the components.
It will become impossible to find the cause of the problem.

(4) Ask user or operator the following.
① Was there any strange thing about machine before failure occurred?
② Under what conditions did the failure occur?
③ Have any repairs been carried out before the failure?

(5) Check before troubleshooting.
① Check oil and fuel level.
② Check for any external leakage of oil from components.
③ Check for loose or damage of wiring and connections.

2. DRIVE SYSTEM

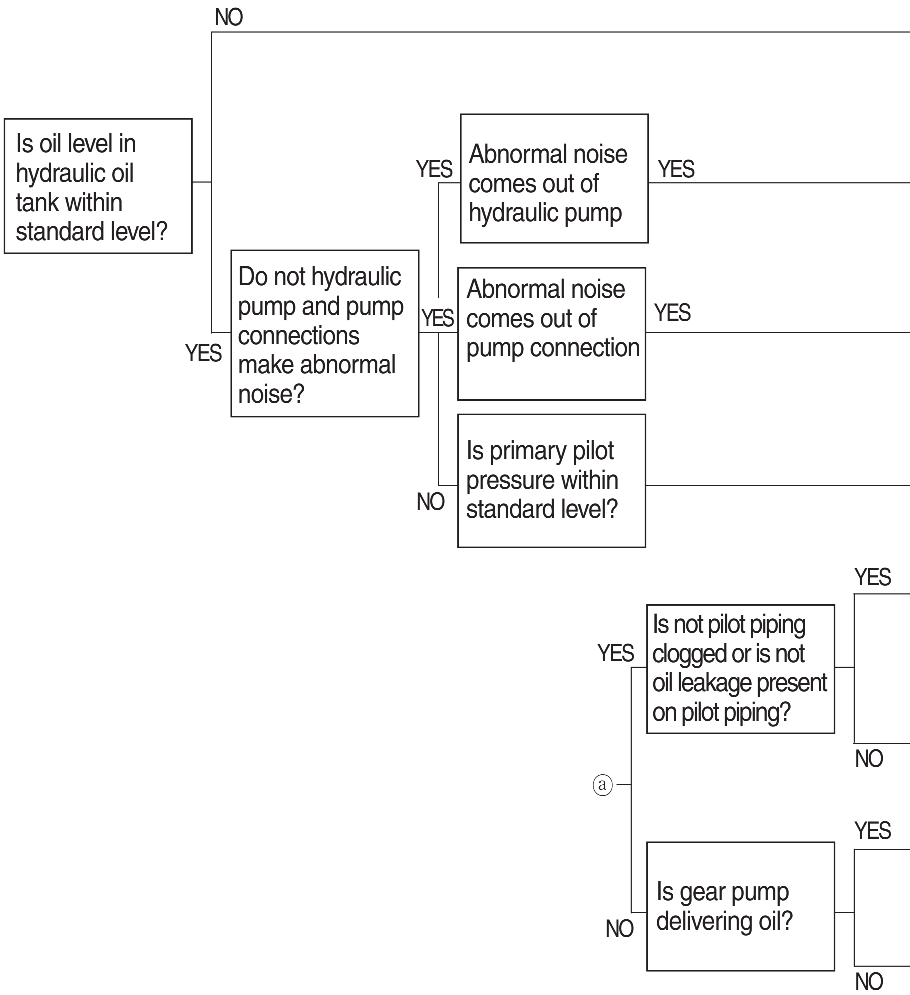
1) UNUSUAL NOISE COMES OUT OF PUMP CONNECTION

Remove dust plug under engine flywheel and check if rubber pieces or particles are not present.

- YES → Cause: Coupling element is broken. Remedy: Disassemble and repair.
- NO → Coupling hub spline is worn or hub fastening setscrew is slack.
  - YES → Remedy: Replace hub or retighten setscrew.
  - NO → If hydraulic pump or engine is suspected as a culprit refer to this manual "Structure and function".

Cause	Remedy
Coupling element is broken.	Disassemble and repair.
	Replace hub or retighten setscrew.

2) ENGINE STARTS BUT MACHINE DOES NOT OPERATE AT ALL



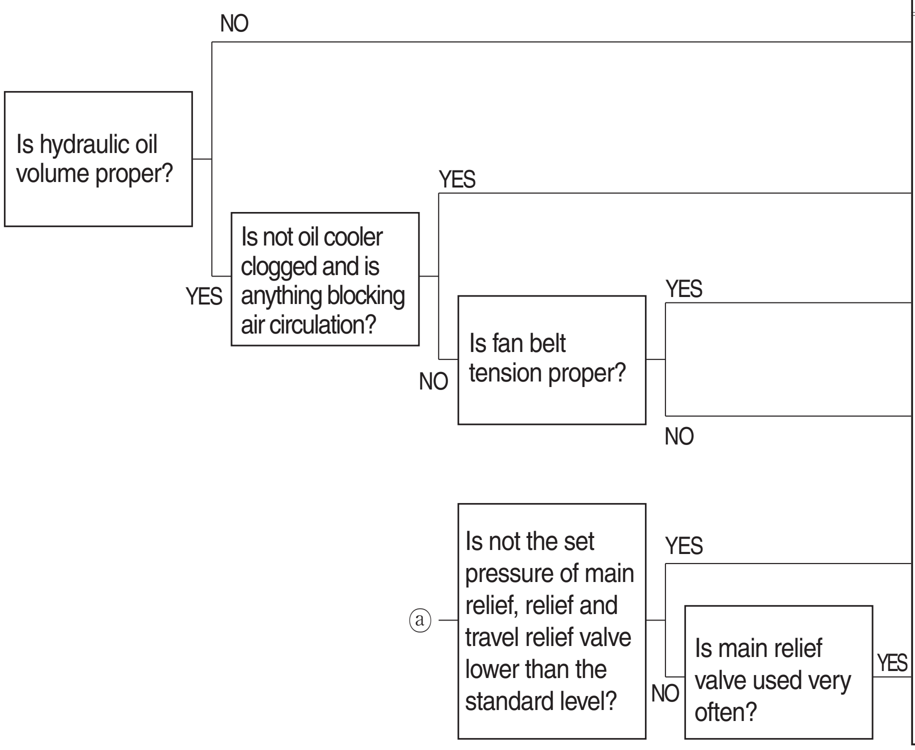
Cause	Remedy
	Replenish specified oil to the standard level.
Hydraulic pump is broken.	Disassemble and repair.
	see item 1). at page 5-5
ⓐ	
	Clean pilot piping interior or repair piping.
Pilot valve is faulty.	Disassemble and repair.
Pilot relief valve is faulty.	Repair or replace.
Gear pump is broken.	Disassemble and repair.

3. HYDRAULIC SYSTEM

1) HYDRAULIC OIL IS CLOUDY

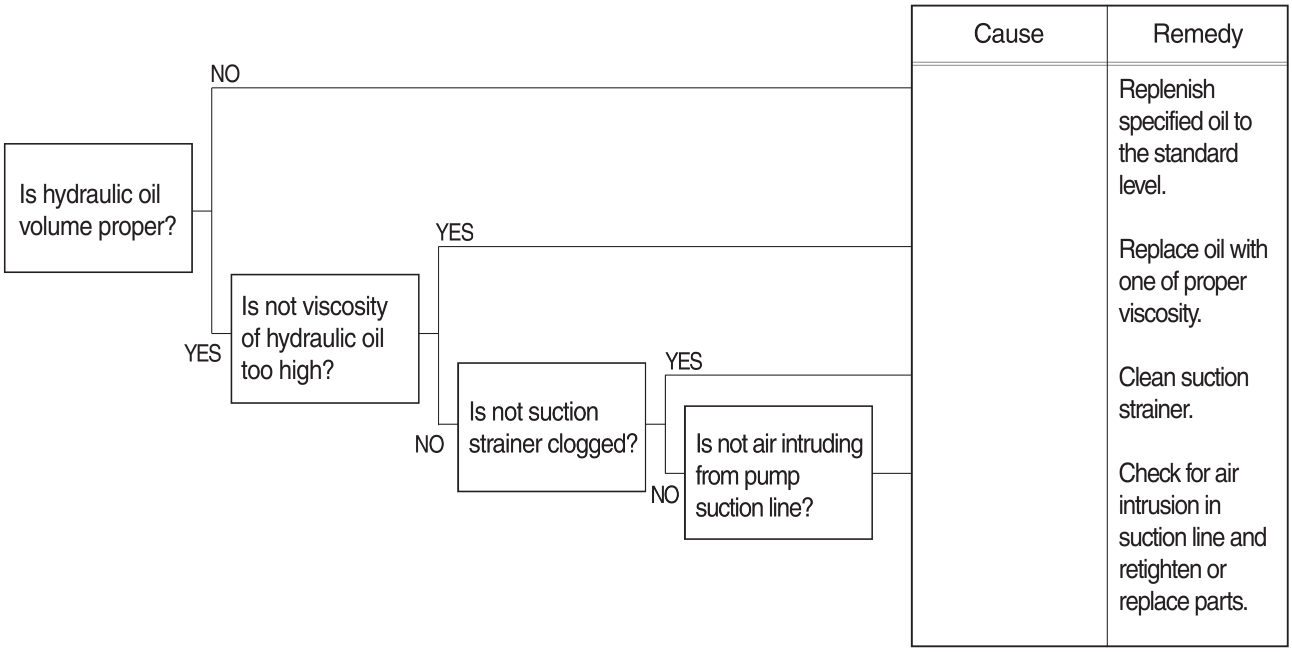
Cause	Remedy
Water is mixed.	Put hydraulic oil still, separate water and dispose it or replace hydraulic oil.
Air is intruded.	Check suction line and return line and eliminate the air intruding source.

2) HYDRAULIC OIL TEMPERATURE HAS RISEN ABNORMALLY

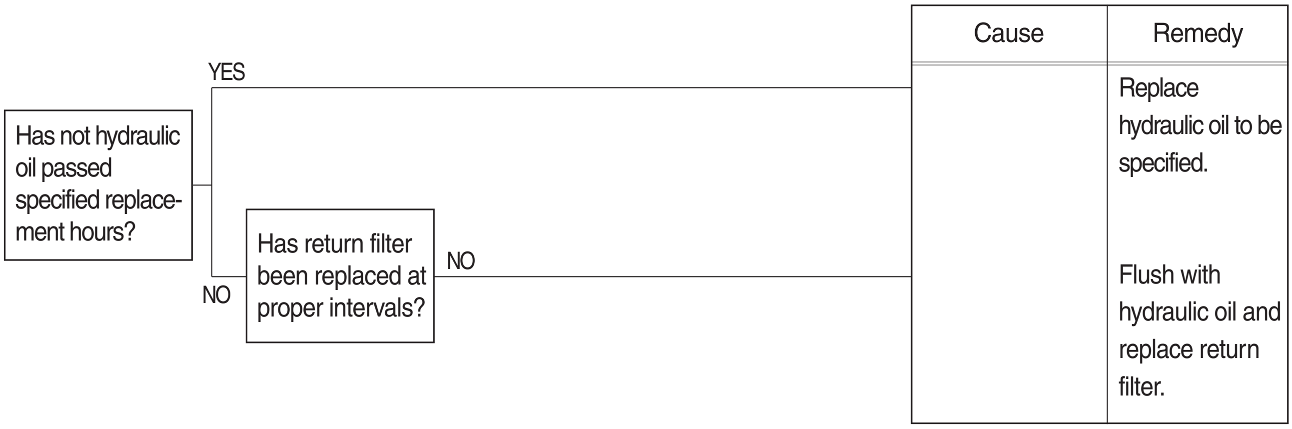


Cause	Remedy
	Replenish specified oil to the standard level.
	Clean oil cooler. Secure air circulation route.
ⓐ	
	Adjust belt tension or replace belt.
	Readjust set pressure.
	Reduce load.

3) CAVITATION OCCURS WITH PUMP

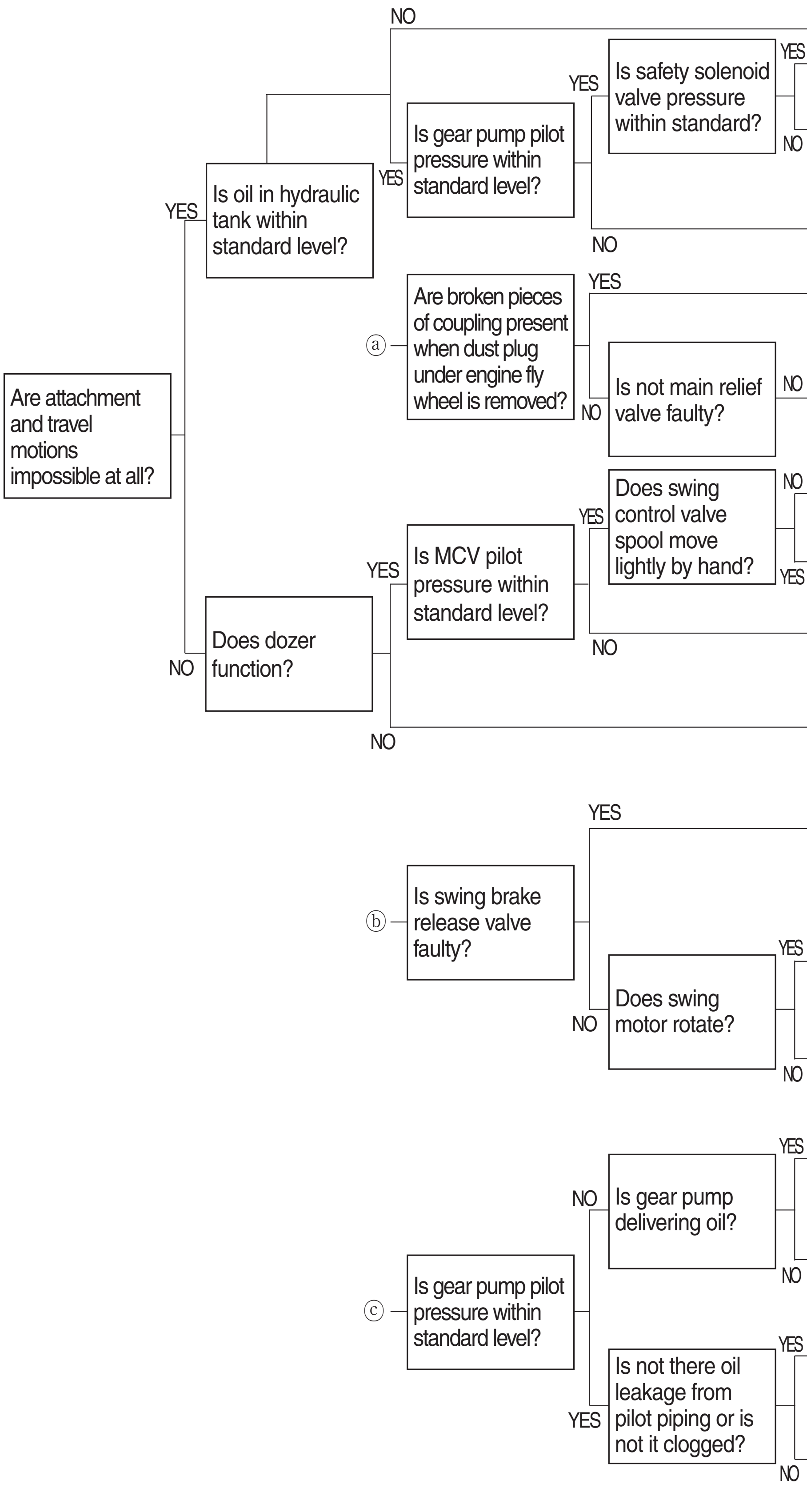


4) HYDRAULIC OIL IS CONTAMINATED



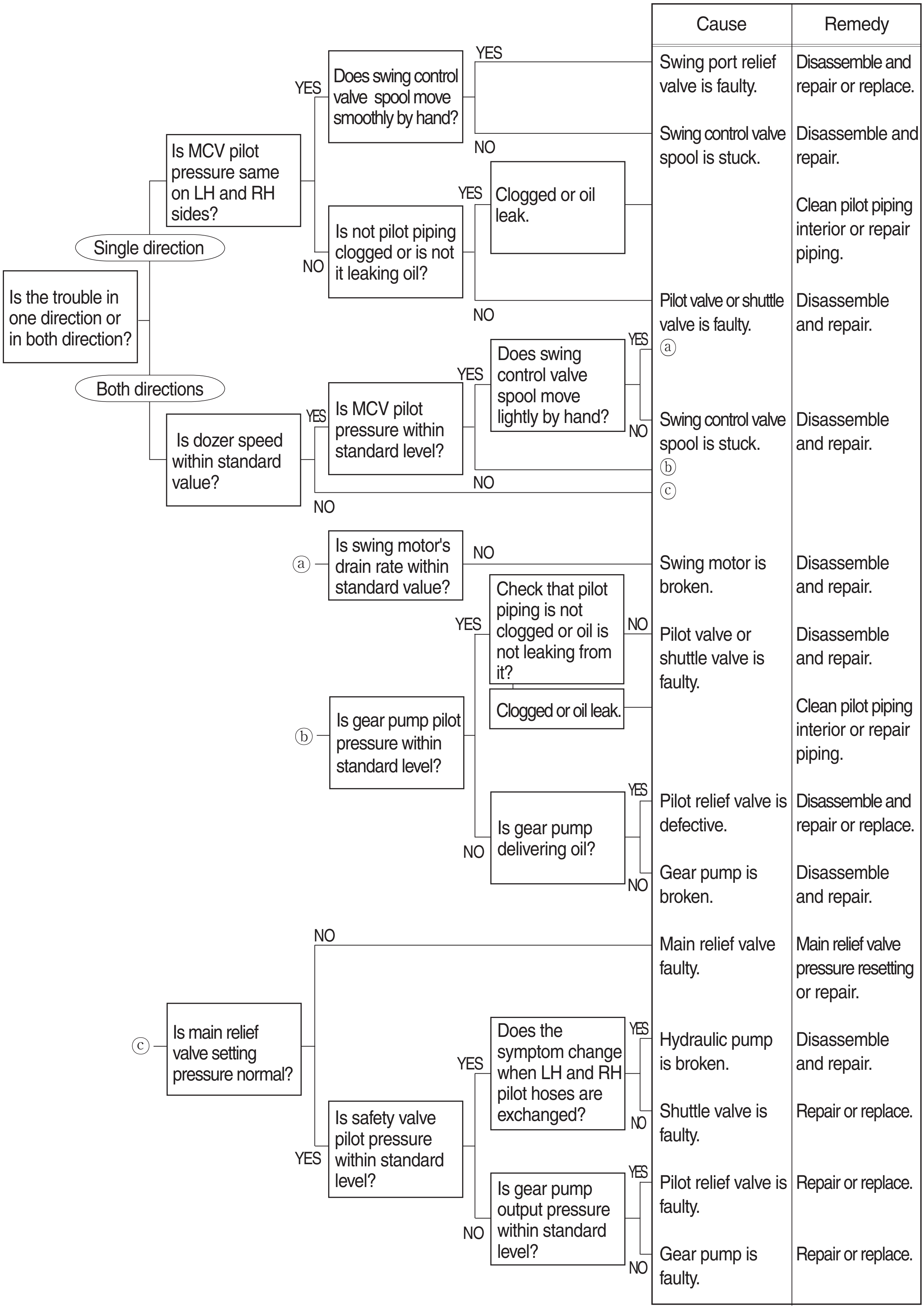
4. SWING SYSTEM

1) BOTH LH AND RH SWING ACTIONS ARE IMPOSSIBLE

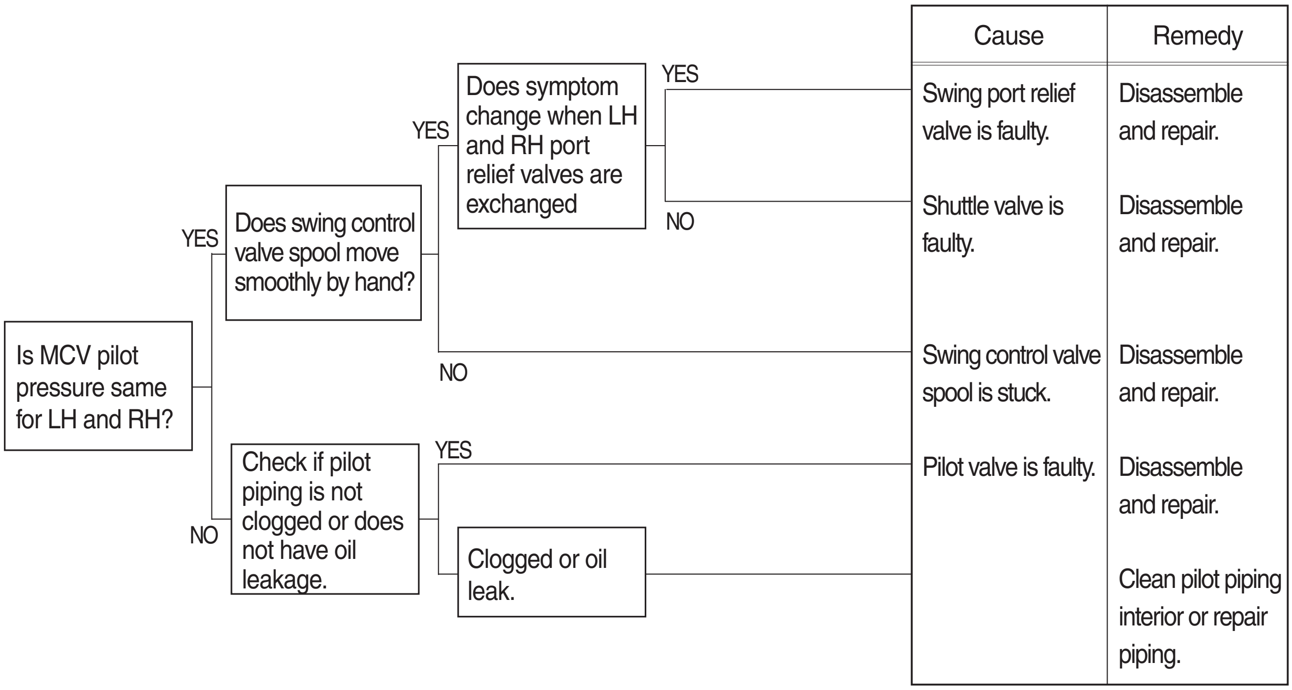


Cause	Remedy
ⓐ	Replenish specified oil to the standard level.
Safety valve faulty or not operated.	Repair or replace.
Gear pump faulty.	Repair or replace.
Pump connection coupling is broken.	Disassemble and repair.
Hydraulic pump is out of order.	Disassemble and repair.
Swing control valve spool is stuck.	Disassemble and repair.
ⓑ	
ⓒ	
Hydraulic pump is broken.	Disassemble and repair.
Swing brake release valve is broken.	Disassemble and repair.
Swing reduction unit is broken.	Disassemble and repair.
Swing motor is broken.	Disassemble and repair.
Pilot relief valve is faulty.	Disassemble and repair or replace.
Gear pump is out of order.	Disassemble and repair.
	Clean pilot piping interior or repair piping.
Pilot valve is broken.	Disassemble and repair.

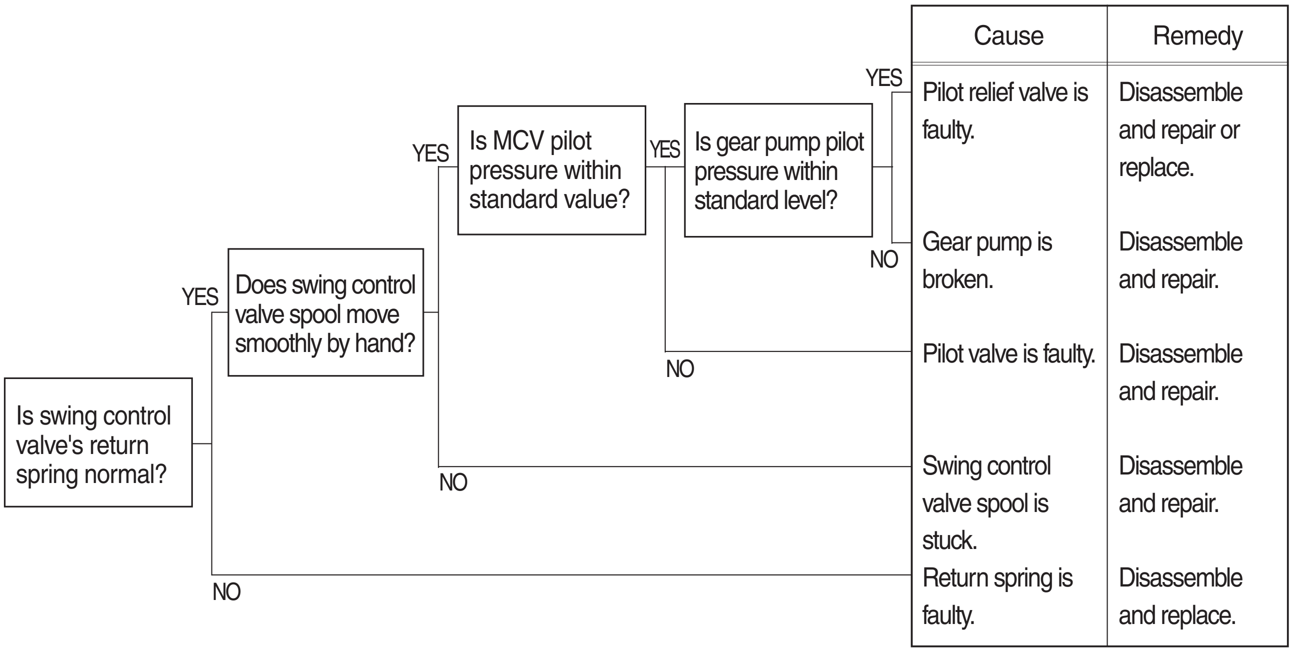
2) SWING SPEED IS LOW



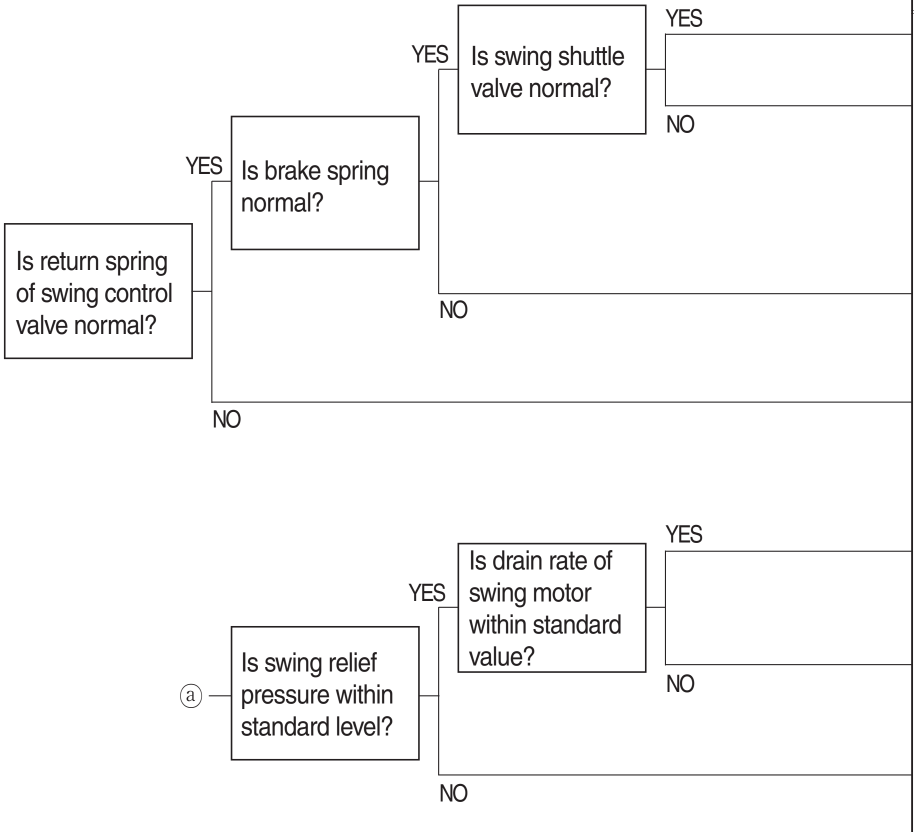
3) SWING MOTION IS IMPOSSIBLE IN ONE DIRECTION



4) MACHINE SWINGS BUT DOES NOT STOP



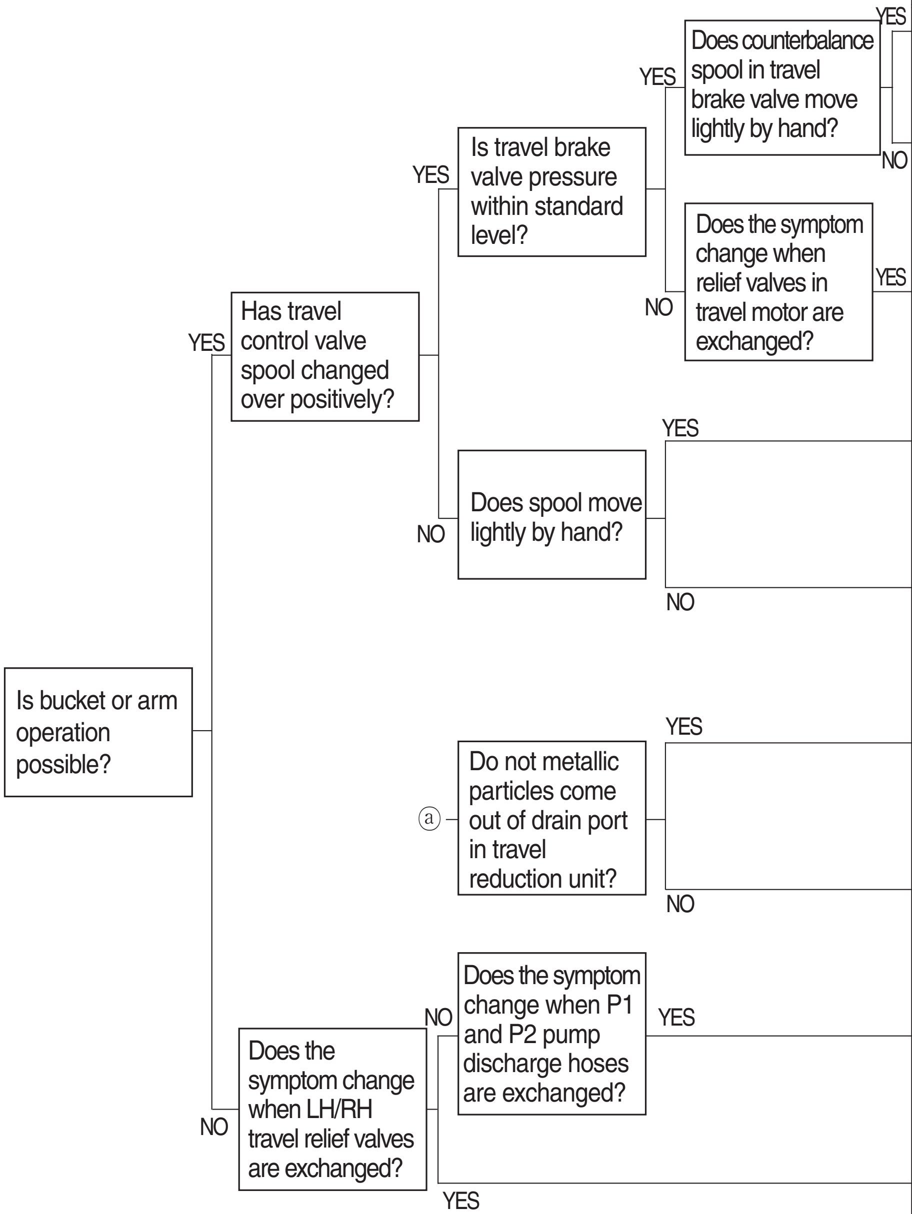
5) THE SWING UNIT DRIFTS WHEN THE MACHINE IS AT REST ON A SLOPE



Cause	Remedy
ⓐ	
Shuttle valve is faulty.	Disassemble and replace.
Brake spring is faulty.	Disassemble and replace.
Return spring of swing control valve is faulty.	Disassemble and replace.
Swing relief valve is faulty.	Disassemble and repair or replace.
Swing motor is broken.	Disassemble and repair.
	Adjust swing relief valve pressure or replace swing relief valve.

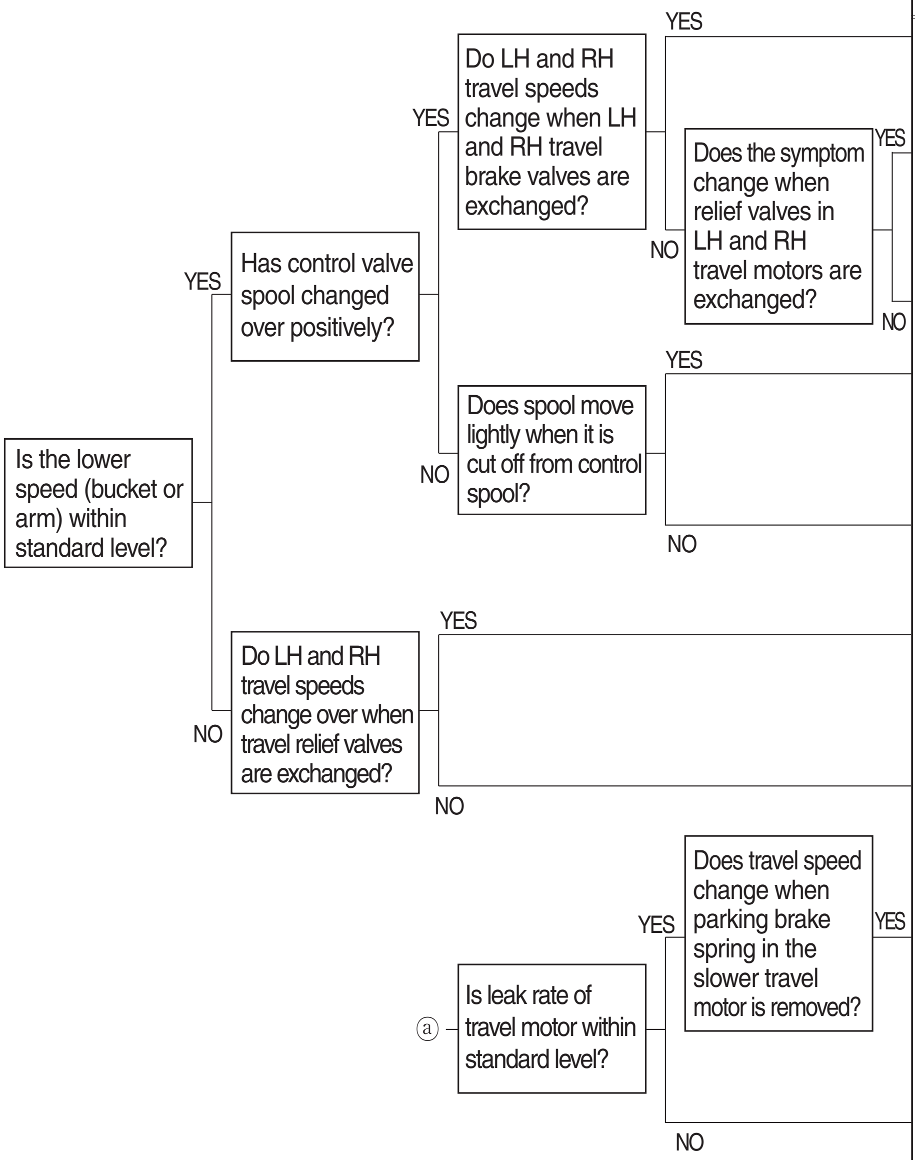
5. TRAVEL SYSTEM

1) TRAVEL DOES NOT FUNCTION AT ALL ON ONE SIDE



Cause	Remedy
ⓐ	
Counter spool in travel brake valve is stuck.	Disassemble and repair or replace.
Relief valve built in travel motor is faulty.	Disassemble and repair.
Control system is defective.	Disassemble inspect and repair.
Travel control valve spool is stuck.	Disassemble and repair.
Travel reduction unit is faulty.	Disassemble and repair.
Travel motor is out of order.	Disassemble and repair.
Hydraulic pump is broken.	Disassemble and repair.
Travel relief valves are faulty.	Disassemble and repair or replace.

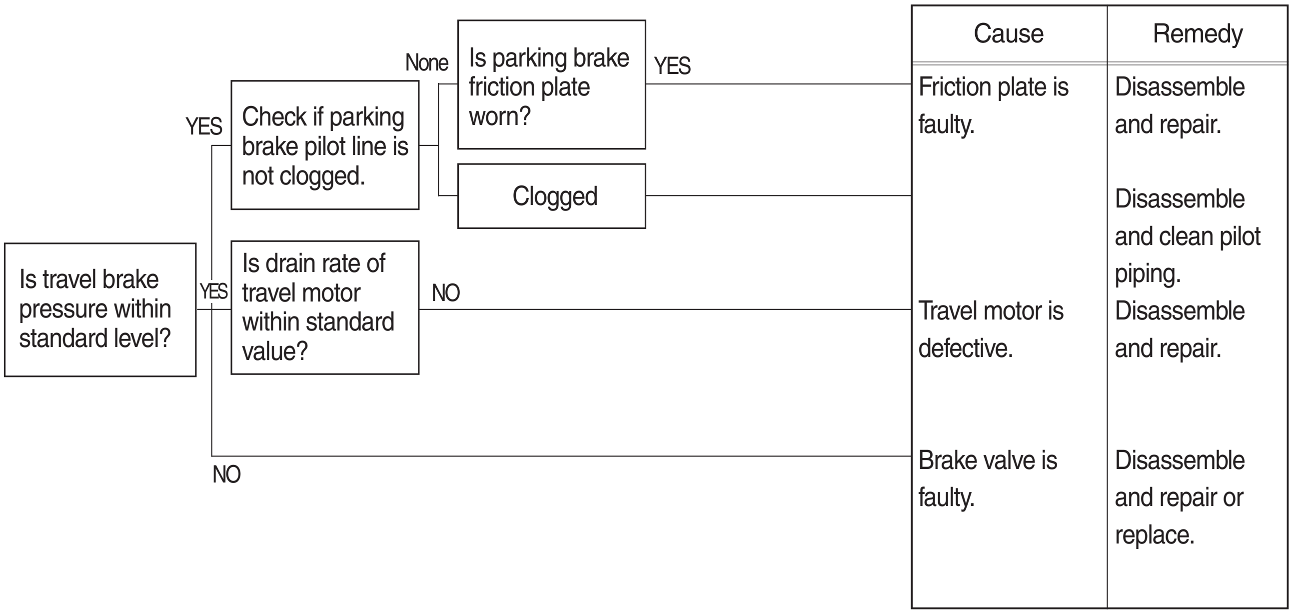
2) SPEED ON ONE SIDE FALLS AND THE MACHINE CURVES



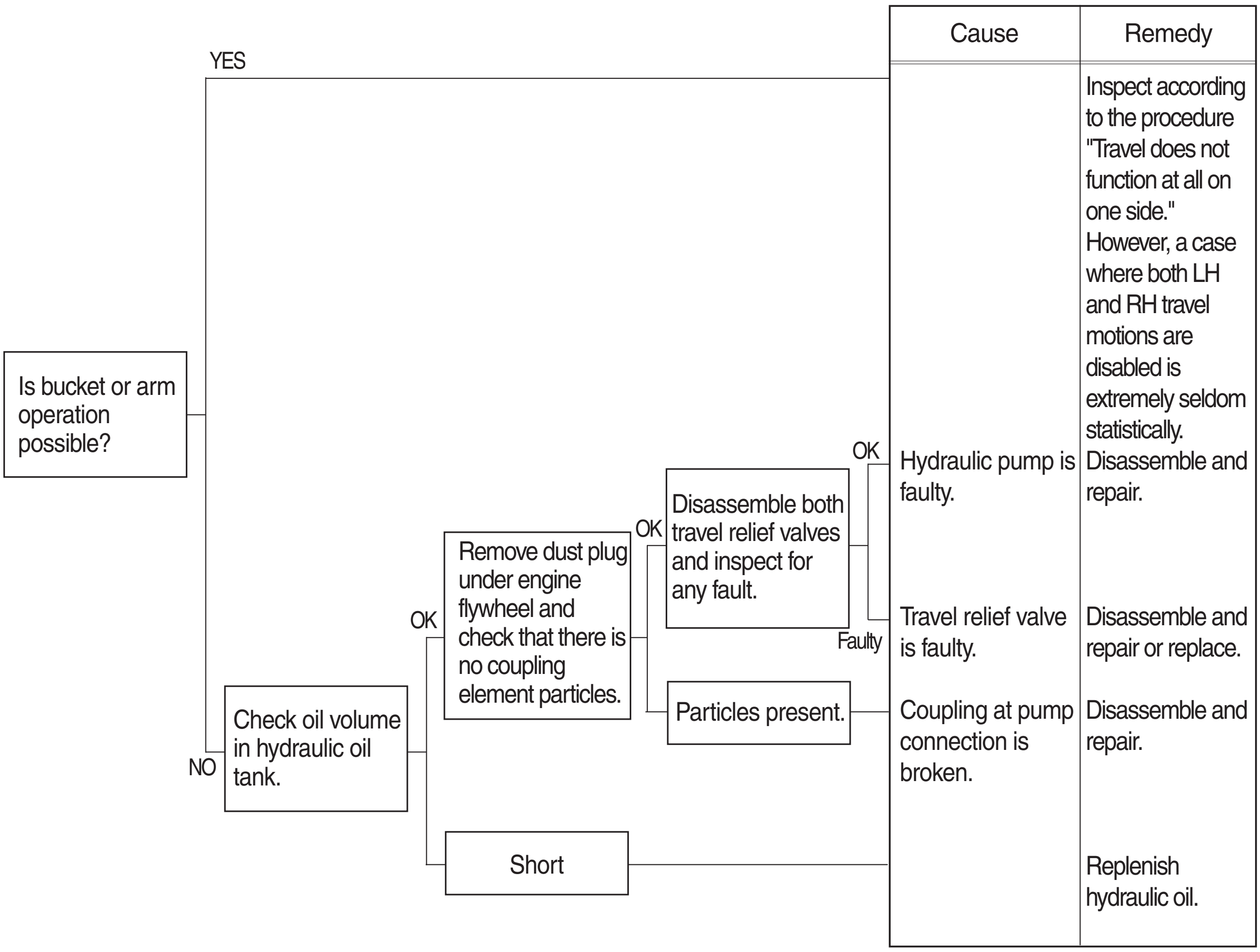
Cause	Remedy
Brake valve is defective.	Disassemble and repair or replace.
Relief valve built in travel motor is faulty.	Disassemble and repair.
ⓐ	
Control system is faulty .	Disassemble, inspect and repair.
Control valve spool is stuck.	Disassemble and repair.
Travel relief valve is faulty.	Disassemble and repair or replace.
Hydraulic pump is broken.	Disassemble and repair.
Travel motor's parking brake is not released properly.	Disassemble and clean pilot piping.
Travel motor is faulty.	Disassemble and repair.

3) MACHINE DOES NOT STOP ON A SLOPE

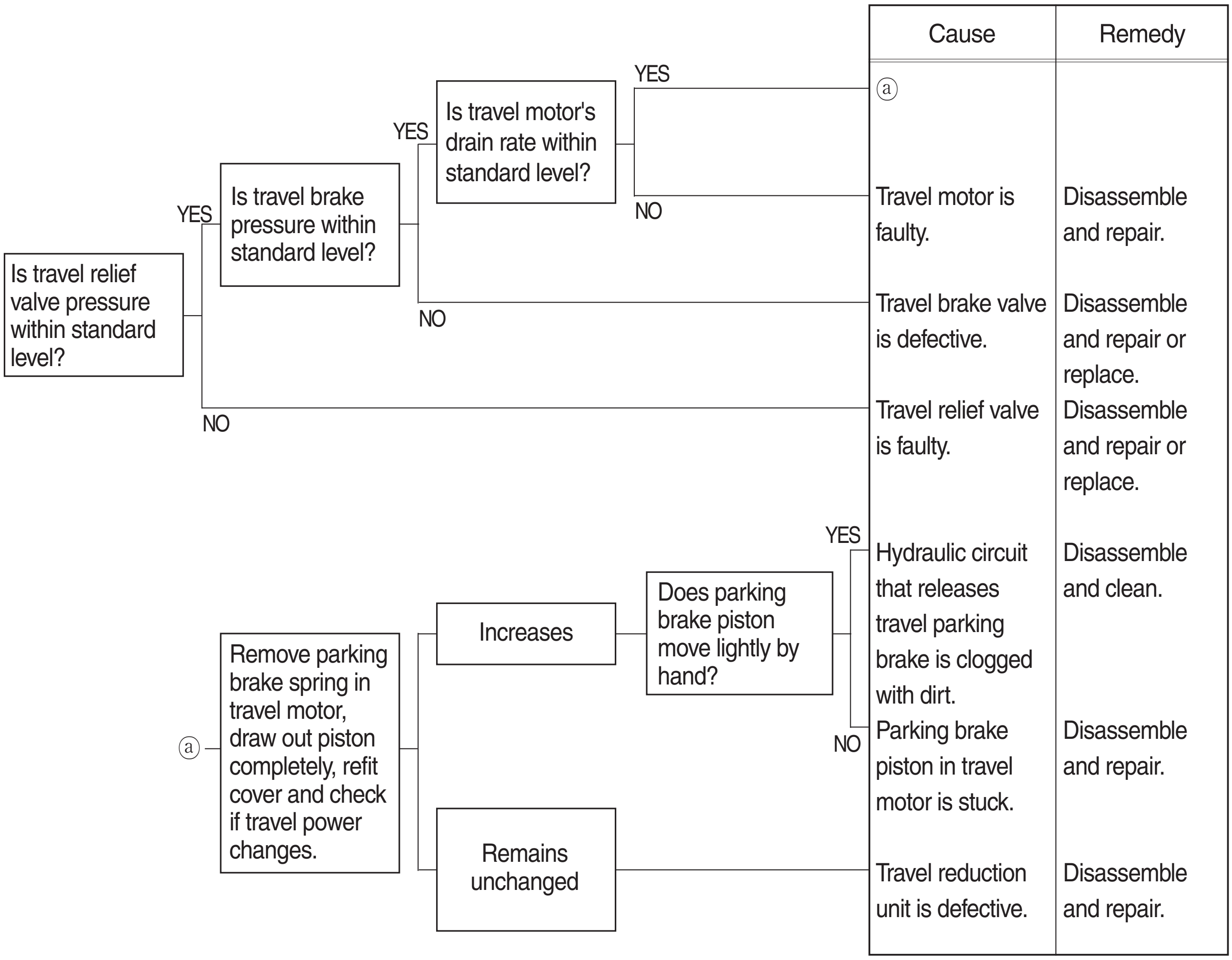
Machine is pulled forward as sprocket rotates during digging operation.



4) LH AND RH TRAVEL MOTIONS ARE IMPOSSIBLE

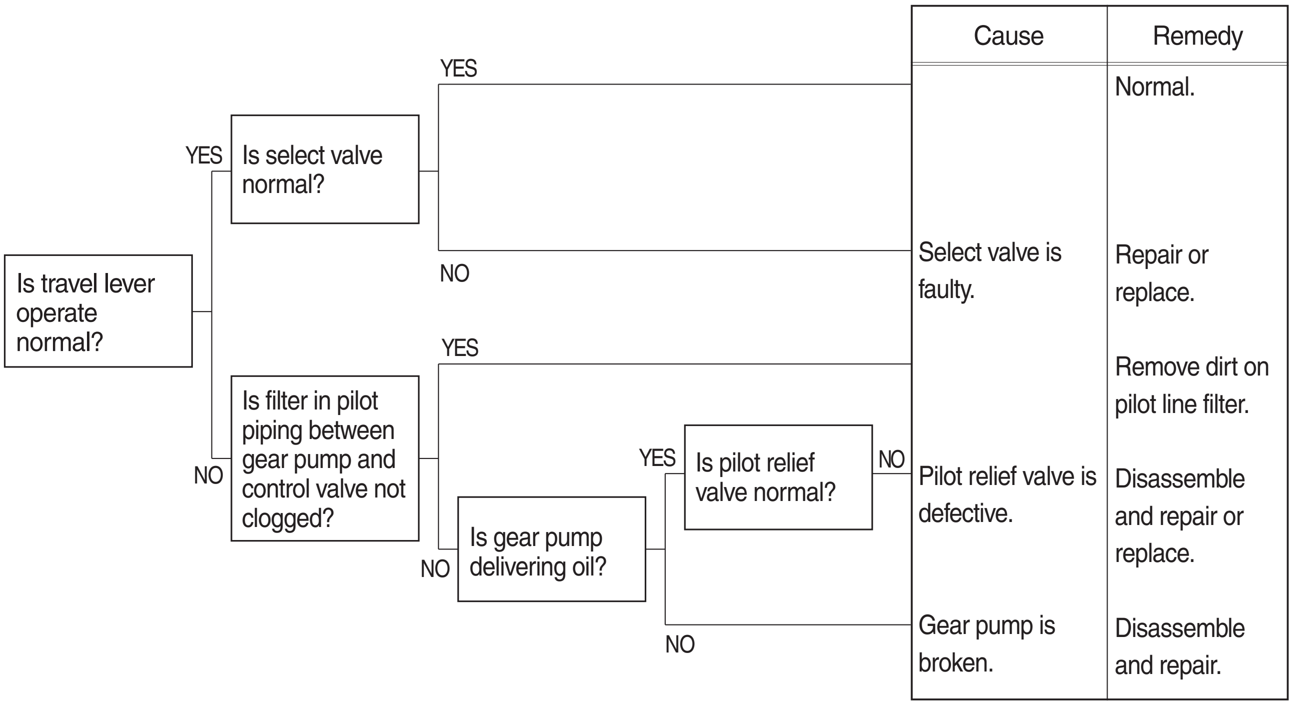


5) TRAVEL ACTION IS POWERLESS (travel only)



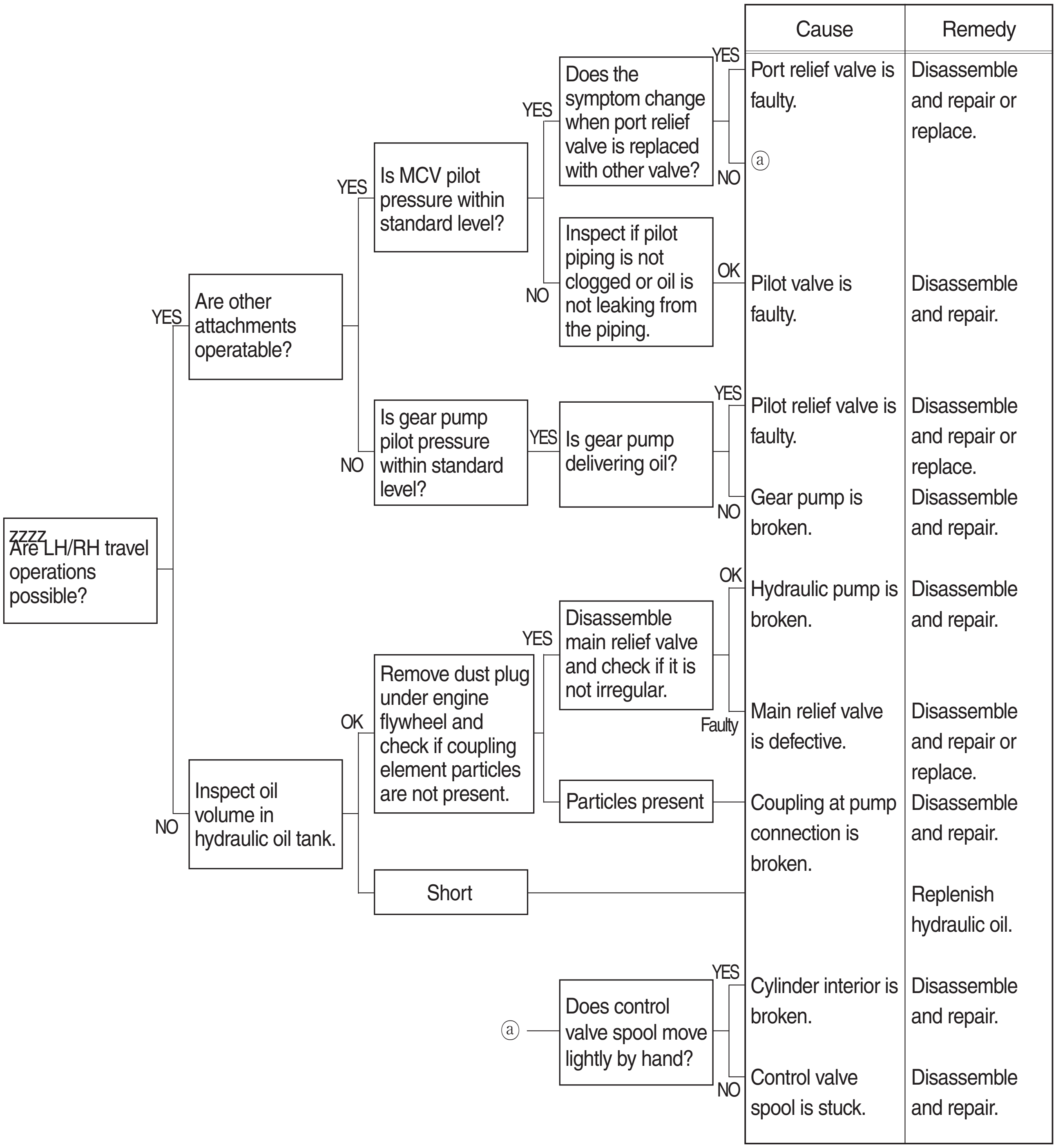
6) MACHINE RUNS RECKLESSLY ON A SLOPE

7) MACHINE MAKES A CURVED TRAVEL OR DOES NOT TRAVEL AT ALL WHEN TRAVEL AND ATTACHMENT OPERATIONS ARE EXECUTED AT THE SAME TIME

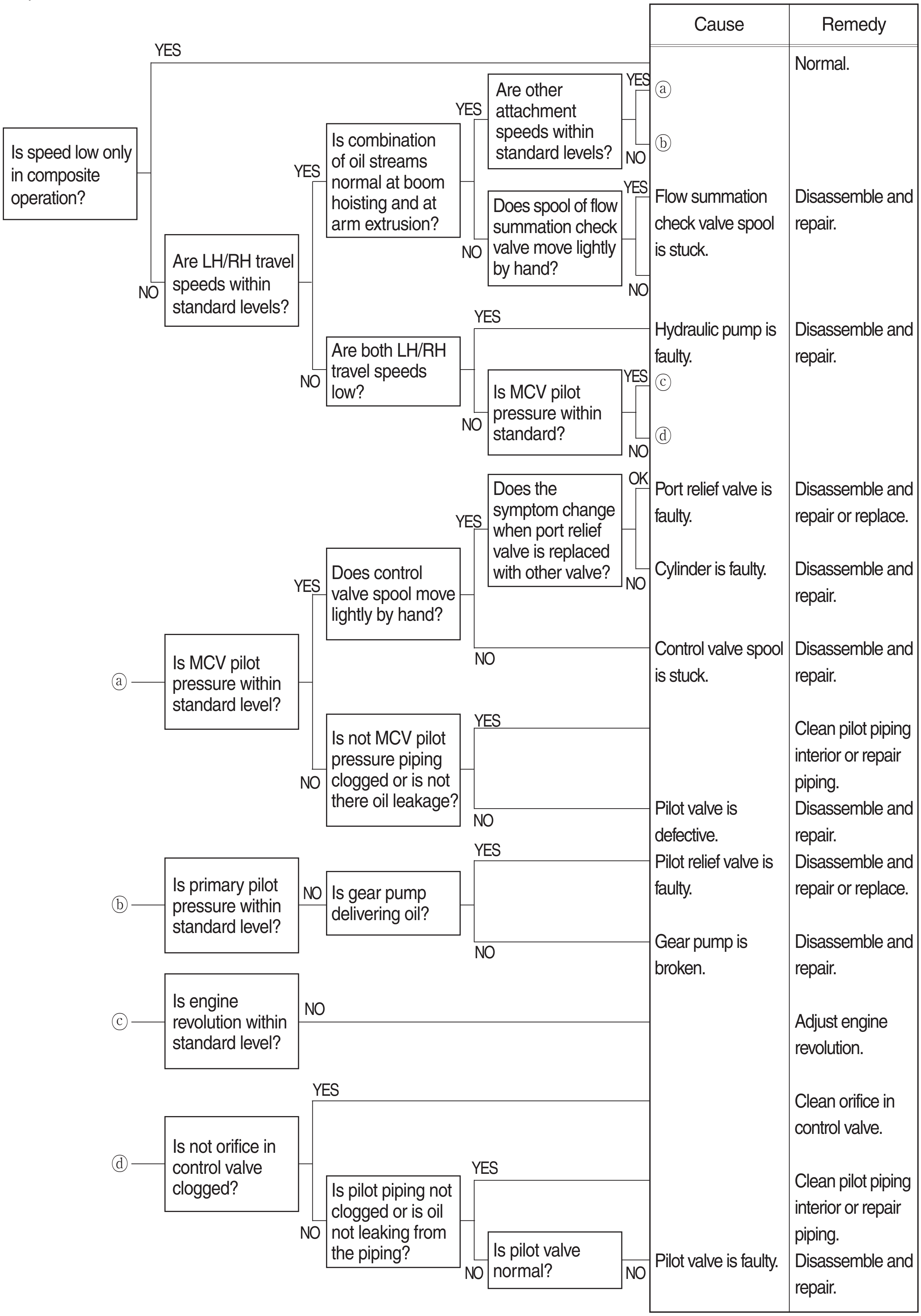


6. ATTACHMENT SYSTEM

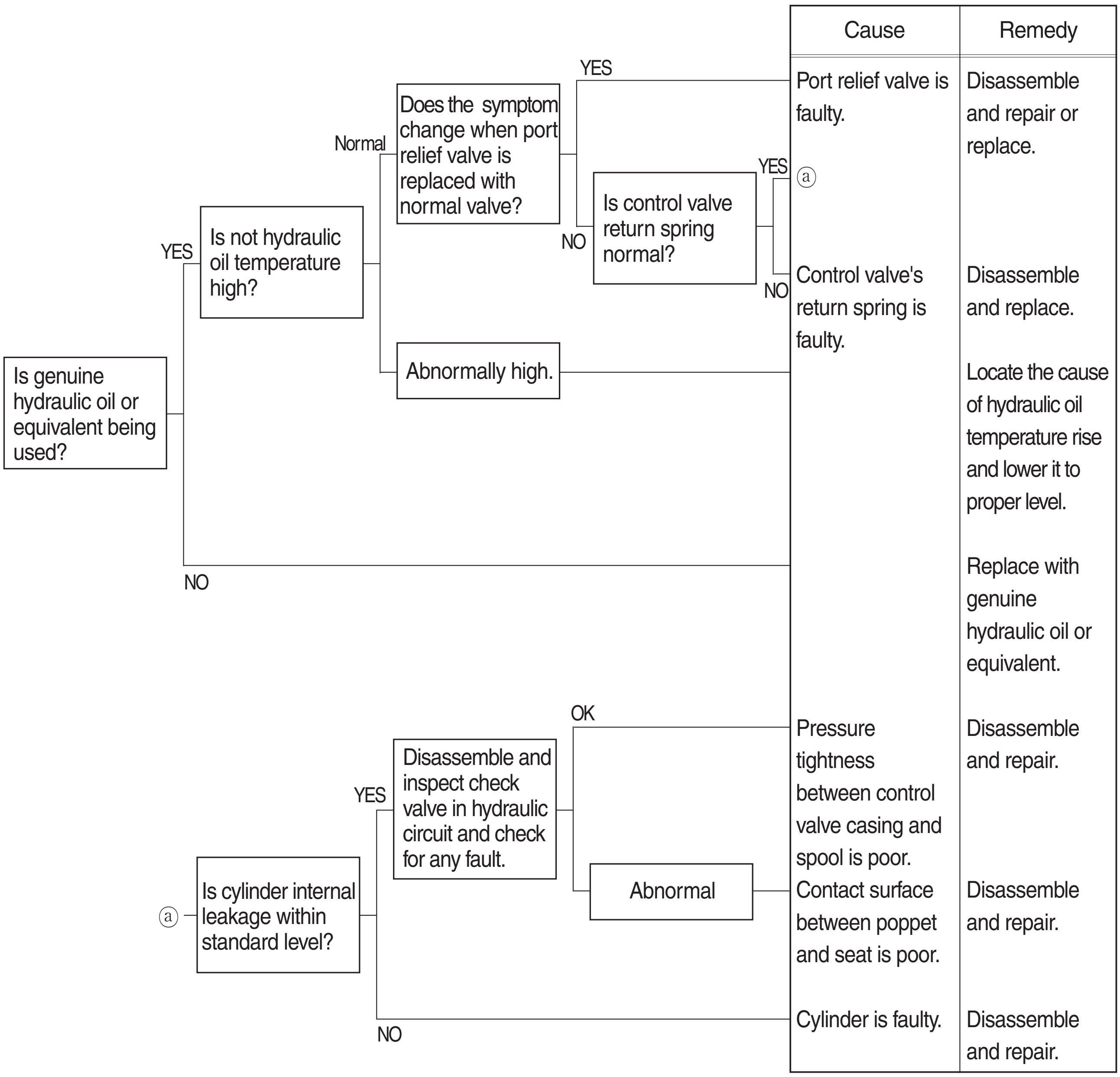
1) BOOM OR ARM ACTION IS IMPOSSIBLE AT ALL



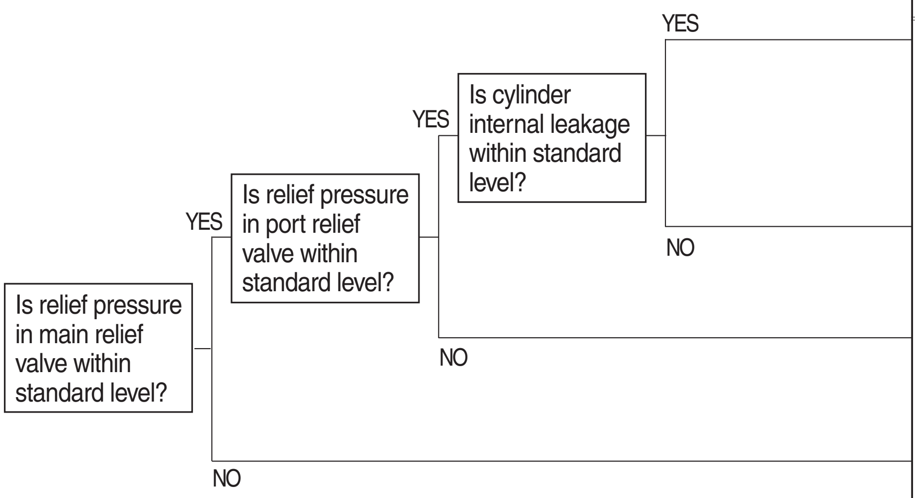
2) BOOM, ARM OR BUCKET SPEED IS LOW



3) BOOM, ARM OR BUCKET CYLINDER EXTENDS OR CONTRACTS ITSELF AND ATTACHMENT FALLS

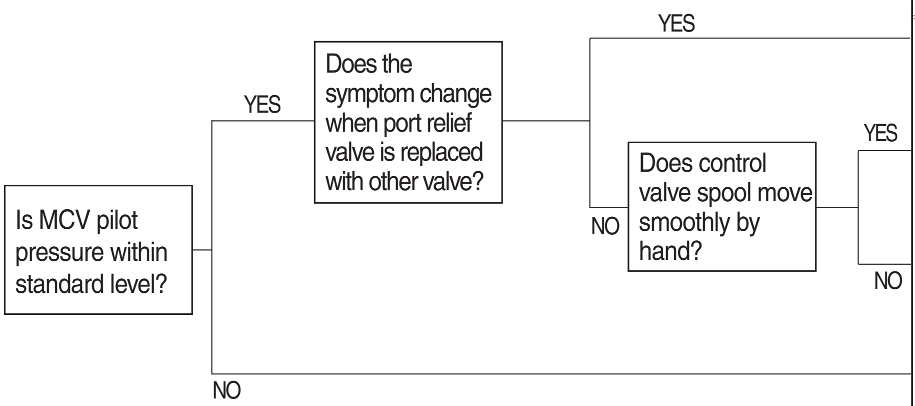


4) BOOM, ARM OR BUCKET POWER IS WEAK



Cause	Remedy
	Check according to the procedure in Item "Speed is low".
Cylinder is faulty.	Disassemble and repair.
Port relief valve is faulty.	Adjust pressure, repair or replace.
Main relief valve is defective.	Adjust pressure, repair or replace.

5) ONLY BUCKET OPERATION IS TOTALLY IMPOSSIBLE



Cause	Remedy
Port relief valve is defective.	Disassemble and repair or replace.
Cylinder interior is broken.	Disassemble and repair.
Control valve spool is stuck.	Disassemble and repair.
Pilot valve is faulty.	Disassemble and repair.

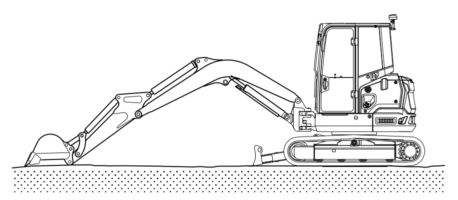
6) BOOM MAKES A SQUEAKING NOISE WHEN BOOM IS OPERATED

Is boom foot pin greased sufficiently?

	Cause	Remedy
YES		Frictional noise occurs between the sliding faces of boom cylinder's oil seal and boom proper. ※ Frictional noise will disappear if they are kept used.
NO	Boom foot pin has run out of grease.	Supply grease to it. ※ If seizure is in an initial stage, supply sufficient grease. If seizure is in a grown state, correct it by paper lapping or with an oil stone.

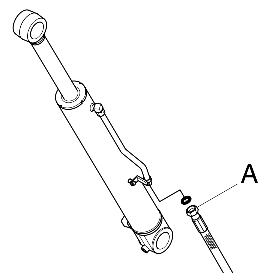
※ HOW TO CHECK INTERNAL BOOM CYLINDER LEAKAGE

1. Lower the bucket teeth to the ground with bucket cylinder fully retracted and arm cylinder rod retracted almost in full.



55ACR6MA02

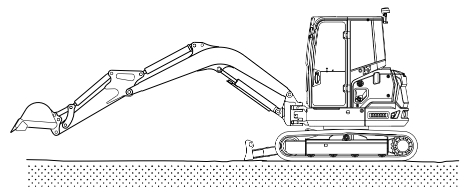
2. Disconnect hose (A) from rod side of boom cylinder and drain oil from cylinders and hose. (put cups on piping and hose ends)



R5575BY02

3. Raise bucket OFF the ground by retracting the arm cylinder rod.

   If oil leaks from piping side and boom cylinder rod is retracted there is an internal leak in the cylinder.
   If no oil leaks from piping side and boom cylinder rod is retracted, there is an internal leak in the control valve.



55ACR5TS02

1. WHEN STARTING SWITCH IS TURNED ON, MONITOR PANEL DISPLAY DOES NOT APPEAR

· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted and short of fuse No. 4.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.

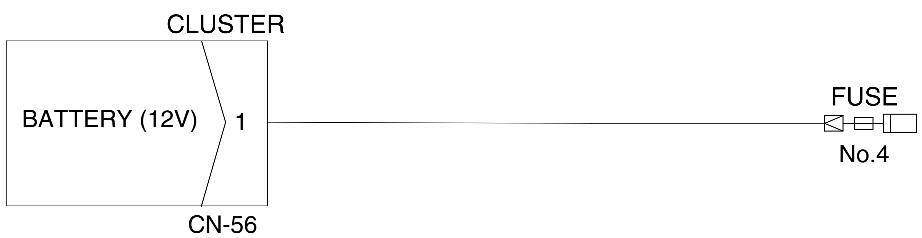
Check voltage between CN-56 (1) and chassis

Starting switch : ON
Voltage : 10~12.5V

	Cause	Remedy
YES	Defective cluster	Replace
NO	Disconnection in wiring harness or poor contact between CN-56 (1) and fuse No.4.	Repair or replace (after clean)

Check voltage

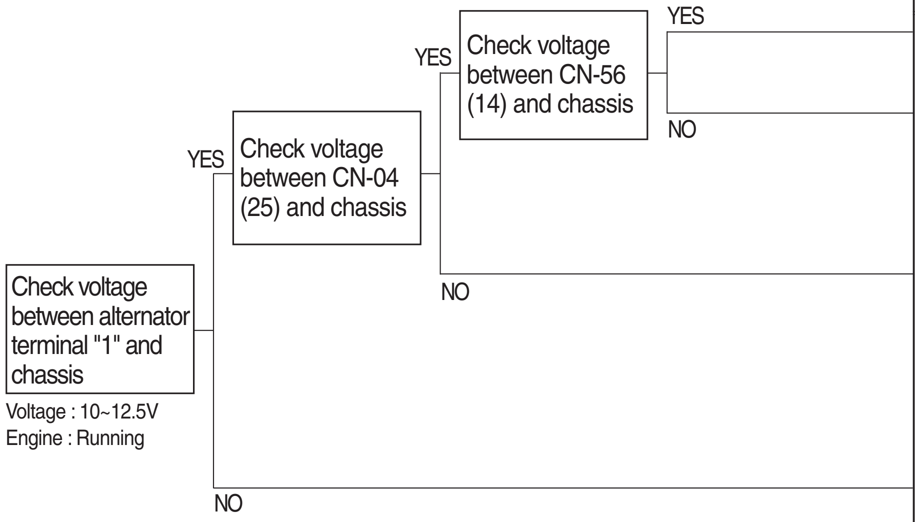
YES	10 ~ 12.5V
NO	0V



35AZ5TS10

2. BATTERY CHARGING WARNING LAMP LIGHTS UP (starting switch : ON)

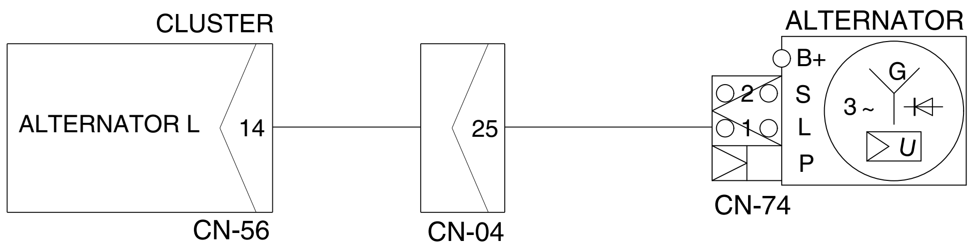
- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.



Cause	Remedy
Defective cluster	Replace
Disconnection in wiring harness or poor contact between CN-56 (14) -CN-04 (25)	Repair or replace (after clean)
Disconnection in wiring harness or poor contact between CN-04 (25)- alternator terminal "1"	Repair or replace (after clean)
Defective alternator	Replace

Check voltage

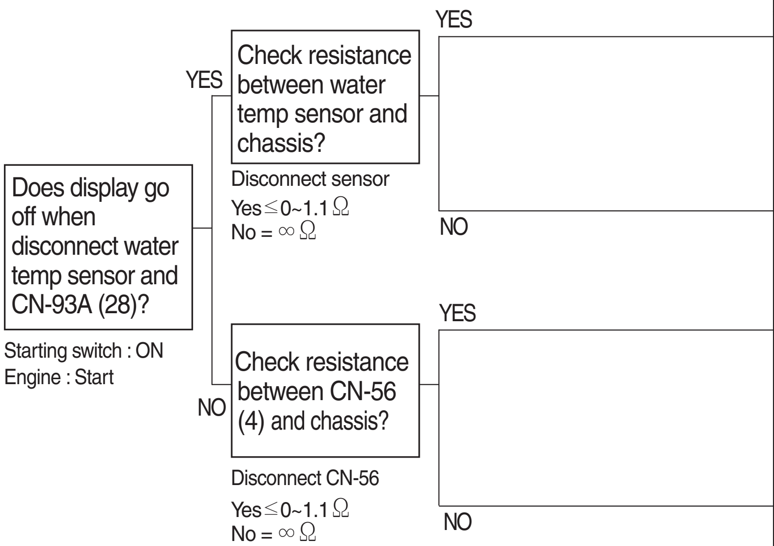
YES	10 ~ 12.5V
NO	0V



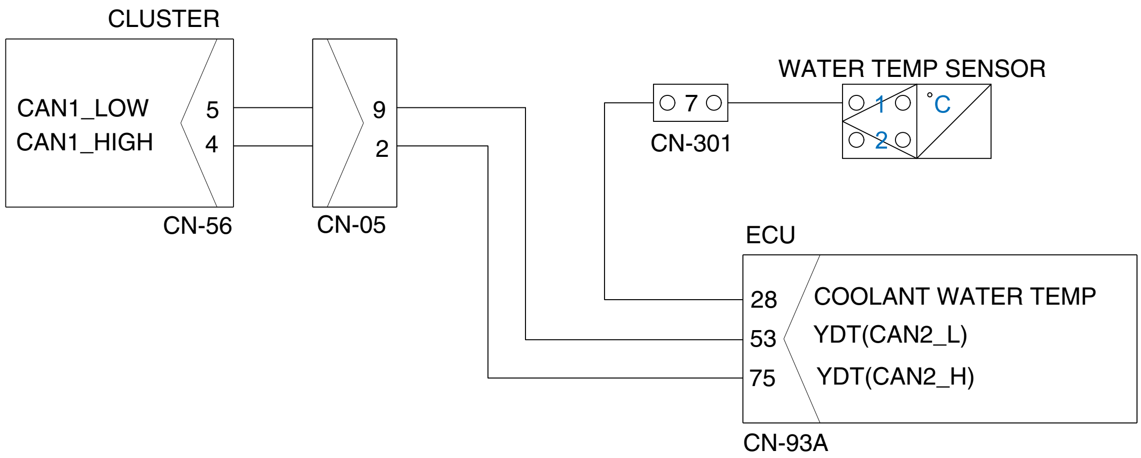
48AZ5TS11

3. WHEN COOLANT OVERHEAT WARNING LAMP LIGHTS UP (engine is started)

· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.



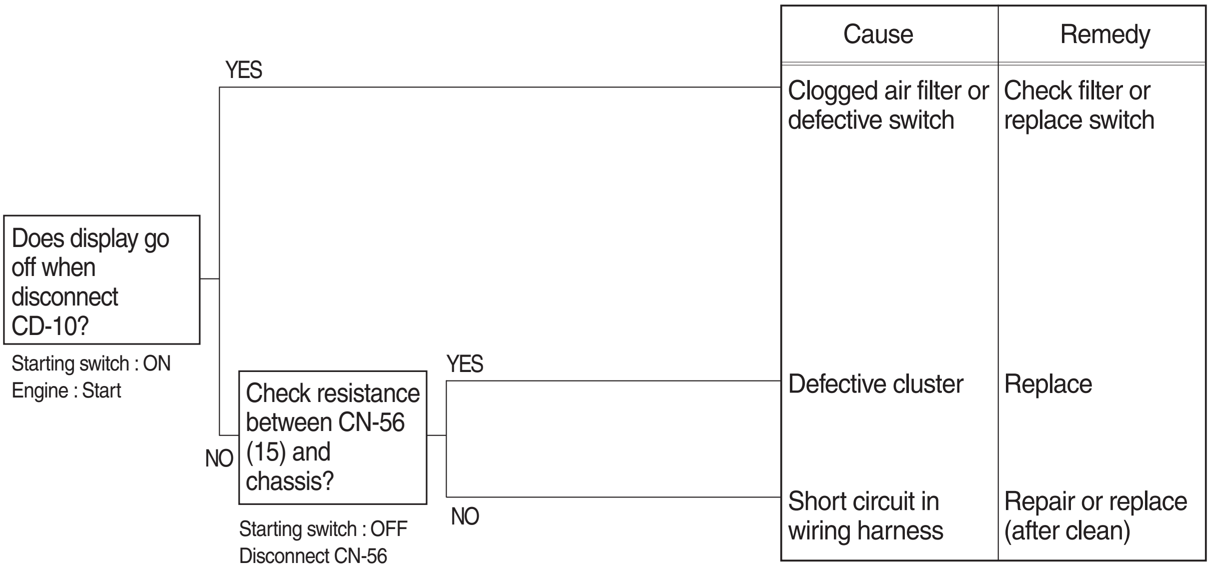
Cause	Remedy
Coolant overheat (115°C ±2°C) or defective temp sensor	Check engine cooling system or replace temp sensor
Defective ECU	Repair or replace the ECU
Short circuit in wiring harness or poor contact between CN-56 (4) and CN-93A (75)	Repair or replace (after clean)
Defective cluster	Replace



48AZ5TS12

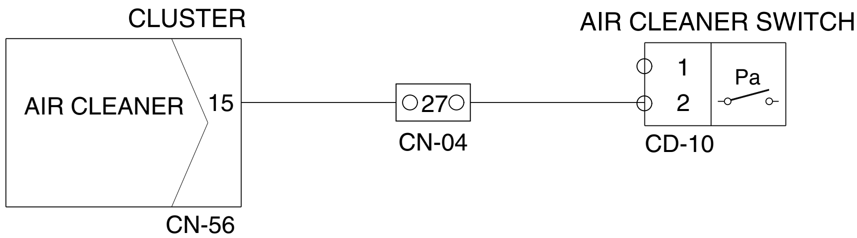
4. WHEN AIR CLEANER WARNING LAMP LIGHTS UP (engine is started)

· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.



Check resistance

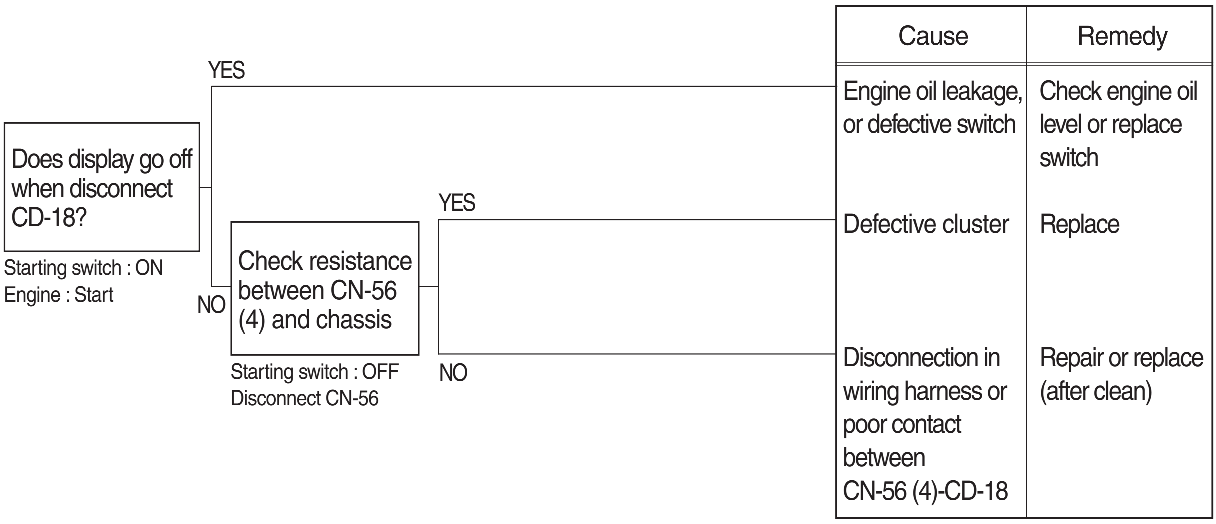
YES	MAX 1Ω
NO	MIN 1MΩ



48AZ5TS13

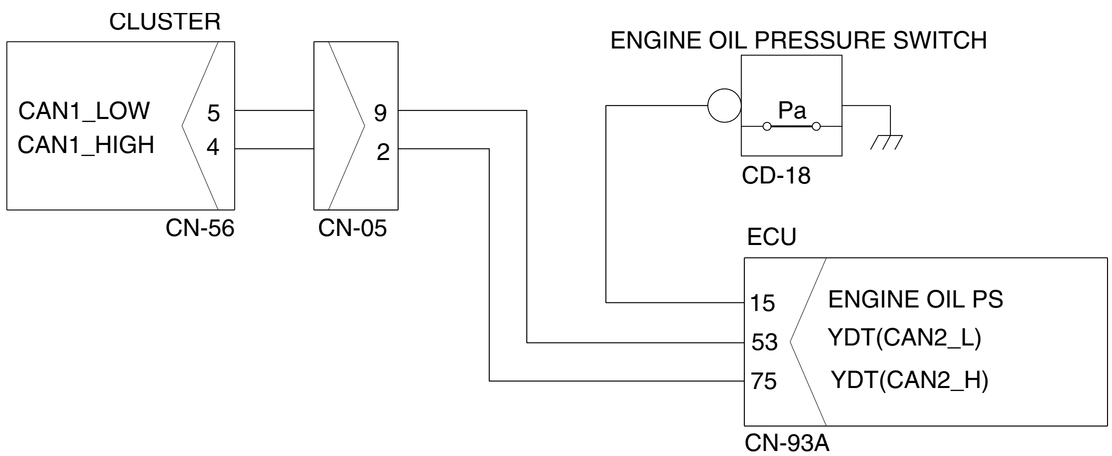
5. WHEN ENGINE OIL PRESSURE WARNING LAMP LIGHTS UP (engine is started)

· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.



Check resistance

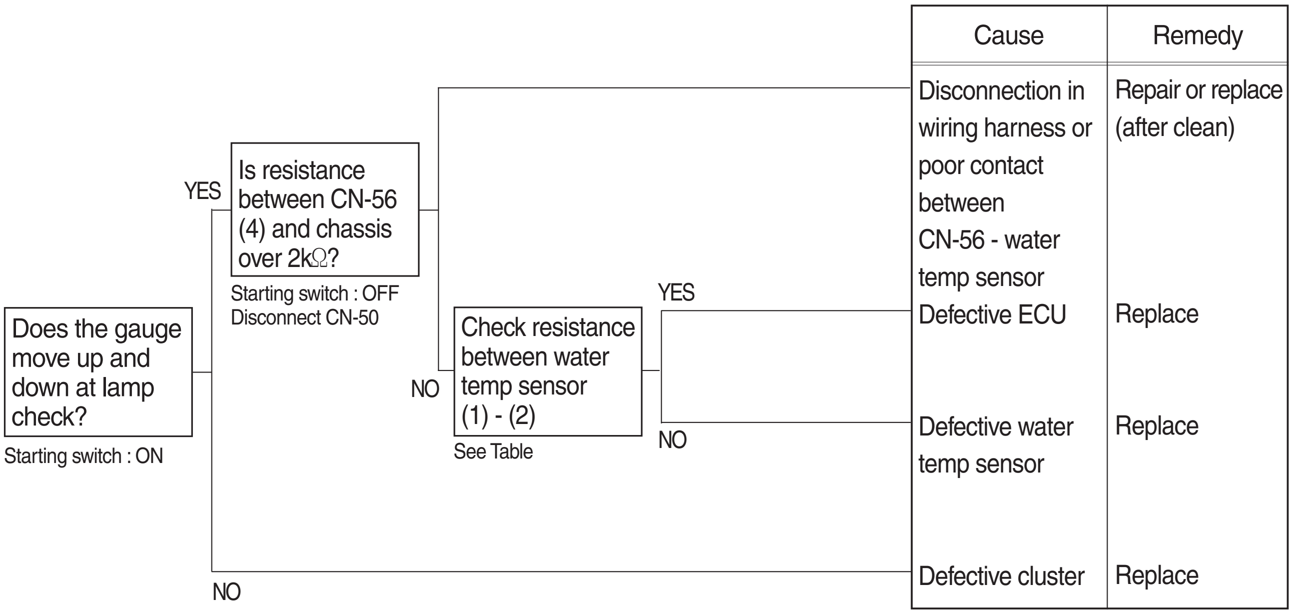
YES	MAX 1Ω
NO	MIN 1MΩ



48AZ5TS14

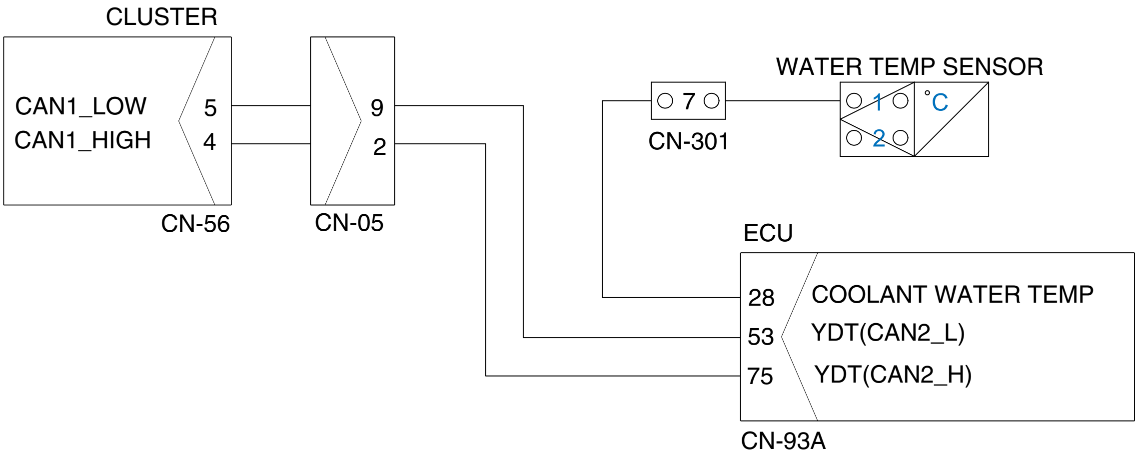
6. WHEN COOLANT TEMPERATURE GAUGE DOES NOT OPERATE

· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.



Check Table

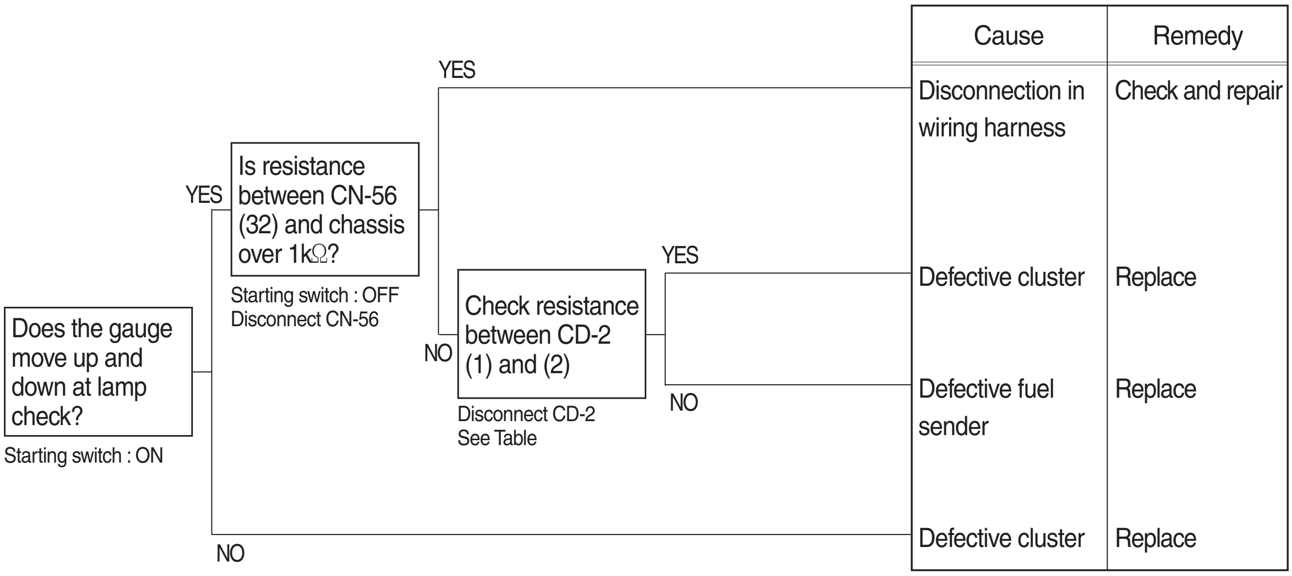
Item \ Temperature	50°C	80°C	100°C	115°C (red range)
Ω	350	118	63.5	36.2



48AZ5TS12

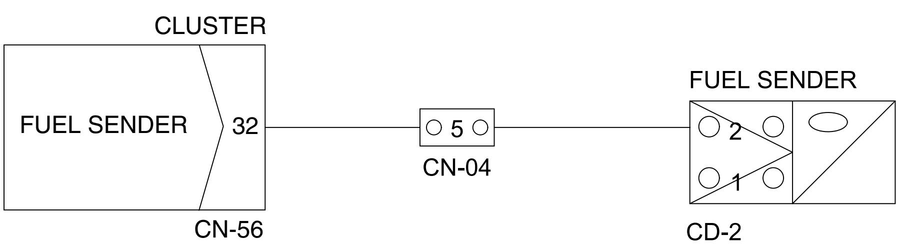
7. WHEN FUEL GAUGE DOES NOT OPERATE (check warning lamp ON/OFF)

· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.



Check Table

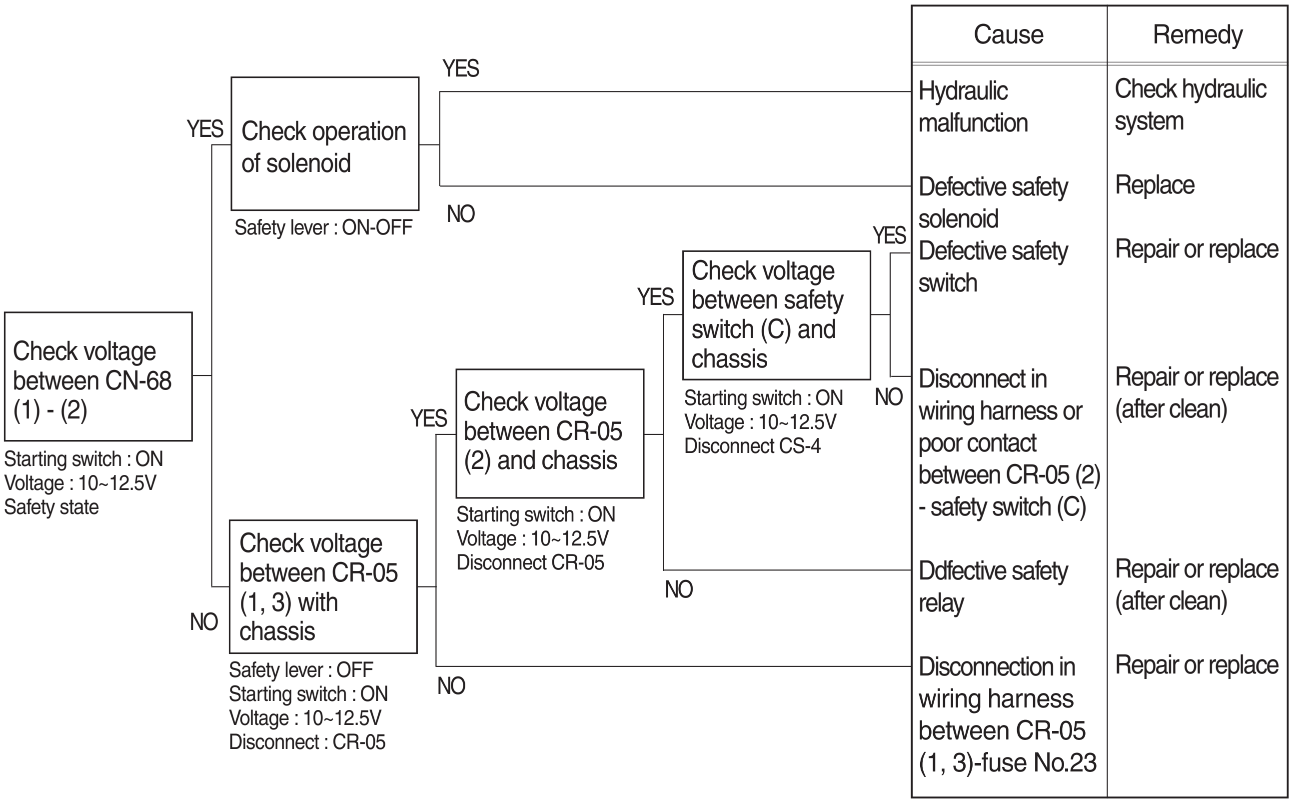
Item \ Temperature	Empty	1/2	Full
Unit resistance (Ω)	90	38	10

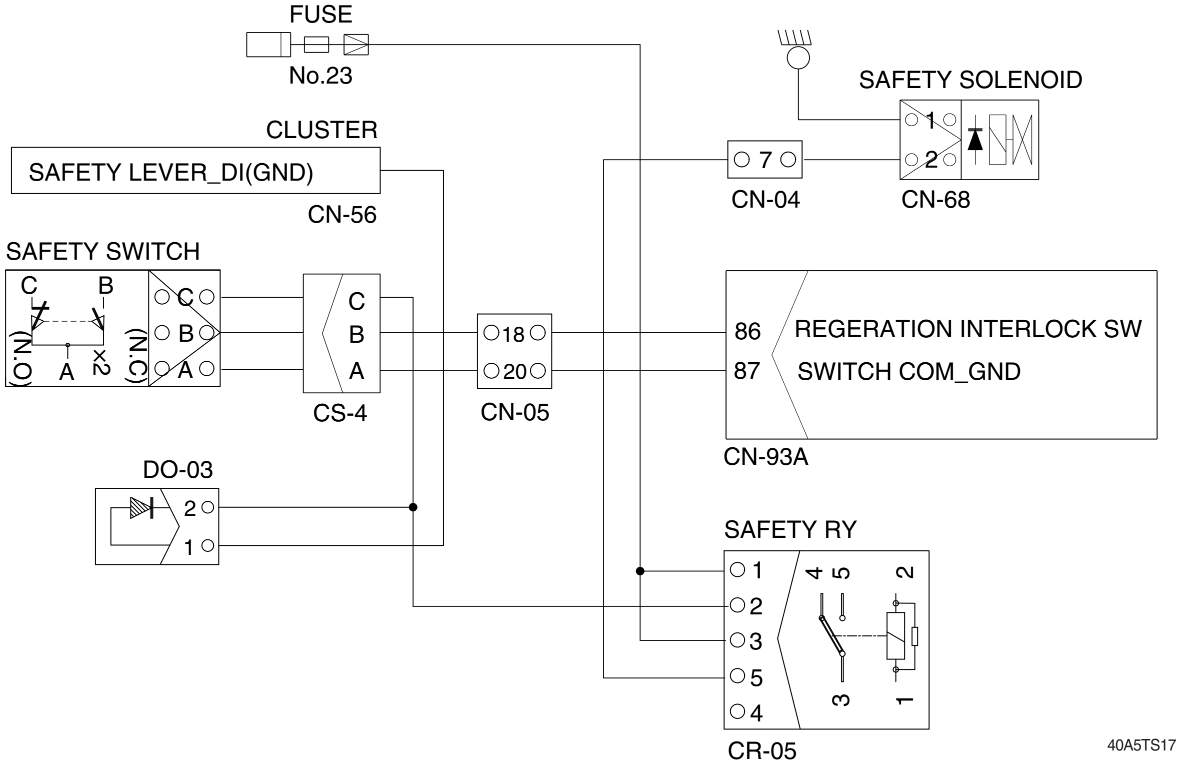


48AZ5TS16

8. WHEN SAFETY SOLENOID DOES NOT OPERATE

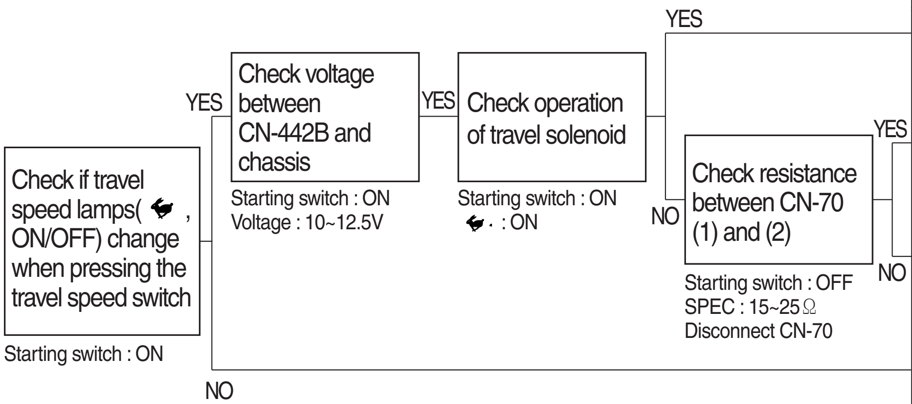
· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted and short of fuse No.23.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.



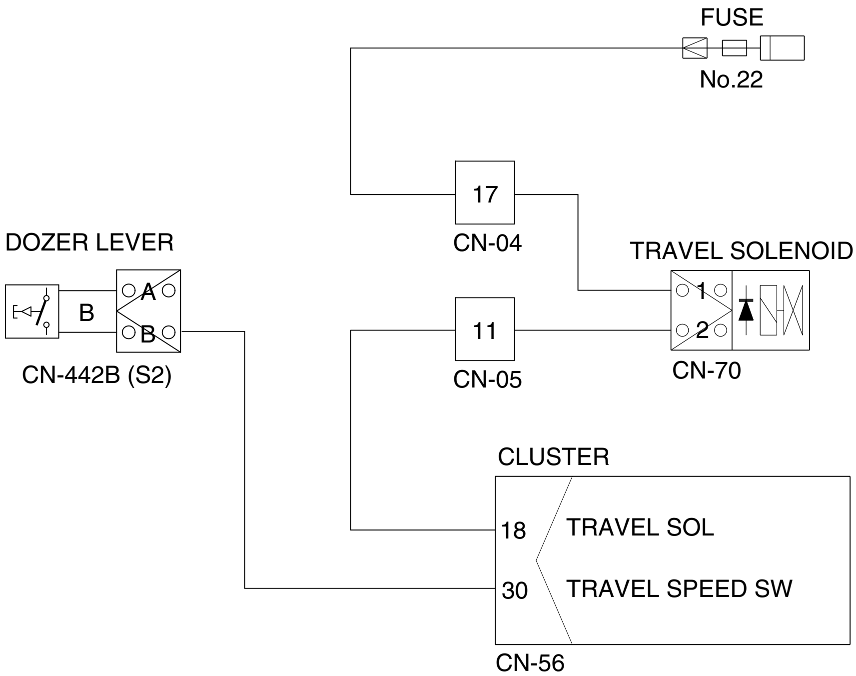


9. WHEN TRAVEL SPEED 1, 2 DOES NOT OPERATE

· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted and short of fuse No.22 .
· After checking, insert the disconnected connectors again immediately unless otherwise specified.



Cause	Remedy
Defective hydraulic system	Check hydraulic system
Defective cluster	Replace
Defective travel solenoid	Replace
Defective switch (CN-442B)	Replace



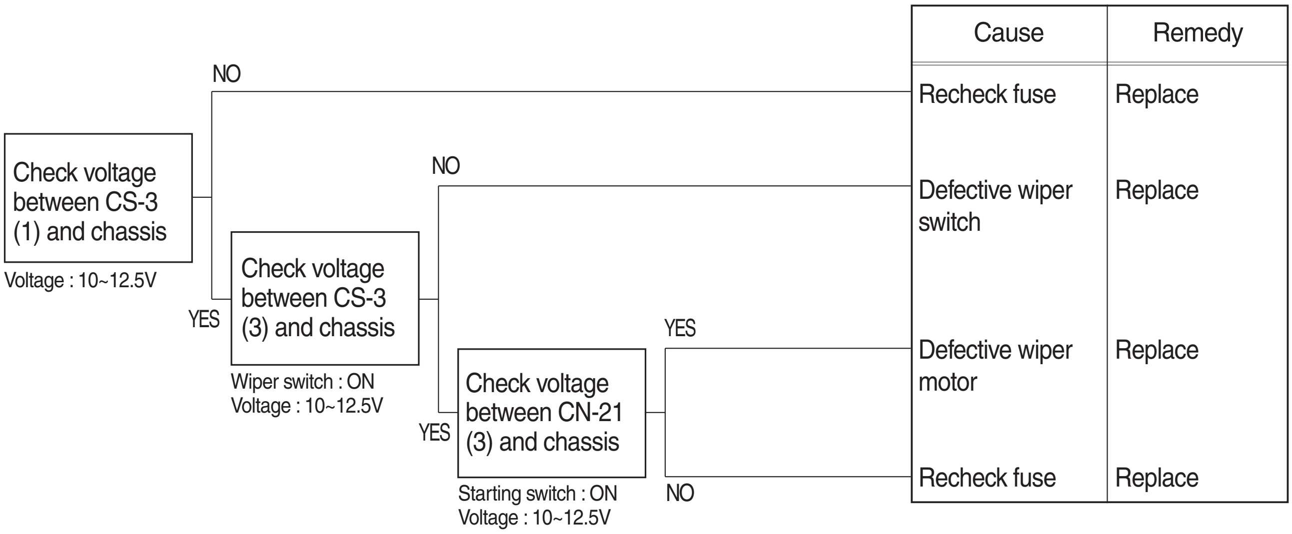
48AZ5TS18

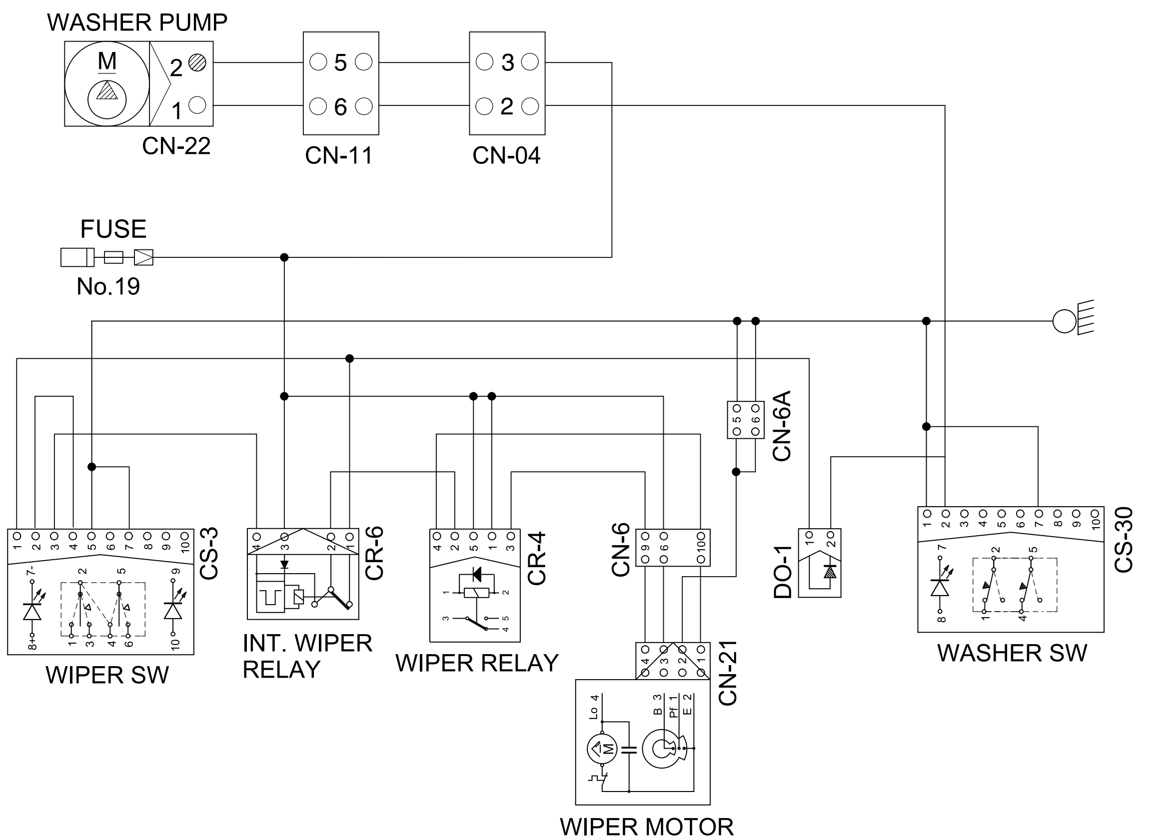
10. WHEN STARTING SWITCH IS TURNED ON, WIPER MOTOR DOES NOT OPERATE

· Before disconnecting the connector, always turn the starting switch OFF.

· Before carrying out below procedure, check all the related connectors are properly inserted and the fuse No.19 is not blown out.

· After checking, insert the disconnected connectors again immediately unless otherwise specified.

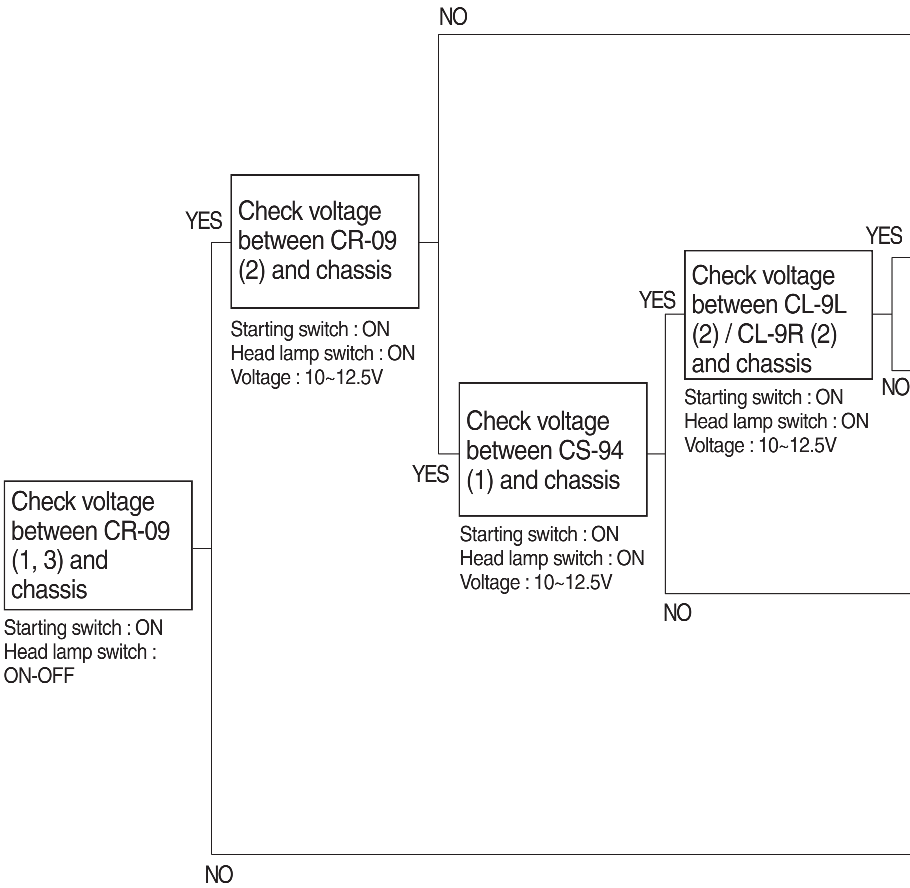




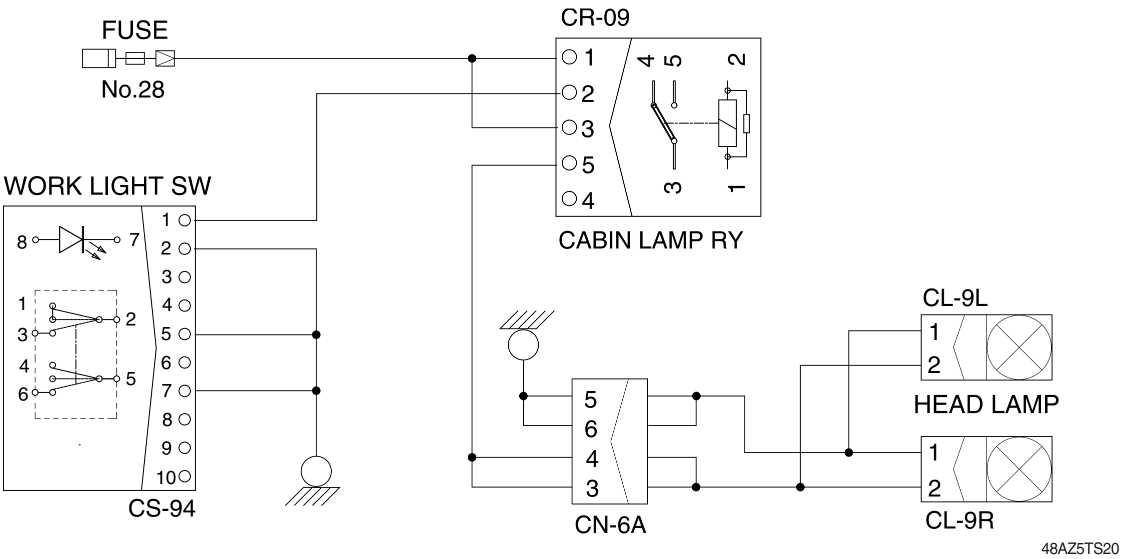
48AZ5TS19

11. WHEN STARTING SWITCH IS TURNED ON, CABIN LAMP DOES NOT LIGHTS UP

· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted and short of fuse No.28.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.

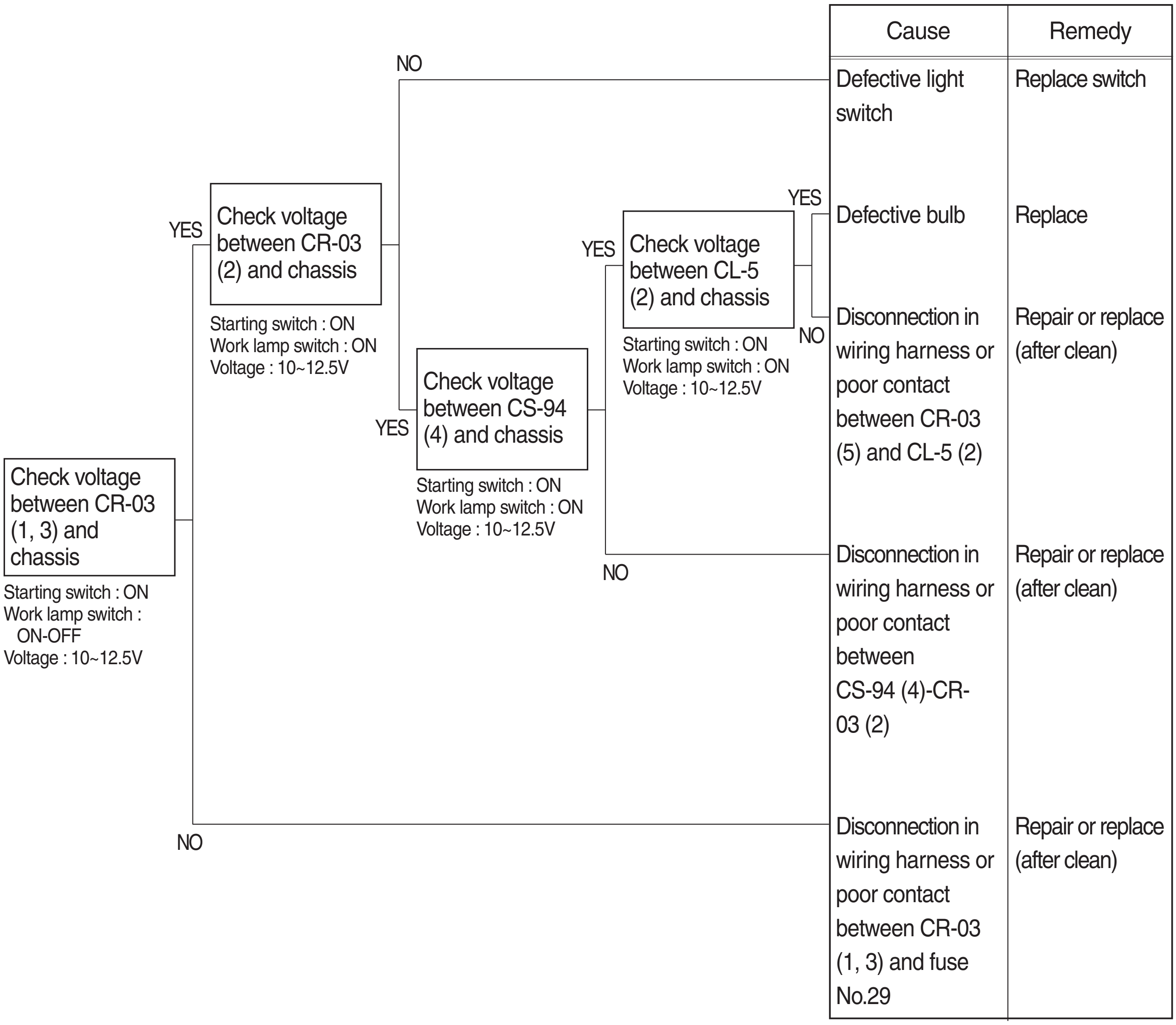


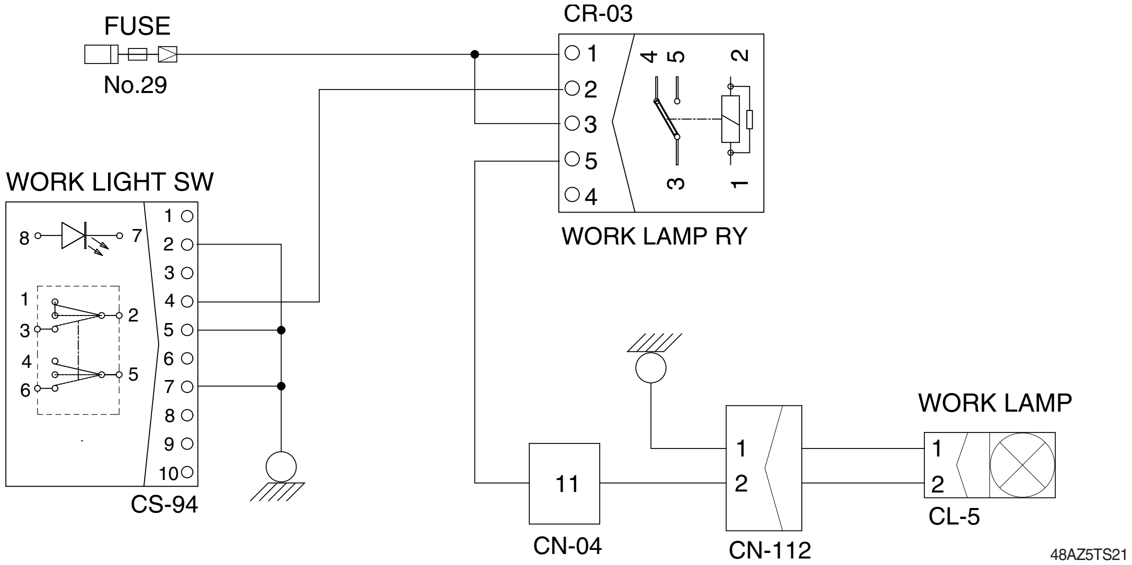
Cause	Remedy
Defective lamp switch	Replace switch
Defective bulb	Replace
Disconnection in wiring harness or poor contact between CR-09 (5) -CL-9L (2)/CL-9R (2)	Repair or replace (after clean)
Disconnection in wiring harness or poor contact between CS-94 (1)-CR-09 (2)	Repair or replace (after clean)
Disconnection in wiring harness or poor contact between CR-09 (1, 3) and fuse No.28.	Repair or replace (after clean)



12. WHEN STARTING SWITCH IS TURNED ON, WORK LAMP DOES NOT LIGHTS UP

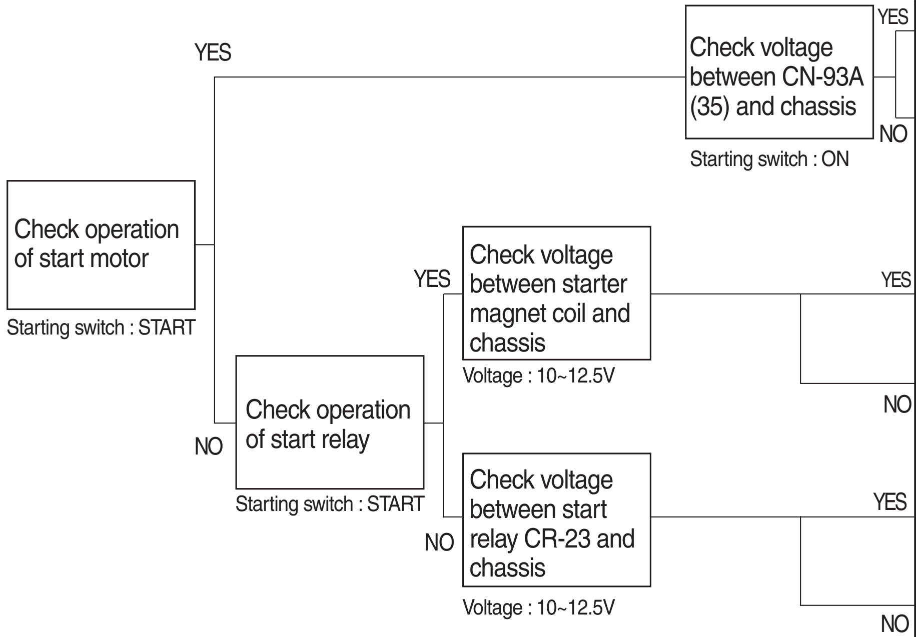
· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted and short of fuse No.29.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.



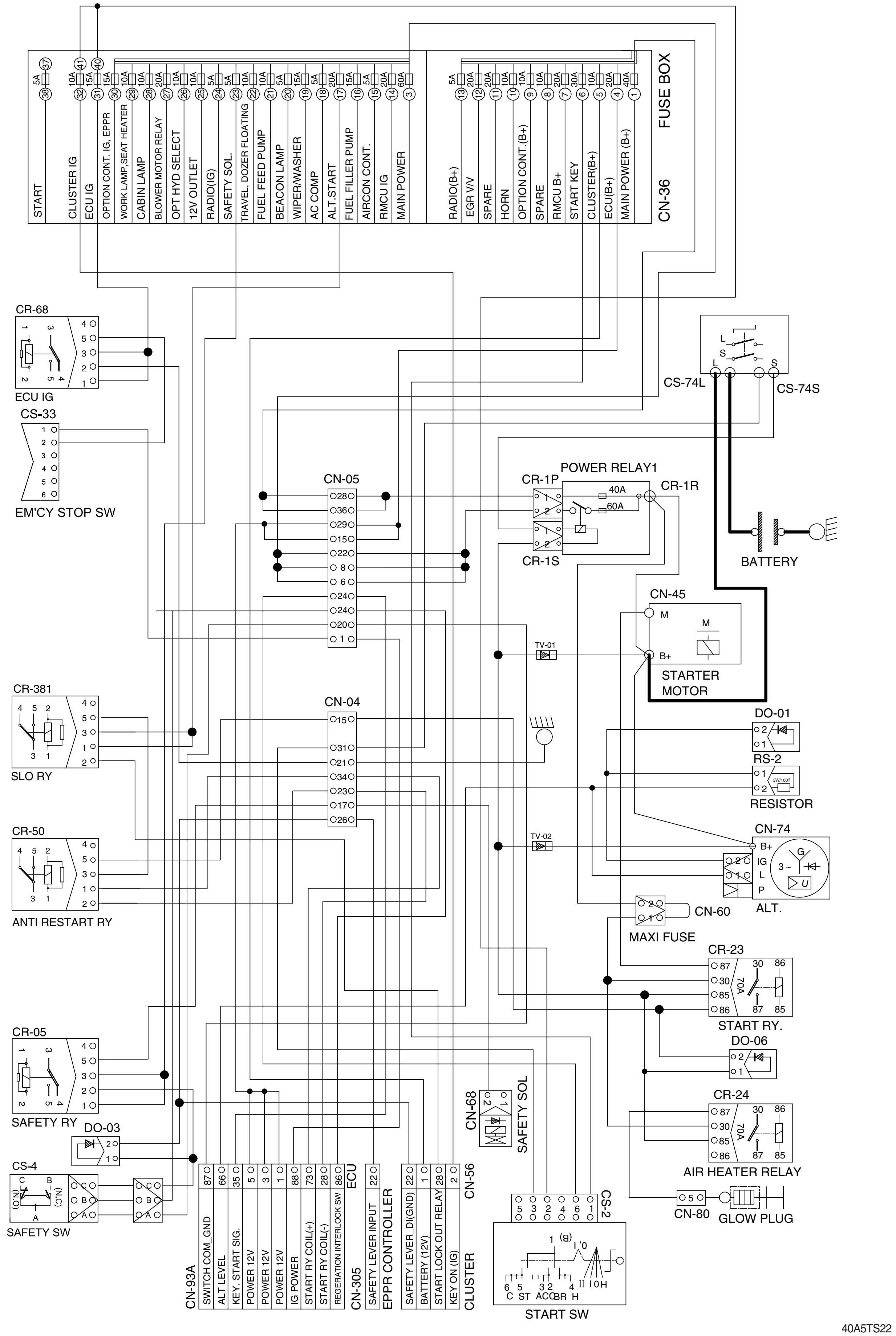


13. WHEN ENGINE DOES NOT START

- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.



Cause	Remedy
Defective ECU	Repair or replace
Disconnection in wiring harness or poor contact between CN-93A (35) and CS-2 (6)	Repair or replace e (after clean)
Defective magnet of start motor	Repair or replace start motor
Defective start relay	Repair or replace start relay
Defective start relay	Repair or replace start relay
Disconnection in wiring harness or poor contact between CR-23 and CS-2 (6)	Repair or replace (after clean)



14. WHEN STARTING SWITCH ON DOES NOT OPERATE

· Before disconnecting the connector, always turn the starting switch OFF.

· Before carrying out below procedure, check all the related connectors are properly inserted and master switch ON.

· After checking, insert the disconnected connectors again immediately unless otherwise specified.

Check voltage and specific gravity of battery

Specific gravity : MIN 1.28
Voltage : MIN 12V

YES → Check voltage between CS-2 (1) and chassis

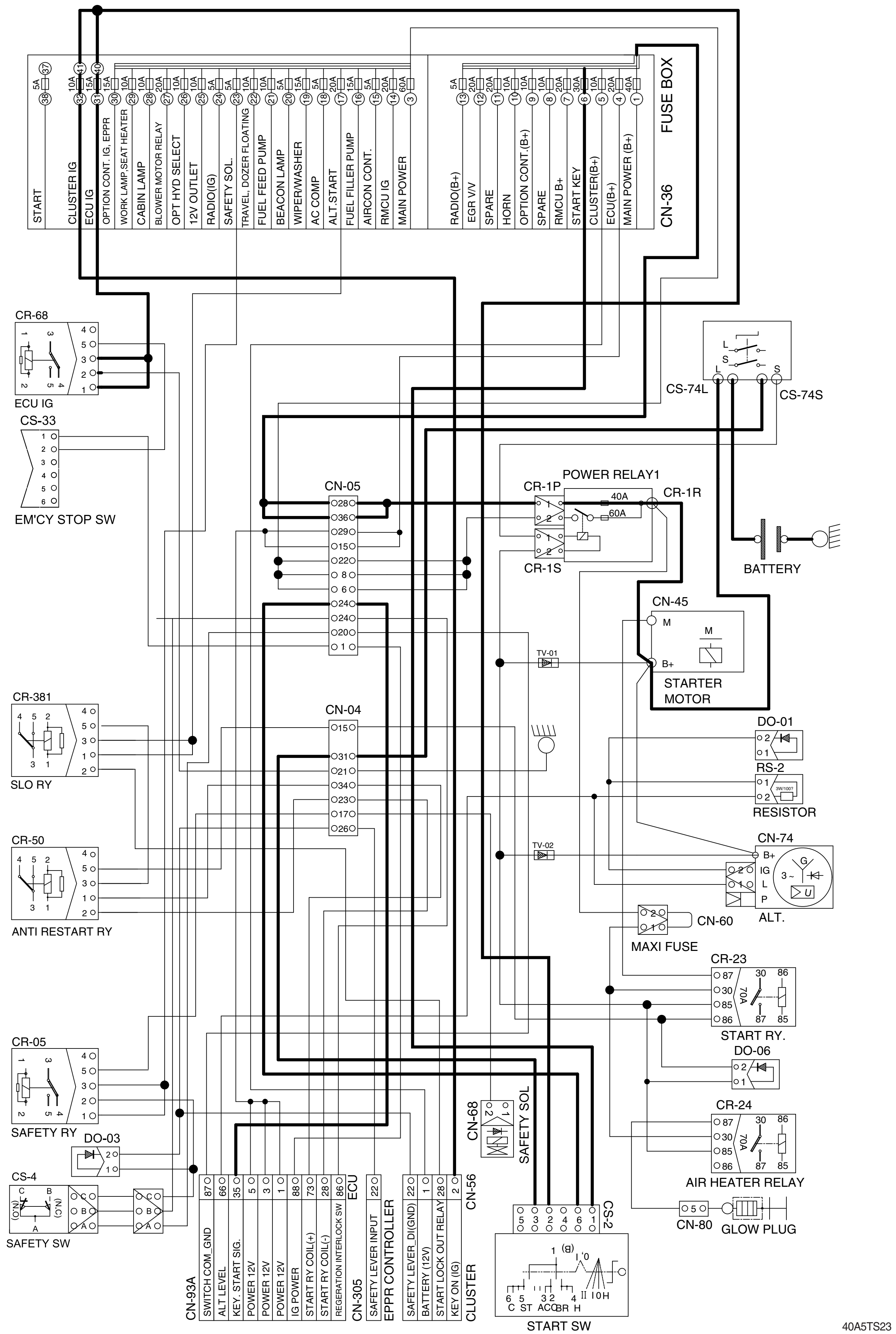
Voltage : 10~12.5V

YES → Defective start switch

NO → Disconnection in wiring harness or poor contact between CS-2 (1)-Master switch or defective power relay 1

NO → Battery capacity too low

Cause	Remedy
Defective start switch	Replace
Disconnection in wiring harness or poor contact between CS-2 (1)-Master switch or defective power relay 1	Replace
Battery capacity too low	Charge or replace (after clean)



SECTION 6 MAINTENANCE STANDARD

Group 1 Operational Performance Test 6-1
Group 2 Major Components 6-21
Group 3 Track and Work Equipment 6-29

GROUP 1 OPERATIONAL PERFORMANCE TEST

1. PURPOSE

Performance tests are used to check:

1) OPERATIONAL PERFORMANCE OF A NEW MACHINE

Whenever a new machine is delivered in parts and reassembled at a customer's site, it must be tested to confirm that the operational performance of the machine meets Hyundai spec.

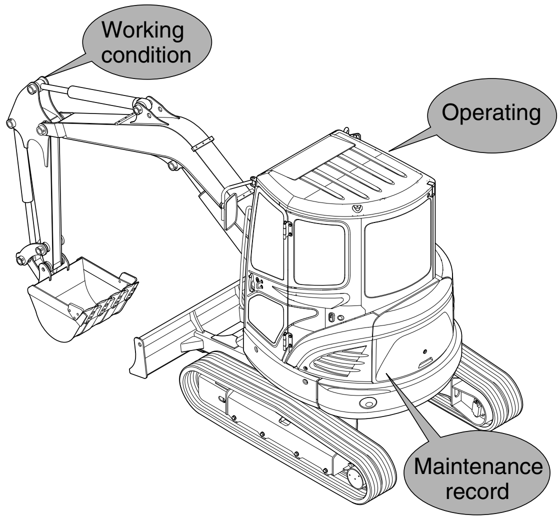
2) OPERATIONAL PERFORMANCE OF A WORKING MACHINE

With the passage of time, the machine's operational performance deteriorates, so that the machine needs to be serviced periodically to restore it to its original performance level.

Before servicing the machine, conduct performance tests to check the extent of deterioration, and to decide what kind of service needs to be done (by referring to the "Service Limits" in this manual).

3) OPERATIONAL PERFORMANCE OF A REPAIRED MACHINE

After the machine is repaired or serviced, it must be tested to confirm that its operational performance was restored by the repair and/or service work done.

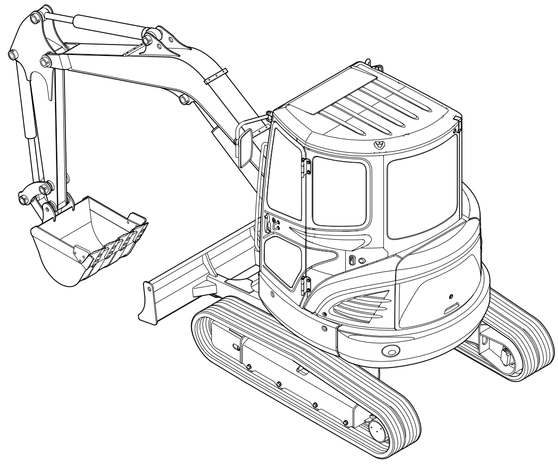


R35Z76MC01

2. TERMINOLOGY

1) STANDARD

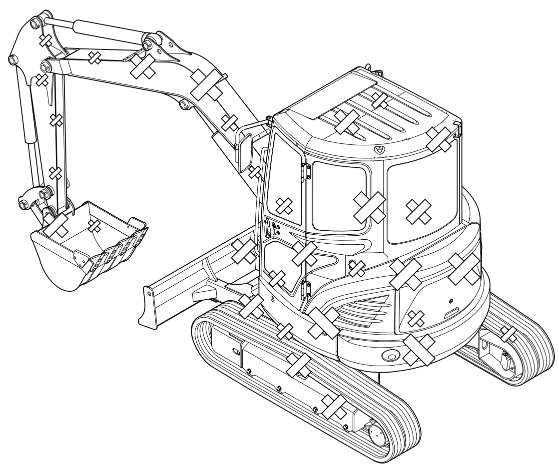
Specifications applied to the brand-new machine, components and parts.



R35Z76MC02

2) SERVICE LIMIT

The lowest acceptable performance level. When the performance level of the machine falls below this level, the machine must be removed from work and repaired. Necessary parts and components must be replaced.



R35Z76MC03

3. OPERATION FOR PERFORMANCE TESTS

1) Observe the following rules in order to carry out performance tests accurately and safely.

(1) The machine

Repair any defects and damage found, such as oil or water leaks, loose bolts, cracks and so on, before starting to test.

(2) Test area

① Select a hard, flat surface.

② Secure enough space to allow the machine to run straight more than 20m, and to make a full swing with the front attachment extended.

③ If required, rope off the test area and provide signboards to keep unauthorized personnel away.

(3) Precautions

① Before starting to test, agree upon the signals to be employed for communication among coworkers. Once the test is started, be sure to communicate with each other using these signals, and to follow them without fail.

② Operate the machine carefully and always give first priority to safety.

③ While testing, always take care to avoid accidents due to landslides or contact with high voltage power lines. Always confirm that there is sufficient space for full swings.

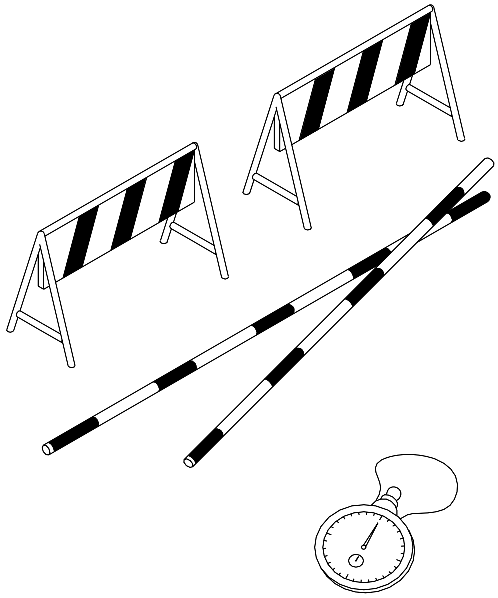
④ Avoid polluting the machine and the ground with leaking oil. Use oil pans to catch escaping oil. Pay special attention to this when removing hydraulic pipings.

(4) Make precise measurements

① Accurately calibrate test instruments in advance to obtain correct data.

② Carry out tests under the exact test conditions prescribed for each test item.

③ Repeat the same test and confirm that the test data obtained can be procured repeatedly. Use mean values of measurements if necessary.



7-3 (140-7)

2) ENGINE SPEED

(1) Measure the engine speed at the maximum RPM.

※ The engine speed must meet standard RPM; if not, all other operational performance data will be unreliable. It is essential to perform this test first.

(2) Preparation and measurement

① Warm up the machine, until the engine coolant temperature reaches 50°C or more, and the hydraulic oil is 50±5°C.

② Set the accel dial switch at the maximum position.

③ Measure the engine RPM.

(3) Evaluation

The measured speeds should meet the following specifications.

Unit : rpm

Model	Engine speed	Standard	Remarks
HX55A CR	P mode	2000±50	
	S mode	1750±50	
	Auto idle	1300±50	
	Low idle	1150±50	

3) TRAVEL SPEED

(1) Measure the time required for the excavator to travel a 20 m test track.

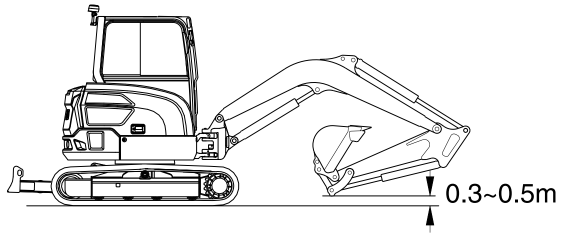
(2) Preparation

① Adjust the tension of both tracks to be equal.

② Prepare a flat and solid test track 20 m in length, with extra length of 3 to 5 m on both ends for machine acceleration and deceleration.

③ Hold the bucket 0.3 to 0.5 m above the ground with the arm and bucket rolled in.

④ Keep the hydraulic oil temperature at 50±5°C.



55ACR6MC04

(3) Measurement

① Measure both the low and high speeds of the machine.

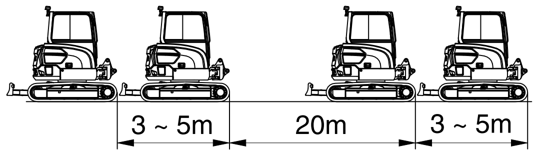
② Before starting either the low or high speed tests, adjust the travel mode switch to the speed to be tested.

③ Start traveling the machine in the acceleration zone with the travel levers at full stroke.

④ Measure the time required to travel 20 m.

⑤ After measuring the forward travel speed, turn the upperstructure 180˚ and measure the reverse travel speed.

⑥ Repeat steps ④ and ⑤ three times in each direction and calculate the average values.



55ACR6MC05

(4) Evaluation

The average measured time should meet the following specifications.

Unit : Seconds / 20 m

Model	Travel speed	Standard	Remarks
HX55A CR	1 Speed	25.6±2.0	
	2 Speed	16.3±2.0	

4) TRACK REVOLUTION SPEED

(1) Measure the track revolution cycle time with the track raised off ground.

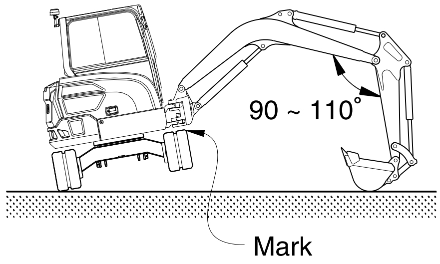
(2) Preparation

① Adjust the tension of both side tracks to be equal.

② On the track to be measured, mark one shoe with chalk.

③ Swing the upperstructure 90° and lower the bucket to raise the track off ground. Keep the boom-arm angle between 90 to 110° as shown. Place blocks under machine frame.

④ Keep the hydraulic oil temperature at 50±5°C.



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(3) Measurement

① Select the following switch positions.

· Travel mode switch : 1 or 2 speed

② Operate the travel control lever of the raised track in full forward and reverse.

③ Rotate 1 turn, then measure time taken for next 3 revolutions.

④ Raise the other side of machine and repeat the procedure.

⑤ Repeat steps ③ and ④ three times and calculate the average values.

(4) Evaluation

The revolution cycle time of each track should meet the following specifications.

Unit : Seconds / 3 revolutions

Model	Travel speed	Standard	Remarks
HX55A CR	1 Speed	18.4±1.5	
	2 Speed	10.2±1.5	

5) TRAVEL DEVIATION

(1) Measure the deviation by the tracks from a 20m straight line.

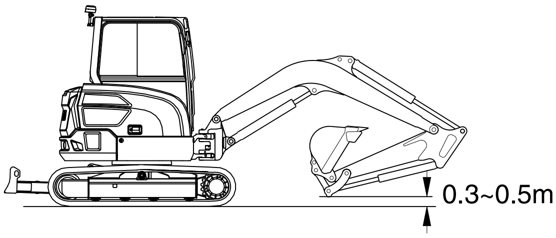
(2) Preparation

① Adjust the tension of both tracks to be equal.

② Provide a flat, solid test yard 20 m in length, with extra length of 3 to 5 m on both ends for machine acceleration and deceleration.

③ Hold the bucket 0.3 to 0.5 m above the ground with the arm and bucket rolled in.

④ Keep the hydraulic oil temperature at 50±5°C.



55ACR6MC04

(3) Measurement

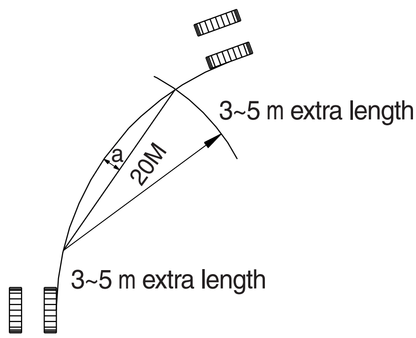
① Measure the amount of mistracking at high and low travel speeds.

② Start traveling the machine in the acceleration zone with the travel levers at full stroke.

③ Measure the distance between a straight 20m line and the track made by the machine. (Dimension a)

④ After measuring the tracking in forward travel, turn the upperstructure 180°and measure that in reverse travel.

⑤ Repeat steps ③ and ④ three times and calculate the average values.



7-7(2) 140-7

(4) Evaluation

Mistrack should be within the following specifications.

Unit : mm / 20 m

Model	Standard	Maximum allowable	Remarks
HX55A CR	200 below	240	

6) SWING SPEED

(1) Measure the time required to swing three complete turns.

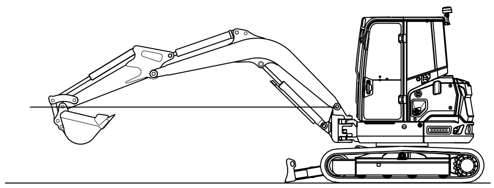
(2) Preparation

① Check the lubrication of the swing gear and swing bearing.

② Place the machine on flat, solid ground with ample space for swinging. Do not conduct this test on slopes.

③ With the arm rolled out and bucket rolled in, hold the bucket so that the height of the bucket pin is the same as the boom foot pin. The bucket must be empty.

④ Keep the hydraulic oil temperature at 50±5°C.



55ACR6MC07

(3) Measurement

① Operate swing control lever fully.

② Swing 1 turn and measure time taken to swing next 2 revolutions.

③ Repeat steps ① and ② three time and calculate the average values.

(4) Evaluation

The time required for 2 swings should meet the following specifications.

Unit : Seconds / 2 revolutions

Model	Standard	Remarks
HX55A CR	12±0.9	

7) SWING FUNCTION DRIFT CHECK

(1) Measure the swing drift on the bearing outer circumference when stopping after a 360° full speed swing.

(2) Preparation

① Check the lubrication of the swing gear and swing bearing.

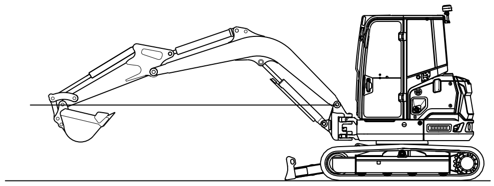
② Place the machine on flat, solid ground with ample space for swinging. Do not conduct this test on slopes.

③ With the arm rolled out and bucket rolled in, hold the bucket so that the height of the bucket pin is the same as the boom foot pin. The bucket must be empty.

④ Make two chalk marks: one on the swing bearing and one directly below it on the track frame.

⑤ Swing the upperstructure 360°.

⑥ Keep the hydraulic oil temperature at 50±5°C.



55ACR6MC07

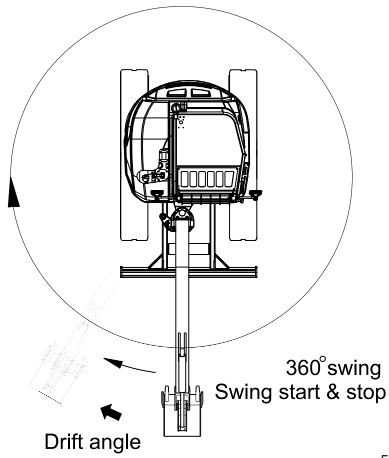
(3) Measurement

① Operate the swing control lever fully and return it to the neutral position when the mark on the upperstructure aligns with that on track frame after swinging 360 °

② Measure the distance between the two marks.

③ Align the marks again, swing 360 °, then test the opposite direction.

④ Repeat steps ② and ③ three times each and calculate the average values.



55ACR6MC08

(4) Evaluation

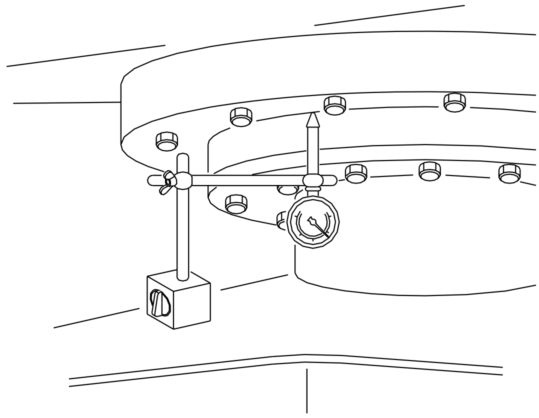
The measured drift angle should be within the following specifications.

Unit : Degree

Model	Standard	Maximum allowable	Remarks
HX55A CR	40 below	50	

8) SWING BEARING PLAY

(1) Measure the swing bearing play using a dial gauge to check the wear of bearing races and balls.



7-10(1) 140-7

(2) Preparation

① Check swing bearing mounting cap screws for loosening.

② Check the lubrication of the swing bearing. Confirm that bearing rotation is smooth and without noise.

③ Install a dial gauge on the track frame as shown, using a magnetic base.

④ Position the upperstructure so that the boom aligns with the tracks facing towards the front idlers.

⑤ Position the dial gauge so that its needle point comes into contact with the bottom face of the bearing outer race.

⑥ Bucket should be empty.

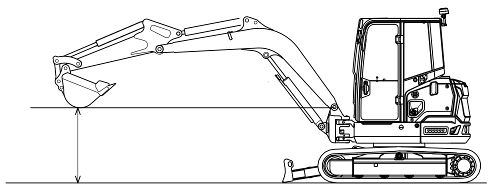
(3) Measurement

① With the arm rolled out and bucket rolled in, hold the bottom face of the bucket to the same height of the boom foot pin.
Record the dial gauge reading (h1).

② Lower the bucket to the ground and use it to raise the front idler 50 ㎝.
Record the dial gauge reading (h2).

③ Calculate bearing play (H) from this data (h1 and h2) as follows.
H=h2-h1

Measurement : h1



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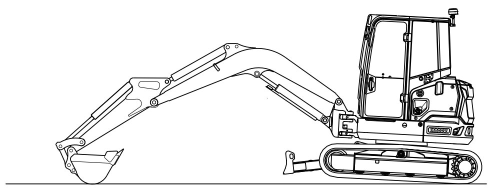
Measurement : h2



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(4) Evaluation

The measured drift should be within the following specifications.

Unit : mm

Model	Standard	Maximum allowable	Remarks
HX55A CR	0.5 ~ 1.2	2.4	

9) HYDRAULIC CYLINDER CYCLE TIME

(1) Measure the cycle time of the boom, standard arm, and standard bucket cylinders.

(2) Preparation

① To measure the cycle time of the boom cylinders:
With the arm rolled out and the empty bucket rolled out, lower the bucket to the ground, as shown.

② To measure the cycle time of the arm cylinder.
With the empty bucket rolled in, position the arm so that it is vertical to the ground. Lower the boom until the bucket is 0.5 m above the ground.

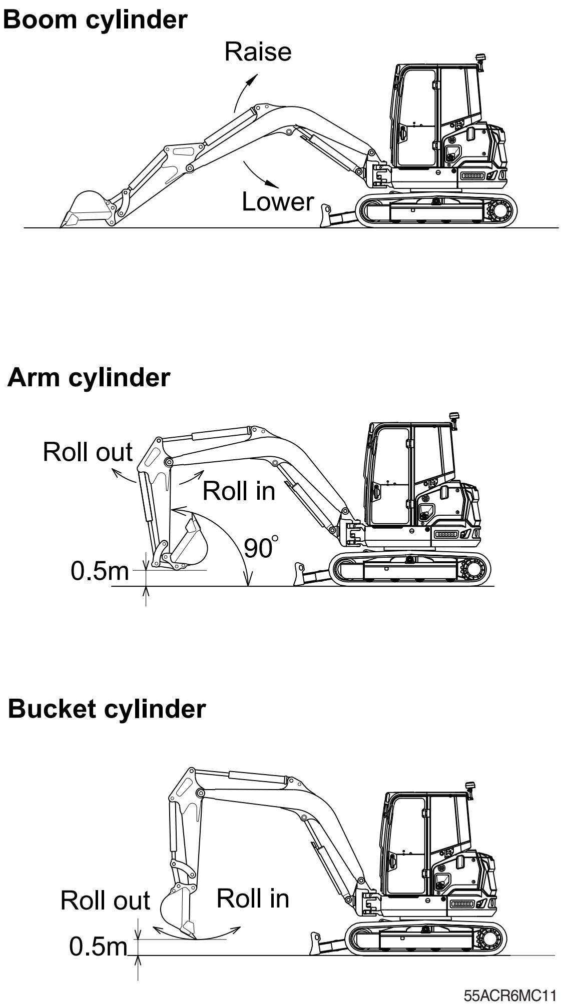
③ To measure the cycle time of the bucket cylinder.
The empty bucket should be positioned at midstroke between roll-in and roll-out, so that the sideplate edges are vertical to the ground.

④ Keep the hydraulic oil temperature at 50±5°C.

(3) Measurement

① To measure cylinder cycle times.

- Boom cylinders
  Measure the time it takes to raise the boom, and the time it takes to lower the boom. To do so, position the boom at one stroke end then move the control lever to the other stroke end as quickly as possible.
- Arm cylinder
  Measure the time it takes to roll in the arm, and the time it takes to roll out the arm. To do so, position the bucket at one stroke end, then move the control lever to the other stroke end as quickly as possible.



- Bucket cylinders
  Measure the time it takes to roll in the bucket, and the time it takes to roll out the bucket. To do so, position the bucket at one stroke end, then move the control lever to the other stroke end as quickly as possible.
- Repeat each measurement 3 times and calculate the average values.

(4) Evaluation

The average measured time should meet the following specifications.

Unit : Seconds

Model	Function	Standard	Remarks
HX55A CR	Boom raise	2.2±0.4	
	Boom lower	2.2±0.4	
	Arm in	2.9±0.4	
	Arm out	2.2±0.3	
	Bucket load	2.2±0.4	
	Bucket dump	1.6±0.3	
	Boom swing (LH)	6.8±0.5	
	Boom swing (RH)	6.5±0.5	
	Dozer up (raise)	3.1±0.3	
	Dozer down (lower)	3.1±0.4	

10) DIG FUNCTION DRIFT CHECK

(1) Measure dig function drift, which can be caused by oil leakage in the control valve and boom, standard arm, and standard bucket cylinders, with the loaded bucket. When testing the dig function drift just after cylinder replacement, slowly operate each cylinder to its stroke end to purge air.

(2) Preparation

① Load bucket fully. Instead of loading the bucket, weight (W) of the following specification can be used.

· $W = M^3 \times 1.5$

Where :

M^3 = Bucket heaped capacity(m^3)

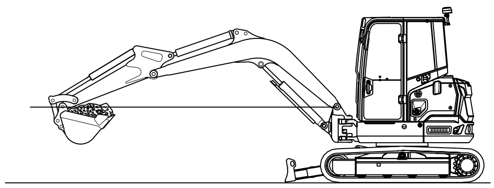
1.5= Soil specific gravity

② Position the arm cylinder with the rod 20 to 30㎜ extended from the fully retracted position.

③ Position the bucket cylinder with the rod 20 to 30㎜ retracted from the fully extended position.

④ With the arm rolled out and bucket rolled in, hold the bucket so that the height of the bucket pin is the same as the boom foot pin.

⑤ Keep the hydraulic oil temperature at 50±5°C.



55ACR6MC12

(3) Measurement

① Stop the engine.

② Five minutes after the engine has been stopped, measure the changes in the positions of the boom, arm and bucket cylinders.

③ Repeat step ② three times and calculate the average values.

(4) Evaluation

The measured drift should be within the following specifications.

Unit : mm / 5 min

Model	Drift to be measured	Standard	Remarks
HX55A CR	Boom cylinder	10 below	
	Arm cylinder	20 below	
	Bucket cylinder	20 below	
	Dozer cylinder	30 below	

11) CONTROL LEVER OPERATING FORCE

(1) Use a spring scale to measure the maximum resistance of each control lever at the middle of the grip.

(2) Preparation

① Keep the hydraulic oil temperature at 50±5°C.

(3) Measurement

① Start the engine.

② Operate each boom, arm, bucket and swing lever at full stroke and measure the maximum operating force for each.

③ Lower the bucket to the ground to raise one track off the ground. Operate the travel lever at full stroke and measure the maximum operating force required. When finished, lower the track and then jack-up the other track.

④ Repeat steps ② and ③ three times and calculate the average values.

(4) Evaluation

The measured operating force should be within the following specifications.

Unit : kgf

Model	Kind of lever	Standard	Maximum allowable	Remarks
HX55A CR	Boom lever	1.4 or below	1.9	
	Arm lever	1.4 or below	1.9	
	Bucket lever	1.4 or below	1.9	
	Swing lever	1.4 or below	1.9	
	Travel lever	2.0 or below	2.5	

12) CONTROL LEVER STROKE

(1) Measure each lever stroke at the lever top using a ruler.

※ **When the lever has play, take a half of this value and add it to the measured stroke.**

(2) Preparation

Keep the hydraulic oil temperature at 50±5°C.

(3) Measurement

① Stop the engine.

② Measure each lever stroke at the lever top from neutral to the stroke end using a ruler.

③ Repeat step ② three times and calculate the average values.

(4) Evaluation

The measured drift should be within the following specifications.

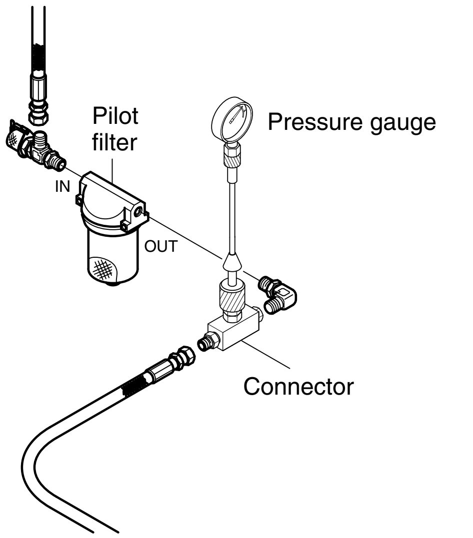
Unit : mm

Model	Kind of lever	Standard	Maximum allowable	Remarks
HX55A CR	Boom lever	87±10	109	
	Arm lever	87±10	109	
	Bucket lever	87±10	109	
	Swing lever	87±10	109	
	Travel lever	86±10	105	

13) PILOT PRIMARY PRESSURE

(1) Preparation

① Stop the engine.
② Push the pressure release button to bleed air.
③ Loosen the cap of screw coupling at the fitting near pilot filter and connect pressure gauge.
④ Start the engine and check for oil leakage from the port.
⑤ Keep the hydraulic oil temperature at 50±5°C.



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(2) Measurement

① Measure the primary pilot pressure in the H mode.

(3) Evaluation

The average measured pressure should meet the following specifications:

Unit : kgf / cm^2

Model	Standard	Remarks
HX55A CR	35+2	-

14) TRAVEL SPEED SELECTING PRESSURE

(1) Preparation

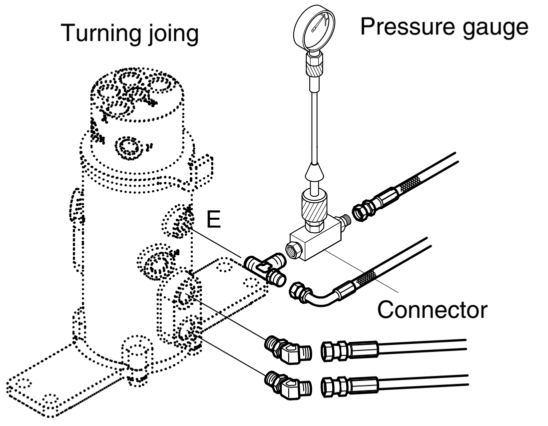
① Stop the engine.

② Push the pressure release button to bleed air.

③ To measure the speed selecting pressure: Install a connector and pressure gauge assembly to turning joint E port as shown.

④ Start the engine and check for on leakage from the adapter.

⑤ Keep the hydraulic oil temperature at 50±5°C.



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(2) Measurement

Select the following switch positions.

① Travel mode switch : 1 speed
2 speed

② Measure the travel speed selecting pressure in the Hi or Lo mode.

③ Lower the bucket to the ground to raise the track off the ground. Operate the travel lever at full stroke and measure the fast speed pressure.

④ Repeat steps ② and ③ three times and calculate the average values.

(3) Evaluation

The average measured pressure should be within the following specifications.

Unit : kgf/cm^2

Model	Travel speed mode	Standard	Maximum allowable	Remarks
HX55A CR	1 Speed	0	-	
	2 Speed	35+2	-	

15) SWING PARKING BRAKE RELEASING PRESSURE

(1) Preparation

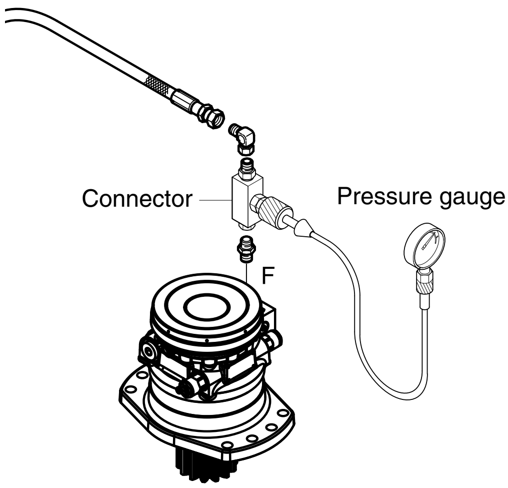
① Stop the engine.

② Push the pressure release button to bleed air.

③ Install a connector and pressure gauge assembly to swing motor F port, as shown.

④ Start the engine and check for oil leakage from the adapter.

⑤ Keep the hydraulic oil temperature at 50±5°C.



(2) Measurement

① Operate the swing function or arm roll in function and measure the swing brake control pressure with the brake disengaged. Release the control lever to return to neutral and measure the control pressure when the brake is applied.

② Repeat three times and calculate the average values.

(3) Evaluation

The average measured pressure should be within the following specifications.

Unit : kgf / cm²

Model	Engine speed	Standard	Remarks
HX55A CR	Brake disengaged	35+2	
	Brake applied	0	

16) MAIN PUMP DELIVERY PRESSURE

(1) Preparation

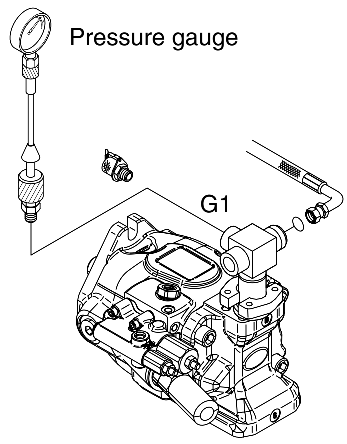
① Stop the engine.

② Push the pressure release button to bleed air.

③ To measure the main pump pressure. Loosen the cap of screw coupling and connect pressure gauge to the main pump gauge port (G1) as shown.

④ Start the engine and check for oil leakage from the port.

⑤ Keep the hydraulic oil temperature at 50±5°C.



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(2) Measurement

① Measure the main pump delivery pressure at high idle.

(3) Evaluation

The average measured pressure should meet the following specifications.

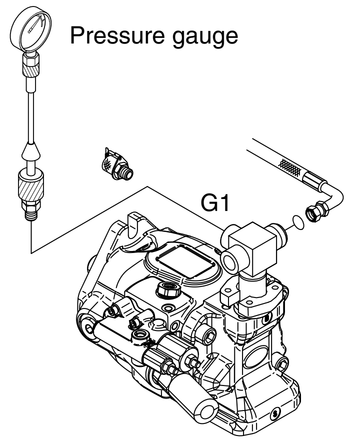
Unit : kgf / cm^2

Model	Engine speed	Standard	Allowable limits	Remarks
HX55A CR	High idle	20±5	-	

17) SYSTEM PRESSURE REGULATOR RELIEF SETTING

(1) Preparation

① Stop the engine.
② Push the pressure release button to bleed air.
③ To measure the system relief pressure. Loosen the cap of screw coupling and connect pressure gauge to the main pump gauge port (G1) as shown.
④ Start the engine and check for oil leakage from the port.
⑤ Keep the hydraulic oil temperature at 50±5°C.



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(2) Measurement

① Slowly operate each control lever of boom, arm and bucket functions at full stroke over relief and measure the pressure.
② In the swing function, place bucket against an immovable object and measure the relief pressure.
③ In the travel function, lock undercarriage with an immovable object and measure the relief pressure.

(3) Evaluation

The average measured pressure should be within the following specifications.

Unit : kgf / cm^2

Model	Function to be tested	Standard
HX55A CR	Boom	290±10
	Arm, bucket	270±10
	Travel	280±10
	Swing	250±10

1. MAIN PUMP

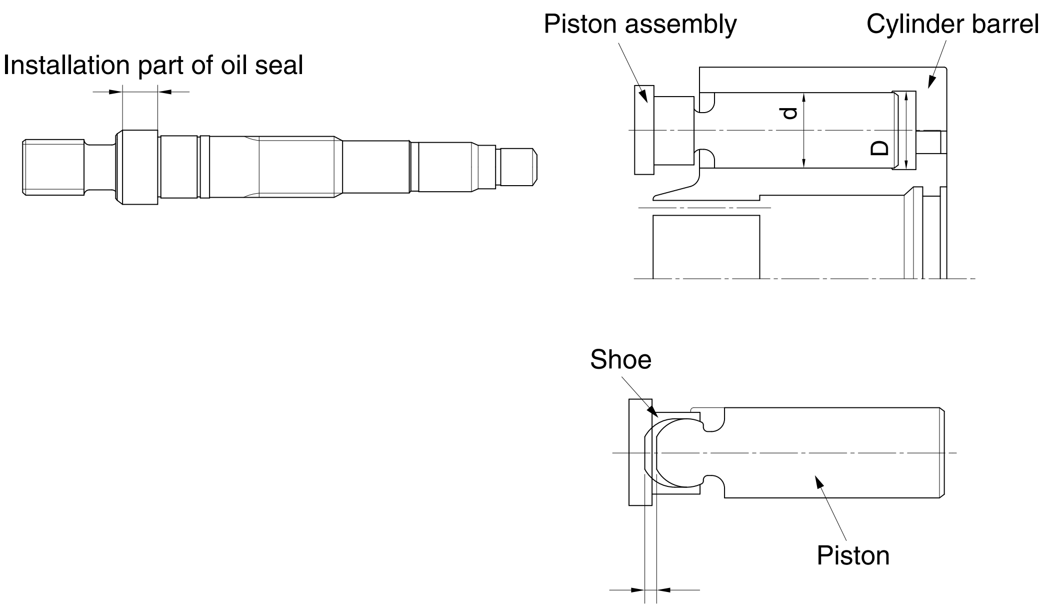
Before inspection, wash the parts well and dry them completely.

Inspect the principal parts with care and replace them with new parts when any abnormal wear exceeding the allowable limit or damage considered harmful is found.

Replace the seal also when any remarkable deformation and damage are found.

1) INSPECTION POINTS WHEN DISASSEMBLED

Part	Extent of the damage	Inspection standard	Action
Shaft	Excessive wear on the seal surface.	Worn depth : 0.025 mm or more	Replace the shaft.
Valve plate	Excessive wear or damages on the sliding surface.	Worn depth : 0.020 mm or more	Replace the cylinder barrel kit.
Cylinder barrel	Excessive wear or damages on the sliding surface.	Worn depth : 0.020 mm or more	Replace the cylinder barrel kit.
	Clearance between the pistons (D-d)	0.030 mm or more	Replace the cylinder barrel kit.
Piston and shoe	Wear of joint section	Check play (ε) between the shoe and the piston ε: 0.2 mm or more by hand operation.	Replace the cylinder barrel kit.
Seals (O-rings, gasket, etc.)	Damage, excessive rust	-	Replace each part.



17Z9A6MC01

2) TROUBLESHOOTING AND COUNTERMEASURE

No.	Trouble	Possible cause	Countermeasure
1	Overload to engine	· Speed is higher than standard · Setting pressure is higher than specifications · Damage of internal parts of pump	· Readjust it as standard · Readjust it as spec · Repair or replace
2	Low pump flow or low pressure	· Speed down of engine · Wrong coupling · Damage of internal parts of pump	· Readjust of engine speed · Repair or replace · Repair or replace
3	Abnormal noise or abnormal vibration (cavitations)	· The level of oil in the tank is low · Air in the oil · Water in the oil · Clog of suction filter · High suction pressure · Damage of piston shoe · Installation condition is no good · Wrong coupling	· Replenish a tank with oil · Check piping Bleed the air in the hydraulic circuit · Replace oil · Clean or replace · Correction · Replace · Correction · Replace
4	Oil leakage	· Damage of O-ring or packing · Loosened plug · Leaking from oil seal	· Replace · Tight up · Replace Replace of oil seal

2. MAIN CONTROL VALVE

Part name	Inspection item	Criteria & measure
Block	· Existence of scratch, rusting or corrosion.	· In case of damage in following section, replace part. - Sliding sections of casing fore and spool, especially land sections applied with holded pressure. - Seal pocket section where spool is inserted. - Seal section of port where O-ring contacts. - Seal section of each relief valve for main, travel, and port. - Other damages that may damage normal functions.
Spool	· Existence of scratch, gnawing, rusting or corrosion. · O-ring seal sections at both ends. · Insert spool in casing hole, rotate and reciprocate it.	· Replacement when its outside sliding section has scratch (especially on seals-contacting section). · Replacement when its sliding section has scratch. · Correction or replacement when O-ring is damaged or when spool does not move smoothly.
Poppet	· Damage of poppet or spring · Insert poppet into casing and function it.	· Correction or replacement when sealing is incomplete. · Normal when it can function lightly without being caught.
Around spring	· Rusting, corrosion, deformation or breaking of spring, spring seat, plug or cover.	· Replacement for significant damage.
Around seal for spool	· External oil leakage. · Rusting, corrosion or deformation of seal plate.	· Correction or replacement. · Correction or replacement.
Main relief valve & port relief valve	· External rusting or damage. · Contacting face of valve seat. · Contacting face of poppet. · Abnormal spring. · O-rings, back up rings and seals.	· Replacement. · Replacement when damaged. · Replacement when damaged. · Replacement. · 100% replacement in general.

3. SWING MOTOR

Replace the parts referring to the following table.

1) MOTOR

Part name	Service criteria
Piston assembly (2-13)	1. The sliding parts are scratched deeply or the sliding surface has become rough. 2 The clearance between the piston and the cylinder block bore is too large. Upper limit of diameter clearance : 0.04 mm 3. The piston shoe ball is loose excessively. Max. clearance (movement) : 0.4 mm
Thrust plate (2-4) Retainer holder (2-11) Retainer plate (2-12) Brake piston (2-15) Valve plate (2-24)	1. The sliding parts are scratched deeply or the sliding surface has become rough.
Cylinder block (2-5)	1. The sliding parts are scratched deeply or the sliding surface has become rough. 2. The meshing surface is worn excessively or cut.
Disc (2-14)	1. The disc (friction material) is scratched deeply or peeled. 2. The meshing surface is worn excessively or cut.
Ball bearings (2-2) (2-22)	1. The rolling contact surface has been flaked or peeled. 2. The rolling contact surface is dented. 3. Bearing rotation produces abnormality (abnormal noise, irregular rotation).
Spring (2-7)	1. The spring is broken or deformed excessively.
O-rings (2-16), (2-17), (2-20), (2-26), (2-42), (2-44), (2-46)	1. Damage that is likely to cause oil leak, damage that is likely to deteriorate the sealing or permanent deformation is noticed.

2) REDUCTION GEAR

Part name	Service criteria
Pinion shaft (1-2)	1. The gear tooth surface is damaged excessively, worn of flaked.
Plates (1-3), (1-8)	1. The plate is damaged or worn excessively.
Taper roller bearings (1-5), (1-7)	1. The roller or the race is damaged excessively, dented or flaked. 2. The rotation produces abnormal noise or is not smooth. ※ To replace the bearing, replace the body assembly.
Oil seal (1-6)	1. The lip is damaged, deformed or worn excessively. 2. The lip is hardened.
Housing (1-1) Holders (1-10), (1-18) Drive gear (1-24) Sun gear (1-17)	1. The gear tooth surface is damaged excessively, worn or flaked. ※ To replace the housing, replace the body assembly.
Inner races (1-12), (1-20)	1. The surface of the needle bearings is damaged excessively or worn or flaked.
Needle bearings (1-13), (1-21)	1. The surface of the needle bearings is damaged excessively or worn or flaked.
Planetary gears (1-14), (1-22)	1. The gear tooth surface is excessively damaged, worn of flaked. 2. The rolling contact surface in contact with the needle bearing is excessively damaged, worn or flaked.
Thrust plates (1-15), (1-23)	1. The sliding surface is excessively damaged, worn or seized.

3) VALVE

Part name	Service criteria
Piston (2-38-14) Case (2-1)	1. The sliding surface is damaged deeply or rough. 2. The clearance between the piston and the case hole is large. Upper limit of diameter clearance : 0.04 mm
Spring (2-40)	1. The spring is broken or deformed excessively.
Plugs (2-38-6), (2-41) Check valve (2-39) O-rings (2-38-8, 9, 10, 11), (2-42) Backup rings (2-38-12, 13)	1. Damage that is likely to cause oil leak, damage that is likely to deteriorate the sealing or permanent deformation is noticed.

4) OTHERS

Part name	Service criteria
Other plugs and O-rings	Damage that is likely to cause oil leak, damage that is likely to deteriorate the sealing or permanent deformation is noticed.

4. TRAVEL DEVICE

Disassembling and inspection of the motor must be done in strict accordance with the servicing standards described here. During servicing, handle each part very carefully not to damage them, especially for their movable or sliding sections.

1) PARTS INSPECTION TIPS AND REPLACEMENT STANDARDS

(1) Sun gear, drive gear, planetary gear, housing.

Pitting and breaking appear on the tooth surface.

※ **When the size of the groove or cavity in one pitting is Ø 1 mm or more or the area ratio is 5% or more for the entire area.**

(2) Oil seal

Replace when the surface of the lip is damaged or worn.

When disassembling the oil seal from the motor for inspection.

(3) Planetary gear F of needle bearing part

As the planetary gear F is assembled, check the boss and circumference direction clearance of the motor casing.

If it is 0.5 mm or more, replace it.

(4) Do not disassemble in housing and check with the following tips.

① Check the raceway surface, rollers or balls in the visible range, and make sure there are no pittings or cracks.

② Check for local corrosion and wear on the ball.

③ Please check again with the following tips.

a) Check the gear oil for excessive wear powder.

b) Make sure that there is excessive wear powder between the ball and cage.

c) When turning lightly by hand, check that it rotates smoothly.

After performing the above inspection, replace any problem.

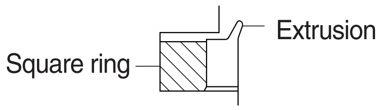
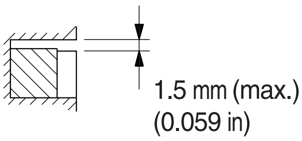
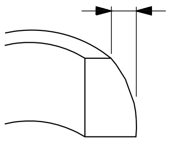
Do not use angular bearing separated from housing again.

(5) Side plate

If the drive gear and sliding surfaces are markedly damaged, they must be replaced.

(6) Fitting on rotating surfaces of needle bearing and inner racefor planetary gear R, should be replaced when broken.

5. TURNING JOINT

Parts Name		Check Points	Measures
Body, Stem	Sliding surface with sealing sections.	Plating worn or peeled due to seizure or contamination.	Replace
	Sliding surface between body and stem other than sealing section.	· Worn abnormality or damaged more than 0.1 mm (0.0039 in) in depth due to seizure contamination.	Replace
		· Damaged more than 0.1 mm (0.0039 in) in depth.	Smooth with oilstone.
	Sliding surface with thrust plate.	· Worn more than 0.5 mm (0.02 in) or abnormality.	Replace
		· Worn less than 0.5 mm (0.02 in).	Smooth
		· Damage due to seizure or contamination remediable within wear limit (0.5 mm) (0.02 in).	Smooth
Cover	Sliding surface with thrust plate.	· Worn more than 0.5 mm (0.02 in) or abnormality.	Replace
		· Worn less than 0.5 mm (0.02 in).	Smooth
		· Damage due to seizure or contamination remediable within wear limit (0.5 mm) (0.02 in).	Replace
Seal set	-	· Extruded excessively from seal groove square ring. 	Replace
	-	· Slipper ring 1.5 mm (0.059 in) narrower than seal groove, or narrower than back ring. 	Replace
	-	· Worn more than 0.5 mm (0.02 in) ~ 1.5 mm (MAX.) (0.059 in) 	Replace

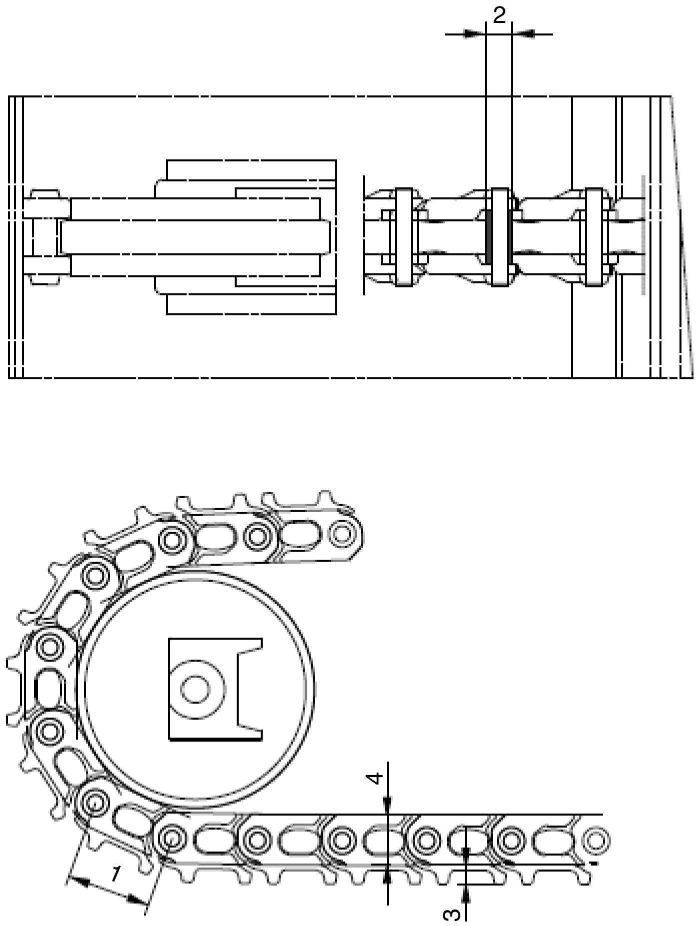
6. CYLINDER

Part name	Inspecting section	Inspection item	Remedy
Piston rod	· Neck of rod pin	· Presence of crack	· Replace
	· Weld on rod hub	· Presence of crack	· Replace
	· Stepped part to which piston is attached.	· Presence of crack	· Replace
	· Threads	· Presence of crack	· Recondition or replace
	· Plated surface	· Plating is not worn off to base metal. · Rust is not present on plating. · Scratches are not present.	· Replace or replate · Replace or replate · Recondition, replate or replace
	· Rod	· Wear of O.D.	· Recondition, replate or replace
	· Bushing at mounting part	· Wear of I.D.	· Replace
Cylinder tube	· Weld on bottom	· Presence of crack	· Replace
	· Weld on head	· Presence of crack	· Replace
	· Weld on hub	· Presence of crack	· Replace
	· Tube interior	· Presence of faults	· Replace if oil leak is seen
	· Bushing at mounting part	· Wear on inner surface	· Replace
Gland	· Bushing	· Flaw on inner surface	· Replace if flaw is deeper than coating

GROUP 3 TRACK AND WORK EQUIPMENT

1. TRACK SHOE

1) STEEL SHOE

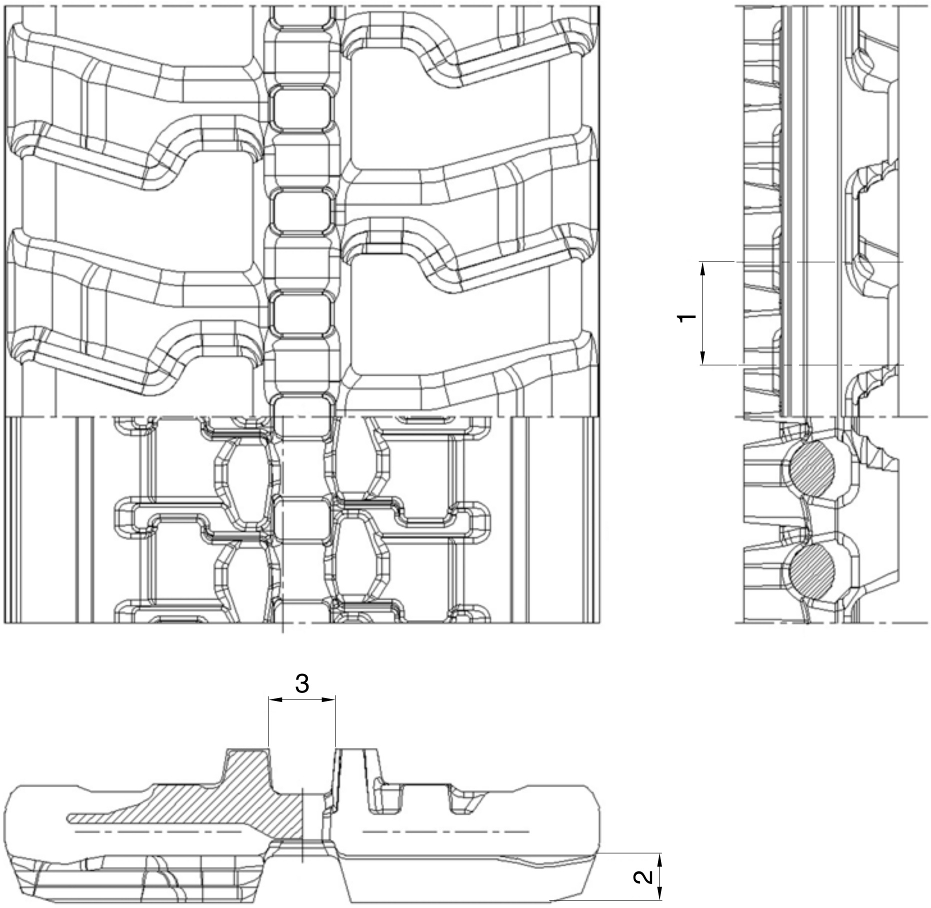


35AZ6MC18

Unit : mm

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Link pitch	135	138.6	Replace bushing and pin and link assembly
2	Outside diameter of bushing	35	31.4	
3	Height of grouser	14	11	Lug welding, rebuild or replace
4	Height of link	67	61.5	

2) RUBBER SHOE

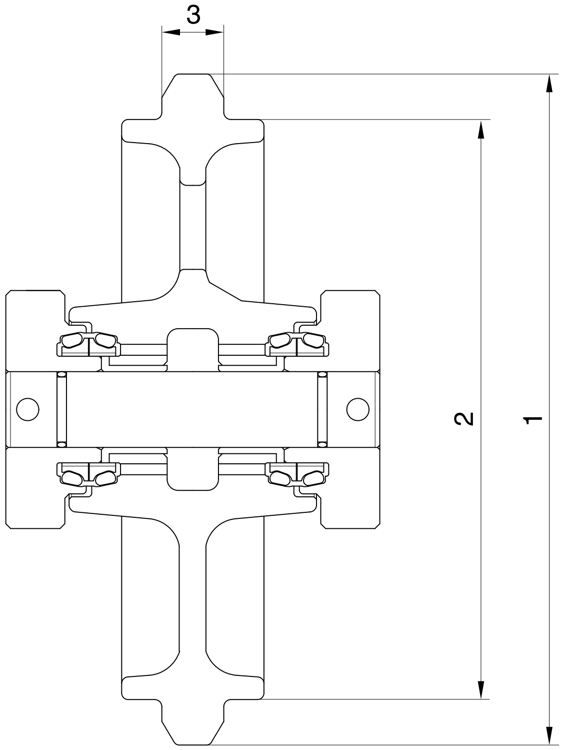


35Z9A6MC17

Unit : mm

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Link pitch	72.5	69.5	Replace
2	Height of grouser	23	5	
3	Width of link	55	67	

2. IDLER

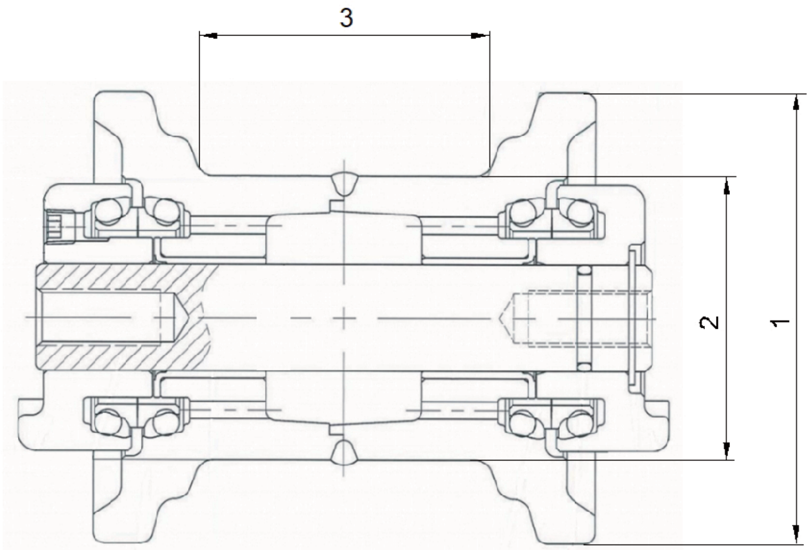


35Z9A6MC18

Unit : mm

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Outside diameter of flange	374	-	Rebuild or replace
2	Outside diameter of thread	330	318	
3	Width of flange	44	38	

3. TRACK ROLLER

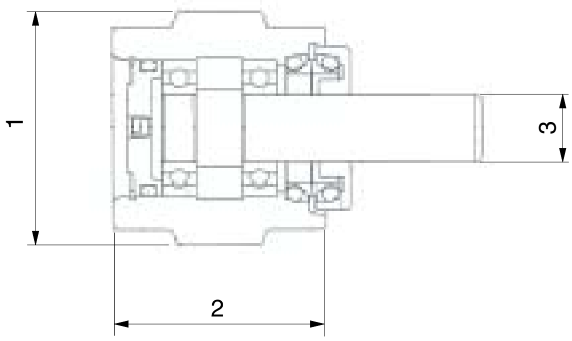


35AZ6MC19

Unit : mm

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Outside diameter of flange	Ø153	Ø147	Rebuild or replace
2	Outside diameter of thread	Ø105	Ø99	
3	Width of flange	89	93	

4. CARRIER ROLLER

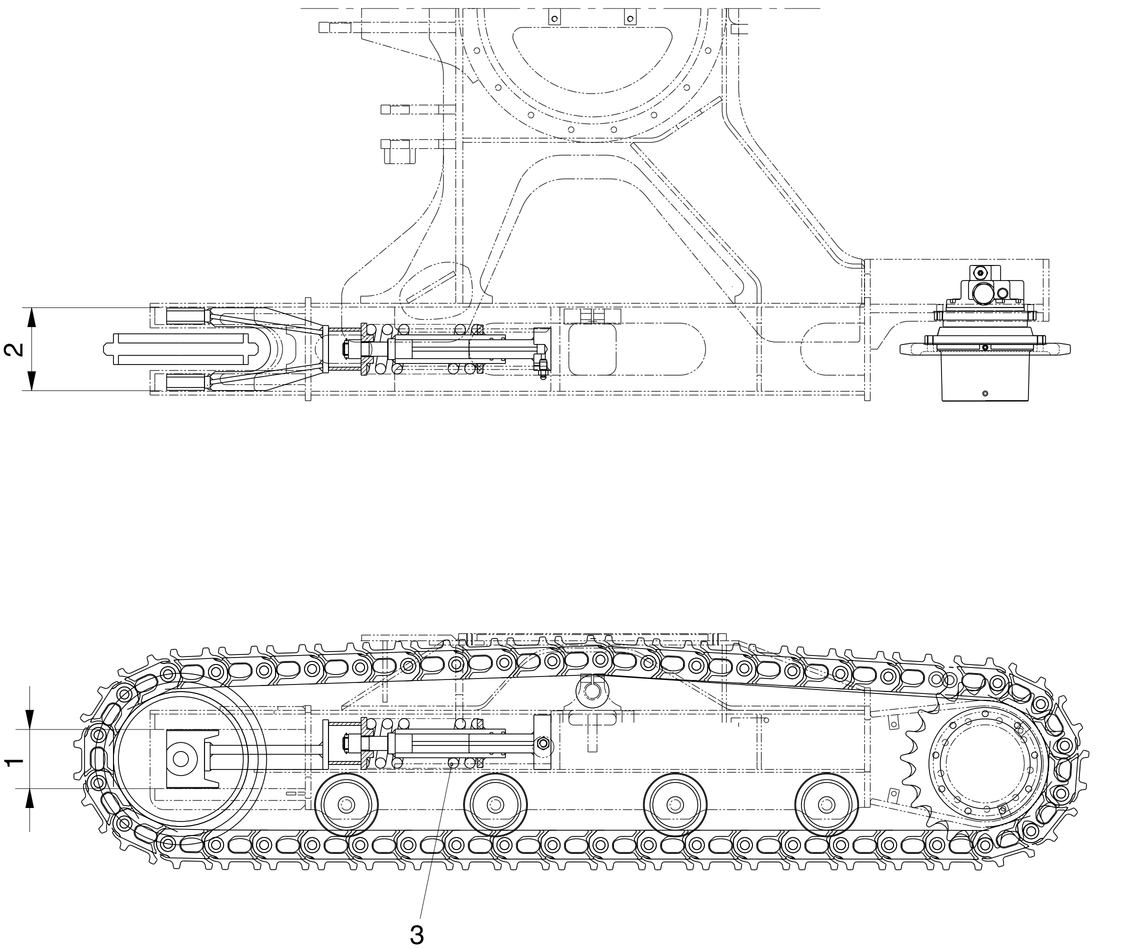


48AZ6MC20

Unit : mm

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Outside diameter of flange	Ø93	Ø87	Replace
2	Width of tread	100	-	
3	Diameter of shaft	30	-	

5. TENSION CYLINDER (steel and rubber track)

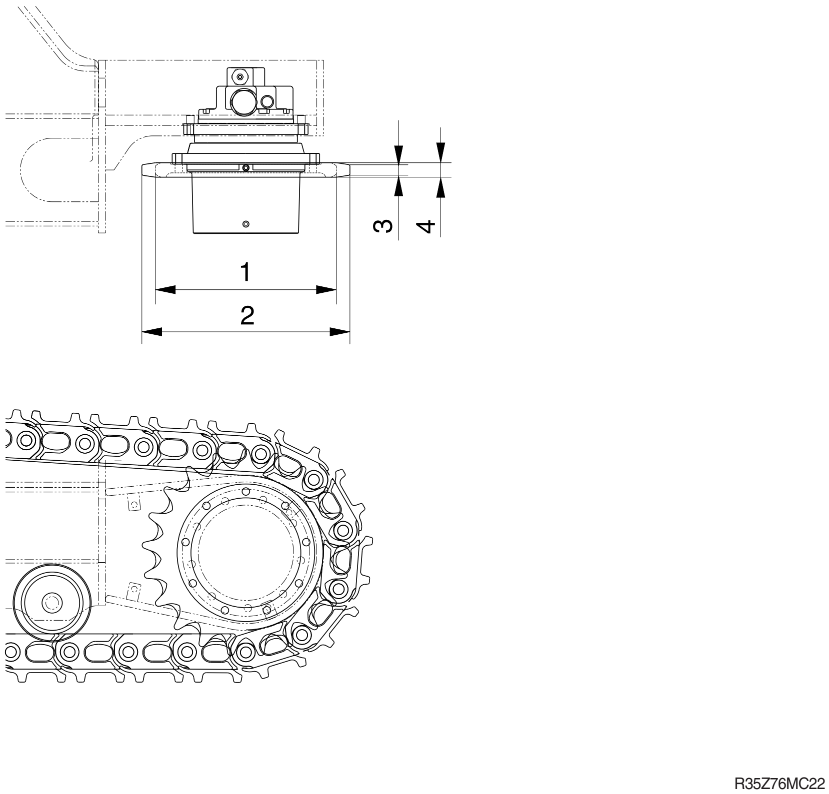


R35Z76MC21

Unit : mm

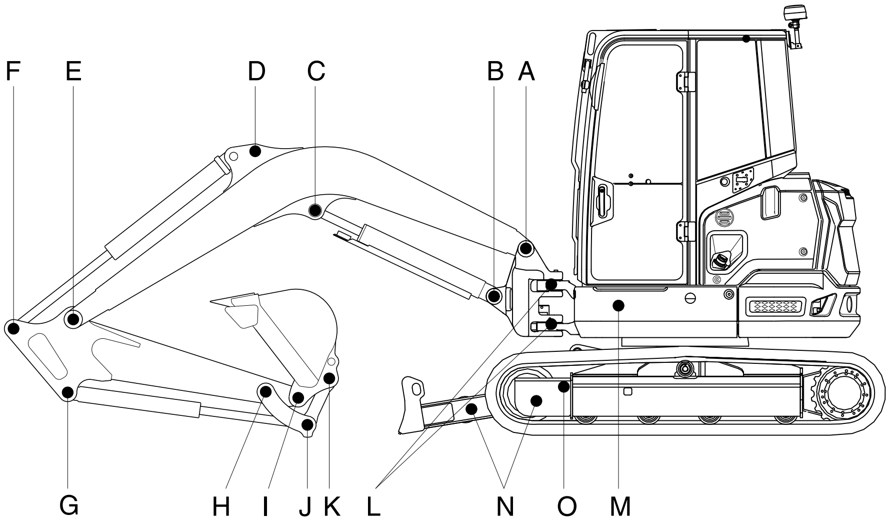
<table>
<tr><th rowspan="2">No</th><th rowspan="2">Check item</th><th colspan="5">Criteria</th><th rowspan="2">Remedy</th></tr>
<tr><th></th><th colspan="2">Standard size</th><th colspan="2">Repair limit</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Vertical width of idler guide</td><td>Track frame</td><td colspan="2">101</td><td colspan="2">105</td><td>Rebuild</td></tr>
<tr><td>Idler support</td><td colspan="2">100</td><td colspan="2">104</td><td>Rebuild or replace</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Horizontal width of idler guide</td><td>Track frame</td><td colspan="2">192</td><td colspan="2">196</td><td>Rebuild</td></tr>
<tr><td>Idler guide</td><td colspan="2">190</td><td colspan="2">194</td><td>Rebuild or replace</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Recoil spring</td><td colspan="3">Standard size</td><td colspan="2">Repair limit</td><td rowspan="3">Replace</td></tr>
<tr><td>Free length</td><td>Installed length</td><td>Installed load</td><td>Free length</td><td>Installed load</td></tr>
<tr><td>296</td><td>230</td><td>4350 kg</td><td>-</td><td>3480 kg</td></tr>
</table>

6. SPROCKET (steel and rubber track)



No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Wear out of sprocket tooth lower side diameter	380.4	372.4	Repair or Replace
2	Wear out of sprocket tooth upper side diameter	426	-	
3	Wear out of sprocket tooth upper side width	29	-	
4	Wear out of sprocket tooth lower side width	38	30	

7. WORK EQUIPMENT



55ACR6MC30

Unit : ㎜

Mark	Measuring point (Pin and Bushing)	Normal value	Pin		Bushing		Remedy & Remark
			Recomm. service limit	Limit of use	Recomm. service limit	Limit of use	
A	Boom Rear	50	49	48.5	50.5	51	Replace
B	Boom Cylinder Head	50	49	48.5	50.5	51	〃
C	Boom Cylinder Rod	50	49	48.5	50.5	51	〃
D	Arm Cylinder Head	45	44	43.5	45.5	46	〃
E	Boom Front	50	49	48.5	50.5	51	〃
F	Arm Cylinder Rod	45	44	43.5	45.5	46	〃
G	Bucket Cylinder Head	45	44	43.5	45.5	46	〃
H	Arm Link	45	44	43.5	45.5	46	〃
I	Bucket and Arm Link	45	44	43.5	45.5	46	〃
J	Bucket Cylinder Rod	45	44	43.5	45.5	46	〃
K	Bucket Link	45	44	43.5	45.5	46	〃
L	Boom swing post	90	89	88.5	90.5	91	〃
M	Boom swing cylinder	50	49	48.5	50.5	51	〃
N	Blade cylinder	55	54	53.5	55.5	56	〃
O	Blade and frame link	45	44	43.5	45.5	46	〃

SECTION 7 DISASSEMBLY AND ASSEMBLY

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Group 2 Tightening Torque 7-4
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Group 7 RCV Lever 7-91
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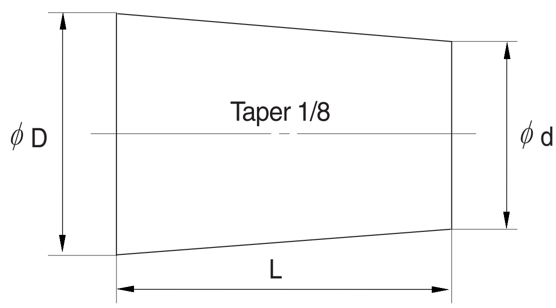
Group 10 Undercarriage 7-140
Group 11 Work Equipment 7-153

GROUP 1 PRECAUTIONS

1. REMOVAL WORK

1) Lower the work equipment completely to the ground.
   If the coolant contains antifreeze, dispose of it correctly.
2) After disconnecting hoses or tubes, cover them or fit blind plugs to prevent dirt or dust from entering.
3) When draining oil, prepare a container of adequate size to catch the oil.
4) Confirm the match marks showing the installation position, and make match marks in the necessary places before removal to prevent any mistake when assembling.
5) To prevent any excessive force from being applied to the wiring, always hold the connectors when disconnecting the connectors.
6) Fit wires and hoses with tags to show their installation position to prevent any mistake when installing.
7) Check the number and thickness of the shims, and keep in a safe place.
8) When raising components, be sure to use lifting equipment of ample strength.
9) When using forcing screws to remove any components, tighten the forcing screws alternately.
10) Before removing any unit, clean the surrounding area and fit a cover to prevent any dust or dirt from entering after removal.
11) When removing hydraulic equipment, first release the remaining pressure inside the hydraulic tank and the hydraulic piping.
12) If the part is not under hydraulic pressure, the following corks can be used.

Nominal number	Dimensions		
	D	d	L
06	6	5	8
08	8	6.5	11
10	10	8.5	12
12	12	10	15
14	14	11.5	18
16	16	13.5	20
18	18	15	22
20	20	17	25
22	22	18.5	28
24	24	20	30
27	27	22.5	34



2. INSTALL WORK

1) Tighten all bolts and nuts(Sleeve nuts) to the specified torque.

2) Install the hoses without twisting or interference.

3) Replace all gaskets, O-rings, cotter pins, and lock plates with new parts.

4) Bend the cotter pin or lock plate securely.

5) When coating with adhesive, clean the part and remove all oil and grease, then coat the threaded portion with 2-3 drops of adhesive.

6) When coating with gasket sealant, clean the surface and remove all oil and grease, check that there is no dirt or damage, then coat uniformly with gasket sealant.

7) Clean all parts, and correct any damage, dents, burrs, or rust.

8) Coat rotating parts and sliding parts with engine oil.

9) When press fitting parts, coat the surface with antifriction compound(LM-P).

10) After installing snap rings, check that the snap ring is fitted securely in the ring groove(Check that the snap ring moves in the direction of rotation).

11) When connecting wiring connectors, clean the connector to remove all oil, dirt, or water, then connect securely.

12) When using eyebolts, check that there is no deformation or deterioration, and screw them in fully.

13) When tightening split flanges, tighten uniformly in turn to prevent excessive tightening on one side.

14) When operating the hydraulic cylinders for the first time after repairing and reassembling the hydraulic cylinders, pumps, or other hydraulic equipment or piping, always bleed the air from the hydraulic cylinders as follows:

(1) Start the engine and run at low idling.

(2) Operate the control lever and actuate the hydraulic cylinder 4-5 times, stopping 100㎜ before the end of the stroke.

(3) Next, operate the piston rod to the end of its stroke to relieve the circuit. (The air bleed valve is actuated to bleed the air.)

(4) After completing this operation, raise the engine speed to the normal operating condition.

※ If the hydraulic cylinder has been replaced, carry out this procedure before assembling the rod to the work equipment.

※ Carry out the same operation on machines that have been in storage for a long time after completion of repairs.

3. COMPLETING WORK

1) If the coolant has been drained, tighten the drain valve, and add water to the specified level. Run the engine to circulate the water through the system. Then check the water level again.

2) If the hydraulic equipment has been removed and installed again, add engine oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.

3) If the piping or hydraulic equipment, such as hydraulic cylinders, pumps, or motors, have been removed for repair, always bleed the air from the system after reassembling the parts.

4) Add the specified amount of grease(Molybdenum disulphied grease) to the work equipment related parts.

GROUP 2 TIGHTENING TORQUE

1. MAJOR COMPONENTS

No.	Descriptions		Bolt size	Torque	
				kgf · m	lbf · ft
1	Engine	Engine mounting bolt (Engine-Bracket)-LH	M10 × 1.5	6.9±1.0	50±7.2
2		Engine mounting bolt (Engine-Bracket)-RH	M10 × 1.5	6.9±1.0	50±7.2
3		Engine mounting bolt (Bracket-Frame)	M12 × 1.75	12.3±2.0	89±14.5
4		Radiator mounting bolt, nut	M12 × 1.75	12.8±3.0	93±22.0
5		Coupling mounting bolt	M14 × 2.0	14±1.0	101±7.2
6		Fuel tank mounting bolt	M10 × 1.5	6.9±1.4	50±10.0
7	Hydraulic system	Main pump mounting bolt	M12 × 1.75	14±1.0	101±7.2
8		Main pump housing mounting bolt	M10 × 1.5	6.9±1.0	50±7.2
9		Main control valve mounting bolt	M 8 × 1.25	2.5±0.5	18.1±3.6
10		Hydraulic oil tank mounting bolt	M12 × 1.75	12.3±2.5	89±18.1
11		Turning joint mounting bolt, nut	M12 × 1.75	12.8±3.0	93±22.0
12		Swing motor mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
13	Power train system	Swing bearing upper mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
14		Swing bearing lower mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
15		Travel motor mounting bolt	M14 × 2.0	19.6±2.9	142±21.0
16		Sprocket mounting bolt	M14 × 2.0	19.6±2.0	142±14.5
17	Under carriage	Upper roller mounting bolt, nut	M16 × 2.0	29.7±3.0	215±32.5
18		Lower roller mounting bolt	M16 × 1.5	31.3±3.0	226±21.7
19	Others	Counterweight mounting bolt	M20 × 2.5	57.9±8.7	419±62.9
20		Counterweight mounting bolt-add type	M24 × 3.0	100±15	723±108
21		Cab mounting bolt, nut	M 8 × 1.25	2.5±0.5	18.1±3.6
22		Operator's seat mounting bolt	M 8 × 1.25	2.5±0.5	18.1±3.6
23		Under cover mounting bolt	M 8 × 1.25	2.5±0.5	18.1±3.6
24		Swing post pin mounting bolt, nut	M12 × 1.75	12.8±3.0	93±22.0
25		Travel motor cover	M10 × 1.5	6.9±1.4	50±10.0

2. TORQUE CHART

Use following table for unspecified torque.

1) BOLT AND NUT

(1) Coarse thread

Bolt size	8T		10T	
	kg · m	lb · ft	kg · m	lb · ft
M 6 × 1.0	0.85 ~ 1.25	6.15 ~ 9.04	1.14 ~ 1.74	8.2 ~ 12.6
M 8 × 1.25	2.0 ~ 3.0	14.5 ~ 21.7	2.7 ~ 4.1	19.5 ~ 29.7
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 81.0	9.8 ~ 15.8	70.9 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 163
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.5	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 344
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	349 ~ 458	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.0	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1656
M36 × 4.0	174 ~ 236	1261 ~ 1704	250 ~ 310	1808 ~ 2242

(2) Fine thread

Bolt size	8T		10T	
	kg · m	lb · ft	kg · m	lb · ft
M 8 × 1.0	2.2 ~ 3.4	15.9 ~ 24.6	3.0 ~ 4.4	21.7 ~ 31.8
M10 × 1.2	4.5 ~ 6.7	32.5 ~ 48.5	5.9 ~ 8.9	42.7 ~ 64.4
M12 × 1.25	7.8 ~ 11.6	56.4 ~ 83.9	10.6 ~ 16.0	76.7 ~ 116
M14 × 1.5	13.3 ~ 18.1	96.2 ~ 131	17.9 ~ 24.1	130 ~ 174
M16 × 1.5	19.9 ~ 26.9	144 ~ 195	26.6 ~ 36.0	192 ~ 260
M18 × 1.5	28.6 ~ 43.6	207 ~ 315	38.4 ~ 52.0	278 ~ 376
M20 × 1.5	40.0 ~ 54.0	289 ~ 391	53.4 ~ 72.2	386 ~ 522
M22 × 1.5	52.7 ~ 71.3	381 ~ 516	70.7 ~ 95.7	511 ~ 692
M24 × 2.0	67.9 ~ 91.9	491 ~ 665	90.9 ~ 123	658 ~ 890
M30 × 2.0	137 ~ 185	990 ~ 1339	182 ~ 248	1314 ~ 1796
M36 × 3.0	192 ~ 260	1390 ~ 1880	262 ~ 354	1894 ~ 2562

2) PIPE AND HOSE (FLARE type)

Thread size (PF)	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

3) PIPE AND HOSE (ORFS type)

Thread size (UNF)	Width across flat (mm)	kgf · m	lbf · ft
9/16-18	19	4	28.9
11/16-16	22	5	36.2
13/16-16	27	9.5	68.7
1-3/16-12	36	18	130
1-7/16-12	41	21	152
1-11/16-12	50	35	253

4) FITTING

Thread size	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

GROUP 3 PUMP DEVICE

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.**

13031GE18

(4) Loosen the drain plug under the hydraulic tank and drain the oil from the hydraulic tank.

· Hydraulic tank quantity : 44 ℓ (11.6 U.S.gal)

(5) Disconnect hoses (13) and loosen bolt (18) and remove pipe (4).

(6) Disconnect pilot line hoses (14, 66, 67) and remove connectors (48, 56, 64).

(7) Remove socket bolts (20) and disconnect pump suction tube (2).

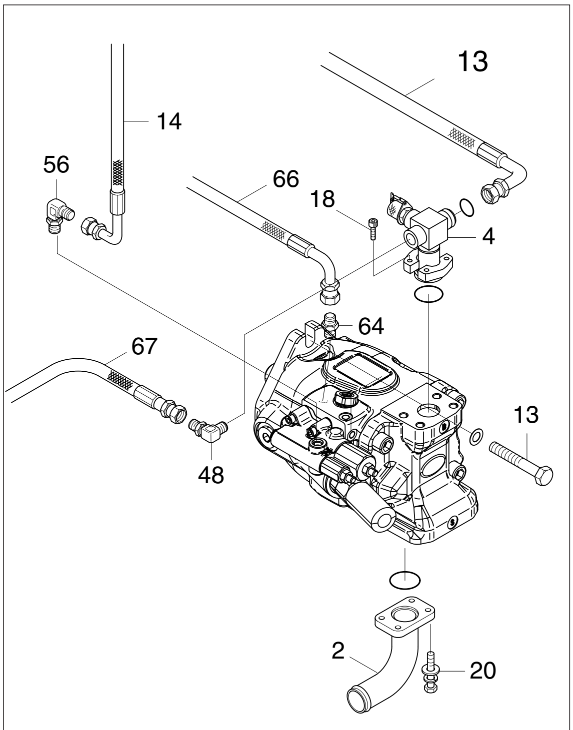
※ When pump suction tube is disconnected, the oil inside the piping will flow out, so catch it in oil pan.

(8) Sling the pump assembly and remove the pump mounting bolts (13).

· Weight : 25 kg (54 lb)

· Tightening torque : 12.8±3.0 kgf·m (93±22 lbf·ft)

※ Pull out the pump assembly from housing. When removing the pump assembly, check that all the hoses have been disconnected.



55ACR7MP01

2) INSTALL

(1) Carry out installation in the reverse order to removal.

(2) Remove the suction strainer and clean it.

(3) Replace return filter with new one.

(4) Remove breather and clean it.

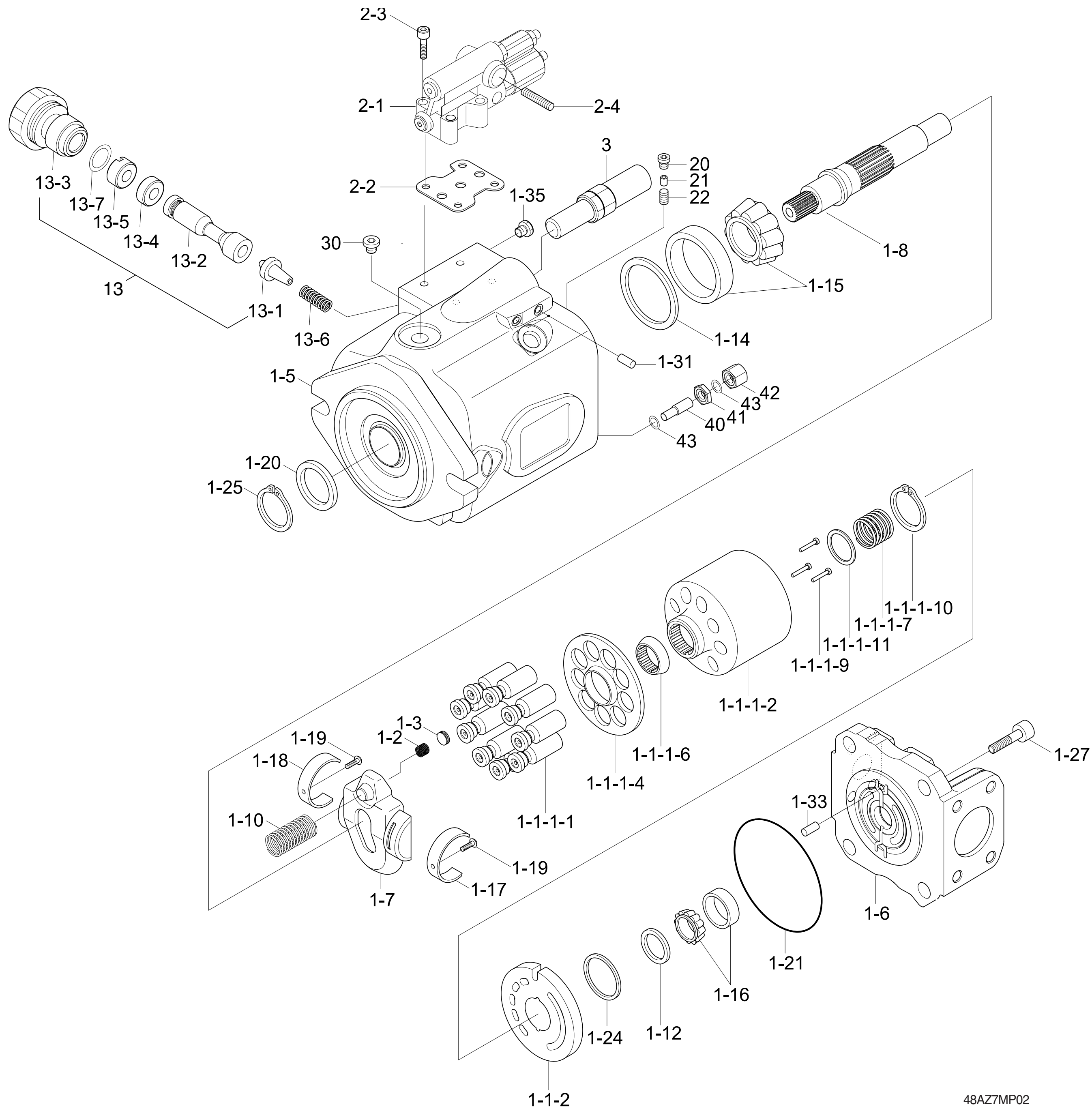
(5) After adding oil to the hydraulic tank to the specified level.

(6) Bleed the air from the hydraulic pump.
① Remove the air vent plug (1EA).
② Tighten plug lightly.
③ Start the engine, run at low idling, and check oil come out from plug.
④ Tighten plug.

(7) Start the engine, run at low idling (3~5 minutes) to circulate the oil through the system.

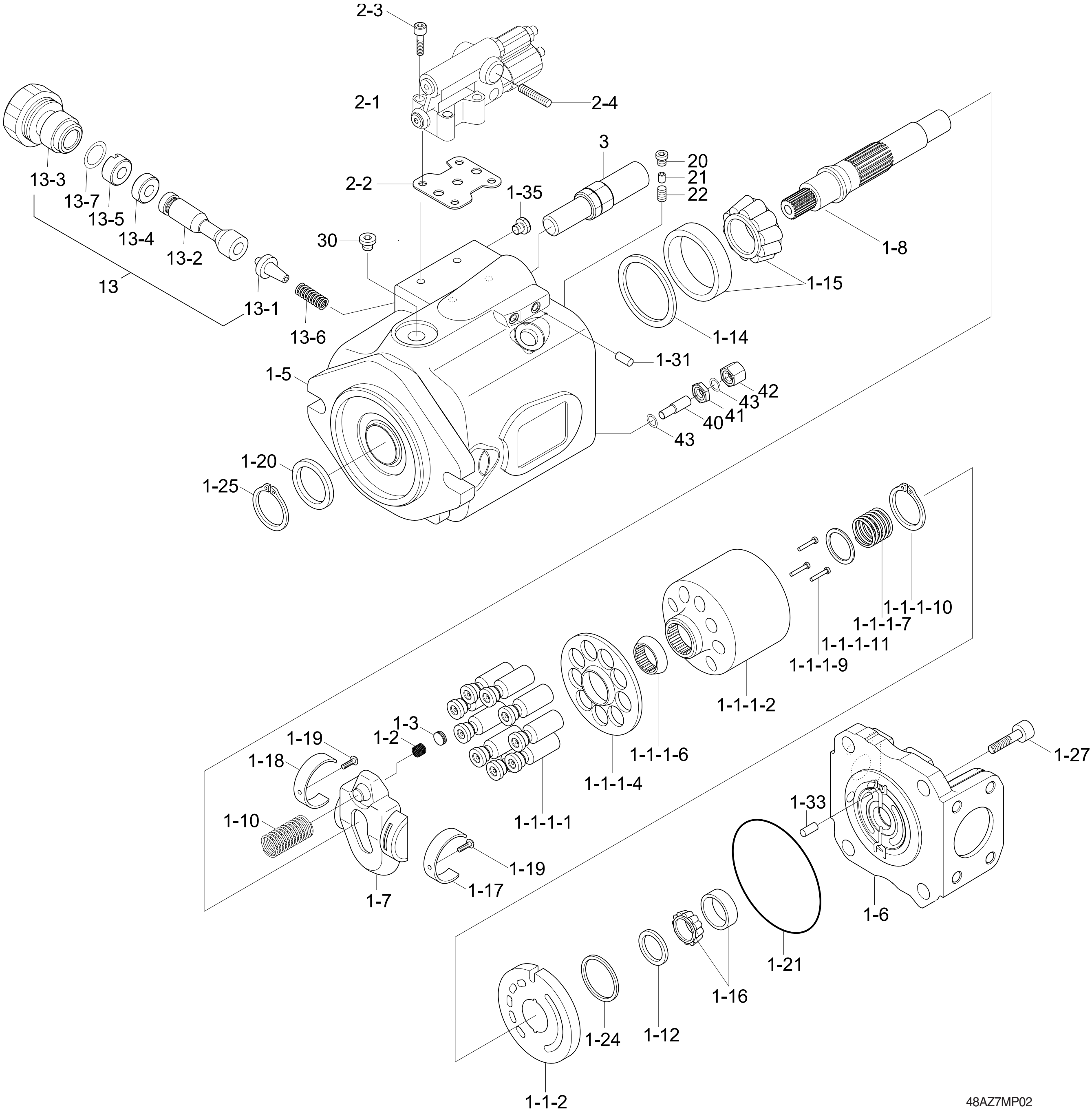
(8) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2. STRUCTURE (1/2)



1-1-1	Rotary assy	1-1-2	Control plate	1-14	Stop ring
1-1-1-1	Piston and shoe	1-2	Pressure spring	1-15	Taper roller bearing
1-1-1-2	Block	1-3	Stopper	1-16	Taper roller bearing
1-1-1-4	Retaining plate	1-5	Pump housing	1-17	Liner bearing
1-1-1-6	Retainer ball	1-6	Connection plate	1-18	Liner bearing
1-1-1-7	Spring	1-7	Swing cradle	1-19	Flat screw
1-1-1-9	Pressure pin	1-8	Drive shaft	1-20	Shaft seal
1-1-1-10	V ring	1-10	Spring	1-21	O-ring
1-1-1-11	Back up plate	1-12	Adjust shim	1-24	Seat

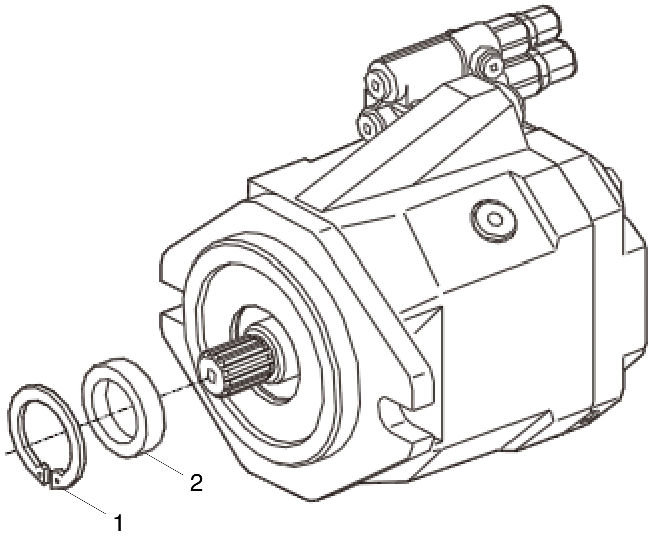
STRUCTURE (2/2)



1-25	Retainer ring	3	Control valve	20	Throttle screw
1-27	Socket screw	13	Control valve	21	Throttle pin
1-31	Pin	13-1	Valve cone	22	Throttle screw
1-33	Straight pin	13-2	Valve seat	30	Lock screw
1-35	Lock screw	13-3	Screw plug	40	Stop screw
2-1	Control valve	13-4	Adjust screw	41	Nut
2-2	Gasket	13-5	Nut	42	Cap nut
2-3	Socket screw	13-6	Compression spring	43	O-ring
2-4	Lock screw	13-7	O-ring		

3. DISASSEMBLY AND ASSEMBLY

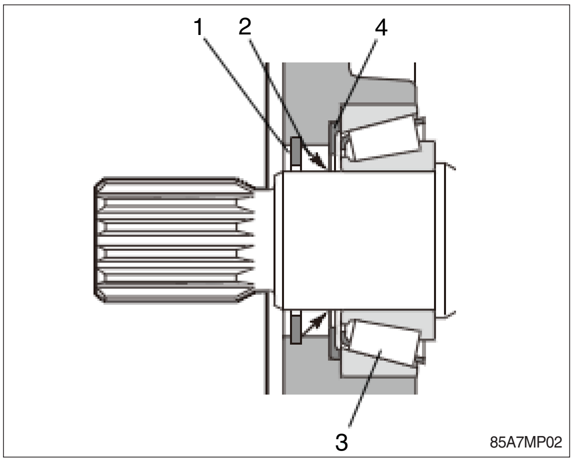
1) SEALING OF THE DRIVE SHAFT



85A7MP01

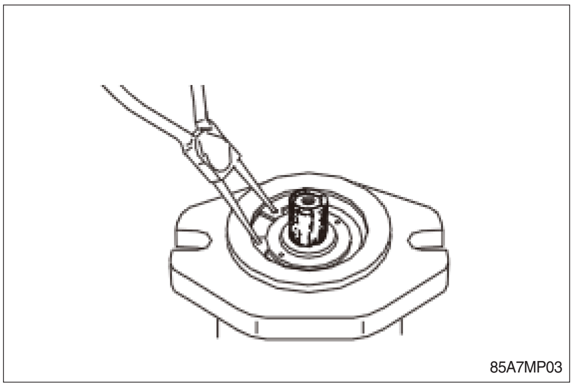
(1) Components

① Circlip
② 2 Shaft seal
③ 3 Bearing
④ 4 Stop ring



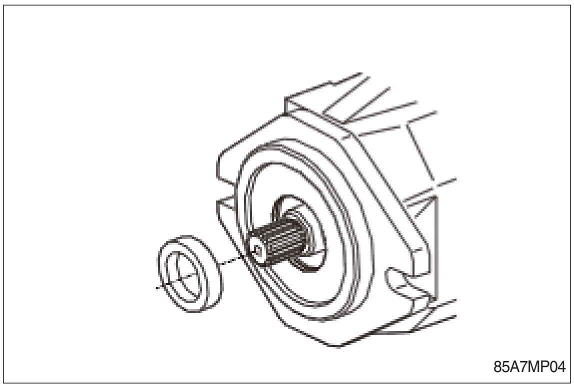
85A7MP02

(2) Protect the drive shaft.
(3) Remove the circlip.
(4) Remove shaft seal to front.



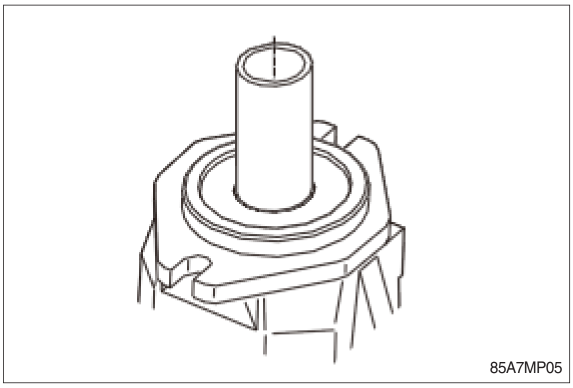
85A7MP03

※ Change the shaft seal and check its sliding surface (drive shaft) and housing and grease the sealing ring.
※ Visual check shaft seal and housing.



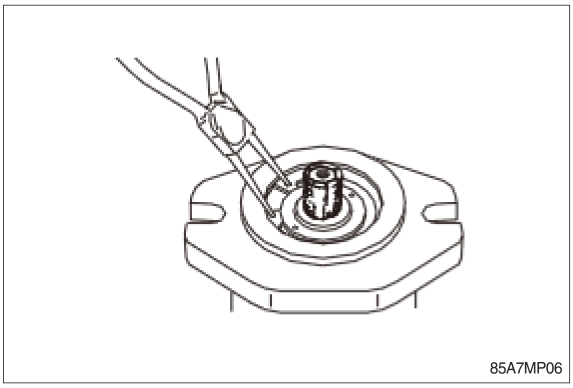
85A7MP04

(5) Assembling of the sealing ring carefully down to the distance ring.



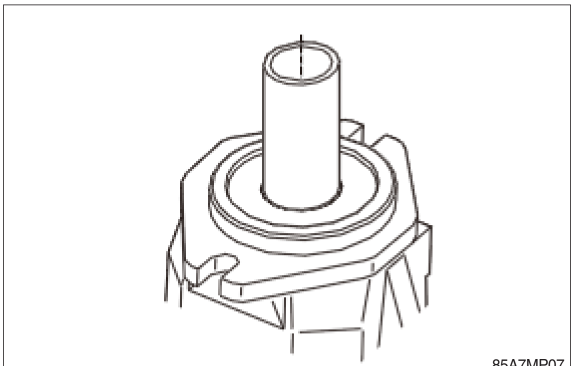
85A7MP05

(6) Assemble the snap ring.



85A7MP06

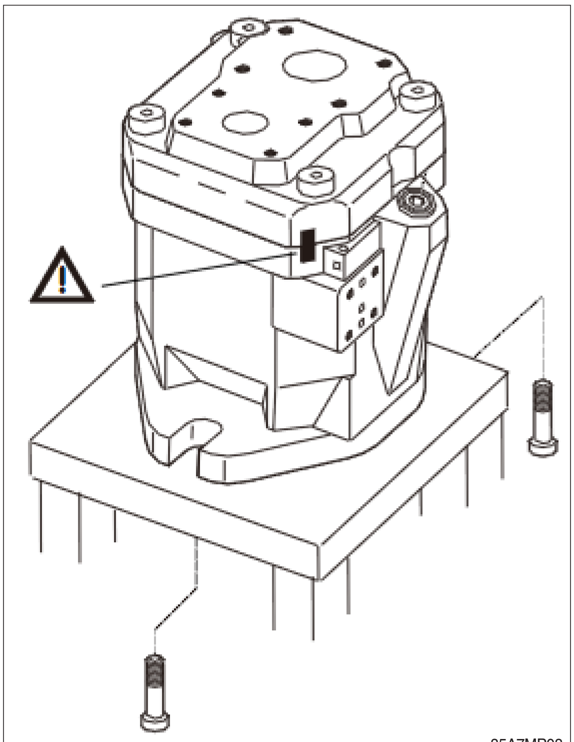
※ Visual check to ensure that the circlip is correctly located in the groove.



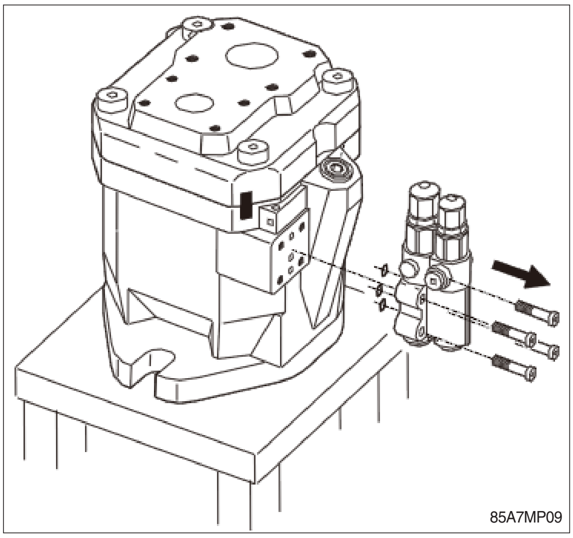
85A7MP07

2) DISSAMBLE THE PUMP

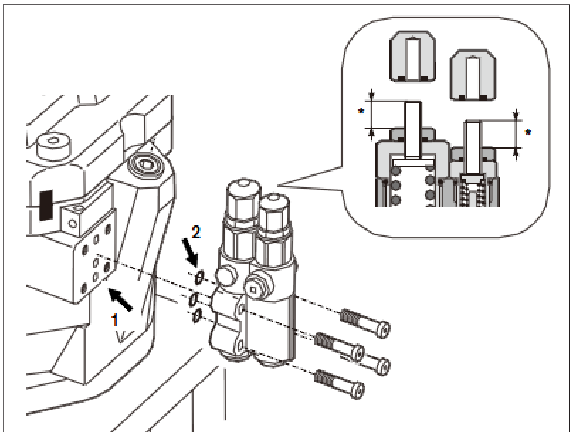
※ Disassembly position
Mark the location of the connection plate on the housing of pump.


85A7MP08

(1) Remove the control valve.

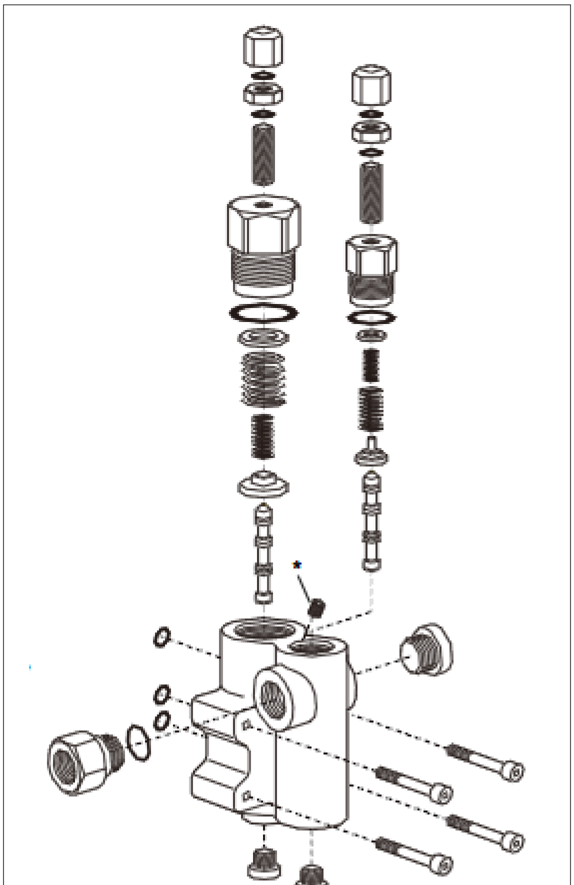

85A7MP09

(2) Remove the control valve
※ Measure dimension * and note down.
※ Check sealing surface (1) and O-rings (2).



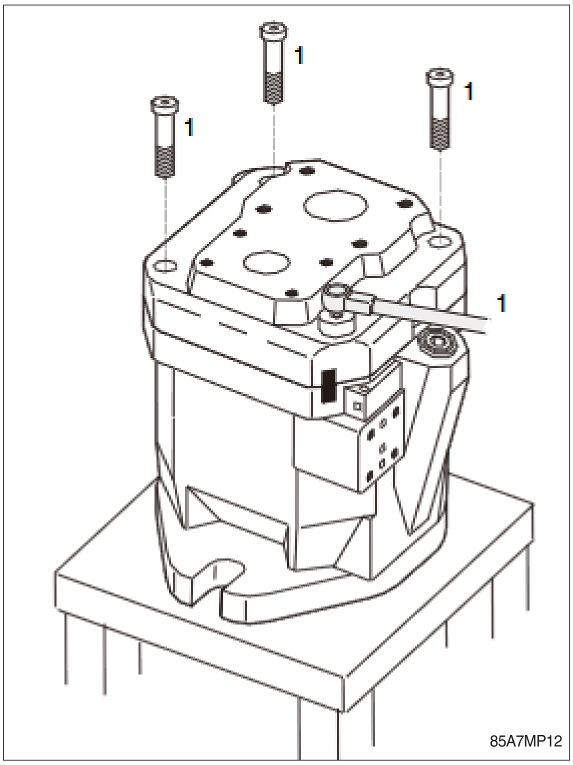
85A7MP10

※ Only DFR with orifice



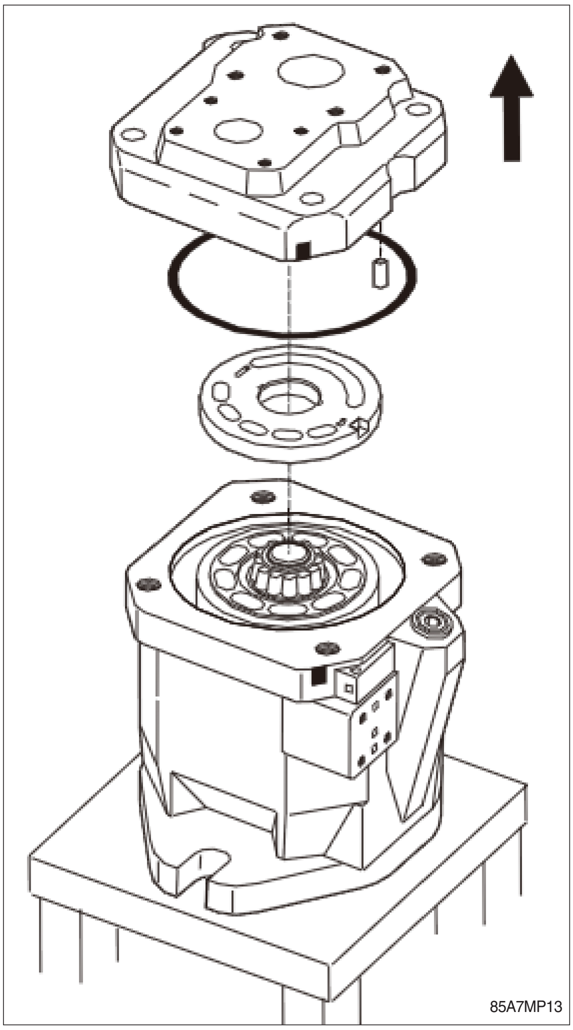
85A7MP11

(3) Remove the socket screws (1).

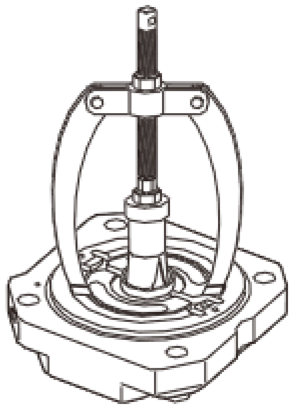


(4) Remove connection plate.

※ Control plate can drop down - keep tight while removing connection plate.

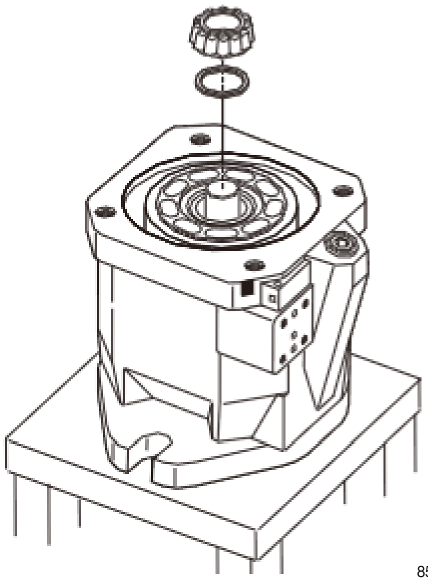


(5) Pull bearing of the connection plate out using a bearing puller.
※ Do not damage the sealing surface.



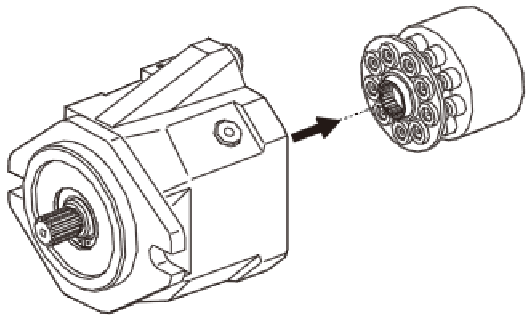
85A7MP14

(6) Remove bearing and shim.
※ Do not damage the sealing surface.



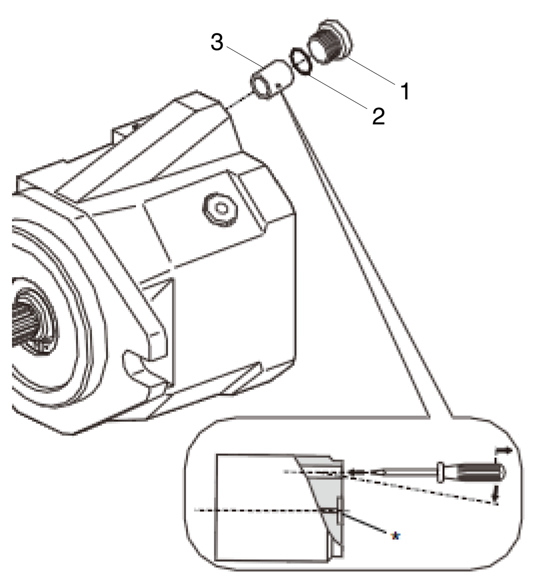
85A7MP15

(7) Remove the rotary group in a horizontal position.



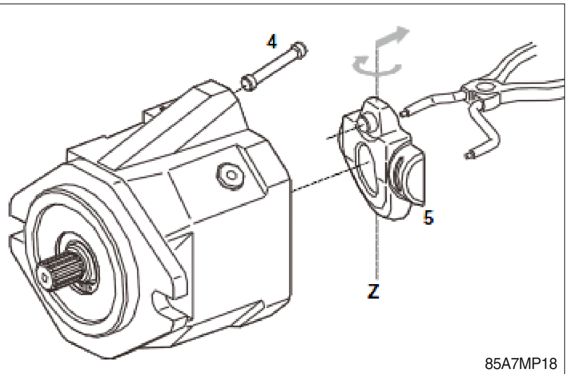
85A7MP16

(8) Remove plug (1) with seal (2).
(9) Pull out control piston (3) (- flat surface *-) with tool.



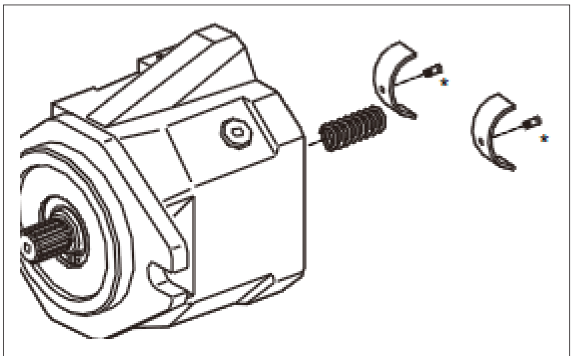
85A7MP17

(10) Remove piston rod and swash plate.
Turn swash plate (5) inside of the housing slightly along Z-axis with tool. Remove piston rod (4). Remove swash plate (5).
Do not damage the piston rod and swash plate.



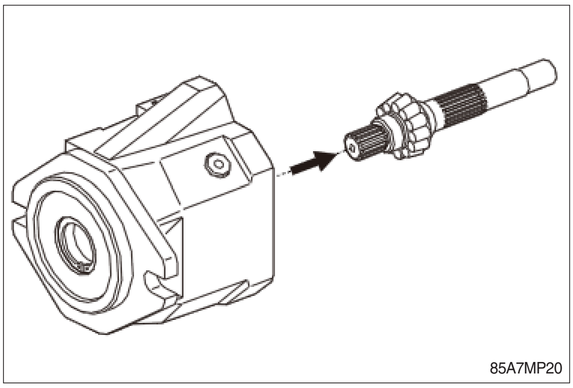
85A7MP18

(11) Remove bearing shells and bearing.
※ Attention for position.
Only size 60~85

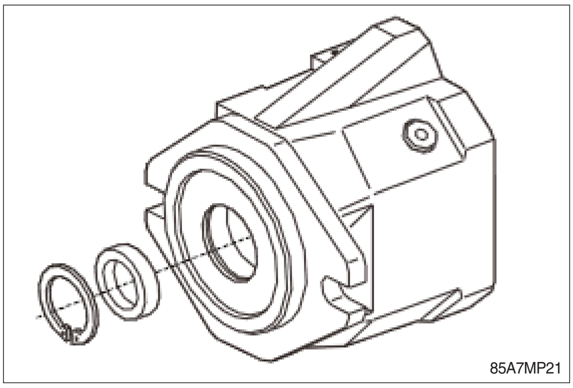


85A7MP19

(12) Remove drive shaft with bearing.



(13) Remove circlip and shaft seal.

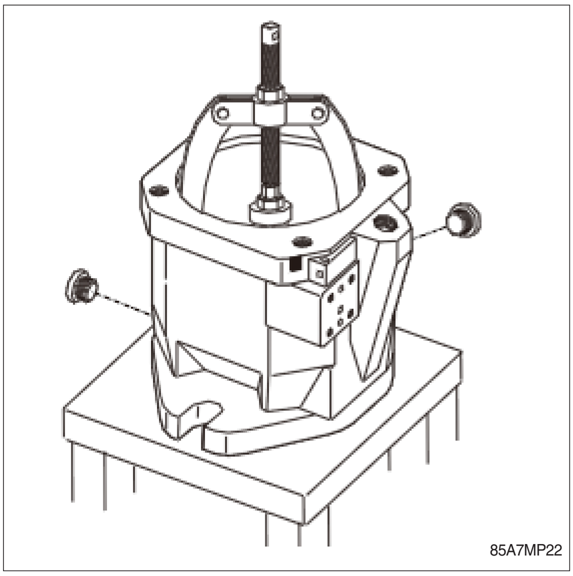


(14) Pull out outer race of tapered bearing out of housing press seat.

※ Use bearing puller.

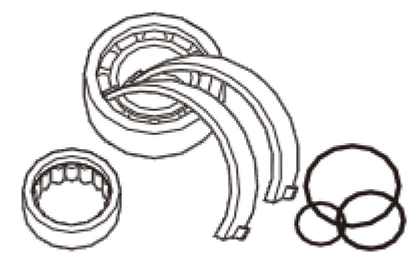
(15) Remove all plugs.

(16) Remove stop ring.



3) INSPECTION

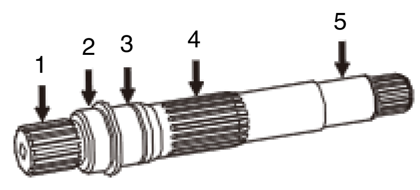
(1) Renew all bearings and seals.



85A7MP23

(2) Check below items

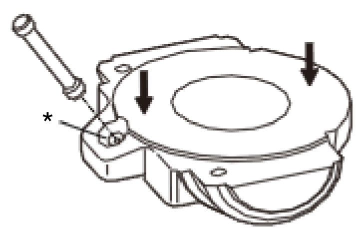
① Wear on slines, fretting
② Drive shaft seal wear grooves
③ Bearing seat
④ Splines for cylinder drive
⑤ Bearing seat



85A7MP24

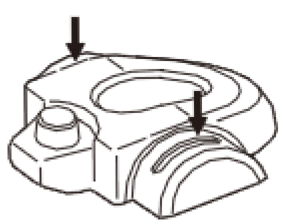
(3) Sliding surface free of grooves.

* Check for freedom of piston rod movem-ent.



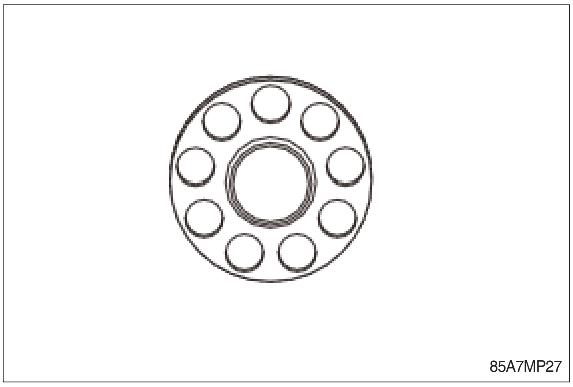
85A7MP25

(4) Bearing surfaces

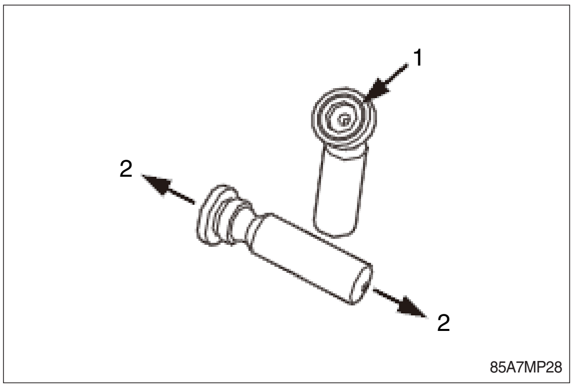


85A7MP26

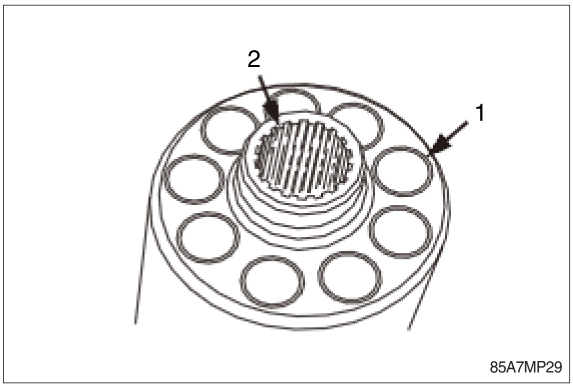
(5) That the retaining plate is free of grooves and that there is no wear in the slipper pad area.



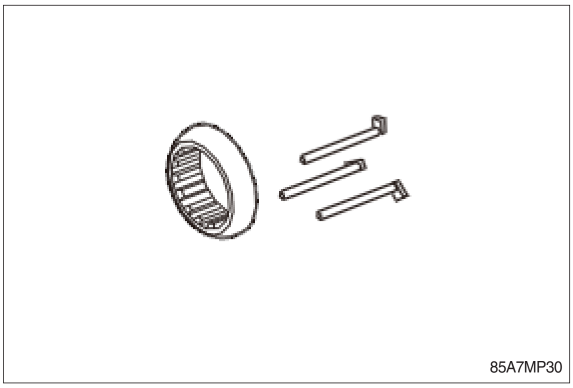
(6) Check to see that there are no scratches or metal deposits on the sliding surface (1), and that there is no axial play (2), (pistons must only be replaced as a set).



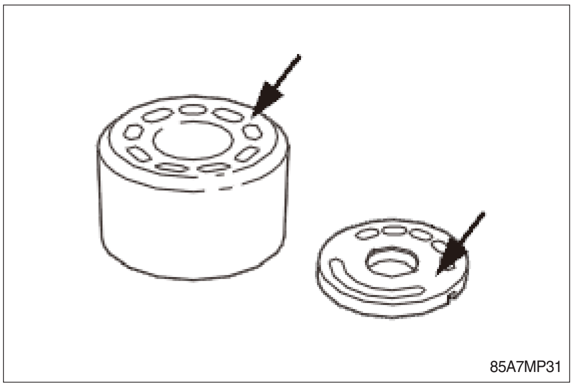
(7) Cylinder bores (1), splines (2).



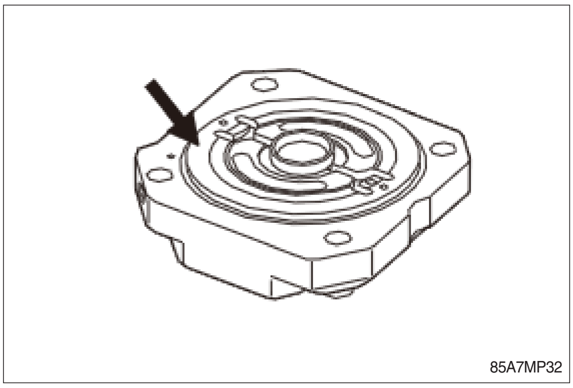
(8) Free of grooves, no signs of wear.



(9) Cylinder sliding surface free of grooves, no wear, no embedded foreign particles. That there are no scratches on the control plate. (Only replace them as a set).

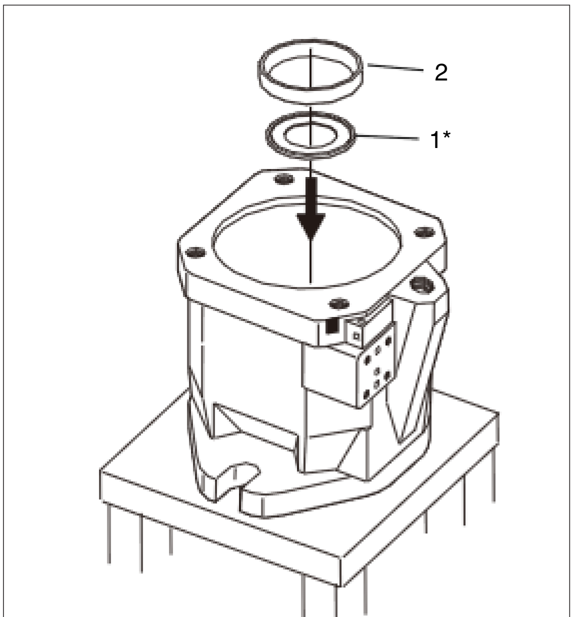


(10) Mounting surface - control plate undamaged

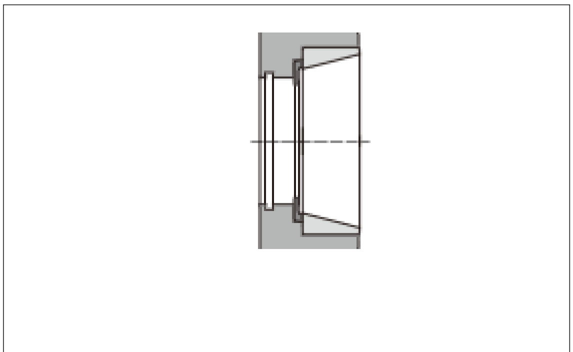


4) ASSEMBLY

(1) Assemble stop ring (1, * see also below spare part list).
(2) Press-in distance ring (2) with tool.

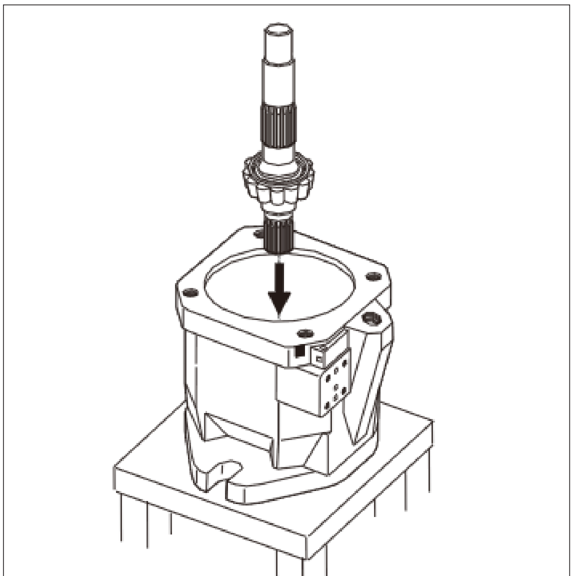


85A7MP33



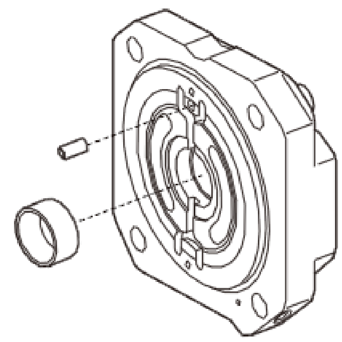
85A8MP34

(3) Assemble shaft in correct position.
※ Do not cut shaft seal.



85A7MP35

(4) Press-in outer racer of rear bearing into connection plate.



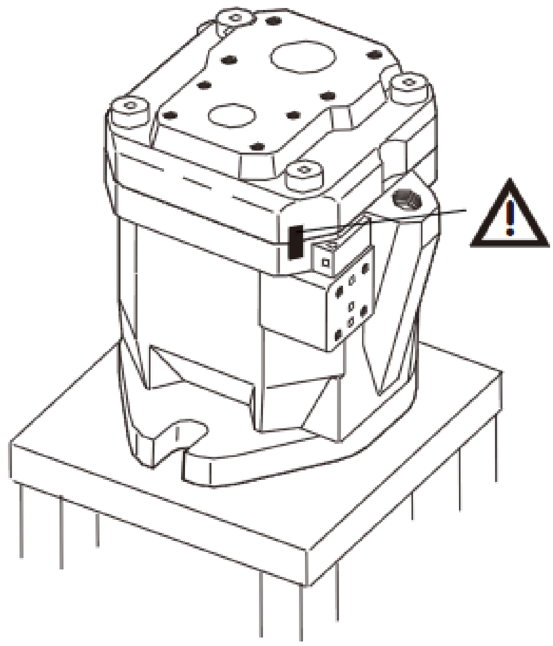
85A7MP36

(5) Assemble connection plate to pump acc. sign.

(6) Tighten the 4 socket screws.

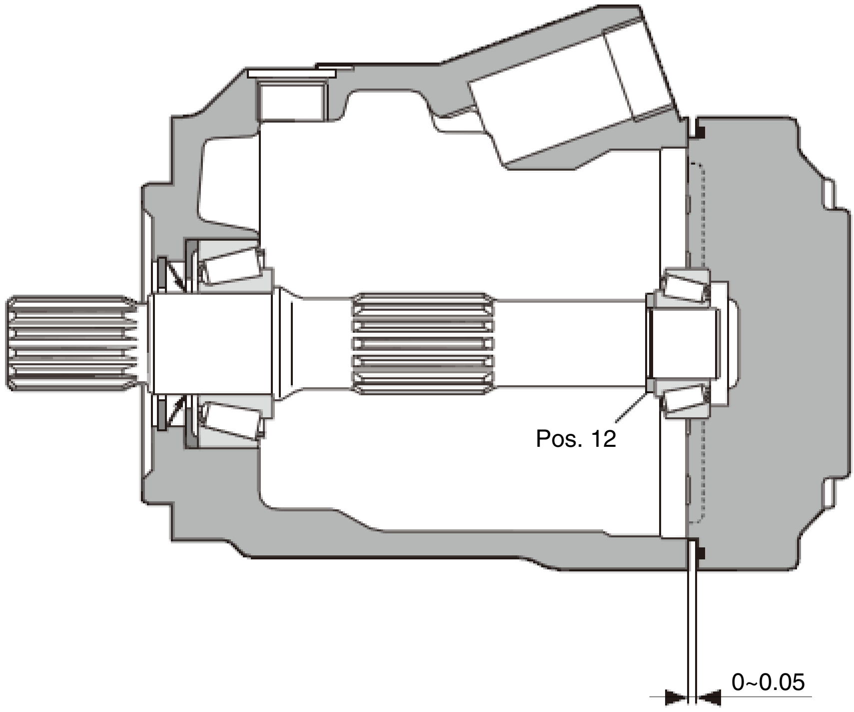
(7) Adjustment of taper roller bearing

① Disassemble connection plate.



85A7MP37

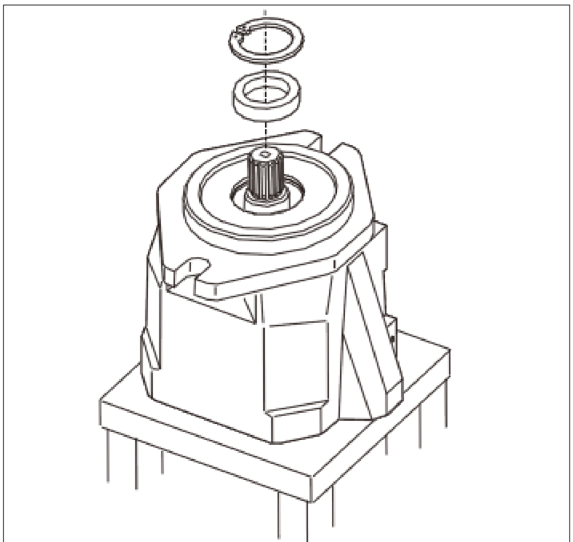
② Taper roller bearing initial tension



85A7MP38

※ Adjustment of taper roller bearing set
Cast iron housing must have initial tension of the bearings :
0~0,05 mm, grind position 12 if necessary.

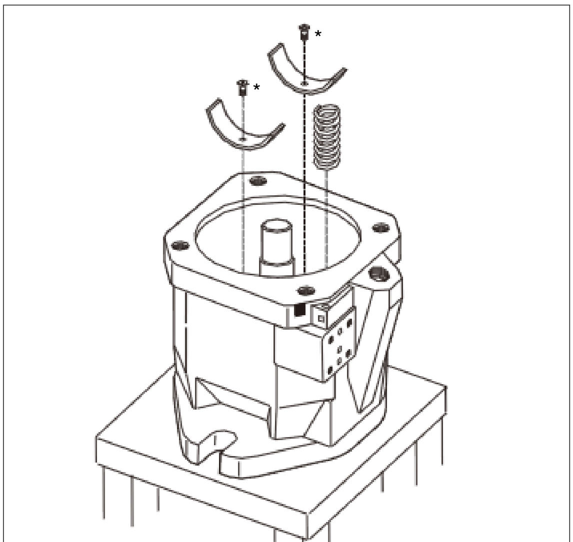
(8) Assembly instruction shaft seal see page 6.


85A7MP39

(9) Fit in bearing shells and spring.

※ Fix with grease.

* Only size 60~85



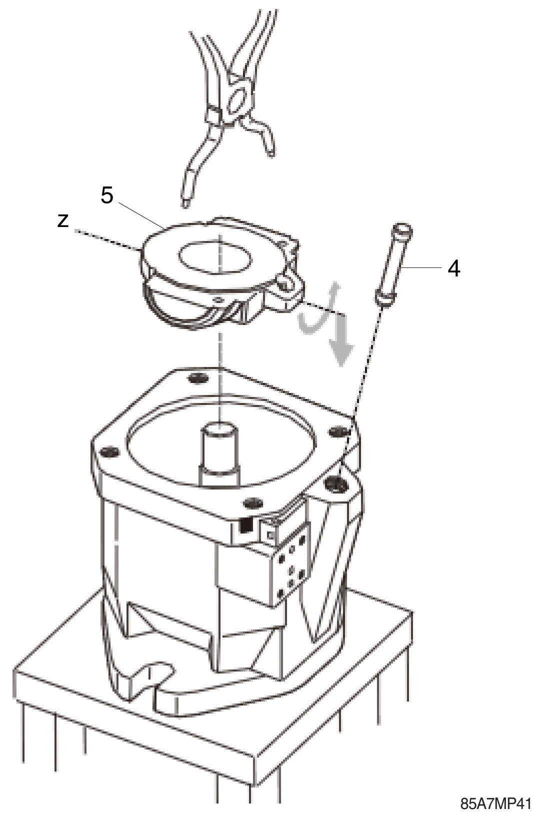
85A7MP40

(10) Assemble swash plate (5) and piston rod (4) into pump.

※ Spring guide pin in correct position.

※ Check correct position of the spring.

(11) Assemble piston rod (4), control piston (3), seal (2), and plug (1).

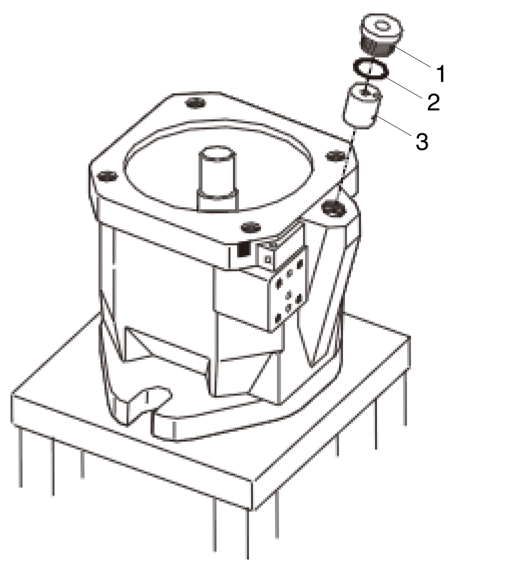


85A7MP41

(12) Assemble piston rod (4), control piston (3),seal (2) and plug (1).

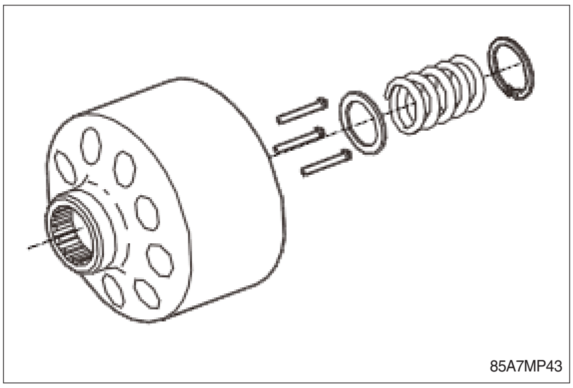
※ Plug tighten torque.

- Size 28, 45, 60
  19.4±2.0 kgf·m (140+14.5 lbf·ft)
- Size 85
  32.6±2.0 kgf·m (236+14.5 lbf·ft)

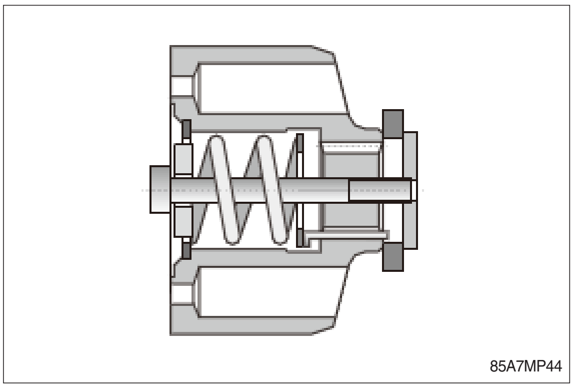


85A7MP42

(13) Fit pressure pins using an assembly aid.

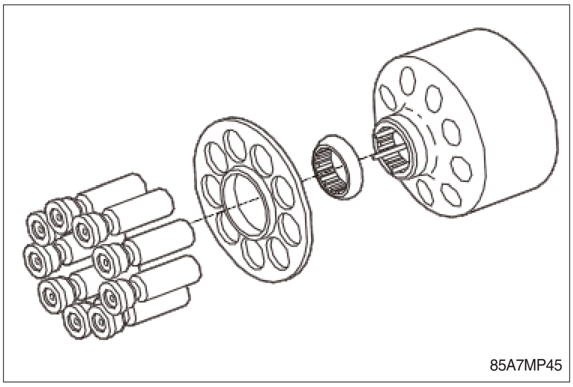


(14) Pre-tension the spring using a suitable device.

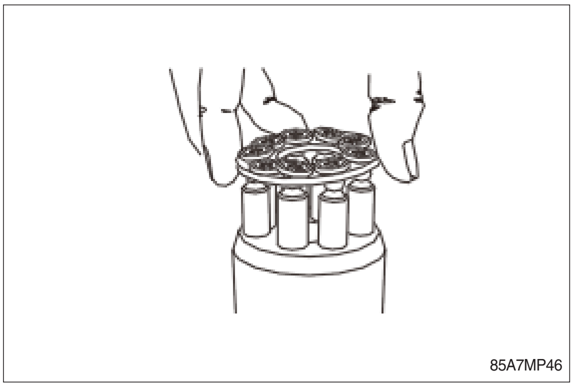


(15) Assemble piston with retaining plate.

※ Oil piston and slipper pad.



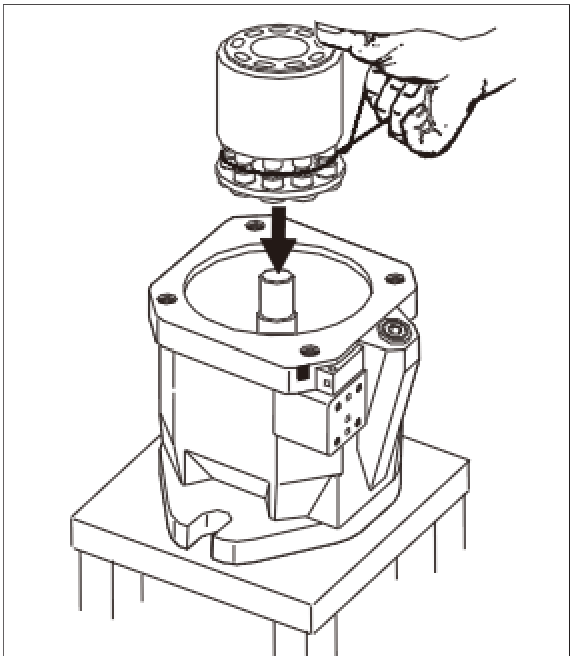
(16) Assemble piston with retaining plate.



(17) Fit rotary group

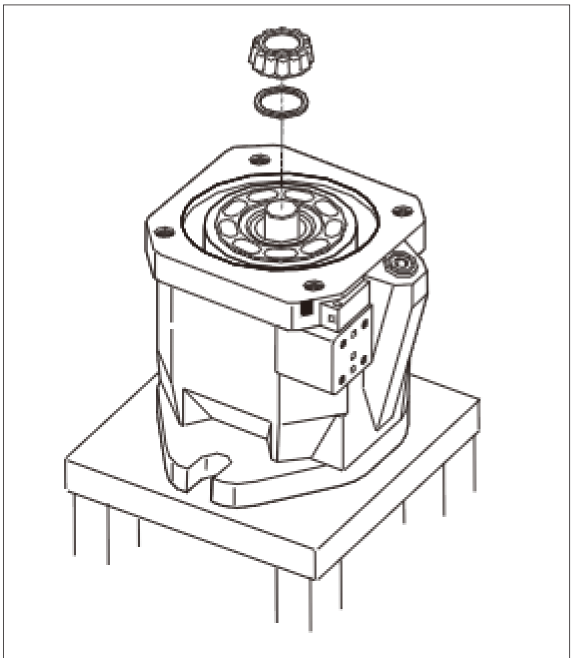
※ Assembly aid

Hold the pistons by using an O-ring.



85A7MP47

(18) Assemble bearing and adjustment shim to shaft.



85A7MP48

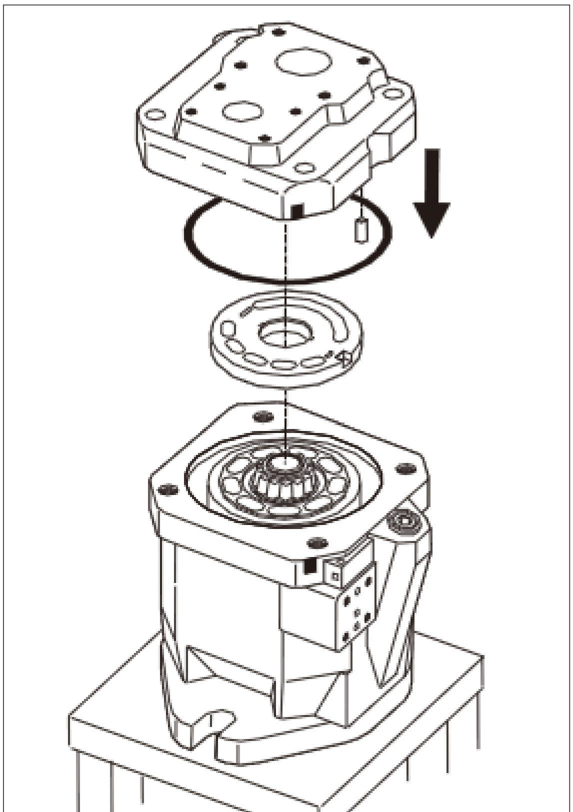
(19) Fit O-ring.

※ Fix with grease.

(20) Fit control plate.

※ Fix with grease.

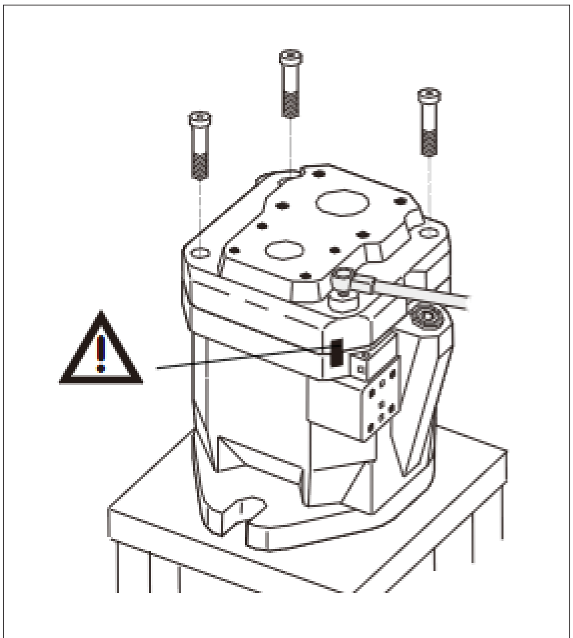
※ Check correct position to pin.



85A7MP49

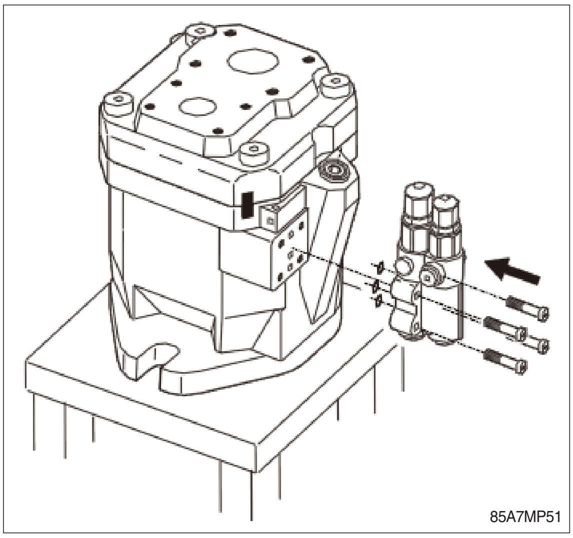
(21) Assemble connection plate.

※ Check the correct position to housing.



85A7MP50

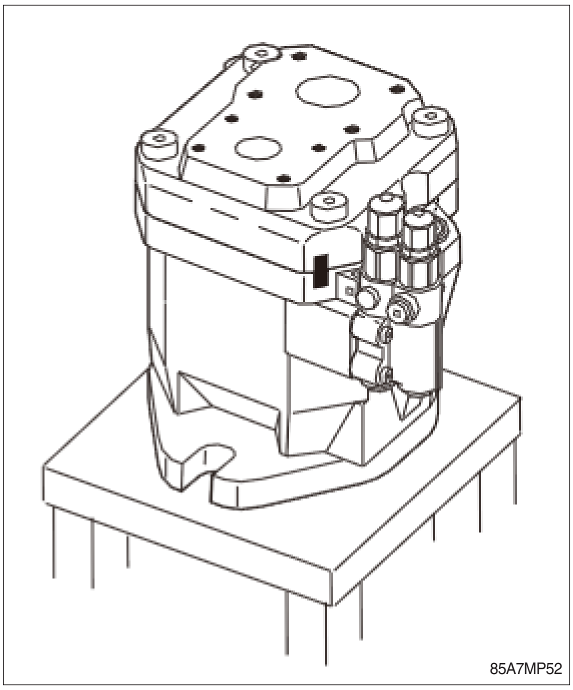
(22) Assemble control valve.



85A7MP51

(23) Final pump assembly

※ Double check of the housing signs.



85A7MP52

1. REMOVAL AND INSTALL OF MOTOR

1) REMOVAL


13031GE18

(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.

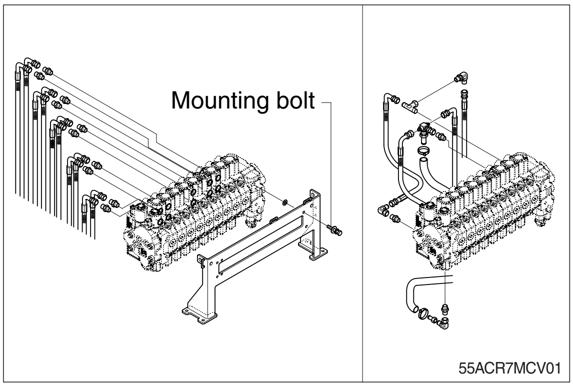
(3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

⚠ 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) Disconnect hydraulic hose.

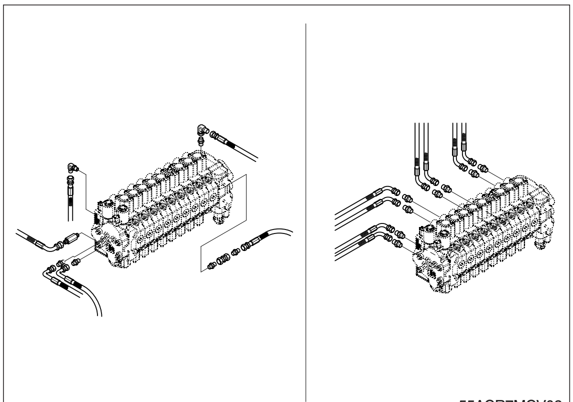
(5) Disconnect pilot line hoses.



55ACR7MCV01

(6) Sling the control valve assembly and remove the control valve mounting bolt.
- · Weight : 55 kg (121 lb)
- · Tightening torque : 6.9±1.4 kgf·m (50±10.0 lbf·ft)

(7) Remove the control valve assembly. When removing the control valve assembly, check that all the piping have been disconnected.

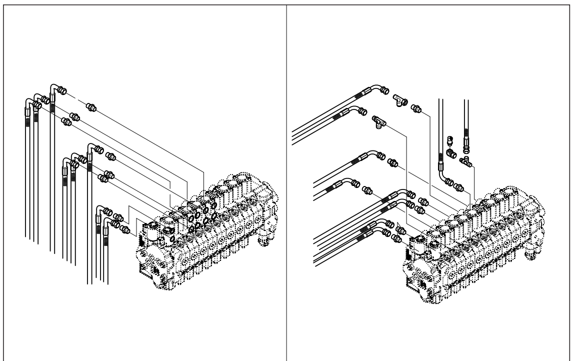

55ACR7MCV02

2) INSTALL

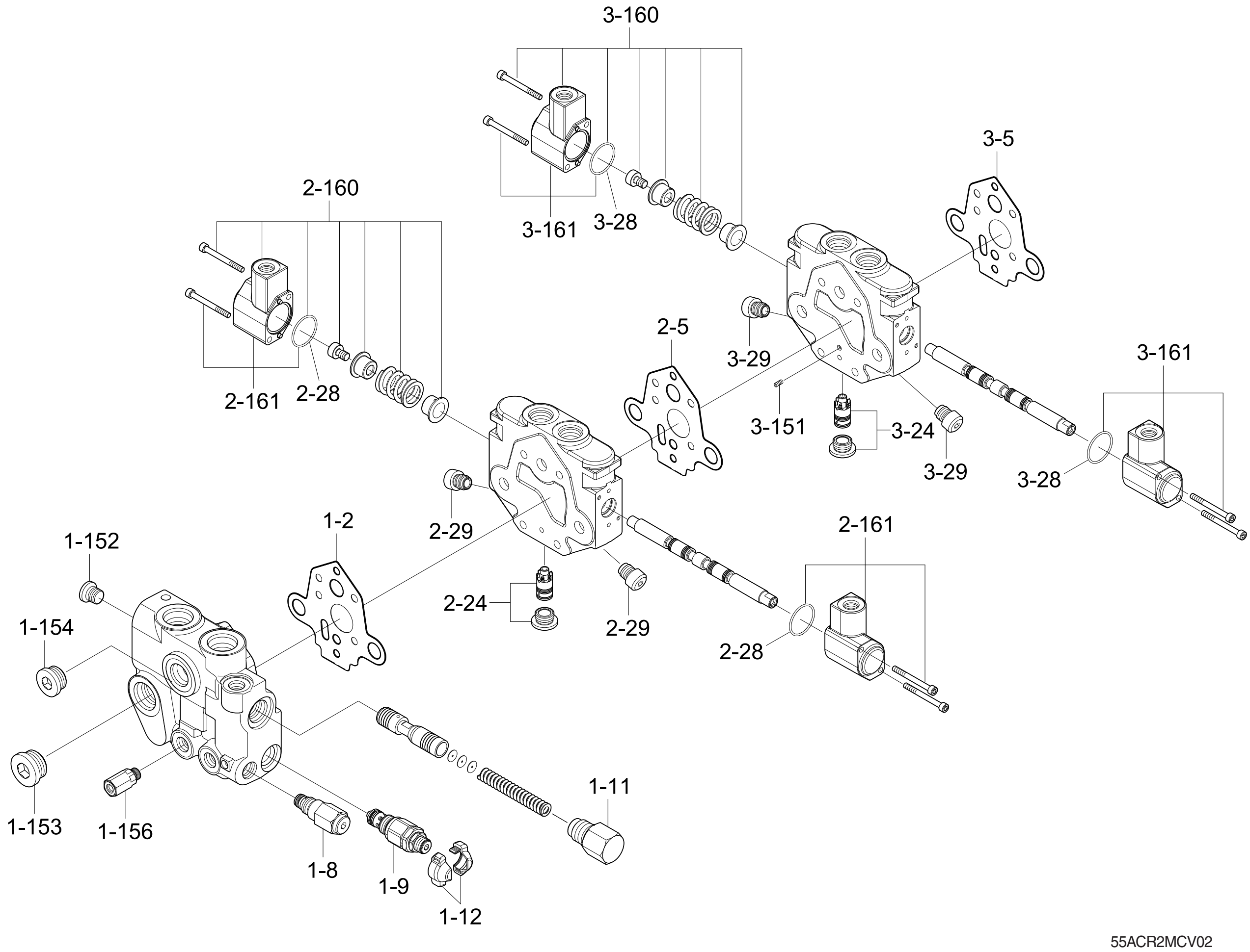
(1) Carry out installation in the reverse order to removal.

(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.

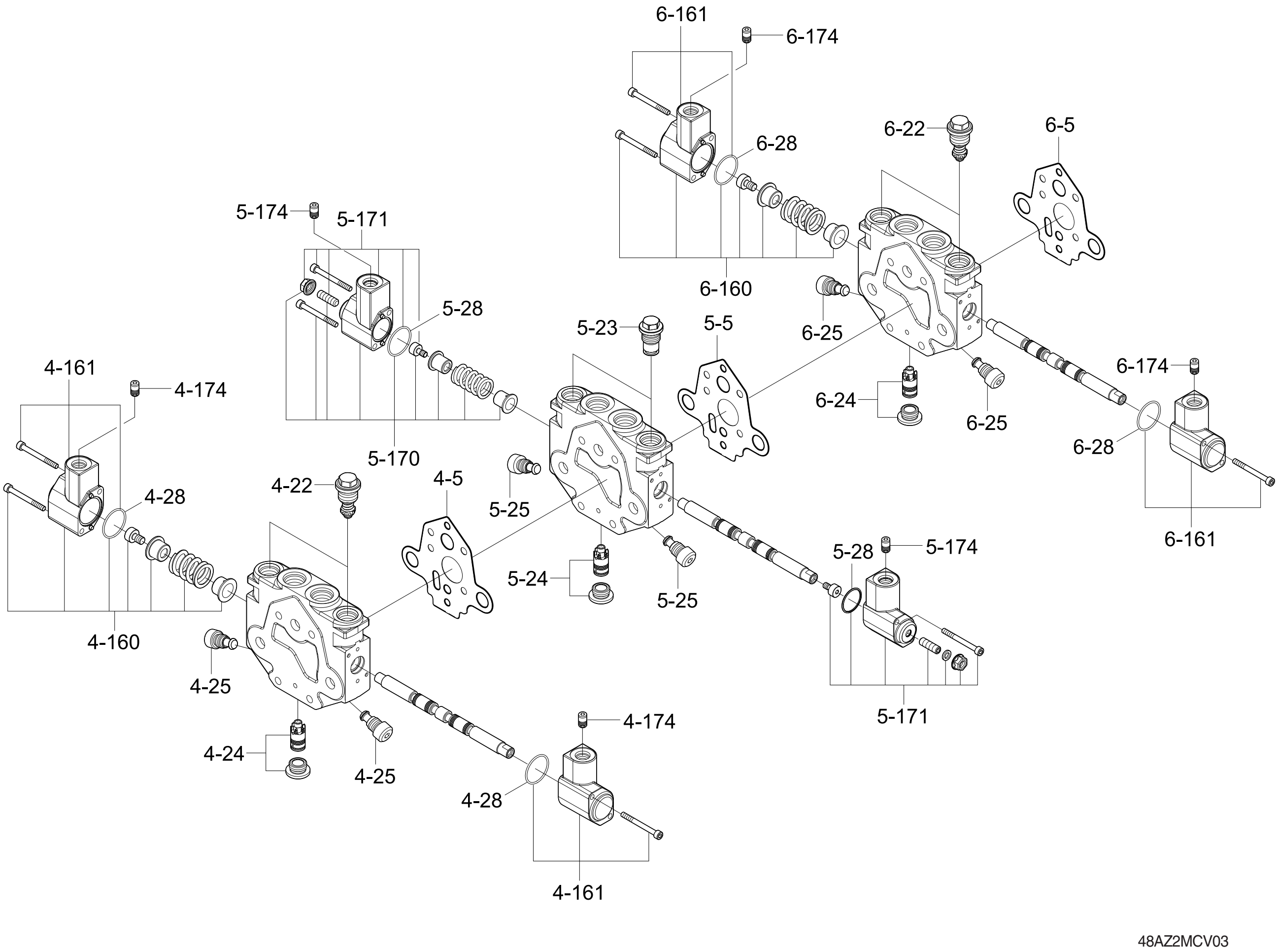

55ACR7MCV03

2. STRUCTURE (1/4)



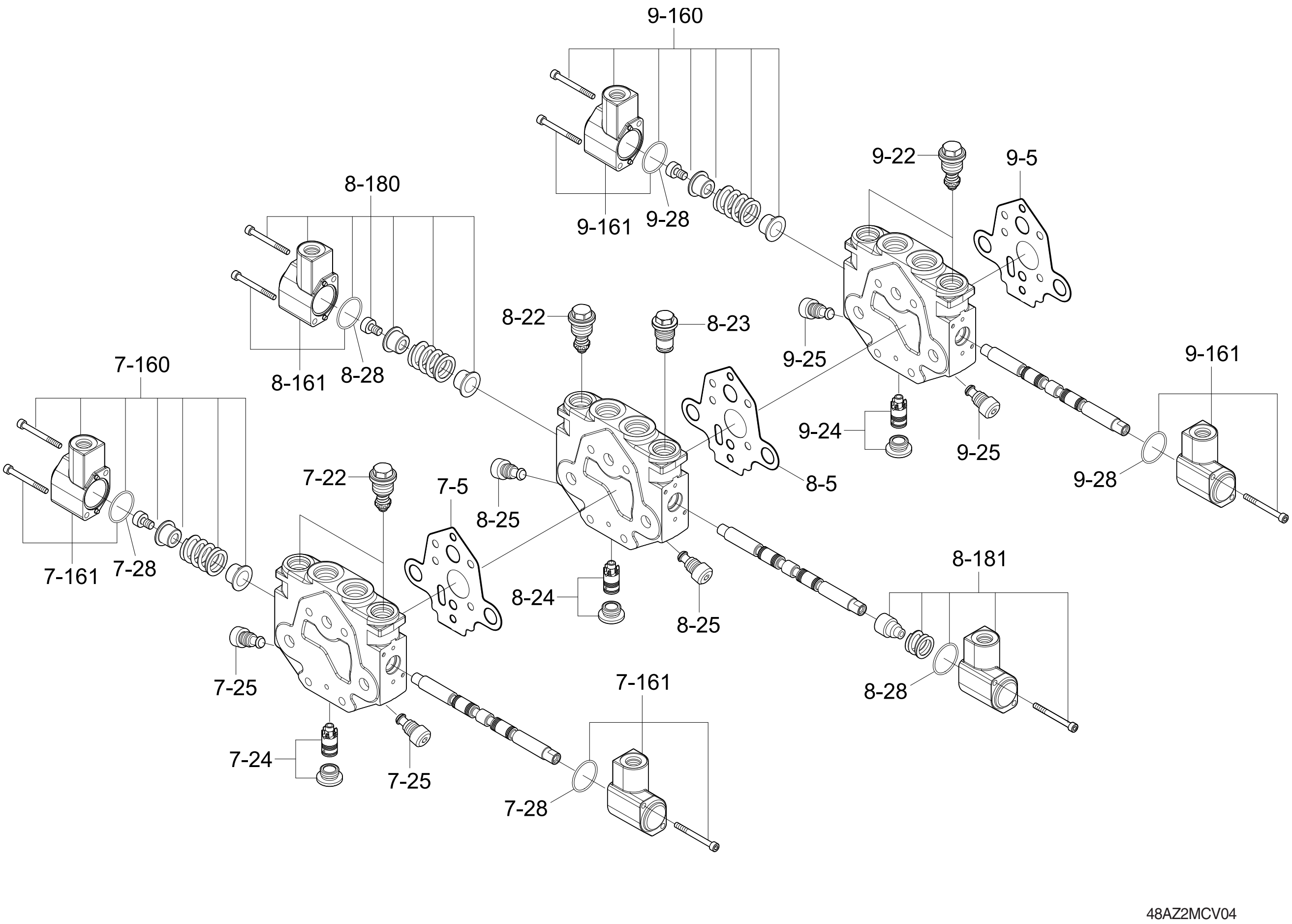
1	Inlet block assy	1-154	Sealing plug	3	Travel block assy
1-2	Plate seal	1-156	Shuttle valve	3-5	Plate seal
1-8	Flow regulator	2	Travel block assy	3-24	Compensator kit
1-9	Relief valve	2-5	Plate seal	3-28	Seal kit
1-11	Plug	2-24	Compensator kit	3-29	Orifice plug
1-12	Locking cover	2-28	Seal kit	3-151	Throttle screw
1-12	Locking cover	2-29	Orifice plug	3-160	W/spool cover kit
1-152	Sealing plug	2-160	W/spool cover kit	3-161	Cover kit
1-153	Sealing plug	2-161	Cover kit		

STRUCTURE (2/4)



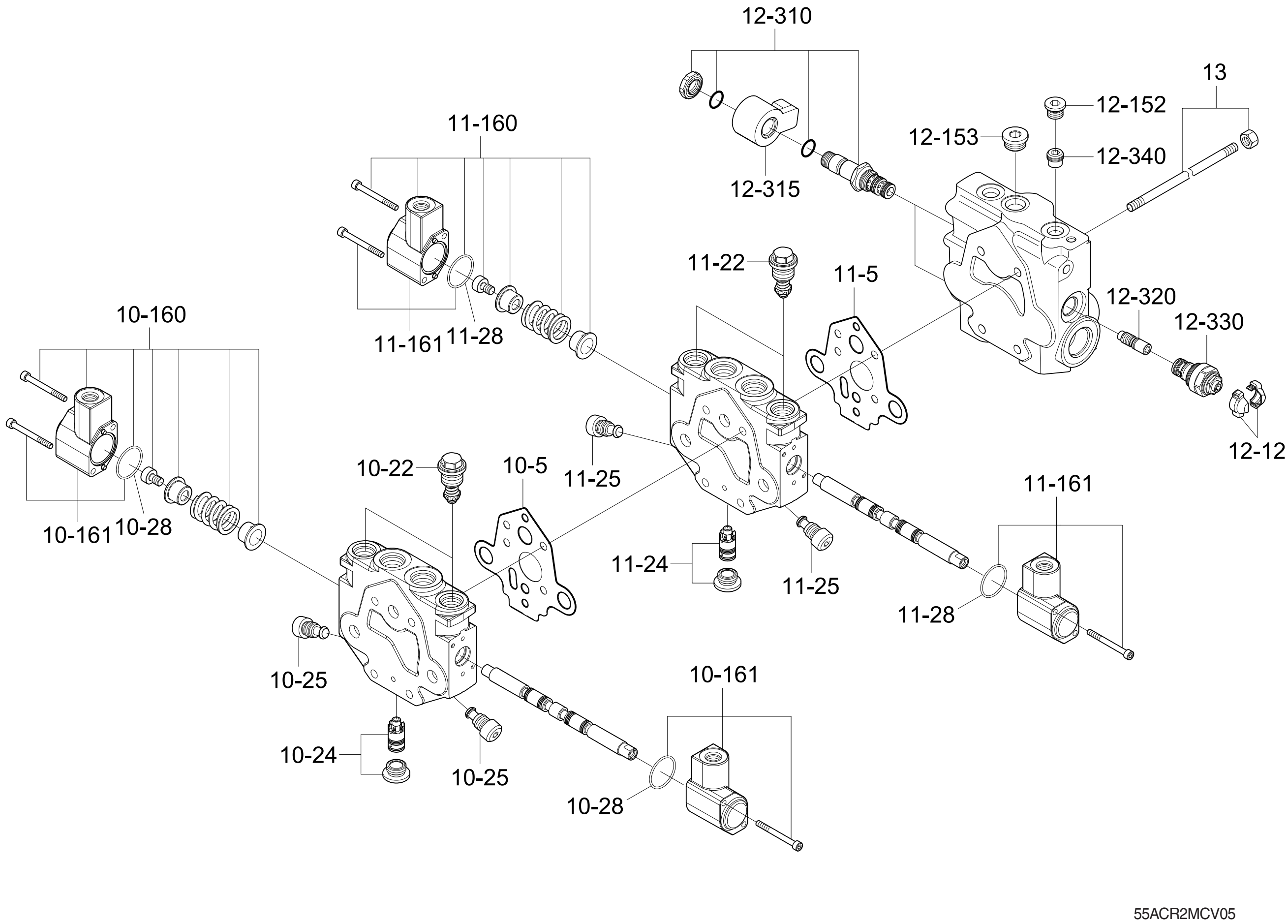
4	Boom block assy	5	Swing block assy	6	Arm block assy
4-5	Plate seal	5-5	Plate seal	6-5	Plate seal
4-22	Relief valve	5-23	Plug	6-22	Relief valve
4-24	Compensator kit	5-24	Compensator kit	6-24	Compensator kit
4-25	Check valve	5-25	Check valve	6-25	Check valve
4-28	Seal kit	5-28	Seal kit	6-28	Seal kit
4-160	W/spool cover kit	5-170	W/spool cover kit	6-160	W/spool cover kit
4-161	Cover kit	5-171	Cover kit	6-161	Cover kit
4-174	Snubber	5-174	Snubber	6-174	Snubber

STRUCTURE (3/4)



7	Bucket block assy	8-5	Plate seal	9	Boom swing block assy
7-5	Plate seal	8-22	Anticavitation valve	9-5	Plate seal
7-22	Relief valve	8-23	Plug	9-22	Relief valve
7-24	Compensator kit	8-24	Compensator kit	9-24	Compensator kit
7-25	Check valve	8-25	Check valve	9-25	Check valve
7-28	Seal kit	8-28	Seal kit	9-28	Seal kit
7-160	W/spool cover kit	8-161	Cover kit	9-160	W/spool cover kit
7-161	Cover kit	8-180	W/spool cover kit	9-161	Cover kit
8	Dozer block assy	8-181	W/spool cover kit		

STRUCTURE (4/4)

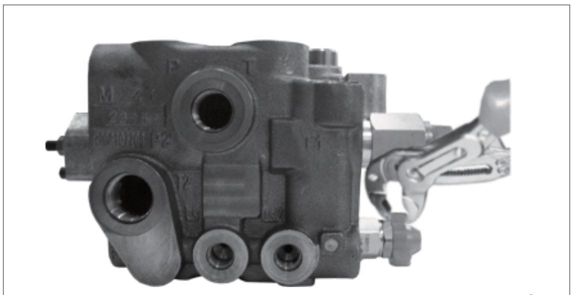


10	Aux 1 block assy	11-5	Plate seal	12-152	Sealing plug
10-5	Plate seal	11-22	Relief valve	12-153	Sealing plug
10-22	Relief valve	11-24	Compensator kit	12-310	Valve kit
10-24	Compensator kit	11-25	Check valve	12-315	Solenoid
10-25	Check valve	11-28	Seal kit	12-320	Shuttle
10-28	Seal kit	11-160	W/spool cover kit	12-330	Pressure relief valve
10-160	W/spool cover kit	11-161	Cover kit	12-340	Filter
10-161	Cover kit	12	Outlet block assy	13	Tie rod
11	Aux 1 block assy	12-12	Locking cover		

3. DISASSEMBLY AND ASSEMBLY

1) STARTING, MAXIMAL PRESSURE SET UP

(1) Break the locking cover with a pair of pliers.
Decalibrate the LS pressure relief valve (17 mm open end spanner on counternut ; 6 mm socket wrench) before starting the machine.
Maintain one of the control block spool valve in action before the linked hydraulic receiver is at the end of stroke.



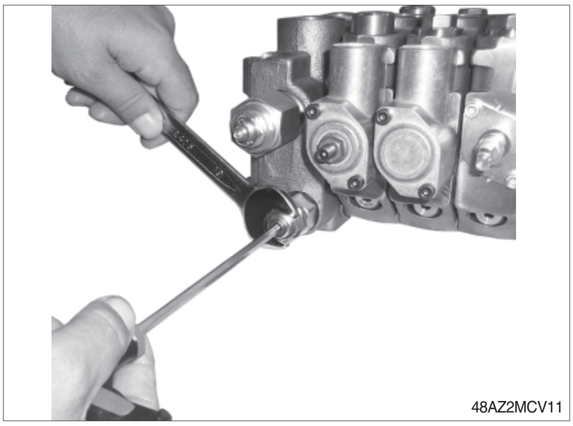
48AZ2MCV10

※ On the spool valve, the value of the secondary valve pressure must be greater than that of the LS pressure relief valve to adjust.

(2) Adjust the maximum pressure measured in M using the LS pressure relief valve (17 mm open end spanner on counternut ; 6 mm socket wrench.

Tighten the counternut of the adjusting screw to the torque :
- 2.0±0.2 kgf · m (14.8±1.5 lbf·ft)

Protect the setting by putting a new locking cover.
Fit together two half covers.



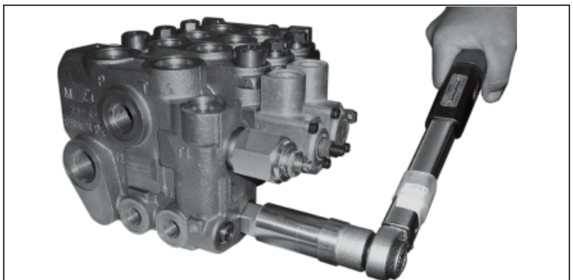
48AZ2MCV11

2) LS PRESSURE RELIEF VALVE REPLACEMENT

The control block does not need to be removed from the machine to perform this operation.

⚠ Place all of the machine's actuators connected to the control block in neutral position. Release stored pressure by operating all the spools.

(1) On the inlet element, unscrew the LS pressure relief valve (24 mm open end spanner).



48AZ2MCV12

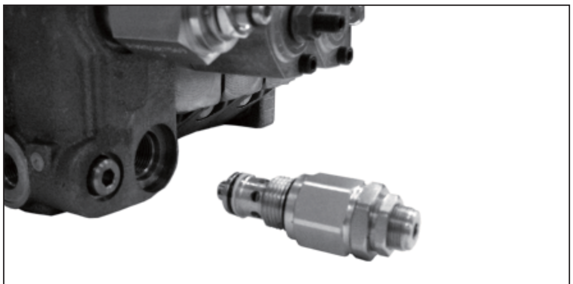
※ Reassembly

Install the LS pressure relief valve on the inlet element.

- Torque :
  4.1±0.4 kgf · m (29.5±3.0 lbf·ft)

Set the LS pressure relief valve to the specified value

Fit a new appropriate locking cover



48AZ2MCV13

3) REGULATING UNIT REPLACEMENT

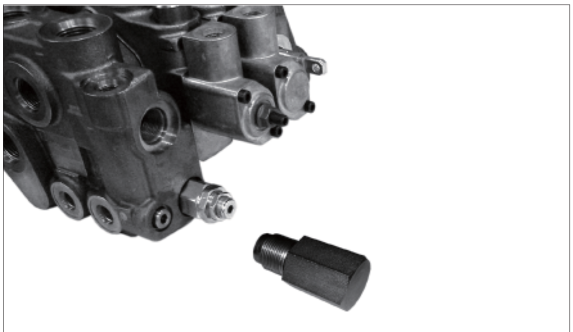
(1) Unscrew the plug (27 mm socket wrench).

48AZ2MCV14

※ Reassembly

Install the plug on the inlet element.

- Torque :
  10.5±1.1 kgf · m (76.0±7.6 lbf·ft)

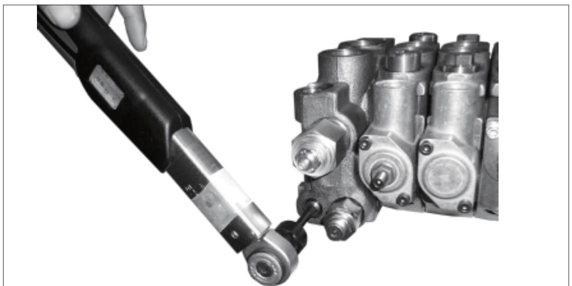


48AZ2MCV15

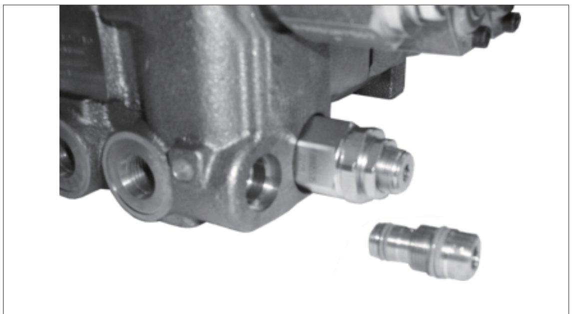
4) FLOW REGULATOR REPLACEMENT

(1) Unscrew the flow regulator (6 mm socket wrench).

※ Reassembly
Install the flow regulator on the inlet element.
- Torque :
2.3±0.2 kgf · m (16.6±1.7 lbf·ft)



48AZ2MCV16



48AZ2MCV17

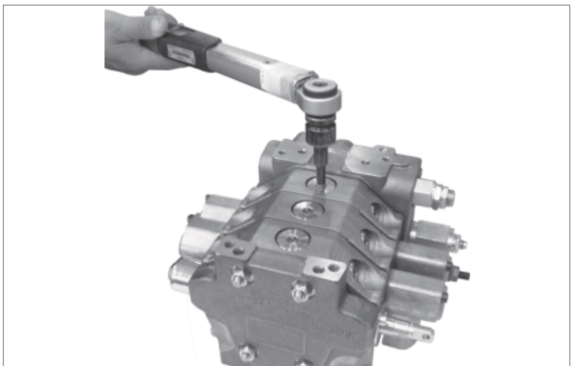
5) PRESSURE COMPENSATOR REPLACEMENT

(1) Unscrew the compensator plug (8 mm socket wrench).

(2) Remove the compensator piston using a magnet to extract it from its bore.

※ Clean parts to remove any attracted metal particle.
Do not use magnet for reassembly.

※ Reassembly
Reassemble parts in reverse order.
- Torque :
5.1±0.5 kgf · m (36.9±3.7 lbf·ft)



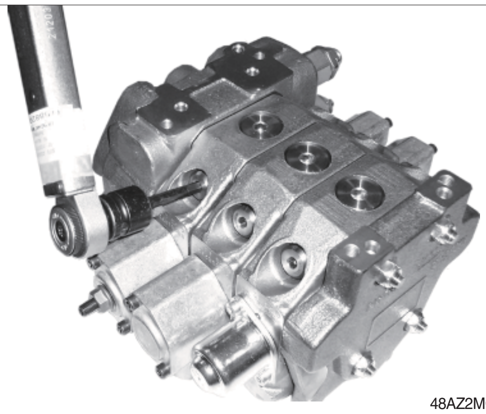
48AZ2MCV18

48AZ2MCV19

6) CHECK VALVE REPLACEMENT

(1) Unscrew one of the check valves (6 mm socket wrench).

※ Reassembly
Install the check valve on the distribution element.
- Torque :
  4.1±0.4 kgf · m (29.5±3.0 lbf·ft)



48AZ2MCV20

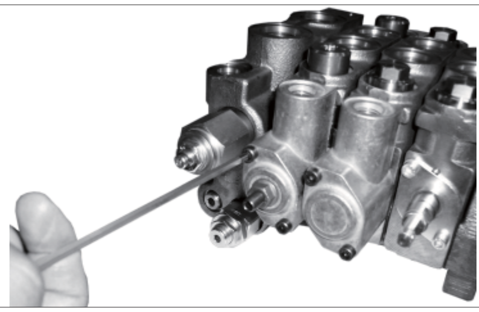
48AZ2MCV21

7) REMOVAL OF THE HYDRAULIC COVER

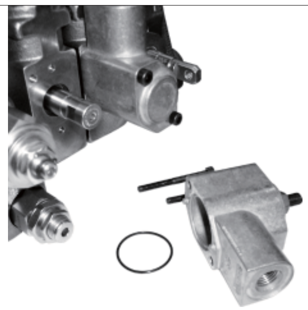
(1) Remove the 2 mounting screws (4 mm socket wrench).

(2) Remove the cover and O-ring.

※ Reassembly
Replace the cover O-ring.
Reassemble parts in reverse order.
Torque for the 2 mounting screws.
- Torque :
  0.5±0.05 kgf · m (3.7±0.4 lbf·ft)



48AZ2MCV22



48AZ2MCV23

8) COMPLET CONTROL BLOCK DISASSEMBLY/ASSEMBLY

(1) Remove the control block from the machine.
Remove the 4 nuts (13 mm ring wrench).

48AZ2MCV24

(2) Remove the outlet element.
Separate the distribution elements with the seal plates from the inlet element.

48AZ2MCV25

(3) Reassembly

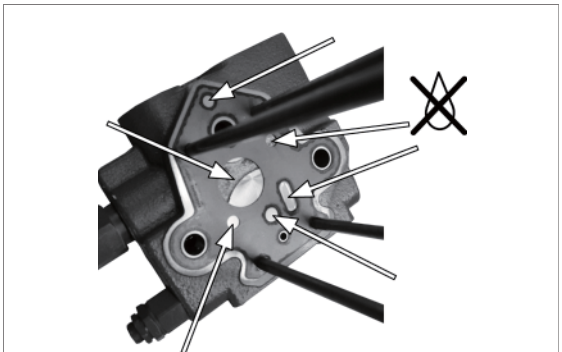
- Replace the seal plates between distribution elements, initial element and outlet element.
- Check the cleanliness of the element faces.

※ When reassembling, make sure the seals plates are correctly positioned so that seals location fit with the canals.

- Carefully wipe oil traces of no-opening cavities between element face and seal plate.
- Torque for the 4 tie rods :
  3.1±0.3 kgf · m (22.1±0.2 lbf·ft)
- Reassemble elements in reverse order
  Place the control block horizontally on an even support area to tight the nuts.
- Torque for the 4 nuts :
  2.7±0.3 kgf · m (19.2±0.2 lbf·ft)

※ Make sure the elements are correctly positioned (engravings A and B downward)

48AZ2MCV26



48AZ2MCV27

GROUP 5 SWING DEVICE

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) Disconnect hose assembly (12, 13).

(5) Disconnect pilot line hoses (15, 29, 32, 33).

(6) Sling the swing motor assembly (1) and remove the swing motor mounting bolts (21).

※ Motor device weight : 46 kg (111 lb)
· Tightening torque : 19.6±2.9 kgf·m
(142±21.0 lbf·ft)

(7) Remove the swing motor assembly.

※ When removing the swing motor assembly, check that all the piping have been disconnected.

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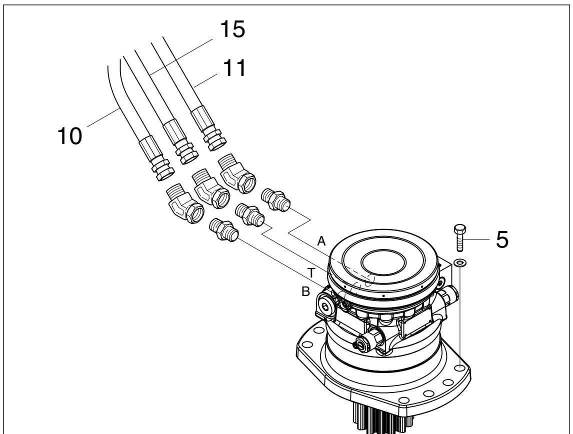
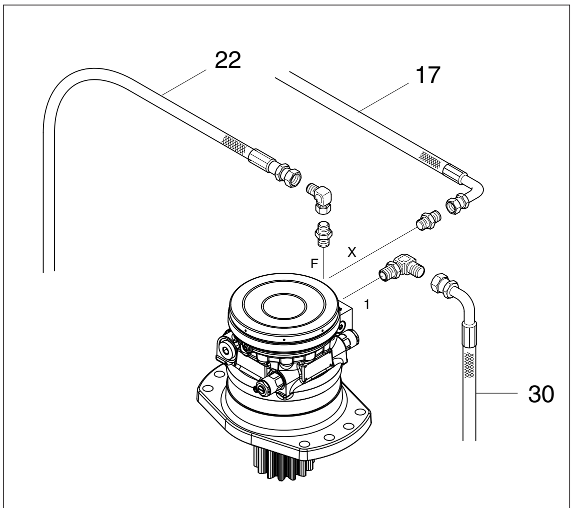


48AZ7SM01



48AZ7SM02

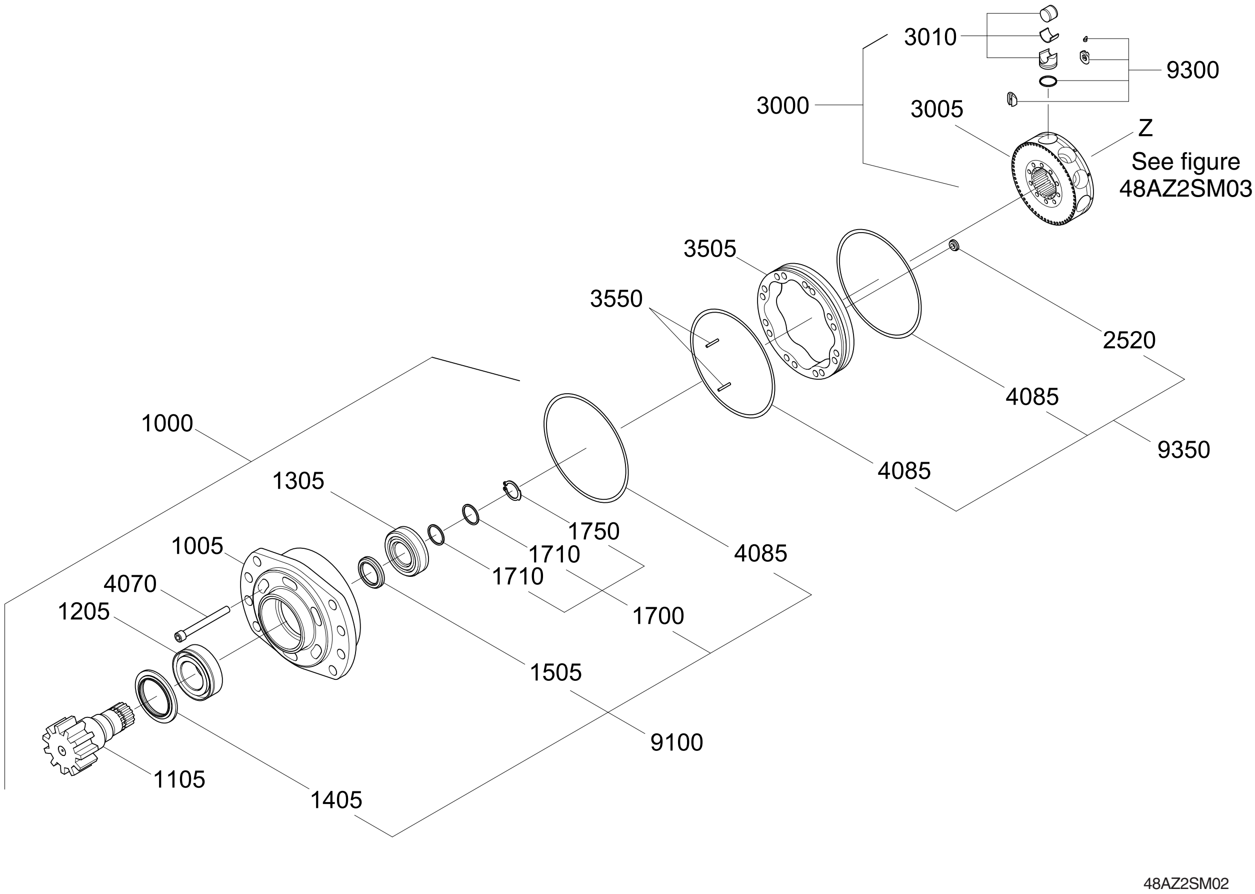
2) INSTALL

(1) Carry out installation in the reverse order to removal.

(2) Bleed the air from the swing motor.
① Remove the air vent plug.
② Pour in hydraulic oil until it overflows from the port.
③ Tighten plug lightly.
④ Start the engine, run at low idling and check oil come out from plug.
⑤ Tighten plug fully.

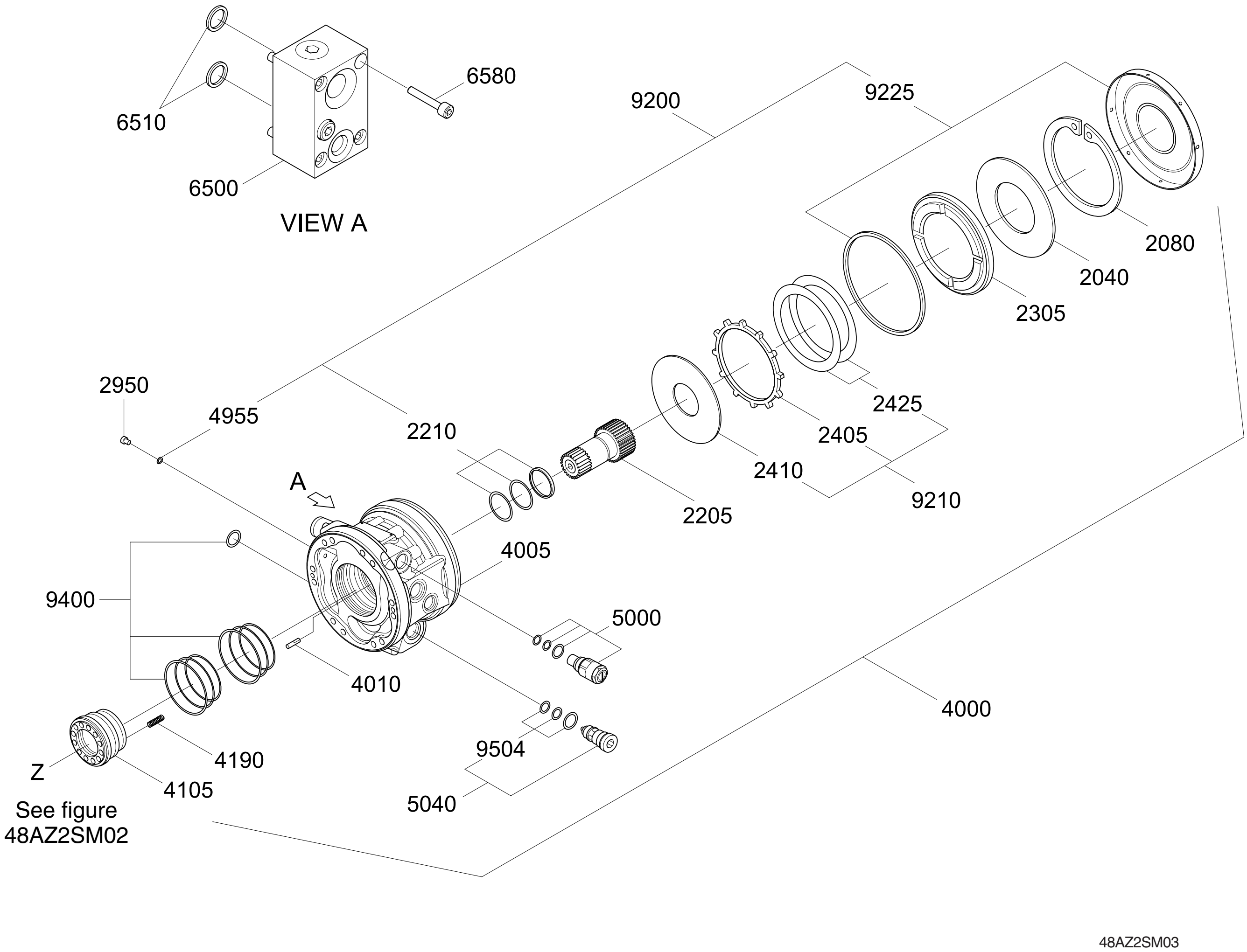
(3) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2. COMPONENTS (1/2)



1000	Bearing support assy	1700	Shim kit	3505	Cam ring
1005	Support	1710	Shim	3550	Spring pin
1105	Shaft	1750	Snap ring	4070	Screw
1205	Taper roller bearing	2520	Plug	4085	O-ring
1305	Taper roller bearing	3000	Cylinder block assy	9100	Seal kit
1405	Seal ring	3005	Block	9300	Piston service kit
1505	Oil seal	3010	Piston kit	9350	Seal kit

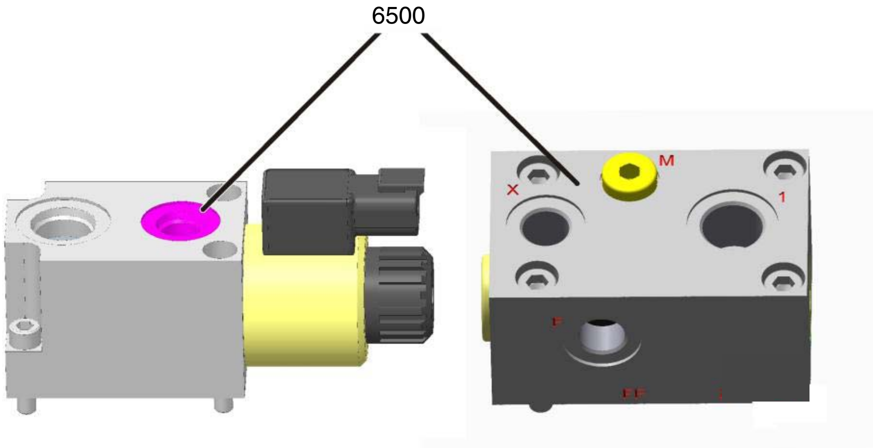
COMPONENTS (2/2)



2040	Spring washer	4000	Brake valve housing assy	6500	Brake valve
2080	Snap ring	4005	Housing	6510	O-ring
2205	Brake shaft	4010	Roll pin	6580	Screw
2210	Seal kit	4105	Brake valve	9200	Brake service kit
2305	Brake piston	4190	Spring	9210	Brake service kit
2405	External disc	4955	O-ring	9225	Brake cover kit
2410	Internal disc	5000	Release valve	9400	Seal kit
2425	Shim kit	5040	Check valve	9504	Seal kit
2950	Screw				

3. DISASSEMBLY AND ASSEMBLY

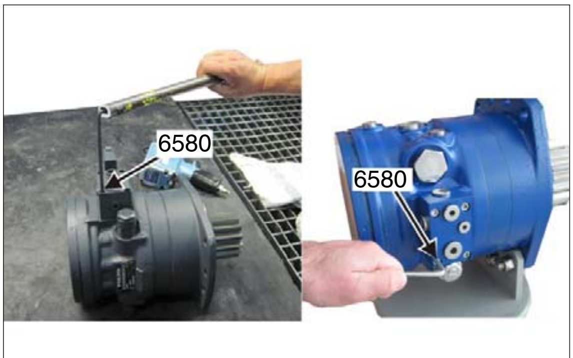
1) BRAKE RELEASE VALVE



48AZ2SM10

(1) Disassembly

① Unscrew 4 screws (6580) from electronic/hydraulics brake release valve (6500).



48AZ2SM11

② Remove the brake release valve (6500).

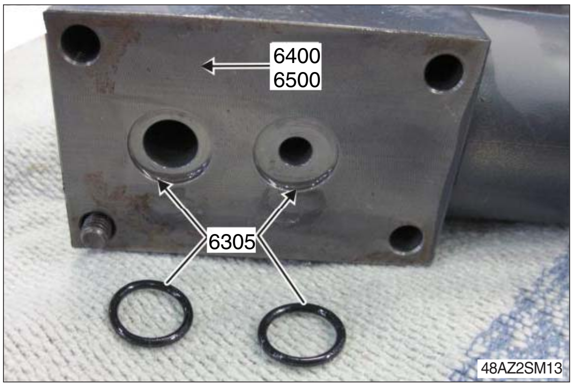
③ Remove and discard two O-rings (6510).

48AZ2SM12

(2) Assembly

※ All matting surfaces must be cleaned and degreased before installation.

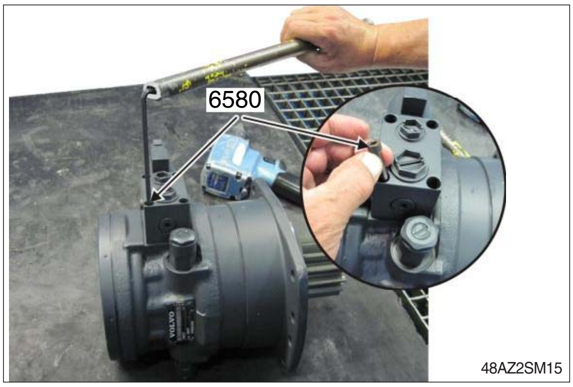
① Install the both O-rings (6510) on the brake release valve (6500).



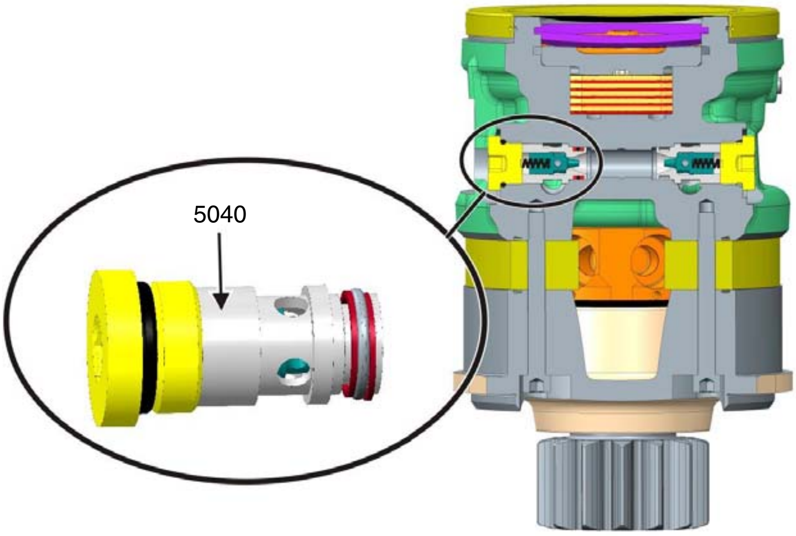
② Install the brake release valve (6500) on the valving/brake body (4005).

③ Install and tighten the brake release valve with all the screws (6580).

· Tightening torque : 1.5±0.15 kgf·m
(11.1±1.11 lbf·ft)



2) CHECK VALVE

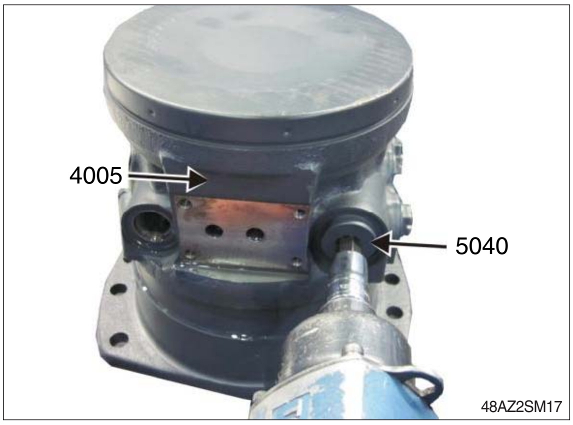


48AZ2SM16

(1) Disassembly

① Unscrew the plugs of the 2 check valves (5040).

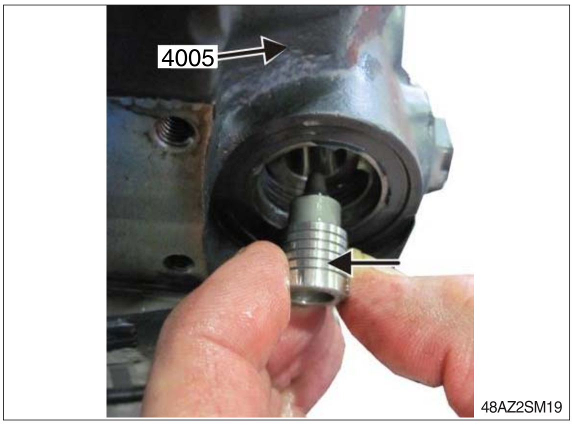
※ Be careful to the small spring under the plug.



② Remove the spring.

③ Remove and discard the O-ring.

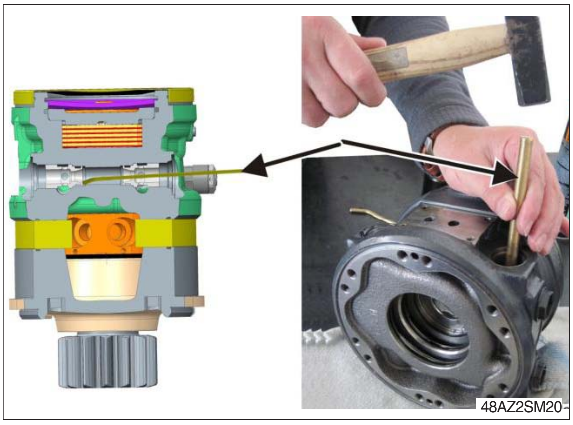
④ Remove the check valve poppet.



48AZ2SM19

⑤ Use a brazen bar tool to remove the check valve body.

- Insert the brazen bar to extract the check valve body as shown on the picture and hit it very lightly with a hammer.
- Do the same on the other side.


48AZ2SM20

(2) Assembly

※ All matting surfaces must be cleaned and degreased before installation.

① Use the check valve seal kit (9504).

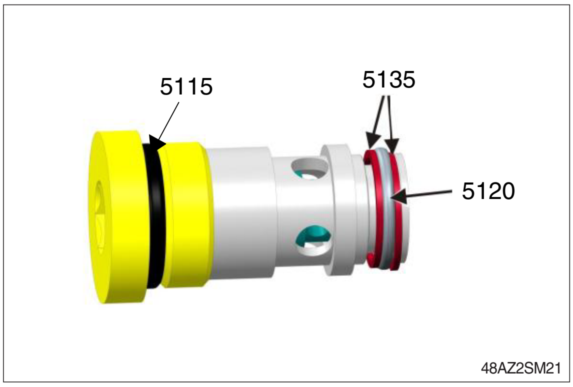
② Oil the O-ring and the back-up rings.

③ Install them in the check valve groove as shown in the picture. The O-ring must be installed between the back-up rings.

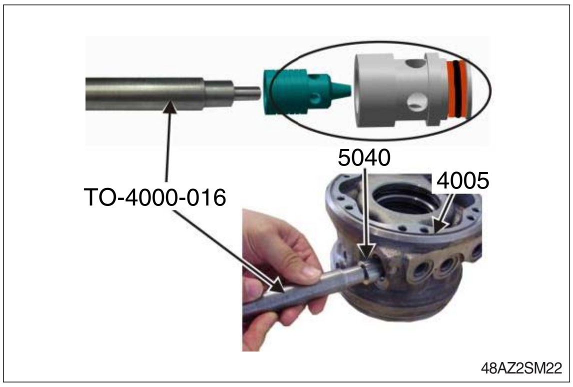
④ Oil the check valve and install it into the valving/brake body (4005).

⑤ With the special centering tool lightly push the poppet into the check valve body.

※ Special tool : TO-4000-016-001



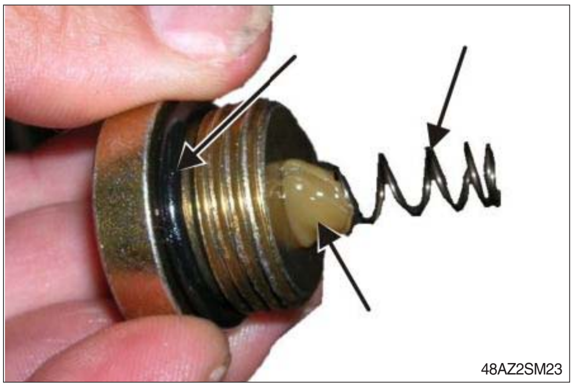
48AZ2SM21



48AZ2SM22

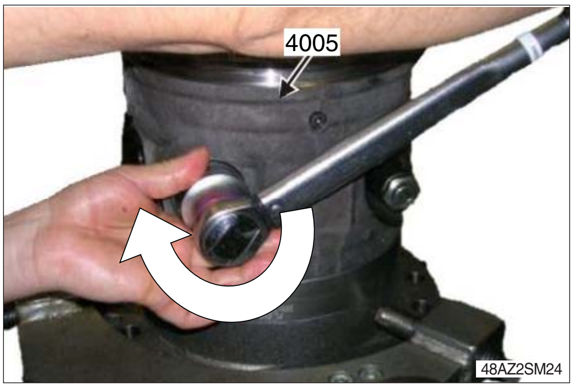
⑥ Insert the O-ring on the plug.

⑦ Apply a small amount of grease to hold spring inside the plug during the assembly into the valving/brake body (4005).



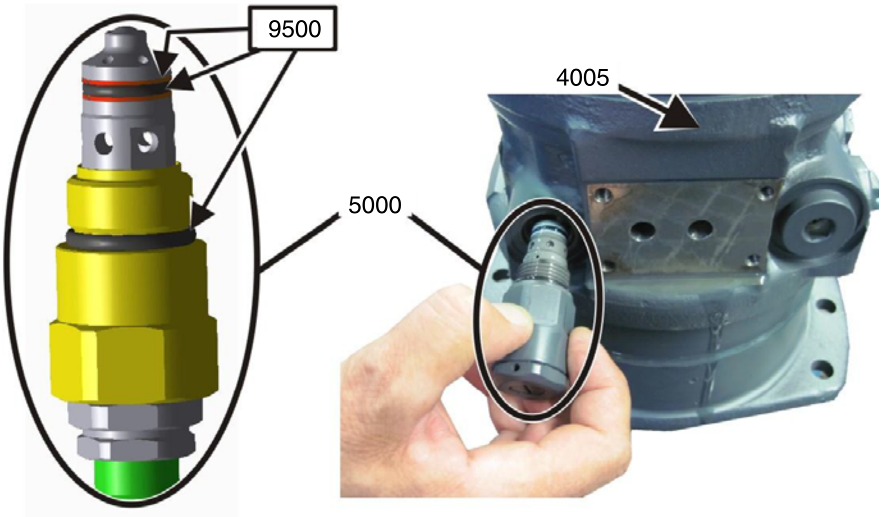
⑧ Carefully screw the check valve plug and respect the tightening torque.

· Tightening torque : 12.2±1.2 kgf·m (88.5±8.6 lbf·ft)



3) PRESSURE RELIEF VALVE

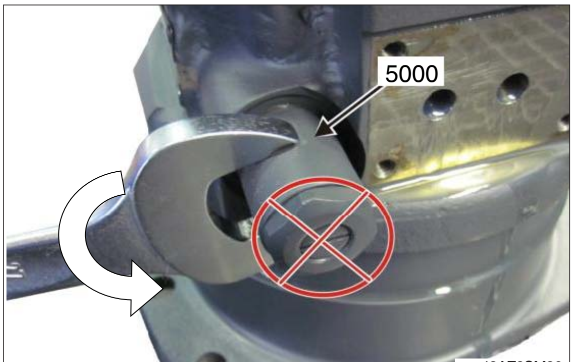
(1) Disassembly



48AZ2SM25

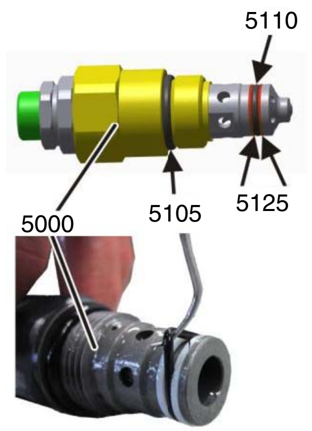
① Unscrew the both pressure relief valves (5000) with the key as shown in the picture.

※ Never unscrew or loose the bolt on the top of the pressure relief valve.



48AZ2SM26

② Remove and discard all O-rings and back-up rings from the pressure relief valve (5000).



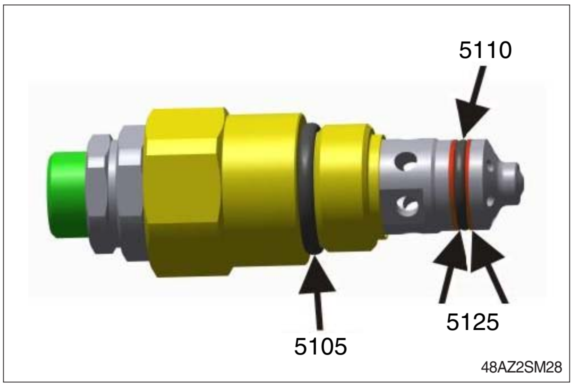
48AZ2SM27

(2) Assembly

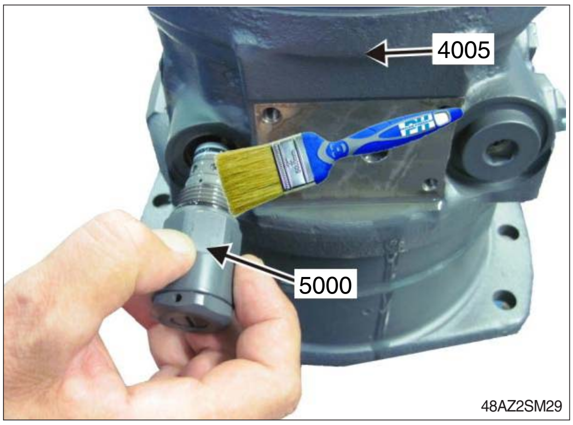
All matting surfaces must be cleaned and degreased before installation

① Install the O-ring (5110) and back up rings (5125) in the pressure relief valve groove as shown on the picture. The O-ring must be installed between the back-up rings.

② Install the biggest O-ring (5105) on the pressure relief valve cartridge.

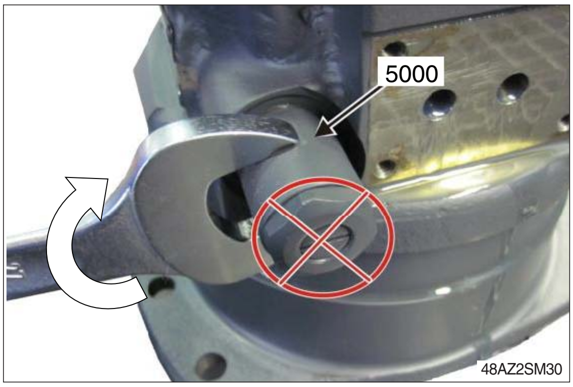


③ Before inserting the pressure relief valve (5000) oil the O-rings and back up rings with hydraulic oil.



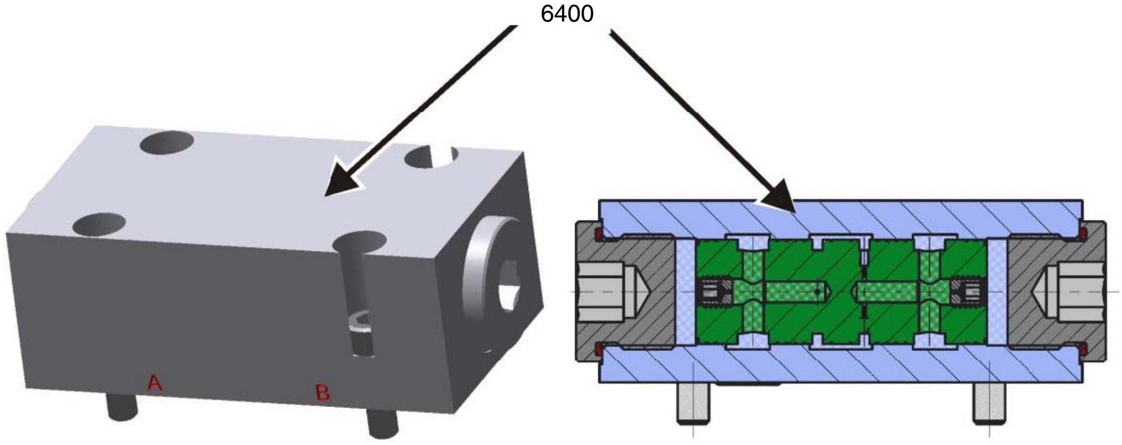
④ Install and tighten the pressure relief valve (5000).

· Tightening torque
- H=27 mm : 5.1±0.5 kgf·m (36.9±3.7 lbf·ft)
- H=32 mm : 8.2±0.8 kgf·m (59.0±5.9 lbf·ft)



4) ANTI-BOUNCING VALVE

(1) Disassembly



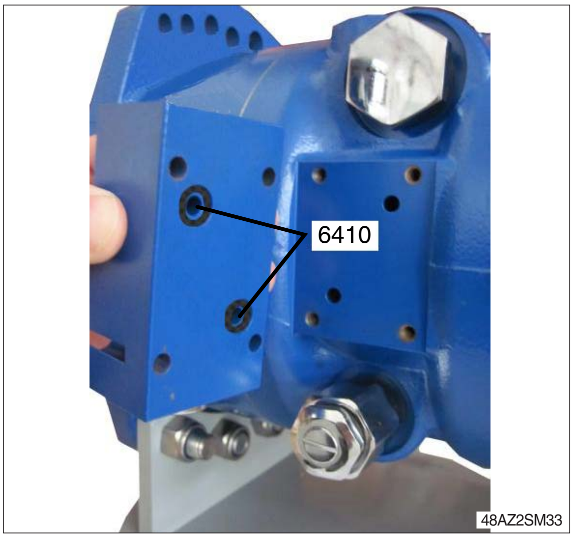
48AZ2SM31

① Unscrew all screws (6480) from the anti-bouncing valve (6400).

48AZ2SM32

② Remove the anti-bouncing valve.

③ Remove and discard two O-rings (6410).

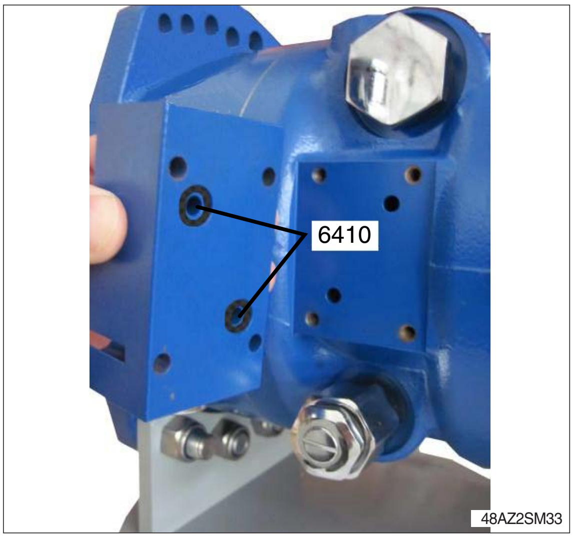


48AZ2SM33

(2) Assembly

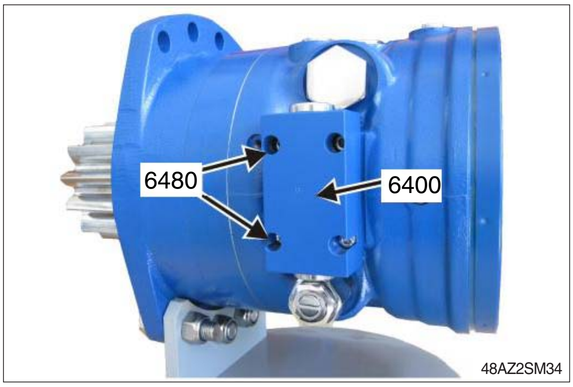
※ All matting surfaces must be cleaned and degreased before installation

① Install the two O-rings (6410) into the anti-bouncing valve.



② Install all 4 screws (6480) into the valving and tight them.

· Tightening torque : 1.5±0.15 kgf·m
(11.1±1.11 lbf·ft)



GROUP 6 TRAVEL DEVICE

1. REMOVAL AND INSTALL

1) REMOVAL


13031GE18

(1) Swing the work equipment 90 °and lower it completely to the ground.

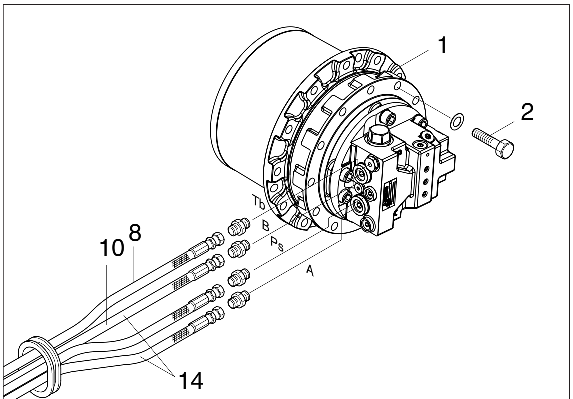
(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

(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 the track shoe assembly.
For details, see removal of track shoe assembly.



48AZ7TM01

(5) Remove the cover.

(6) Remove the hose (8, 10, 12).

※ Fit blind plugs to the disconnected hoses.

(7) Remove the bolts and the sprocket.

(8) Sling travel device assembly (1).

(9) Remove the mounting bolts (2), then remove the travel device assembly.
- · Weight : 80 kg (180 lb)
- · Tightening torque : 13.8±1.0 kgf·m (100±7.2 lbf·ft)

2) INSTALL

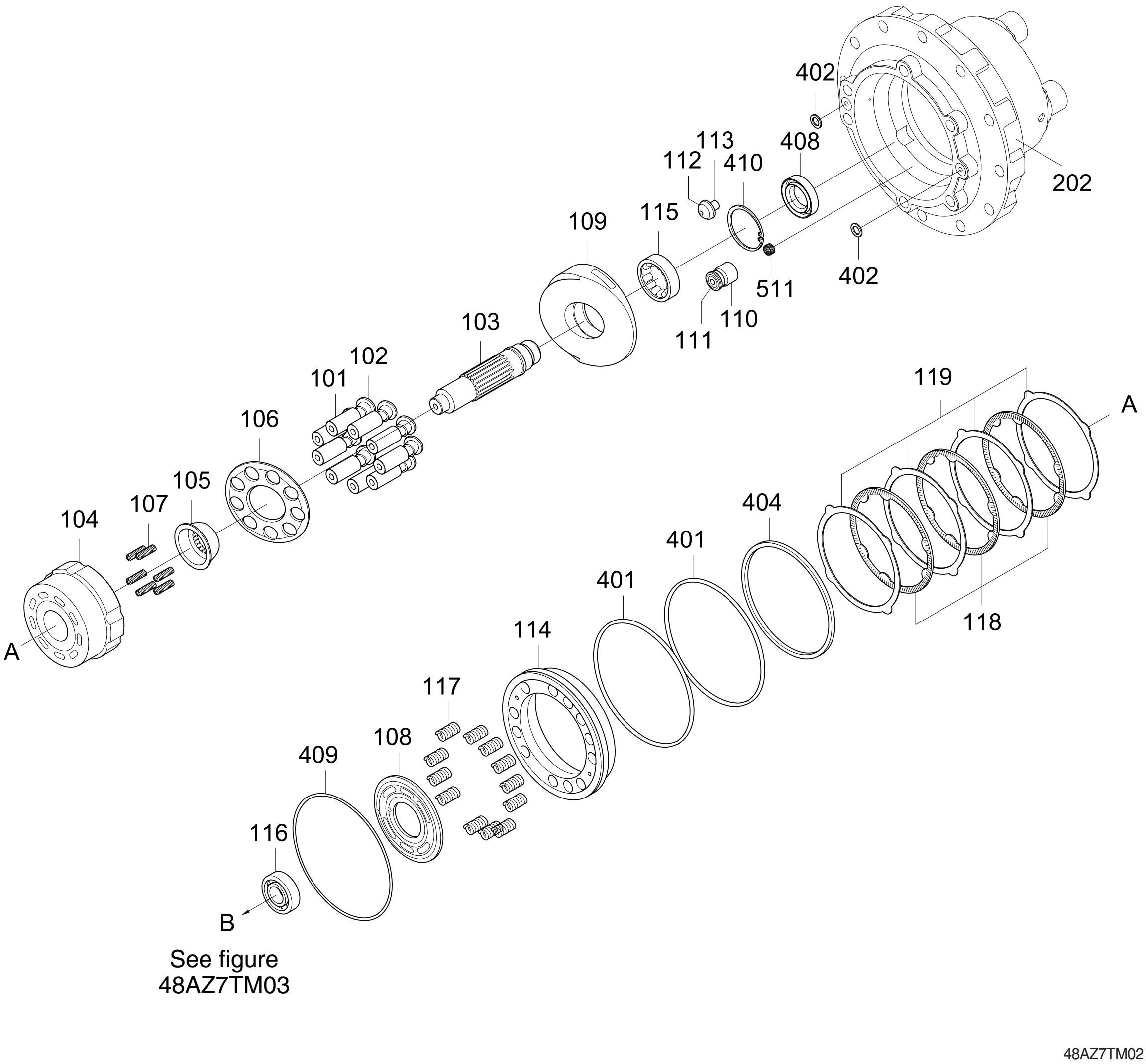
(1) Carry out installation in the reverse order to removal.

(2) Bleed the air from the travel motor.
- ① Remove the air vent plug.
- ② Pour in hydraulic oil until it overflows from the port.
- ③ Tighten plug lightly.
- ④ Start the engine, run at low idling, and check oil come out from plug.
- ⑤ Tighten plug fully.

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

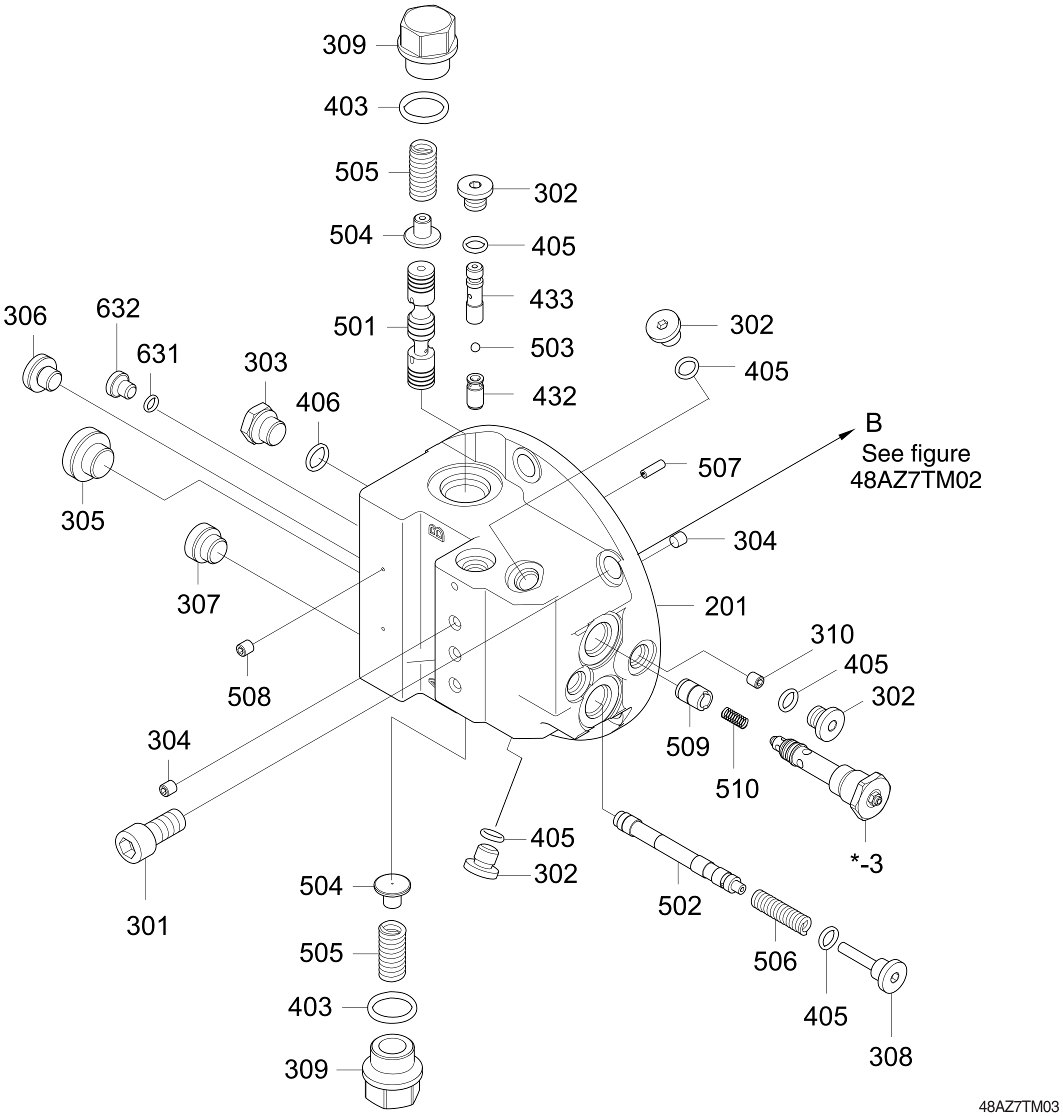
2. DISASSEMBLY AND ASSEMBLY OF MOTOR UNIT

1) PARTS LIST (1/2)



101	Piston	111	Swash shoe	202	Casing
102	Shoe	112	Pivot	401	O-ring
103	Drive shaft	113	Pivot pin	402	O-ring
104	Cylinder block	114	Brake piston	404	O-ring
105	Spherical bushing	115	Roller bearing	408	Oil seal
106	Set plate	116	Ball bearing	409	Back up ring
107	Cylinder spring	117	Brake spring	410	Snap ring
108	Valve plate	118	Friction plate	511	Swash piston spring
109	Swash plate	119	Separator plate		
110	Swash piston	201	Valve casing		

PARTS LIST (2/2)



*-3	Relief valve assy	309	Set plug	504	Plunger
201	Valve casing	310	Restrictor	505	Main spool spring
301	Screw	403	O-ring	506	2 speed spool spring
302	Plug	405	O-ring	507	Spring pin
303	Drain plug	406	O-ring	508	Rivet screw
304	Plug	432	Seat	509	Cap
305	Dust plug	433	Seat casing	510	Spring cap
306	Dust plug	501	Main spool	631	O-ring
307	Dust plug	502	2 speed spool	632	Plug
308	2 speed plug	503	Steel ball		

2) TOOLS AND TIGHTENING TORQUE

(1) Tightening torque

This table shows the typical screw sizes and tightening torques used in the motor

Item	Part name	Size	Tightening torque	
			kgf · m	lbf · ft
*-3	Relief valve assy	G 1/2	11.2	81.0
301	Screw	M14	16.3	118
302	Plug	G 1/4	3.6	26.0
303	Drain plug	G 3/8	7.5	54.2
304	Plug	NPTF 1/16	1.1	8.0
308	2 speed plug	G 1/4	3.6	26.0
309	Set plug	G 3/4	17.3	125
310	Restrictor	NPTF 1/16	1.1	8.0
626	Pipe plug	RC 1/8	1.2	8.7
632	Plug	G 1/8	1.5	10.8

(2) Tools

① Hexagon and socket wrench

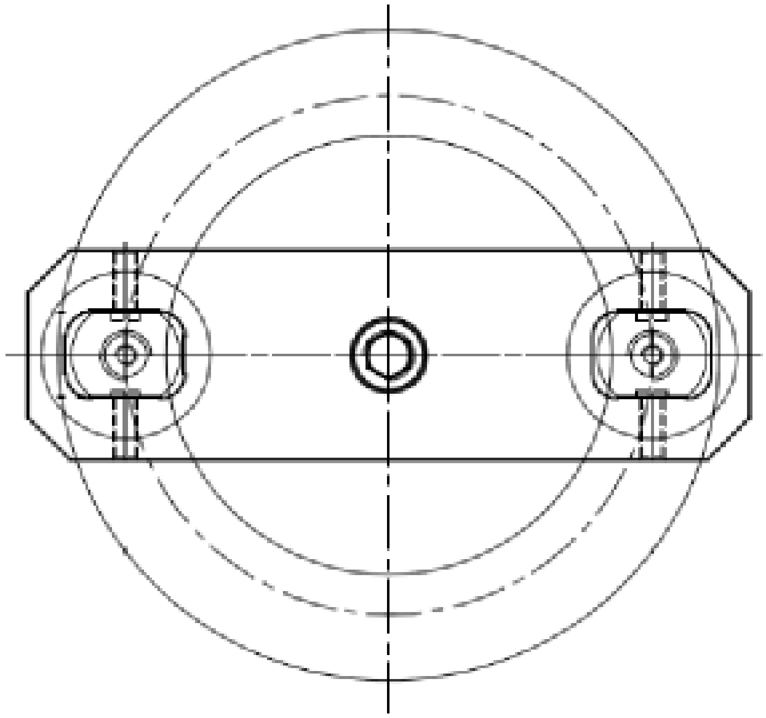
Tools	Item	Part name	B size	Screw size
Hexagon wrench	304, 310	Plug, Restrictor	4	R 1/16
	626, 632	Pipe plug, Plug	5	R 1/8
	302, 308	Plug, 2 speed plug	6	G 1/4
	301	Screw	12	M14
Socket wrench	303	Drain plug	22	G 3/8
	*-3	Relief valve assy	27	G 1/2
	309	Set plug	30	G 3/4
	*-3	Relief valve assy	8	M5

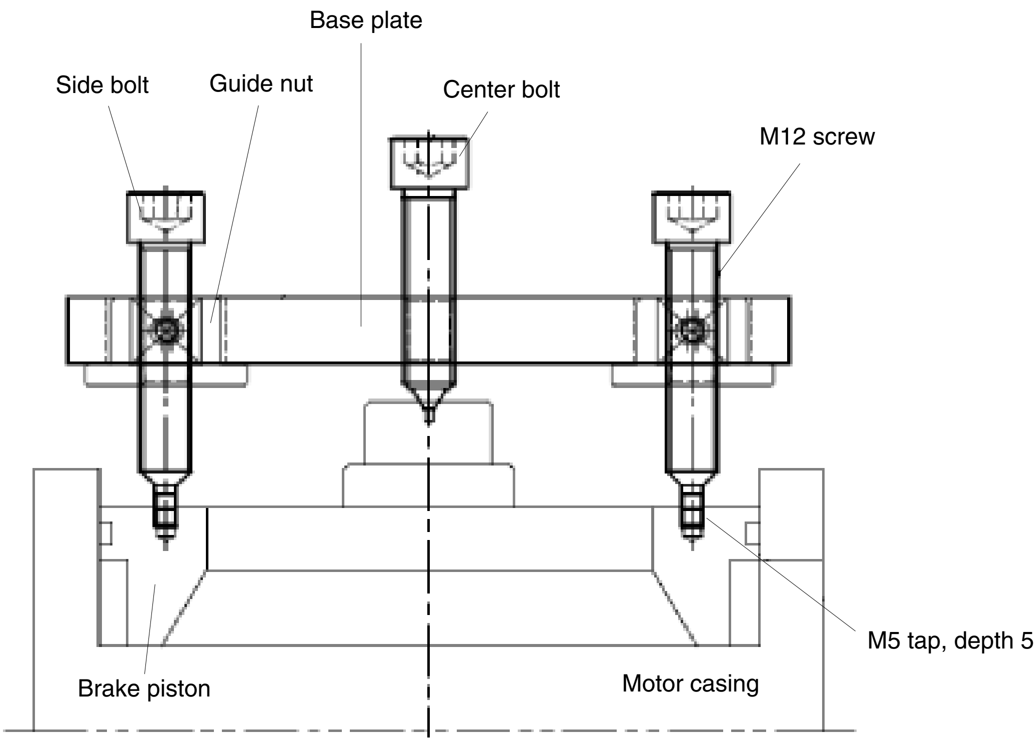
② Others

Tools	Specification
Driver	Screw driver (small, medium)
Hammer	Rubber or plastic hammer, iron hammer
	Round bar : about Ø45 mm x 150 mm
Bearing press jig	Round bar : about Ø60 mm x 150 mm
Torque wrench	Torque adjustment range
	- For 4~20 Nm
	- For 20~100 Nm
	- For 40~200 Nm
Slide hammer bearing puller	-
Brake piston disassembly jig	-
Brake piston press jig	-
Snap ring plier	Inner diameter

(3) Special tools

① Brake piston disassembly jig

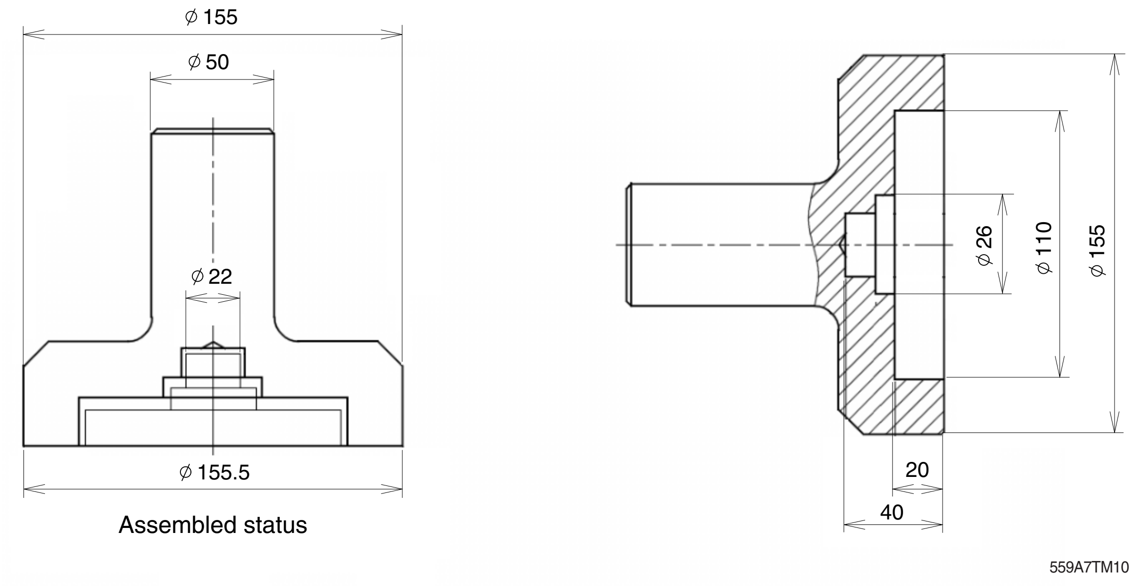




559A7TM05

② Brake piston press jig

The below dimensions are the reference dimensions.

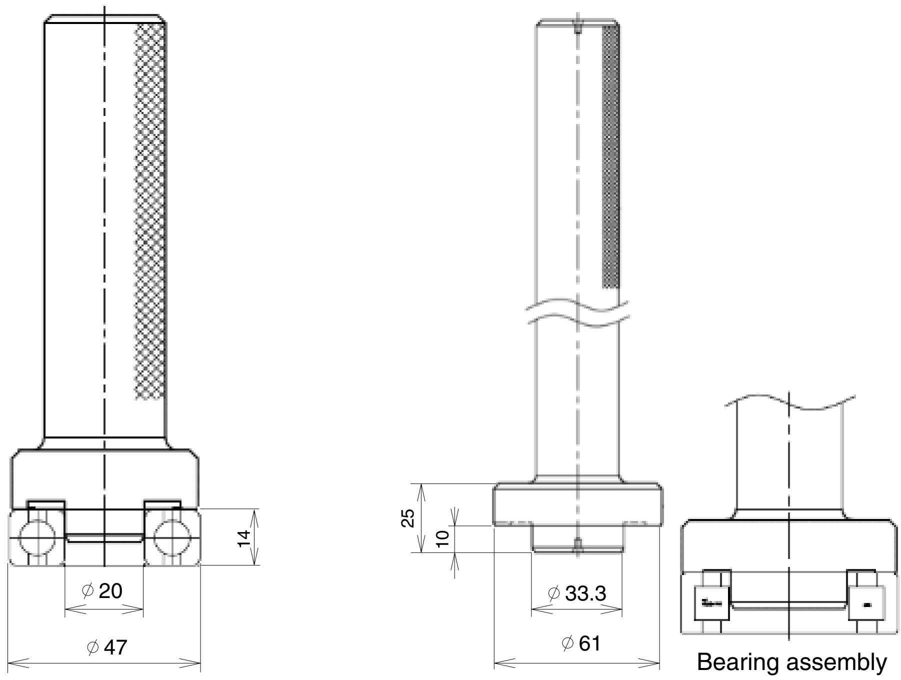


Assembled status

559A7TM10

③ Bearing press jig

The below dimensions are the reference dimensions.



Bearing pressing jig for valve casing

Roller bearing pressing jig for casing

559A7TM11

3) DISASSEMBLY

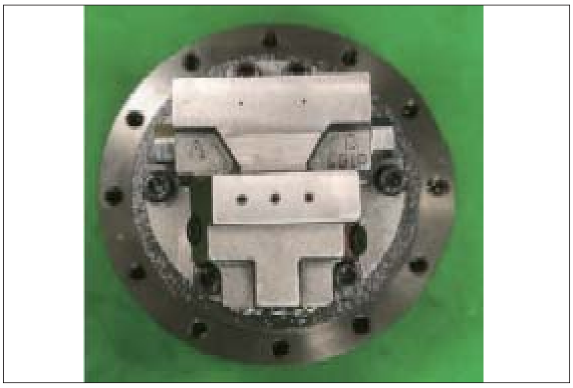
When disassembling the motor, disassemble in the order shown below. The number in brackets after part name means item number of section drawing.

(1) Wrap a wire rope around the outer periphery of the motor, lift it with a crane, and wash it with white kerosene. After washing, dry with compressed air.

※ The motor can be disassembled into an mounted state on the excavator. In this case, disassemble not to be got foreign materials: dust, mud, etc.

(2) Remove the oil in the casing (202) from the drain plug.

※ In the case of automatic 1-speed specification, 2 speed spool (502) may drop out during operation. Block pilot port with dust plug (306).



559A7TM12

(3) Disassembly is easily fixed to the workstation.

Place the shaft end of the drive shaft (103) facing down.

Mark the joint mark at the junction point of casing (202) and valve casing (201).

※ Choose a clean place.

Spread a rubber plate or cloth on the workbench to prevent friction and damage of the parts.

■ Disassembly of valve casing kit

(4) Loosen the relief valve assy (*-3) and remove it from the valve casing (201).

559A7TM13

(5) Disassemble the spring cap (510) → cap (509).

559A7TM14

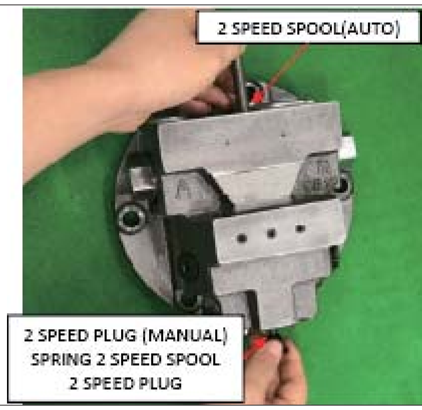
(6) Loosen the set plug (309), remove the plunger (504) and the main spool spring (505).
Then take out the main spool (501).

※ Main spool is disassembled in the horizontal direction with the hole. Be careful not to scratch the sliding surface of the main spool.

559A7TM15

559A7TM16

(7) Loosen the 2 speed plug (308), take out the 2 speed plug spring (506) and the 2 speed spool (502).

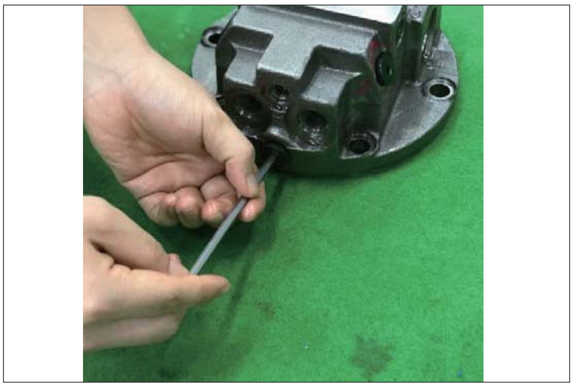


559A7TM17

(8) The following operations should be carried out if necessary.

① Loosen the plug (302) and remove the restrictor (310).

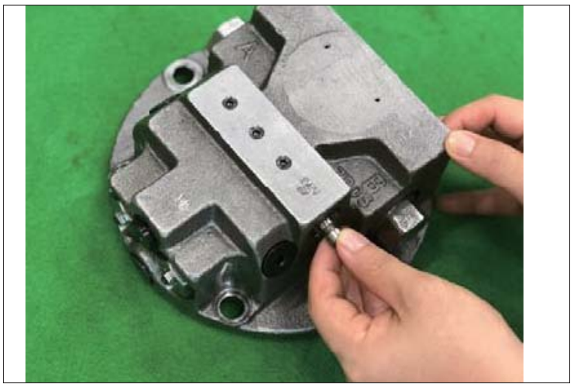
※ If there is no problem with the 1st / 2nd speed switching, no special disassembly is required.



559A7TM18

② Release plug (302) and disassemble in the following order: Seat casing (433) → steel ball (503) → seat (432).

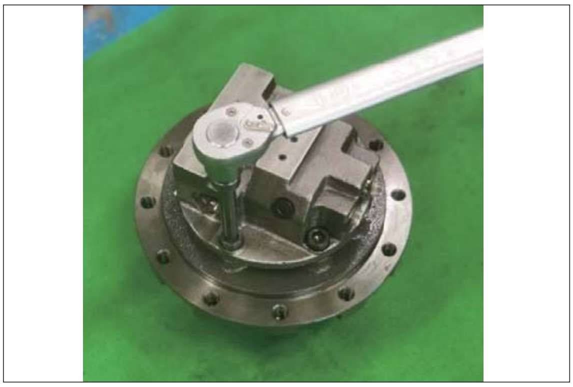
※ If there is no problem with the 1st / 2nd speed switching, no special disassembly is required. Please be careful about the loss of the steel ball. Please be careful not to damage the inner diameter of the seat casing and seat.



559A7TM19

(9) Loosen screw (301) and remove valve casing (201) from casing (202).

※ (Due to the force of the brake spring E (117), when the screw (301) is unscrewed, the valve casing (201) is raised from the casing (202). Further, remove the valve plate (108) from the valve casing (201).

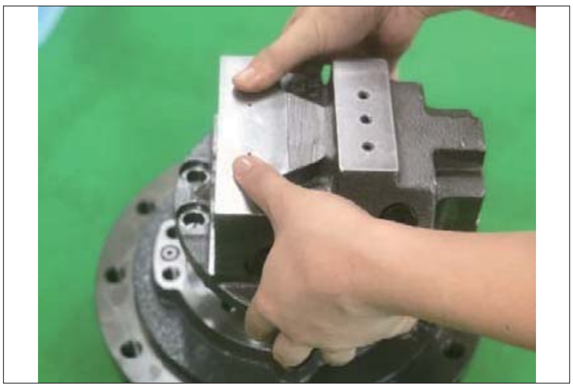


559A7TM20

Carefully work so that the valve plate does not fall off the valve casing.

※ In some cases, the valve plate is attached to the cylinder block.

Be careful not to scratch the sliding surface and mating surface when you disassemble the mating surface with a screwdriver or the like.



559A7TM21

559A7TM22

■ DISASSEMBLY OF MOTOR BODY

(10) Remove the brake spring (117) from the brake piston (114).

559A7TM25

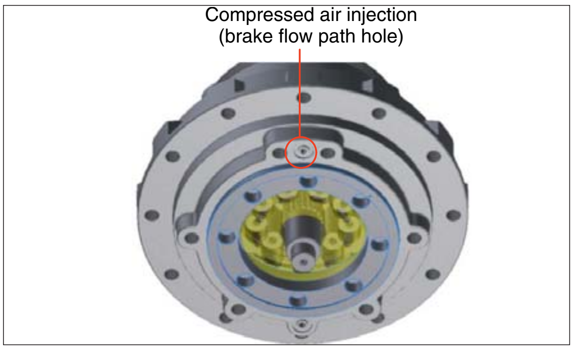
(11) Using the jig, remove the brake piston (114) from the casing (202). No.16

※ If you need to disassemble without jig, Fill the brake flow path hole with compressed air.
If you blow compressed air suddenly brake piston can jump out of casing.
There is a risk of damage or injury to the part;
Please follow the directions below.

① Cover the casing with a clean cloth.
② Press the cloth lightly with your hand to prevent the brake piston from jumping out.
③ Fill the brake flow path hole with compre-ssed air.

559A7TM26

※ Both ends of the jig are hooked to the groove of the brake piston. The center of the jig is hooked to the center of the drive shaft and makes the jig and brake piston parallel.



559A7TM40

(12) Put the motor horizontally.
Disassemble cylinder block (104) from drive shaft (103).
Also, disassemble piston assy (10), set plate (106), spherical bush (105), cylinder spring (107).

559A7TM31

※ Mark each cylinder block bore, piston assy, and set plate bore in the assembled position so that the assembled position does not change.
Be careful not to scratch the sliding surface of cylinder block, piston, shoe, etc.

559A7TM32

559A7TM33

559A7TM34

(13) Disassemble friction plate (118) and separator plate (119) in casing (202).

559A7TM35

(14) Disassemble the drive shaft (103) and swash plate (109).

559A7TM37

(15) Disassemble swash piston assy (20), swash piston spring (511), pivot (112), pivot pin (113).

559A7TM38

(16) Do not disassemble any further unless there is a specific problem. At this state, check bearing according to the following inspection instructions.

① Check the raceway surface, rollers or balls in the visible range, and make sure there are no pittings or cracks.

② Check for local corrosion and wear on the ball or roller.

③ Make sure that there is excessive wear powder between the ball or roller and cage.

④ When turning lightly by hand, check that it rotates smoothly.

If there is no problem after checking in this step, the following disassembly is not necessary.

559A7TM41

(17) The following operations should be carried out if necessary.
From the casing (202), the outer ring of the cylindrical roller bearing (115) is tapped lightly from the housing part side of the oil seal (408) via the steel bar and is pulled out.

※ Do not reuse the removed roller bearing.

(18) Disassemble the snap ring (410) using a snap ring plier (inner diameter) in casing (202).

(19) From the casing (202), the gently tap out the housing side of the oil sea (408) is tapped lightly from the rear of the casing (202) via the steel bar and is pulled out.

※ Do not reuse the removed oil seal.

(20) Remove the cylindrical ball bearing (116) from the valve casing (201) using the slide hammer bearing puller.

※ Do not reuse the removed ball bearing.

※ The disassembly operation is finished. Please check that there is no problem in each part.

4) ASSEMBLY

(1) The assembly way is the reverse of the disassembly way, but be careful of the following items.

① Be sure to repair damaged parts during disassembly. Please prepare replacement parts in advance.

② Wash each part thoroughly with wash liquid and dry with compressed air.

③ Be sure to coating clean hydraulic oil to sliding parts, bearings, etc. and assemble them.

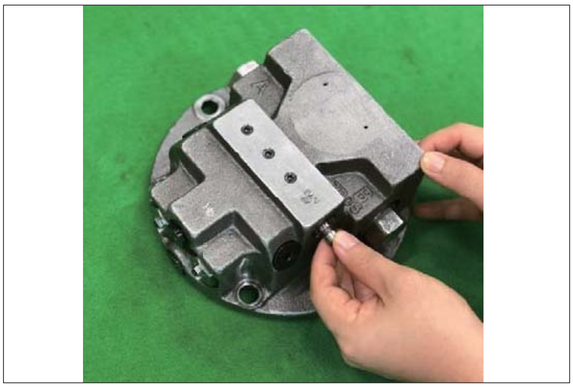
④ In principle, should replace seal parts such as O ring and oil seal.

⑤ Use the torque wrench to tighten the mounting bolts and plugs of each part, and tighten with the torque shown in page 7-56.

■ ASSEMBLY OF VALVE CASING KIT

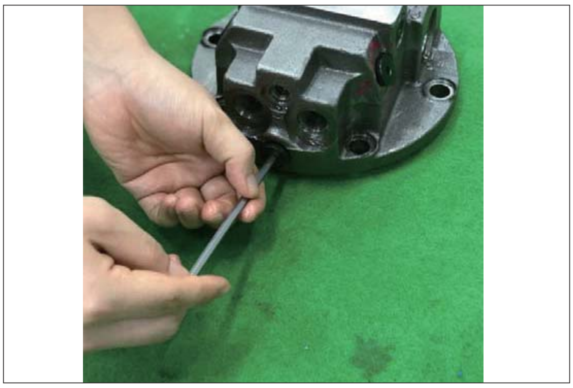
(2) This operation is necessary only when the seat assy is removed.
Assemble seat (432) → steel ball (503) → seat casing (433) → plug (302) in this order.

※ Please pay attention to the assembly sequence.
Refer to section drawing.



559A7TM19

(3) This operation is necessary only when the restrictor is removed.
Apply loctite on the restrictor (310) and assemble to casing (201). And tighten plug (302) with specified torque.



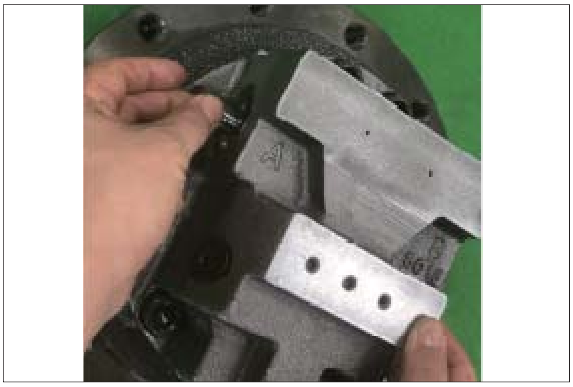
559A7TM18

(4) Assemble the 2 speed spool (502), the 2 speed spool spring (506), the 2 speed plug (308).

559A7TM17

(5) Assemble main spool (501), Plunger (504) → main spool spring (505) → O-ring (403) → Assemble set plug (309) in order.

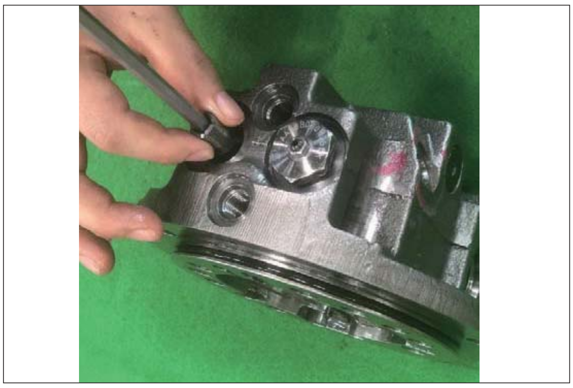
※ Make sure the main spool moves smoothly.



559A7TM16

559A7TM15

(6) Assemble the cap (509).



559A7TM14

(7) Assemble the spring cap (510) to the relief valve assy (*-3). Attach the relief valve to the valve casing (201).

※ It is advisable to apply grease thinly on the mating surface of spring cap to prevent falling off.

559A7TM13

■ ASSEMBLY OF MOTOR BODY

(8) Place the casing (202) on the work surface with the valve casing (201) assembly surface facing up.

(9) Insert the oil seal (408) into the casing (202) using a jig.

※ Pay attention to the direction of the oil seal. (refer to cross-section drawing) Apply grease thinly to the lip portion of the oil seal.
Hit it uniformly and be careful not to scratch the outer circumference.

(10) Assemble the snap ring (410) using the snap pliers (internal diameter) on the casing (202).

※ The snap ring "R" faces the oil seal.

(11) The outer ring of the cylindrical roller bearing (115) is tapped lightly on the casing (202) via the bearing press jig and incorporated.

559A7TM39

(12) Assemble pivot pin (113), pivot (112) to casing (202).

559A7TM38

(13) Assemble swash piston spring (511) and swash piston assy (20) to casing (202).

※ It is advisable to apply grease thinly on the mating surface of swash piston spring to prevent falling off.
When assembled normally, the pushed swash piston assy goes deeper than the casing stage.
Make sure the swash piston assy moves smoothly.

559A7TM38

(14) Place casing (202) horizontally and insert swash plate (109).

※ Make sure the swash plate moves smoothly.

559A7TM37

(15) The drive shaft (103) is attached to the casing (202).

※ Carefully insert so that the lip of the oil seal will not be scratched.
Assemble by applying oil to the oil seal assembly of drive shaft.
When assembled normally, the pushed swash piston assy goes deeper than the casing stage.
Make sure the swash piston assy moves smoothly.

559A7TM36

(16) Set the cylinder spring (107) and the spherical bush (105) into the cylinder block (107). and insert the piston assy. (10) to the bore of set plate (106).

※ Assemble the Larger outer diameter face of set plate and the sliding movement face of shoe in the same direction. (Refer to section drawing)

559A7TM34

559A7TM33

(17) The piston assy (101) set on the set plate (106) is assembled in the cylinder block (104). And the cylinder block sub assembled is inserted in accordance with the spline of the drive shaft (103) to casing (202).

※ Before assembly, apply oil to the surface of cylinder bore or piston.

※ It is easy to insert into drive shaft by matching spline of cylinder block and the spherical bush.

※ After assembly, try rotating the cylinder block lightly in the forward and reverse directions by hand.

559A7TM32

(18) Place casing (202) with the valve casing (201) assembly surface of casing (202) facing up.
Separator plate (119) and friction plate (118) are alternately assembled to casing (202).

※ Put the separator plate in arc groove of casing.
※ Please refer to the assembly drawing for the number of assembly of the separator plate and friction plate.

559A7TM30

559A7TM29

(19) Install the O-ring (118, 401) and the back up ring (409) on the brake piston (114).

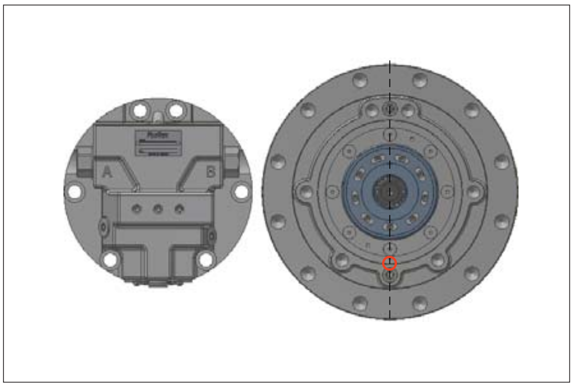
※ Back up ring is installed to the valve casing direction.
※ If the grease is lightly applied to the O-ring, it will not be cut when the brake piston is inserted.

559A7TM28

(20) The brake piston (114) is tapped lightly via the brake piston press jig and pressed into casing (202).

559A7TM27

※ Pay attention to the assembly direction of the brake piston. The orifice of the brake piston is located downward on the same vertical line as the flow hole in casing.



559A7TM42

(21) Attach the brake spring (117) to the brake piston (114).

(22) Attach the O-ring (402) to the casing (202).

559A7TM25

(23) This term is necessary only when the cylindrical ball bearing (116) is removed. The outer ring of the cylindrical ball bearing (116) is tapped lightly on the valve casing (201) via the bearing press JIG and incorporated.

559A7TM24

(24) The valve plate (108) is installed in the valve casing (202) and the O-ring (401) is mounted.

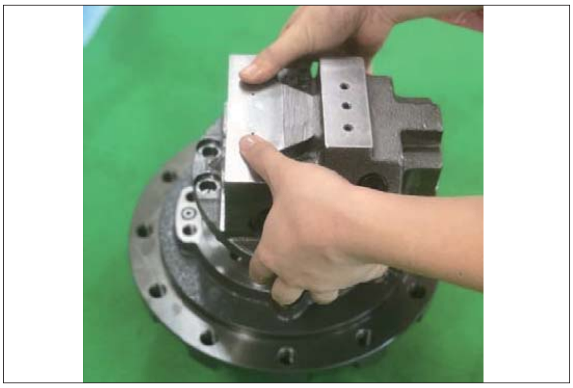
※ Apply grease thinly to the joint surface of the valve plate. (prevention of dropout)

559A7TM23

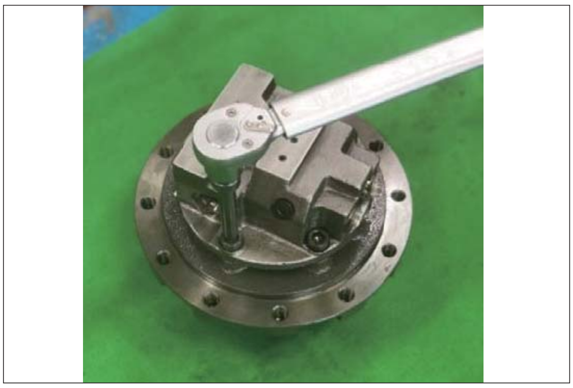
559A7TM22

(25) Attach the valve casing (201) to the casing (202) and fasten it with a screw (301).

※ Be careful not to remove the valve plate.
Be careful not to tilt the brake spring.
Tighten the socket bolt evenly until specified torque.



559A7TM21

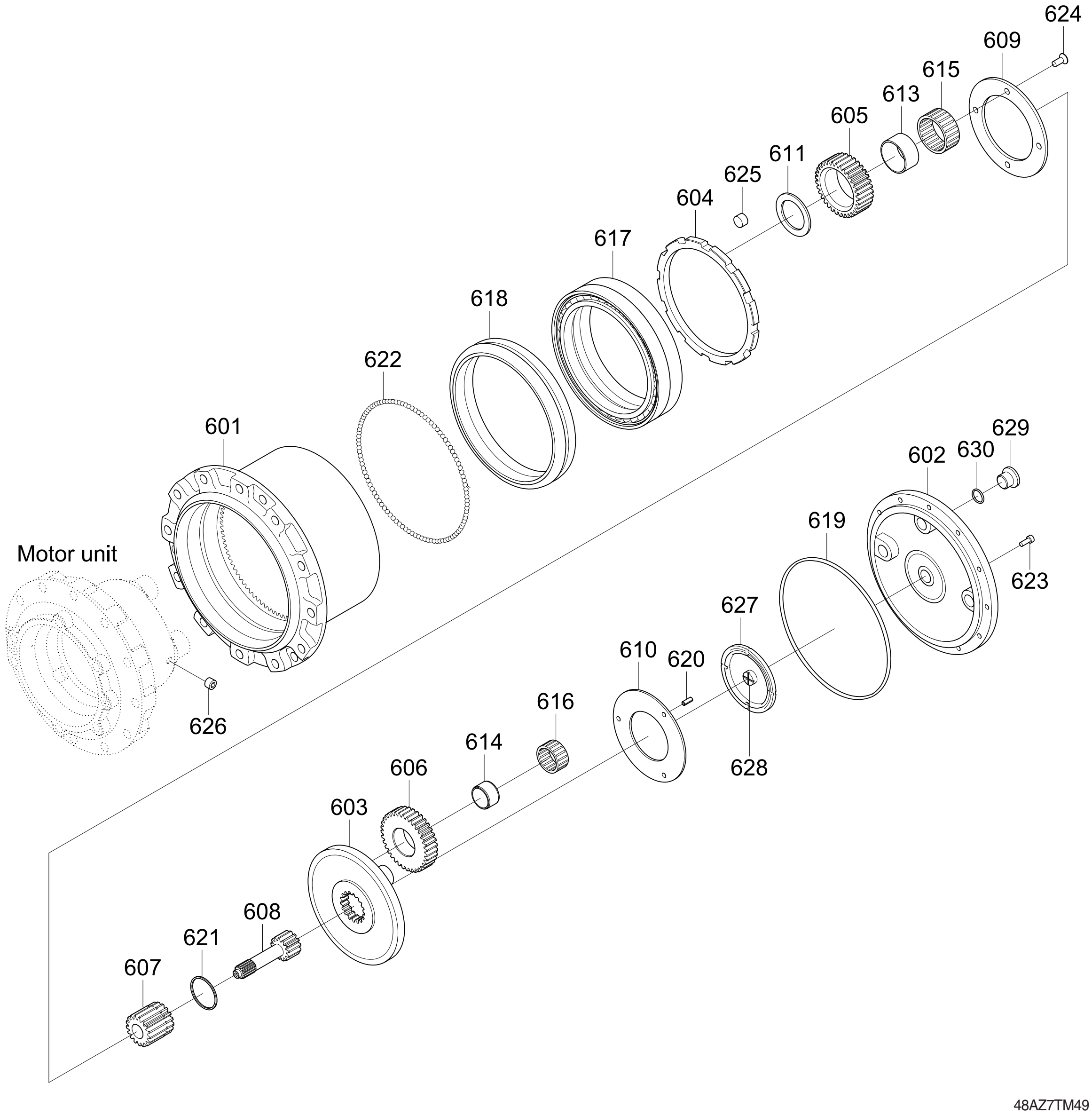


559A7TM20

※ Assembly is completed with the above.

3. DISASSEMBLY AND ASSEMBLY OF REDUCTION GEAR

1) PARTS LIST



601	Housing	611	Thrust washer	622	Steel ball
602	Cover	613	Collar	623	Socket bolt
603	Holder	614	Inner race	624	Bolt
604	Ring nut	615	Needle bearing	625	Plug
605	Planetary gear F	616	Needle bearing	626	Plug
606	Planetary gear R	617	Angular bearing	627	Side plate A
607	Sun gear	618	Floating seal kit	628	Side plate B
608	Drive gear	619	O-ring	629	Plug
609	Thrust plate F	620	Spring pin	630	O-ring
610	Thrust plate R	621	Snap ring		

2) GENERAL PRECAUTIONS

This reduction gear is designed to reduce the number of parts and balance the life of the parts. Therefore, all parts can be supplied separately, but when replacing, it is often necessary to replace them both structurally and functionally.

			Parts to be replaced at the same time													
	Part number		617	618	611	613	615	605	612	609	624	603	620	614	616	606
	Name of part		Angular bearing	Floating seal	Thrust washer	Collar	Needle bearing	Planetary gear F	Thrust washer	Thrust plate F	Ext. flush bolt	Holder	Spring pin	Inner race	Needle bearing	Planetary gear R
Replace-ment parts	617	Angular bearing	—	○												
	618	Floating seal	△	—												
	611	Thrust washer			—	△	△	△	△	○	○					
	613	Collar			△	—	○	○	△	○	○					
	615	Needle bearing			△	○	—	○	△	○	○					
	605	Planetary gear F			△	△	△	—	△	○	○					
	612	Thrust washer			△	△	△	△	—	○	○					
	609	Thrust plate F			△	△	△	△	△	—	○					
	624	Ext. flush bolt			△	△	△	△	△	○	—					
	603	Holder														
	620	Spring pin											No disassembly			
	614	Inner race										Please replace the entire No.1 holder assy.				
	616	Needle bearing														
	606	Planetary gear R														

○ Indicates parts that must be replaced at the same time.

▲ Indicates parts that is desirable to be replaced at the same time.

※ Be sure to replace the bearing inner and outer rings at the same time.

3) TOOLS AND TIGHTENING TORQUE

(1) Tightening torque

This table shows the typical screw sizes and tightening torques used in the reduction gear.

Item	Part name	Size	Tightening torque	
			kgf · m	lbf · ft
604	Ring nut	M165	18	130
623	Socket bolt	M6	1.2	8.7
624	Ext flush bolt	M8	3	21.7
625	Pipe plug	RC 3/8	10	72.3
626	Pipe plug	RC 1/8	1.2	8.7
629	RO plug	G 1/2	8.4	60.8
632	ROH plug	G 1/8	1.5	10.8

(2) Tools

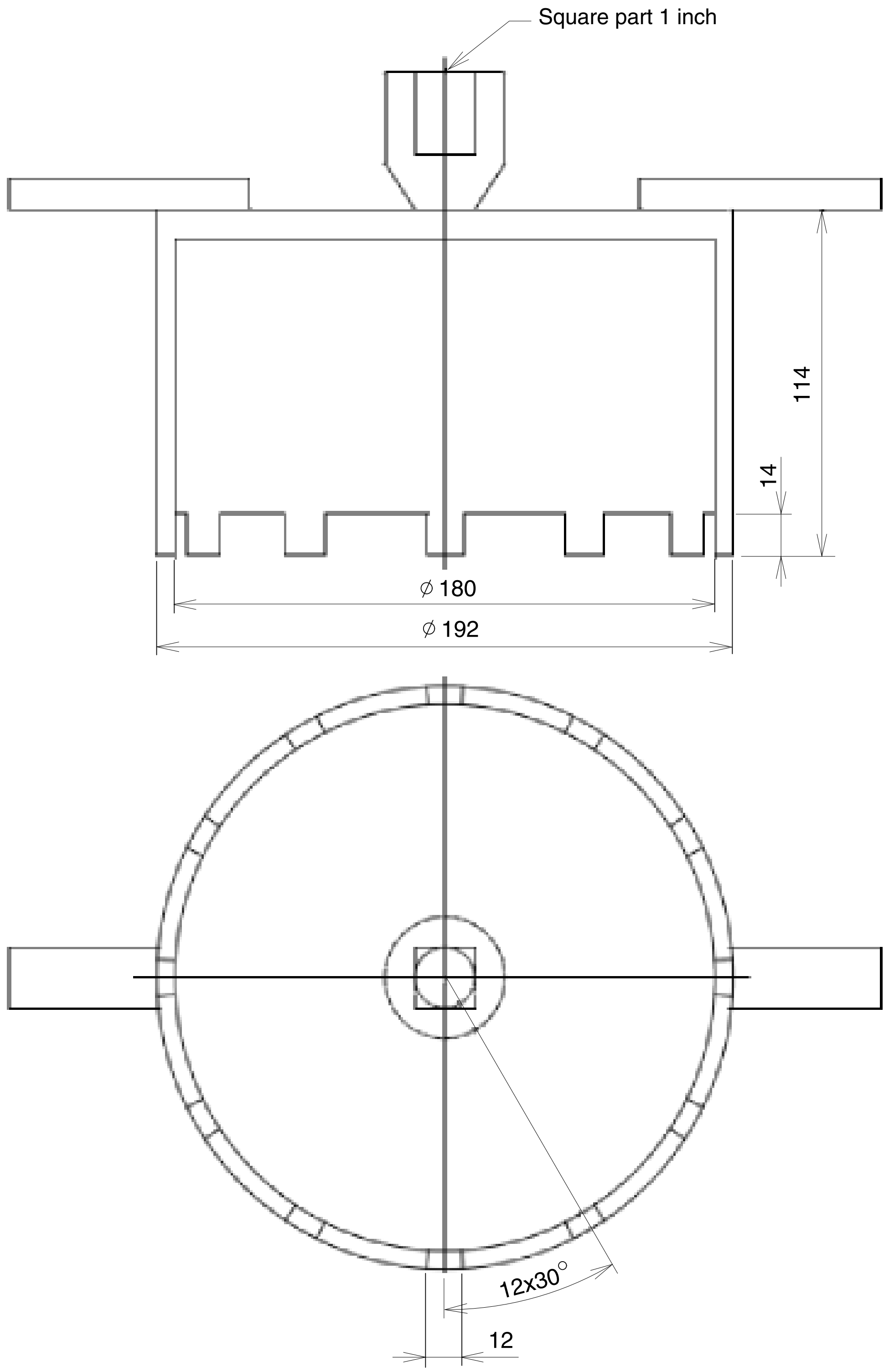
① Hexagon wrench and exclusive jig

Tools	Item	Part name	B size	Screw size
Hexagon wrench	626	Pipe plug	5	R 1/8
	625	Pipe plug	8	R 3/8
	629	RO plug	10	G 1/2
	623	Socket bolt	5	M6
	624	Ext flush bolt	6	M8
Exclusive jig	604	Nut ring	-	M165

② Others

Tools	Specification
Driver	Screw driver (small, medium)
Hammer	Rubber or plastic hammer, iron hammer
Torque wrench	Torque adjustment range
	- For 4~20 Nm
	- For 20~100 Nm
	- For 40~200 Nm
Snap ring plier	Outer diameter
Nut ring disassembly and assembly jig	-

(3) Special tools



559A7TM50

4) ASSEMBLY

(1) Disassembly and assembly tips

① When disassembling, be careful not to damage the parts.

② Wash each part with washing oil and dry it with compressed air.

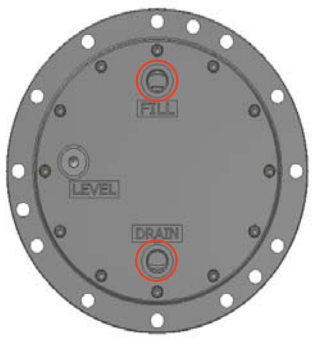
③ The numbers in parentheses after the part name represent the symbols of the cross-sectional drawing.

(2) Wrap a wire rope around the outside of the traveling device to lift it with a crane. Then wash with white kerosene. After washing, dry with compressed air.

559A7TM51

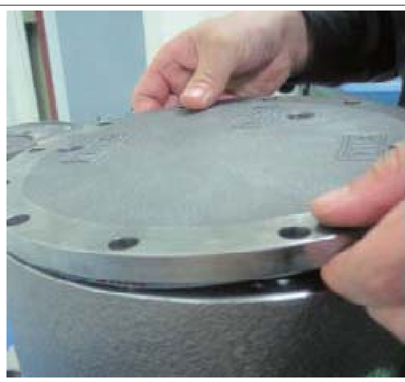
(3) Make sure that the fill plug (629) and drain plug (629) shown in the dimensional installation drawing are perpendicular to the horizontal plane.
Unplug both ports and remove the gear oil.
Place it on a suitable base.

※ Receive the gear oil in a clean container and inspect the presence and presence of wear powder.



559A7TM52

(4) Loosen the socket bolt (623) and disassemble the cover (602).



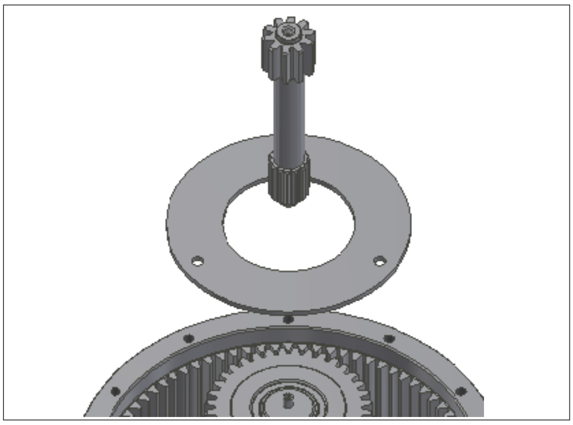
559A7TM53

※ Be careful not to damage the O-ring (619) of the cover during disassembly.

559A7TM54

(5) Disassemble thrust plate R (610), drive gear (608).

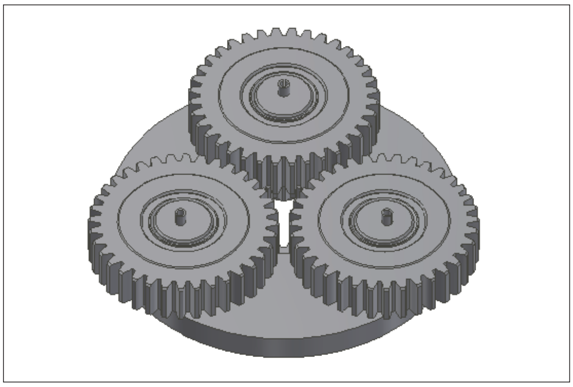
559A7TM55



559A7TM56

(6) Disassemble the No.1 holder assembly with the planetary gear R (606) attached.

※ No. 1 holder assy components are as follows.
- Holder (603)
- Spring pin (620)
- Planetary gear R (606)
- Needle bearing (616)
- Inner race (614)



559A7TM57

(7) Disassembly of No.1 holder assy

Do not disassemble the No.1 holder assy further.
In this state, check the parts according to the inspection instructions shown in section 6.
As mentioned above, it is recommended to exchange No.1 holder assy as a set as much as possible.
Please follow the instructions below when you are forced to exchange parts.

559A7TM58

① Disassemble in the order of planetary gear R (606) → Needle bearing (616) → Inner race (614).

② Unplug the spring pin.

※ Mark each planetary gear, needle bearing, and inner race in the assembled position so that each combination and assembly position does not change.

※ When disassembling the spring pin, do not reuse it.

559A7TM59

(8) Disassemble the sun gear (607).
Then, the snap ring (621) is separated from the sun gear (607) using a snap ring pliers.

559A7TM60

559A7TM61

(9) Disassemble the No.2 holder assy.

(10) Disassembly of No.2 holder assy

Do not disassemble any more No.2 holder assy unless otherwise specified.

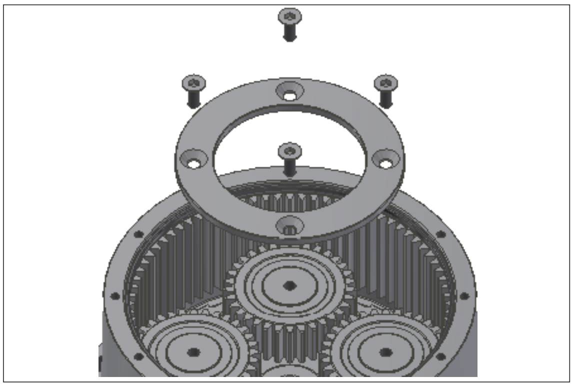
In this state, check the parts according to the inspection instructions shown in section 6.

As mentioned above, it is recommended to exchange No.2 holder assy as a set as much as possible.

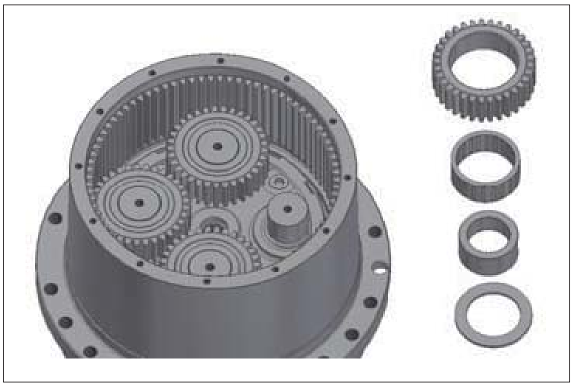
Please follow the instructions below when you are forced to exchange parts.


559A7TM62

① Apply enough heat to ext flush bolt(624)
② Disassemble thrust plate F (609).
③ Disassemble in the order of thrust plate F (609) → Planetary gear F (605) → Needle bearing (615) → Collar (613) → Thrust washer (611)


559A7TM63

※ Mark each planetary gear, needle bearing, and inner race in the assembled position so that each combination and assembly position does not change.


559A7TM64

(11) Do not disassemble any further unless there is a specific problem.

In this condition, check the parts according to the inspection instructions shown in Section 1-2.

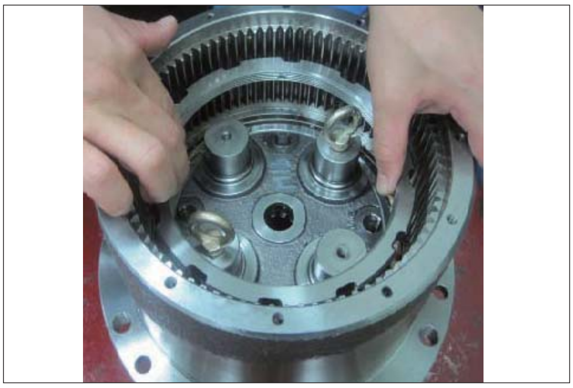
※ If there is no problem after checking in this step, the following disassembly is not necessary.

(12) Disassemble pipe plug (625).

※ When disassembling the pipe plug (625), Do not reuse.

559A7TM65

(13) Disassemble the nut ring (604).



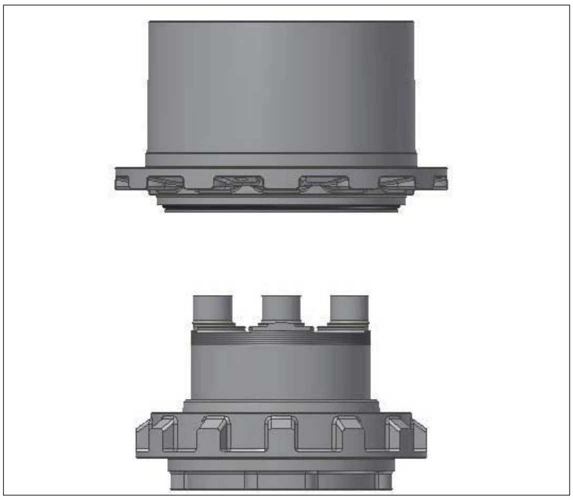
559A7TM66

※ Please disassemble the nut ring using the dedicated jig referring to the attachment.

559A7TM67

(14) Disassemble casing (202) from housing (601).

559A7TM68



559A7TM69

(15) After disassembling the pipe plug (626), remove the steel ball (622).

※ The number of steel ball is 105.
When disassembling, be sure to check the number of balls.

559A7TM70

(16) Disassemble the floating seal kit (618).

559A7TM71

(17) Disassemble angular bearing (617).

559A7TM72

※ Use a press for disassembly.

559A7TM73

※ The disassembly process is finished.

5) ASSEMBLY

(1) After placing angular bearing (617) on housing (601), press the angular bearing (617) using a press.

559A7TM72

※ Assemble the protrusion of the inner ring face down.

559A7TM73

(2) Insert 105ea steel ball (622) into housing (601) and tighten the pipe plug (626).

※ Pipe plug is assembled by wrapping Teflon tape.
After assembling the pipe plug, check if the cloud condition of the angular bearing is smooth.

(3) Assemble the floating seal kit (618) using dedicated jig for casing (202) and housing (601).

559A7TM74

※ Before assembling, check the metal surface of the floating seal for cracks, dents, and O-ring damage.
Do not apply oil to the floating seal rubber part.
After assembling the floating seal, check if there are any deviations.

559A7TM75

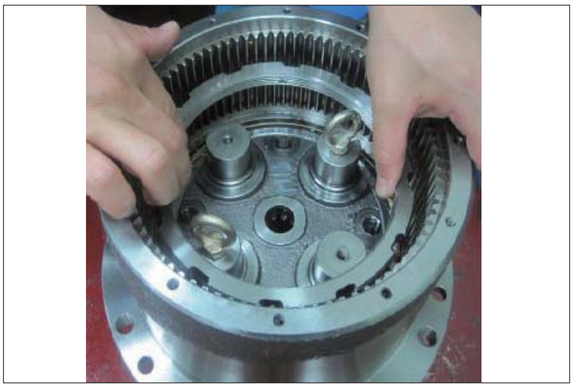
(4) Using a press, assemble the housing sub on the casing (202).

※ Floating seal are located on the same circumference.
Rotate so that the floating seal is in place.

559A7TM68

(5) Use the nut ring disassembly jig to assemble the nut ring (604).

※ After tightening, check the gap between casing and housing (0.5 ~1.5 mm) with a gauge.

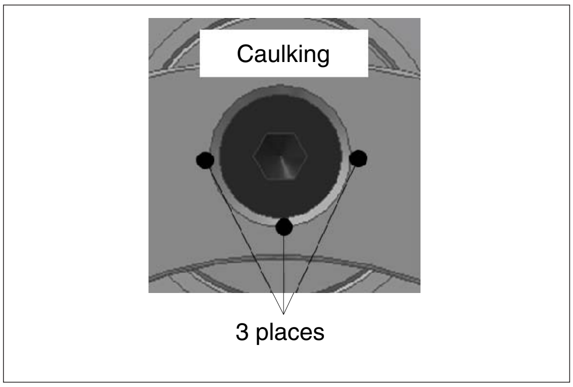


559A7TM66

(6) Tighten pipe plug (625).

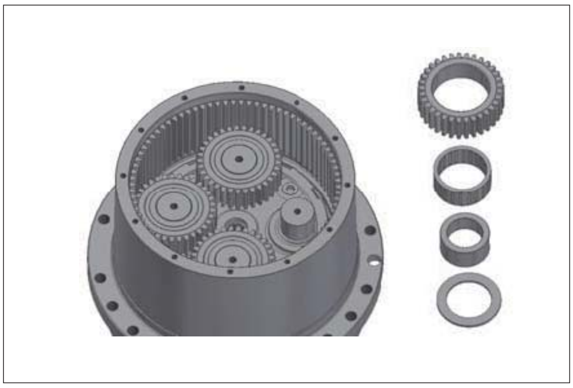
559A7TM65

※ Caulking is performed to prevent loosening around the assembly.



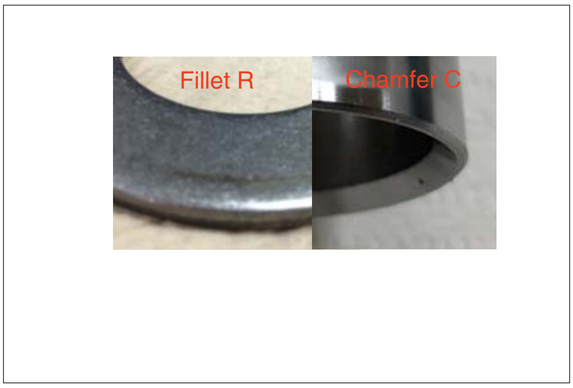
559A7TM76

(7) Assemble the No. 2 holder assy
Assemble in the order of thrust washer (611) → Collar (613) → Needle bearing (615) → Planetary gear F (605)



559A7TM64

※ The thrust washer R part is assembled in the bearing direction and the chamfered part of the collar is assembled in the casing direction.



559A7TM77

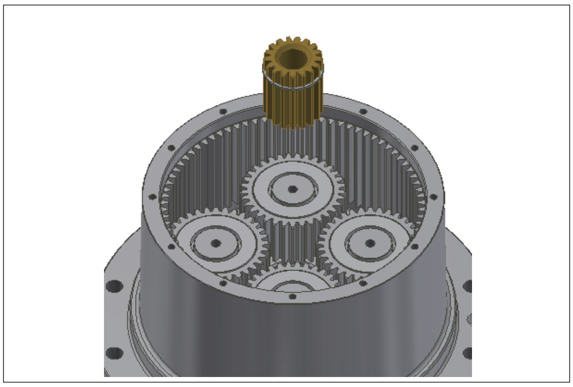
(8) Assemble the thrust plate F (609), ext flush bolt (624).

※ Assemble ext flush bolt by applying loctite in the axial direction.

559A7TM60

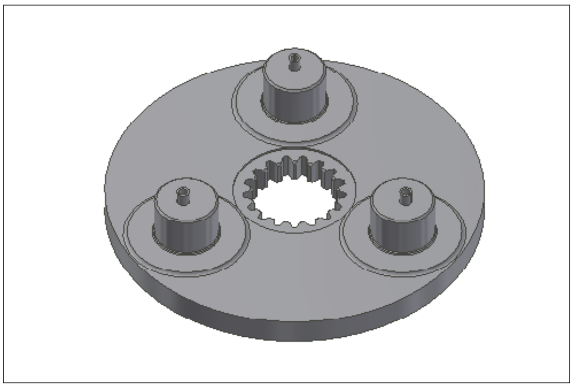
(9) Fasten snap ring (621) to sun gear (607) using snap ring pliers. And assemble in the center of planetary gear F.

※ Assemble R part of snap ring toward cover.
Sun gear is assembled with the long end facing toward casing.



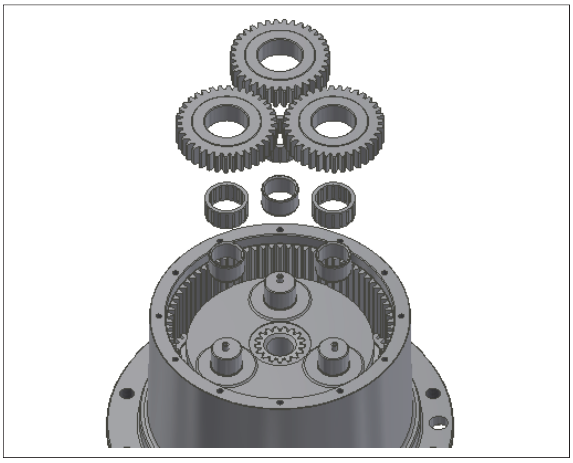
559A7TM78

(10) Assemble the No.1 holder assy.
Assemble spring pin (620) to holder (603).



559A7TM79

(11) Assemble the holder sub to the sun gear (607).
Then, assemble inner race (614) → Needle bearing (616) → planetary gear R.



559A7TM80

※ When assembling planetary gear R, assemble the convex part in the direction of thrust plate R.

※ Check the rotation status.

559A7TM81

(12) Assemble drive gear (608) and thrust plate R (610).

559A7TM55

(13) Assemble the O-ring (619), side plate A (627) and side plate B (628) on the cover (602).

※ After assembling the side plate B, remove any debris from the side.

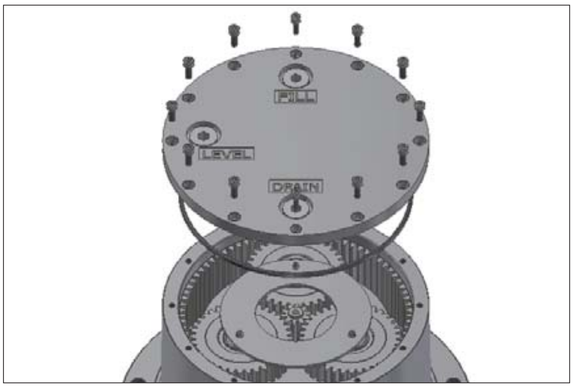
559A7TM82

(14) Assemble cover sub to housing.

559A7TM53

(15) Assemble the socket bolt (623).

※ Assemble by applying loctite in the direction of the socket bolt axis.



559A7TM54

※ The assembly process is finished.

1. REMOVAL AND INSTALL

1) REMOVAL

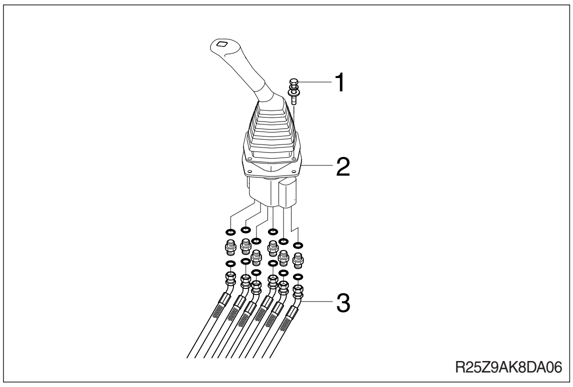

13031GE18

(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.**



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(4) Loosen the socket bolt(1).

(5) Remove the cover of the console box.

(6) Disconnect pilot line hoses(3).

(7) Remove the pilot valve assembly(2).

※ When removing the pilot valve assembly, check that all the hoses have been disconnected.

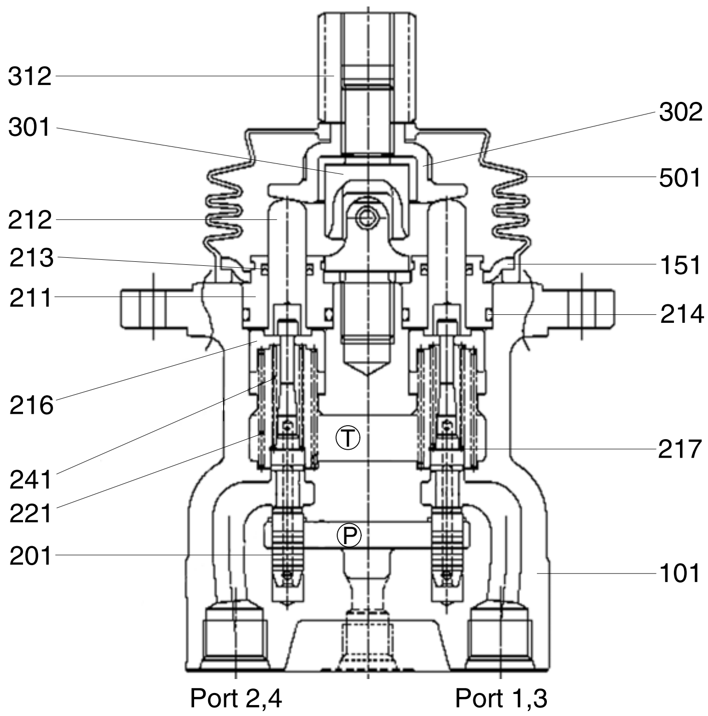
2) INSTALL

(1) Carry out installation in the reverse order to removal.

(2) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2. DISASSEMBLY AND ASSEMBLY (KPM, Type 1 and 2)

1) STRUCTURE



17Z9A7RCV50

101	Casing	213	Seal	241	Spring
151	Plate	214	O-ring	301	Joint
201	Spool	216	Spring seat	302	Disc
211	Plug	217	Washer	312	Nut
212	Push rod	221	Spring	501	Bellows

2) DISASSEMBLY AND ASSEMBLY

(1) Rinse the pilot valve in paraffin.

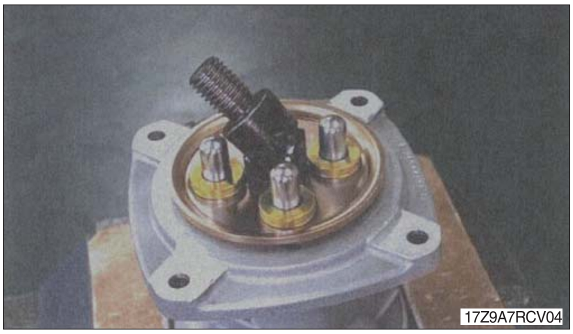
※ Place blind plug in all ports.

(2) Secure the pilot valve in a vice using a copper or aluminium faced jaws.

(3) Detach the bellows (501) (If outer bellows is attached, then this bellows may not be attached).

※ Take care not to damage the bellows (501).

(4) Use a spanner applied to both the adjustment nut (312) and plate (302) and loosen and then remove them.



⚠ Items under tension. The return spring (221), plate (151) and push-rod (212) will rise as joint (301) is loosened. Make sure the items do not fly out and damage personnel in the vicinity.

(5) Using the jig, turn the joint (301) counter-clockwise to loosen it.
The right illustration shows the jig attached.

(6) Remove the plate (151).
- When the return spring (221) is strong

- When the return spring (221) is weak

⚠ Items under tension. The return spring (221) tension will be released when plug (211) is removed. Make sure the item does not fly out and damage personnel in the vicinity.

(7) When the return spring (221) is weak, the plug (211) is held in the casing (101) by the friction of the O-ring. Remove this using a screwdriver.

※ Use the groove around the plug and take care to apply force evenly to avoid damage.


17Z9A7RCV09

(8) Remove the push-rod (212), plug (211), reduction valve assembly and return spring (221) from the casing (101).

※ The location in relationship with the casing aperture.


17Z9A7RCV10

※ The surface of the spool (201) and the spring seat (216) can be damaged by mis-handling. Take care not to damage the surface of the spool during removal and do not push the spring seat down more than 6 mm.

(9) The reduction valve is disassembled by pressing down the spring seat (216) and flexing the secondary pressure spring (241), sliding the spring seat (216) sideways and removing it from the spool (201) via the larger aperture.

※ Take care not to damage the surface of the spool (201).


17Z9A7RCV11

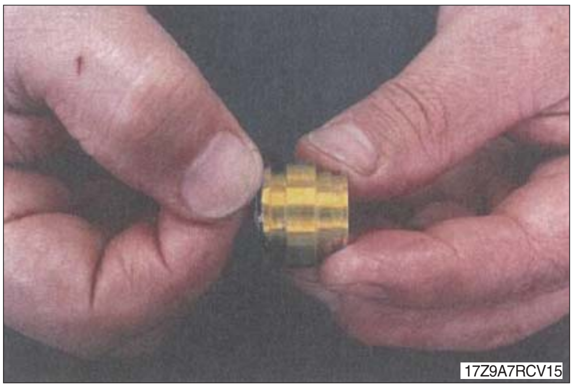
(10) Take the spool (201), spring seat (216), secondary pressure spring (241) and washer #2 (217) apart.

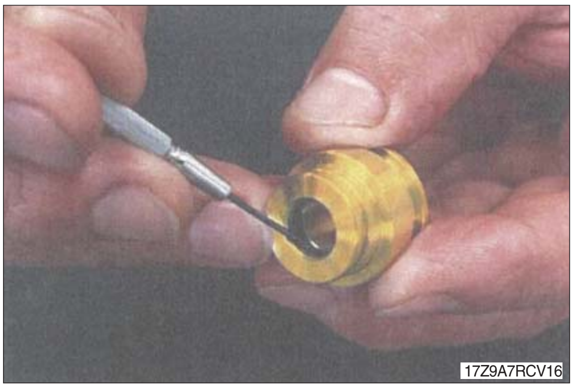
※ Take care not to damage the surface of the spool (201).

※ Keep these parts together until reassembly.

(11) Extract the push-rod (212) from the plug (211).

(12) Detach the O-ring (214) and oil seal (213) from the plug (211). Detach the oil seal (213) using a small screwdriver.





(13) CLEANING OF PARTS

① Wash the parts by placing in an initial bath containing paraffin oil (or similar cleaning fluid).

※ To reduce the risk of damage if dirty parts are initially washed in oil. To remove the dirt and oil, soak thoroughly so that dirt and oil float to the surface.

※ Dirty paraffin could result in damage to the parts, and deterioration in performance after reassembly. Ensure the contamination of the paraffin is thoroughly monitored and controlled.

② Place the parts in a finish wash container, rotate this slowly until even the inner areas of the parts are clean (Finish wash).
Wipe of the paraffin oil on the parts using clean cloth.

※ If compressed air is used for drying, dust and moisture in the compressed air may damage the parts and make corrosion more likely.

(14) PREVENTION OF CORROSION OF PARTS

Coat the parts with the anti-corrosion preparation.

※ If the parts are left to stand for some time after cleaning, they may start to corrode and the performance after reassembly will be impaired.

3) ASSEMBLY

※ The surface of the spool (201) and the spring seat (216) can be damaged by mis-handling. Take care not to damage the surface of the spool during assembly and do not push the spring seat down more that 6 mm.

(1) Insert, in this order, the washer #2 (217), secondary spring (241) and spring seat (216) onto the spool (201).

(2) Press down the spring seat (216) to flex the secondary pressure spring (241) while sliding the spring sideways through the larger aperture to attach it to the spool (201).
Fit the return spring (221) into the casing (101).

※ Do not press the spring seat down more than 6mm.

(3) Fit the reduction valve assembly into the casing (101).

※ Fit in the locations noted in step 8 of the disassembly procedure.

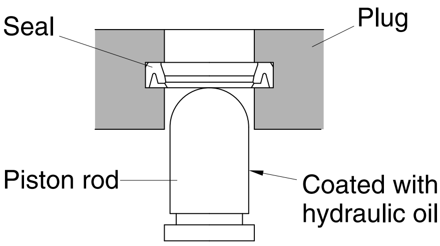
(4) Fit the O-ring (214) into the plug (221).

(5) Fit the oil seal (213) into the plug (211).

※ Fit the lip of the oil seal (213) as shown right.

(6) Fit the push-rod (212) into the plug (211).

※ Apply hydraulic oil to the surface of the push rod.



Push rod, plug & seals

17Z9A7RCV32

⚠ Items under tension. The plug assembly and plate (151) have to be assembled against spring tension. Make sure the item does not fly out and damage personnel in the vicinity.

※ The surface of the spool (201) and aperture (101) can be damaged by mis-handling. Take care not to damage the surface of either during assembly.

(7) Fit the plug assembly into the casing (101). When the return spring (221) is weak, it is held in place by the friction of the O-ring (214).
When the return spring (221) is strong, use the plate (151) to insert all four simultaneously and temporarily secure them with the joint (301).

(8) Attach the plate (151).

(9) Tighten the joint (301) to the casing (101) to the specified torque using the special jig.

※ The right figure shows the jig attached. Screw down to a position where the four push rods (212) are in contact equally.

※ Excessive tightening or wrong positioning of the disc can cause the valve to malfunction.

(10) Attach the plate (302) onto the joint (301).


17Z9A7RCV28

(11) Install the adjustment nut (312), tighten up the plate (302) with a spanner on both and tighten the adjustment nut to the specified torque.

※ Do not allow the position of the plate (302) to shift during tightening.


17Z9A7RCV29

(12) Apply grease to the rotating part of the joint (301) and end of the push-rod (212).


17Z9A7RCV30

(13) Attach the bellows (501).
If outer bellows is attached, then this bellows may not be attached.

※ Take care not to tear the bellows.

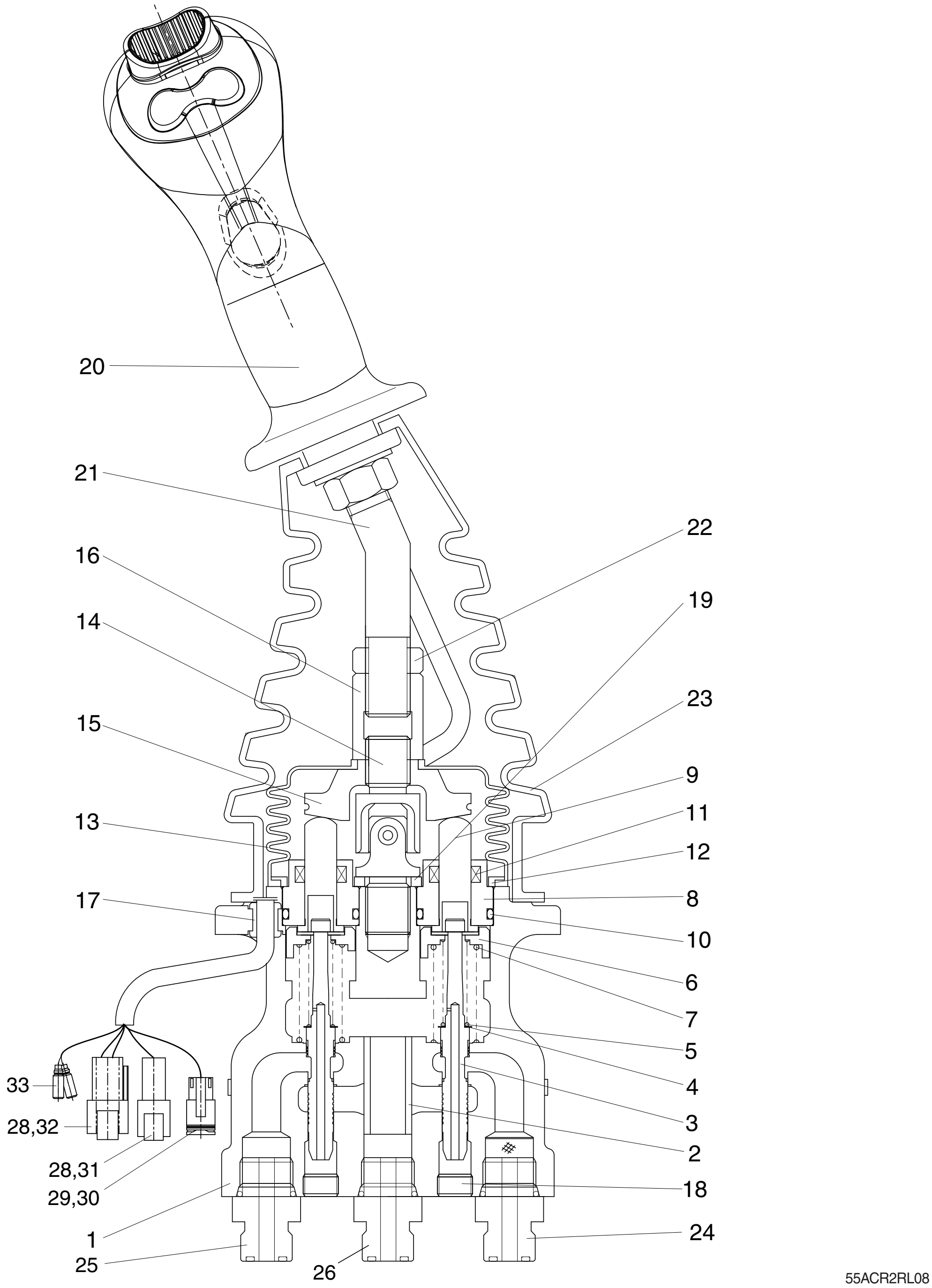
(14) Fit the handle assembly into the valve.

(15) Spray anti-corrosion preparation into each port and insert blind plugs.


17Z9A7RCV29

DISASSEMBLY AND ASSEMBLY (DANFOSS, Type 3)

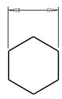
1) STRUCTURE



1	Case	12	Plate	23	Boots
2	Bushing	13	Inner boot	24	Last guard filter
3	Spool	14	Joint assembly	25	Connector
4	Shim	15	Swash plate	26	Connector
5	Spring	16	Adjusting nut	28	Connector pin-male
6	Spring seat	17	Bushing	29	Connector pin-female
7	Spring	18	Plug	30	Connector assy
8	Plug	19	Spacer	31	Connector assy
9	Push rod	20	Handle assembly	32	Connector assy
10	O-ring	21	Handle bar	33	Connector
11	Rod seal	22	Nut		

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
(L) Hexagonal wrench	10	
Spanner	22	
	27	
(+) Driver	Length 150	
(-) Driver	Width 4~5	
Torque wrench	Capable of tightening with the specified torques	

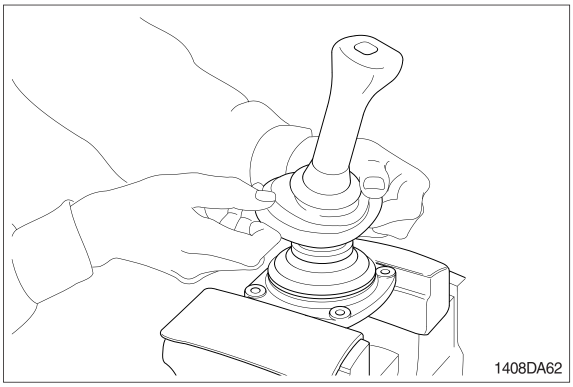
3) DISASSEMBLY

(1) Clean pilot valve with kerosene.

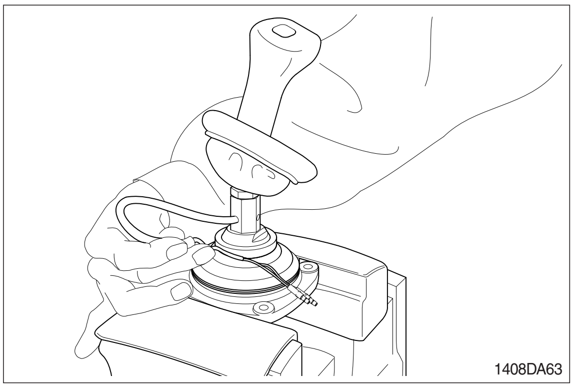
※ Put blind plugs into all ports.

(2) Fix pilot valve in a vise with copper (or lead) sheets.

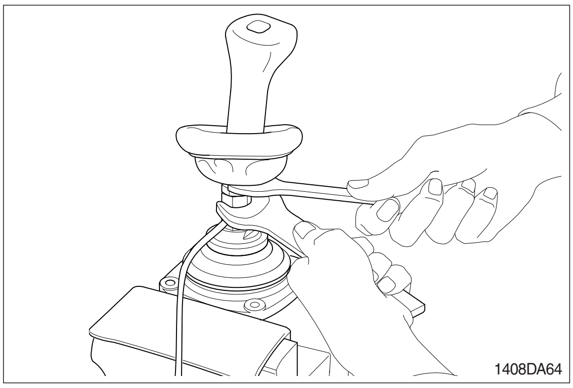
(3) Remove end of boot (23) from case (1) and take it out upwards.



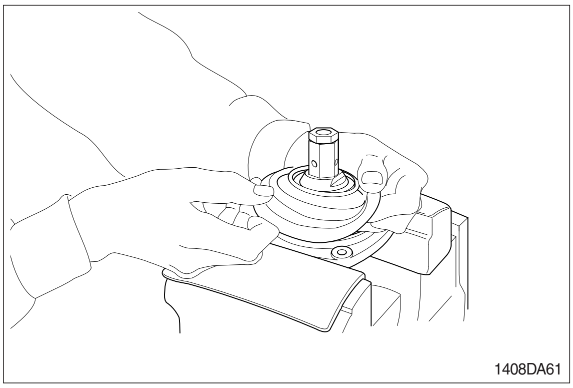
※ For valve with switch, remove cord also through hole of casing.



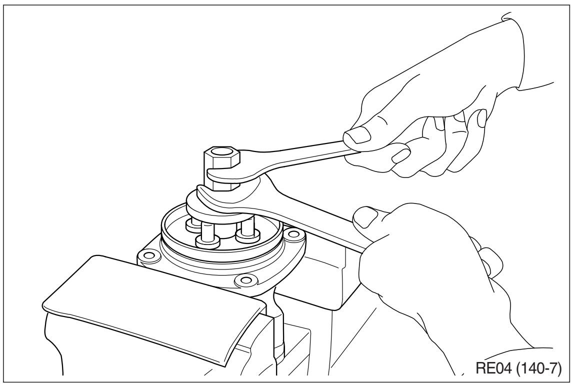
(4) Loosen lock nut (22) and adjusting nut (16) with spanners on them respectively, and take out handle section as one body.



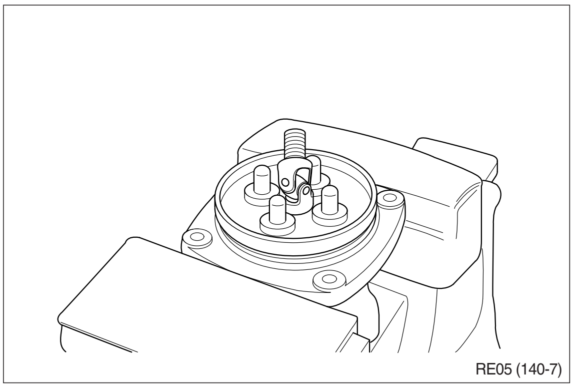
(5) Remove the boot (23).



(6) Loosen adjusting nut (16) and plate (12) with spanners on them respectively, and remove them.



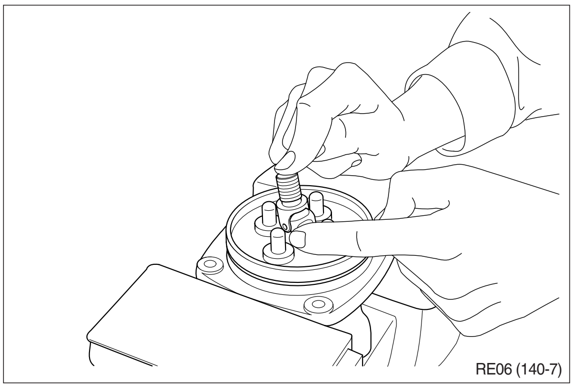
RE04 (140-7)



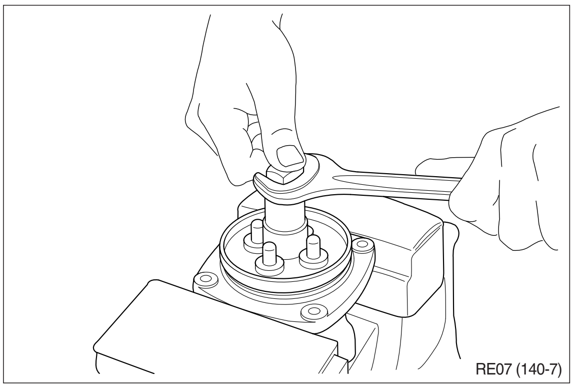
RE05 (140-7)

(7) Turn joint anticlockwise to loosen it, utilizing jig (special tool).

※ When return spring (7) is strong in force, plate (12), plug (8) and push rod (9) will come up on loosening joint.
Pay attention to this.

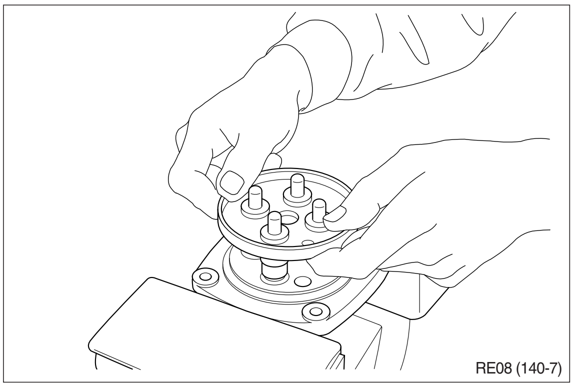


RE06 (140-7)



RE07 (140-7)

(8) Remove plate (12).

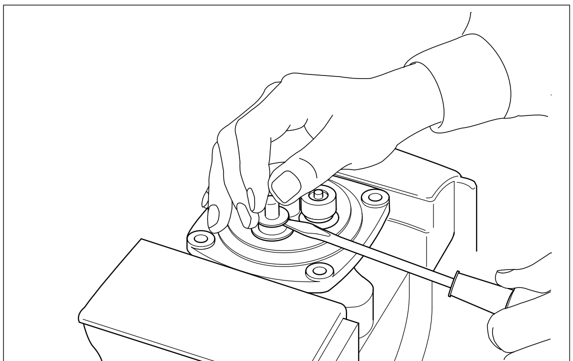


RE08 (140-7)

(9) When return spring (7) is weak in force, plug (8) stays in casing because of sliding resistance of O-ring.

※ Take it out with minus screwdriver. Take it out, utilizing external periphery groove of plug and paying attention not to damage it by partial loading.

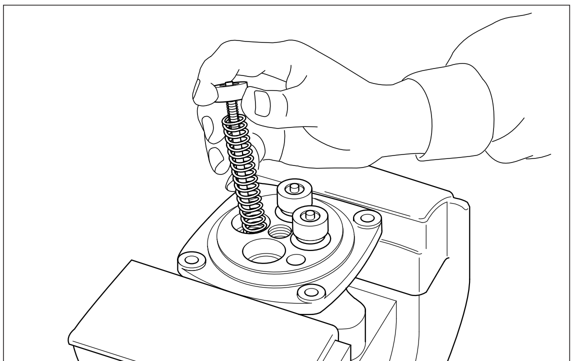
※ During taking out, plug may jump up due to return spring (7) force. Pay attention to this.



RE09 (140-7)

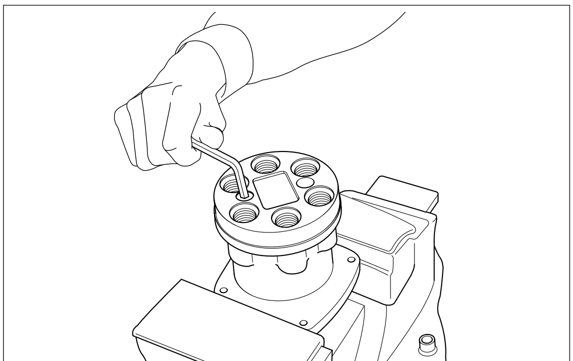
(10) Remove reducing valve subassembly and return spring (7) out of casing.

※ Record relative position of reducing valve subassembly and return springs.



RE10 (140-7)

(11) Loosen hexagon socket head plug (18) with hexagon socket screw key.



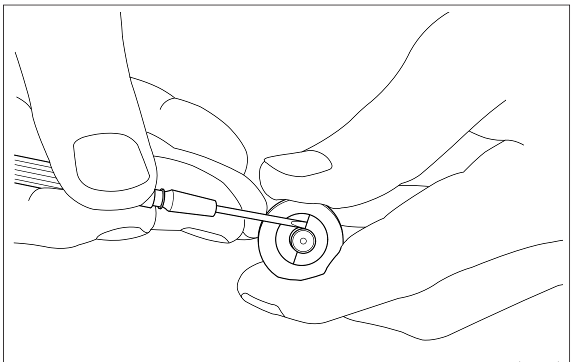
RE11 (140-7)

(12) For disassembling reducing valve section, stand it vertically with spool (3) bottom placed on flat workbench. Push down spring seat (6).

※ Pay attention not to damage spool surface.

※ Record original position of spring seat (6).

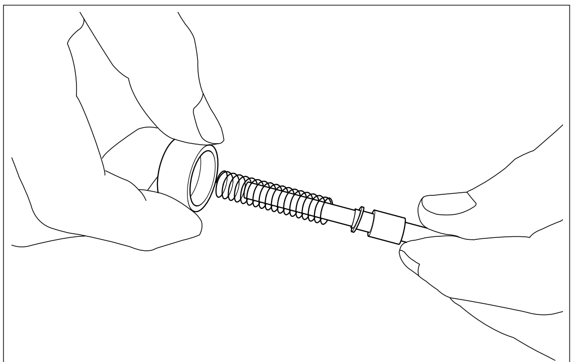
※ Do not push down spring seat more than 6 mm.



RE14 (140-7)

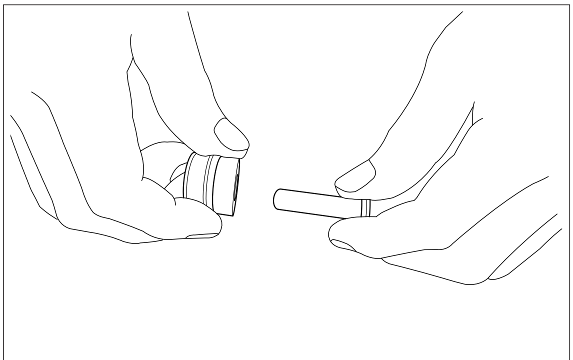
(13) Separate spool (3), spring seat (6), spring (5) and shim (4) individually.

※ Until being assembled, they should be handled as one subassembly group.



RE15 (140-7)

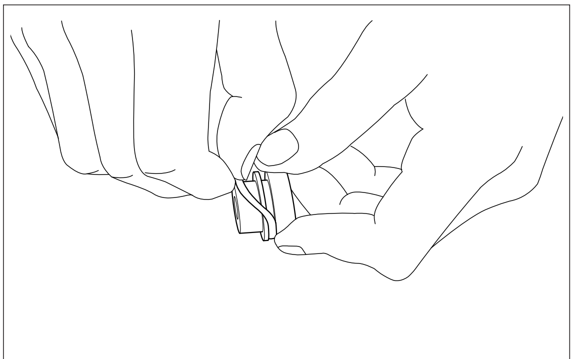
(14) Take push rod (9) out of plug (8).



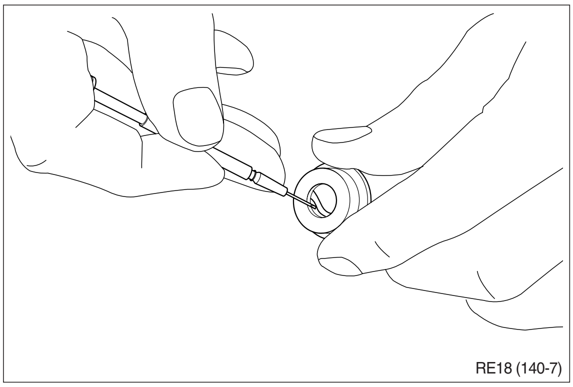
RE16 (140-7)

(15) Remove O-ring (10) and seal (11) from plug (8).

Use small minus screwdriver or so on to remove this seal.

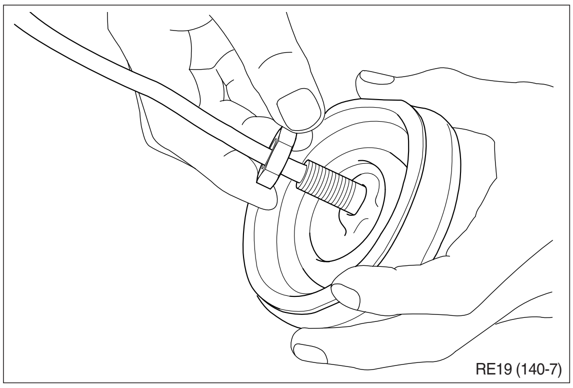


RE17 (140-7)

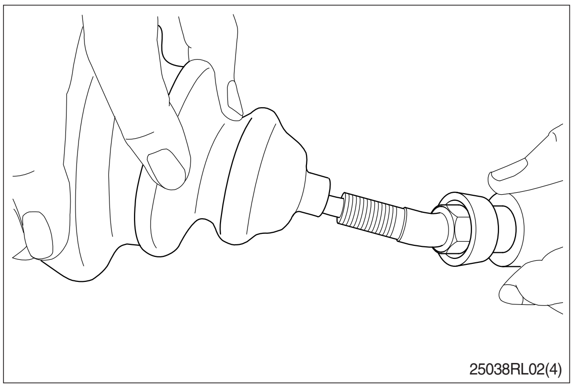


RE18 (140-7)

(16) Remove lock nut (22) and then boot (13).



RE19 (140-7)



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(17) Cleaning of parts

① Put all parts in rough cleaning vessel filled with kerosene and clean them (rough cleaning).

※ If dirty part is cleaned with kerosene just after putting it in vessel, it may be damaged. Leave it in kerosene for a while to loosen dust and dirty oil.

※ If this kerosene is polluted, parts will be damaged and functions of reassembled valve will be degraded.
Therefore, control cleanliness of kerosene fully.

② Put parts in final cleaning vessel filled with kerosene, turning it slowly to clean them even to their insides (finish cleaning).

※ Do not dry parts with compressed air, since they will be damaged and/or rusted by dust and moisture in air.

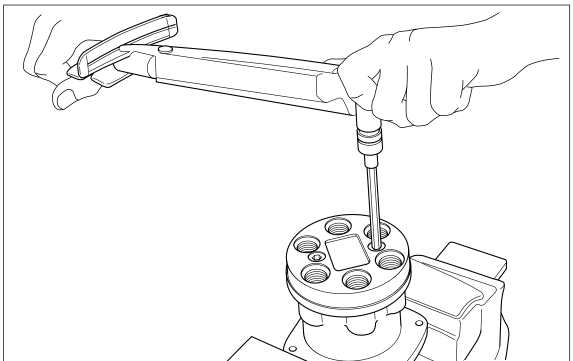
(18) Rust prevention of parts.
Apply rust-preventives to all parts.

※ If left as they after being cleaned, they will be rusted and will not display their functions fully after being reassembled.

4) ASSEMBLY

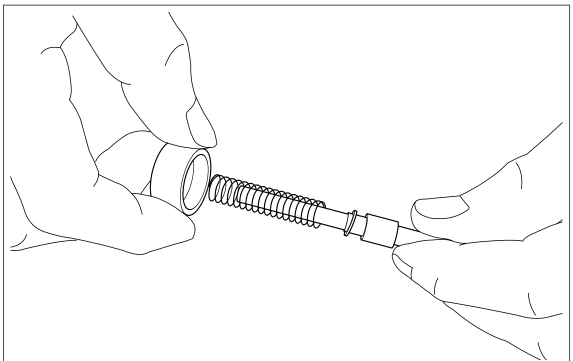
(1) Tighten hexagon socket head plug (18) to the specified torque.

※ Tighten two bolts alternately and slowly.



RE29 (140-7)

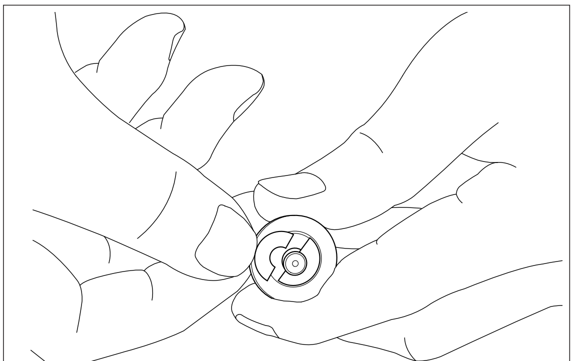
(2) Put shim (4), springs (5) and spring seat (6) onto spool (3) in this order.



RE30 (140-7)

(3) Stand spool vertically with its bottom placed on flat workbench, and with spring seat pushed down.

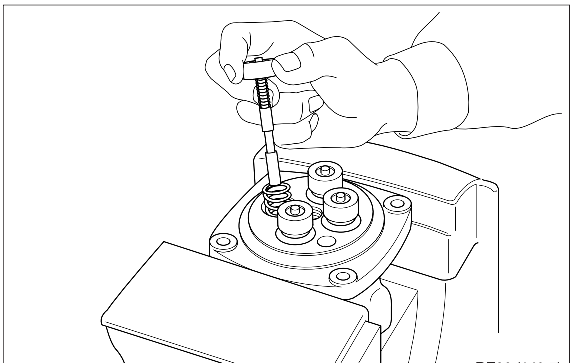
※ Do not push down spring seat more than 6 mm.



RE31 (140-7)

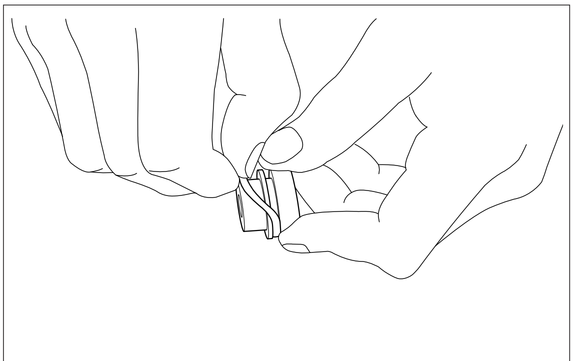
(4) Assemble spring (5) into casing.
Assemble reducing valve subassembly into casing.

※ Assemble them to their original positions.



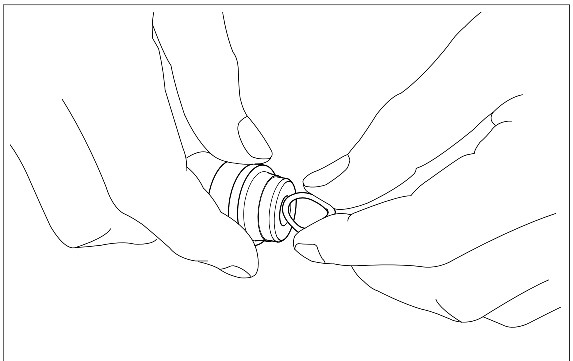
RE32 (140-7)

(5) Assemble O-ring (10) onto plug (8).



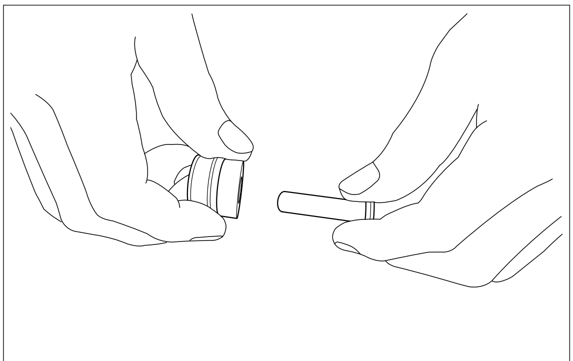
RE33 (140-7)

(6) Assemble seal (11) to plug (8).
※ Assemble seal in such lip direction as shown below.



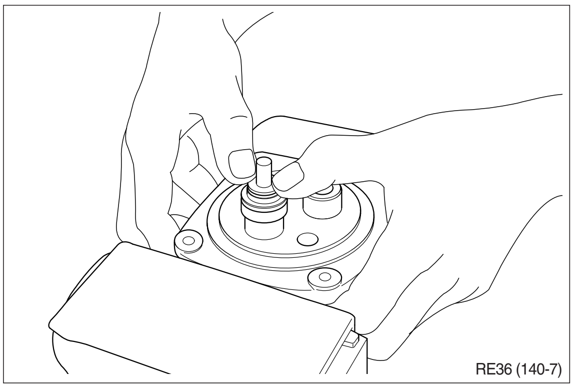
RE34 (140-7)

(7) Assemble push rod (9) to plug (8).
※ Apply working oil on push-rod surface.



RE35 (140-7)

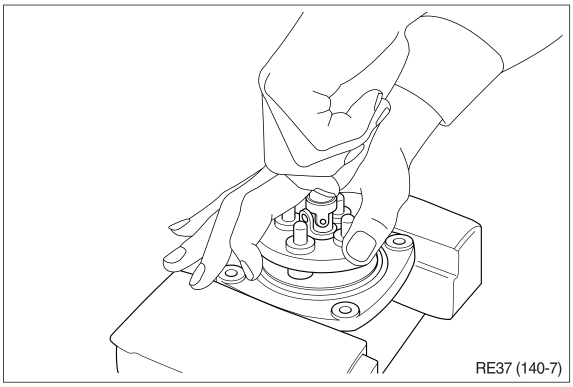
(8) Assemble plug subassembly to casing.
※ When return spring is weak in force, subassembly stops due to resistance of O-ring.



RE36 (140-7)

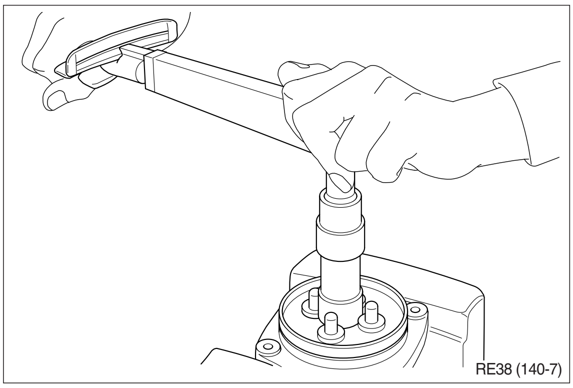
(9) When return spring is strong in force, assemble 4 sets at the same time, utilizing plate (12), and tighten joint (14) temporarily.

(10) Fit plate (12).



RE37 (140-7)

(11) Tighten joint (14) with the specified torque to casing, utilizing jig.

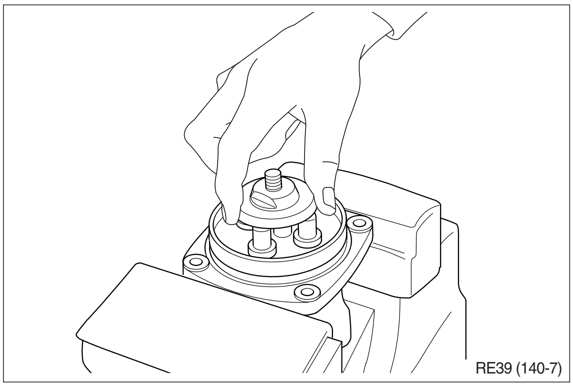


RE38 (140-7)

(12) Assemble plate (15) to joint (14).

※ Screw it to position that it contacts with 4 push rods evenly.

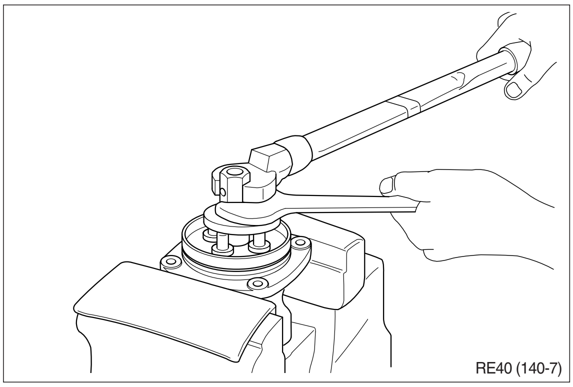
※ Do not screw it over.



RE39 (140-7)

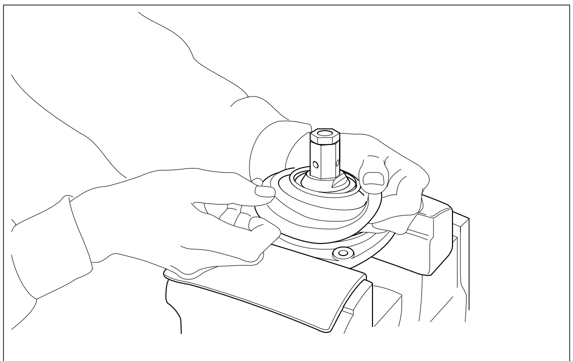
(13) Assemble adjusting nut (16), apply spanner to width across flat of plate (15) to fix it, and tighten adjusting nut to the specified torque.

※ During tightening, do not change position of disk.



RE40 (140-7)

(14) Fit boot (23) to plate.



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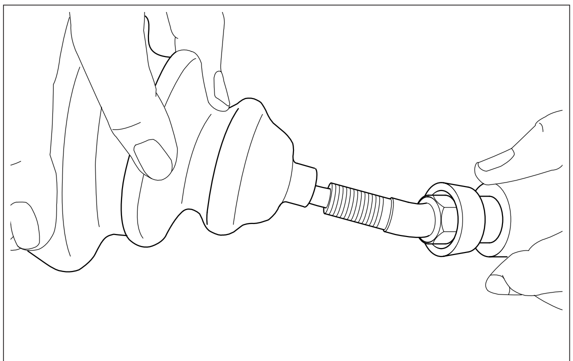
(15) Fit boot (13) and lock nut (22), and handle subassembly is assembled completely.



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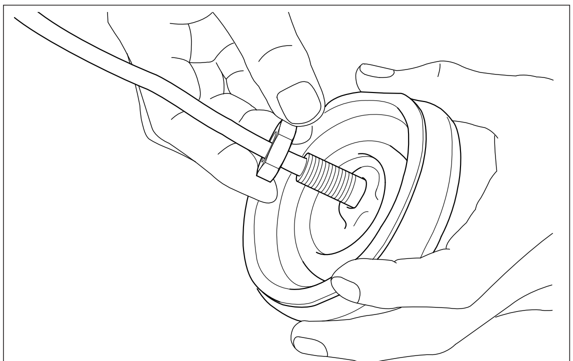
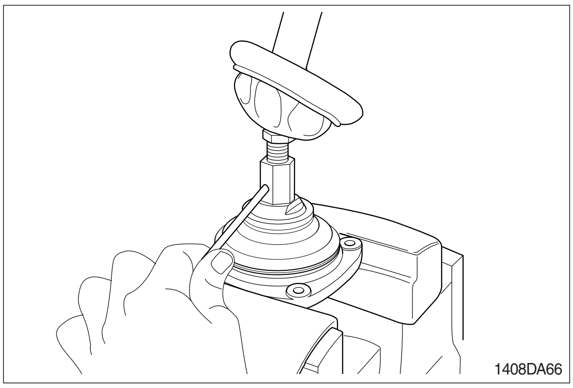


RE48 (140-7)

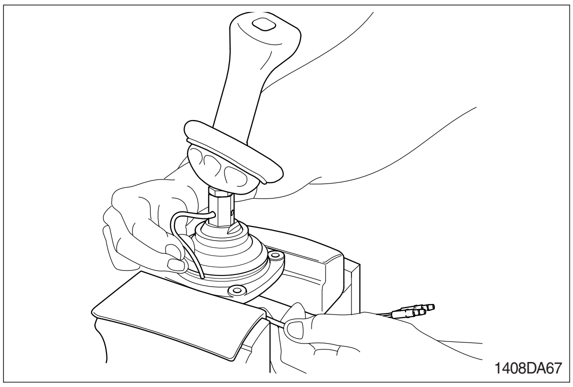
(16) Pull out cord and tube through adjusting nut hole provided in direction 60° to 120° from casing hole.



1408DA66

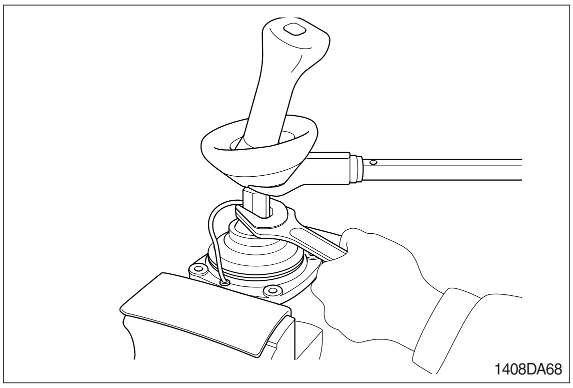
(17) Assemble bushing (17) to plate and pass cord and tube through it.

※ Provide margin necessary to operation.



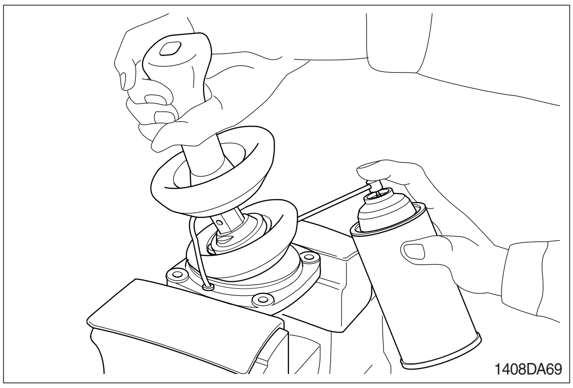
1408DA67

(18) Determine handle direction, tighten lock nut (22) to specified torque to fix handle.



1408DA68

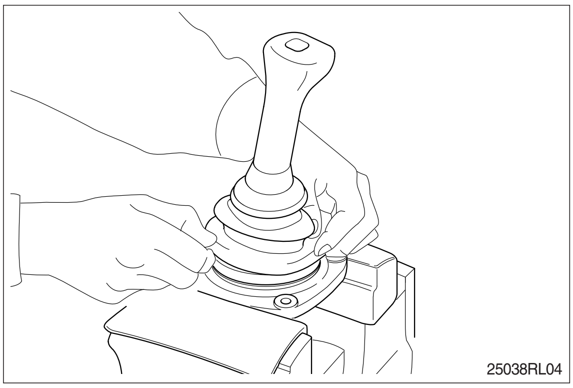
(19) Apply grease to rotating section of joint and contacting faces of disk and push rod.



1408DA69

(20) Assemble lower end of bellows to casing.

(21) Inject volatile rust-preventives through all ports and then put blind plugs in ports.



25038RL04

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.

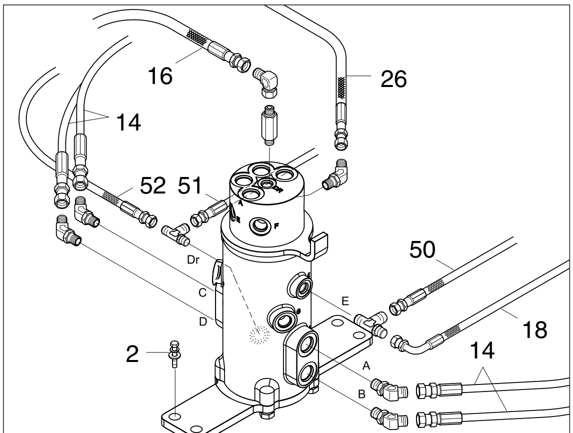
※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

13031GE18

(4) Disconnect all hoses (8, 9, 10, 11, 14, 16, 26, 50, 51, 52).

(5) Sling the turning joint assembly (1) and remove the mounting bolt (2).
- · Weight : 26 kg (57 lb)
- · Tightening torque : 6.9±1.4 kgf · m (49.9±10.1 lbf · ft)

Remove the turning joint assembly.



48AZ7TJ01

(6) When removing the turning joint, check
※ that all the hoses have been disconnected.

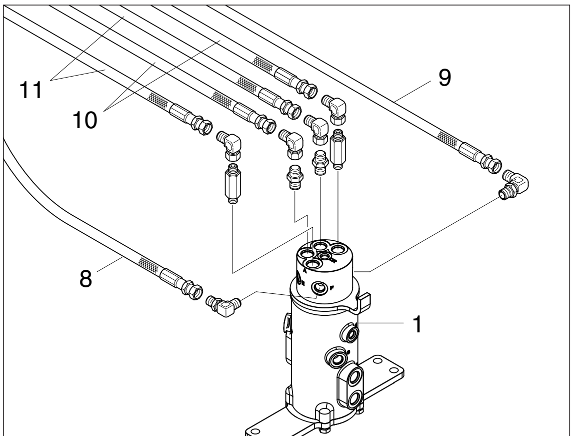
2) INSTALL

(1) Carry out installation in the reverse order to removal.

※ Take care of turning joint direction.

※ Assemble hoses to their original positions.

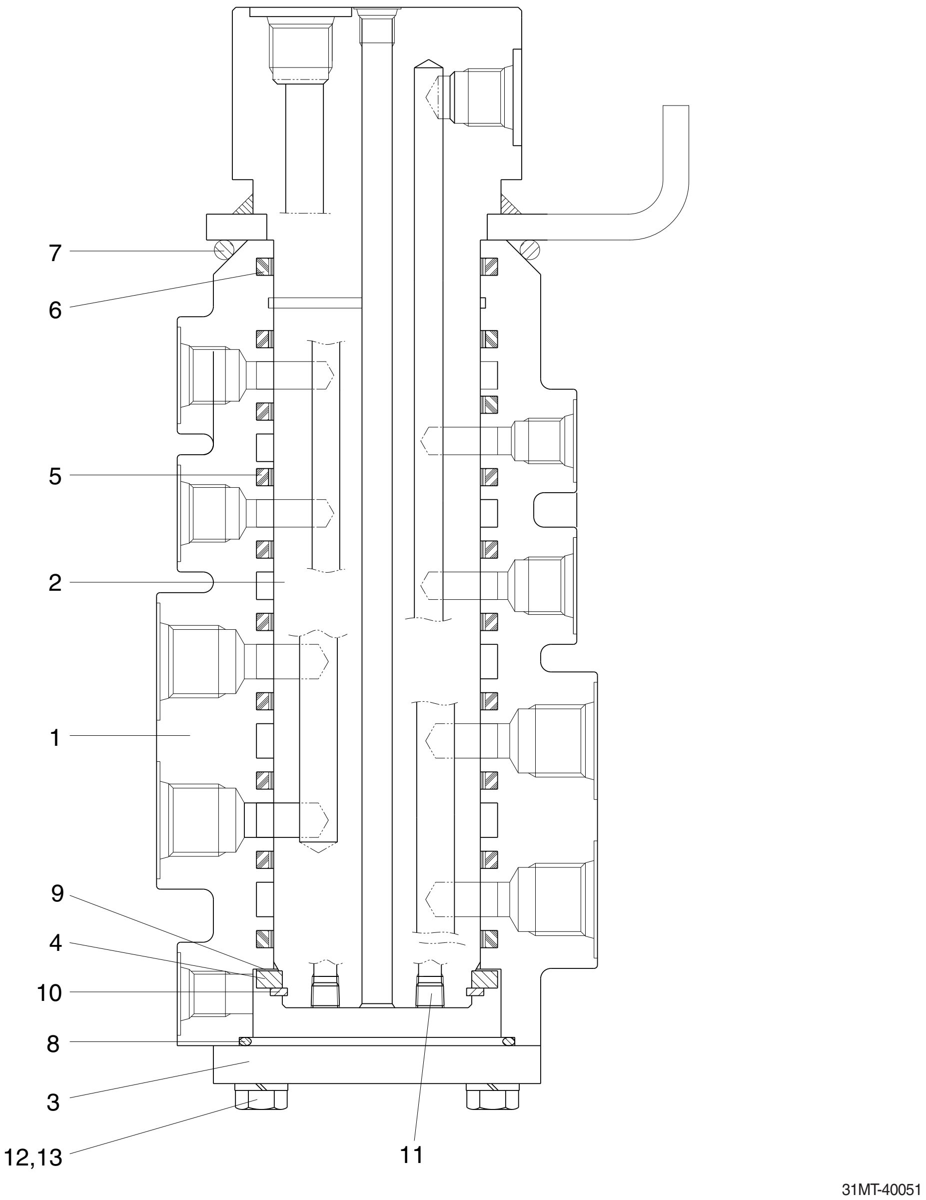
※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.



48AZ7TJ02

2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

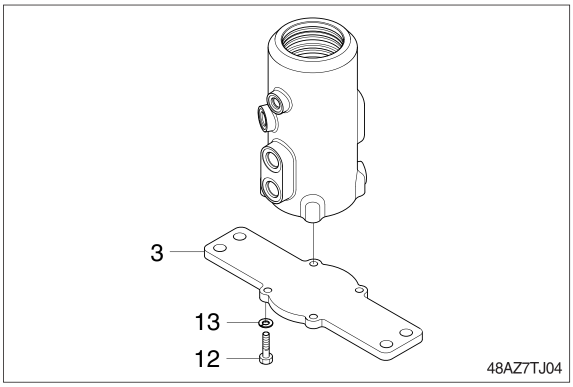


1	Hub	6	O-ring	11	Plug
2	Shaft	7	O-ring	12	Hexagon bolt
3	Cover	8	O-ring	13	Spring washer
4	Ring	9	Shim		
5	Slipper seal	10	Retainer ring		

2) DISASSEMBLY

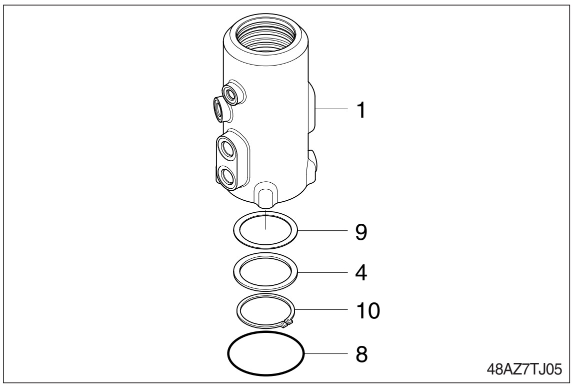
※ Before the disassembly, clean the turning joint.

(1) Remove bolts (12), washer (13) and cover (3).



(2) Remove O-ring (8).

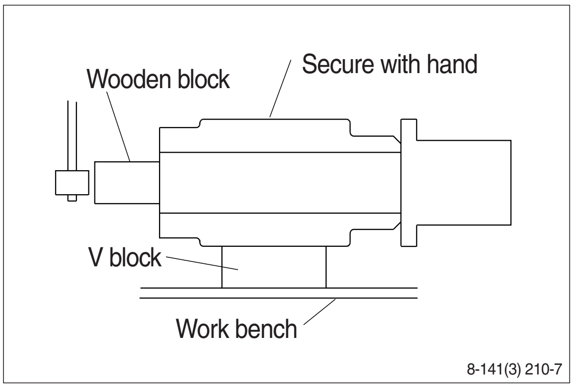
(3) Remove retainer ring (10), ring (4) and shim (9).



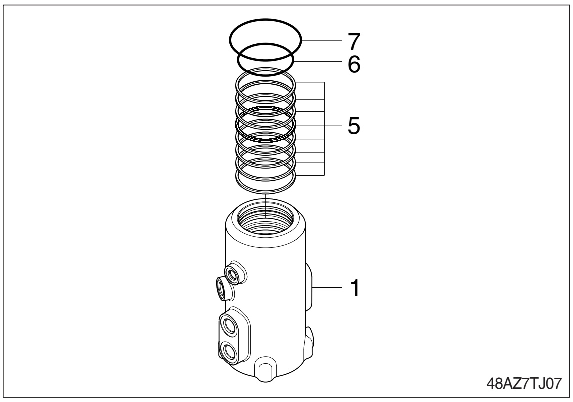
(4) Place hub (1) on a V-block and by using a wood buffer at the shaft end, hit out shaft (2) to about 1/2 from the body with a hammer.

※ Take care not to damage the shaft (2) when remove hub (1) or rest it sideway.

※ Put a fitting mark on hub (1) and shaft (2).



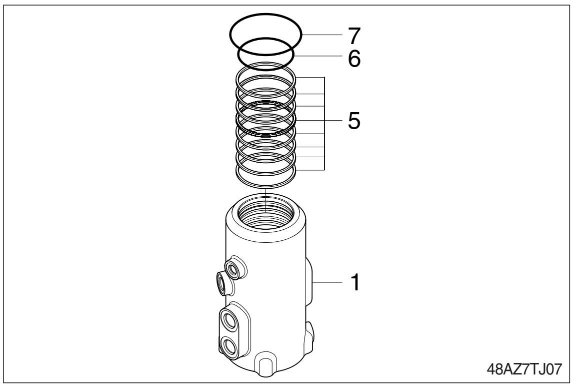
(5) Remove eight slipper seals (5) and O-ring (6, 7) from hub (1).



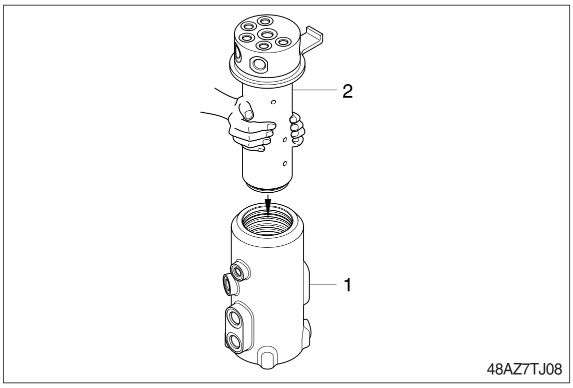
3) ASSEMBLY

※ Clean all parts.
※ As a general rule, replace oil seals and O-ring.
※ Coat the sliding surfaces of all parts with engine oil or grease before installing.

(1) Fix eight slipper seal (5) and O-ring (6, 7) to hub (1).

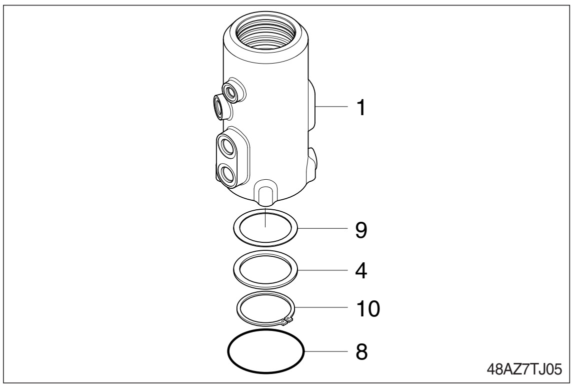


(2) Set hub (1) on block, install shaft (2) into hub (1) by hand.



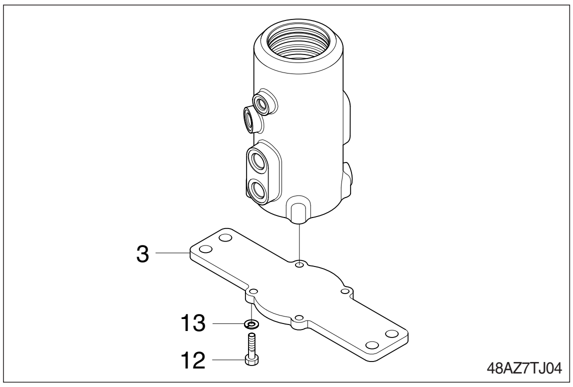
(3) Fit ring (4), shim (9) and retainer ring (10) to shaft (2).

(4) Fit O-ring (8) to hub (1).



(5) Install cover (3) to hub and tighten bolts (12).

· Tightening torque : 5~6 kgf·m (36.2~43.4 lbf·ft)



GROUP 9 BOOM, ARM AND BUCKET CYLINDERS

1. REMOVAL AND INSTALL

1) BUCKET CYLINDER

(1) Removal

※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.

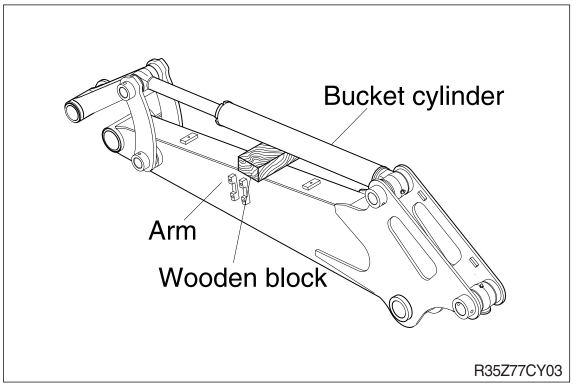
※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

13031GE18

⚠ Loosen the breather slowly to release the pressure inside the hydraulic tank. Escaping fluid under pressure can penetrate the skin causing serious injury.

※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Set block between bucket cylinder and arm.

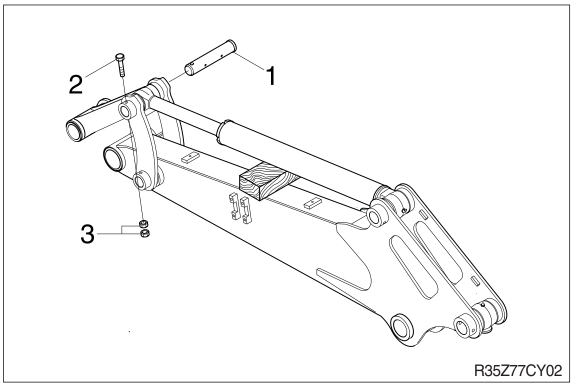


R35Z77CY03

② Remove bolt (2), nut (3) and pull out pin (1).

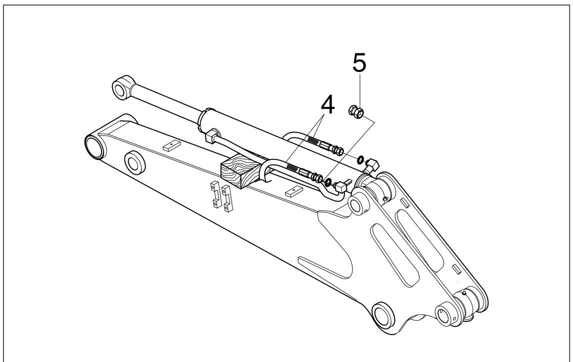
· Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)

※ Tie the rod with wire to prevent it from coming out.



R35Z77CY02

③ Disconnect bucket cylinder hoses (4) and put plugs (5) on cylinder pipe.



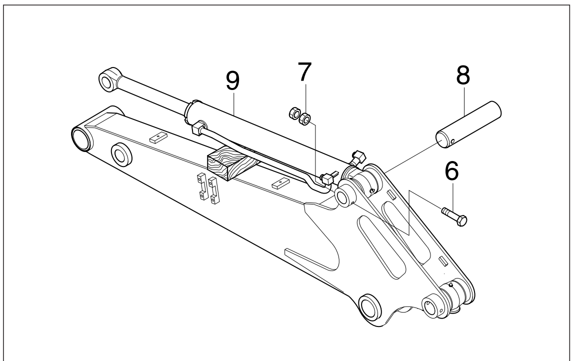
R35Z77CY04

④ Sling bucket cylinder assembly (9) and remove bolt (6) and nut (7) then pull out pin (8).

· Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)

⑤ Remove bucket cylinder assembly (9).

· Weight : 32 kg (71 lb)



R35Z77CY05

(2) Install

① Carry out installation in the reverse order to removal.

⚠ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.

※ Bleed the air from the bucket cylinder.

※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2) ARM CYLINDER

(1) Removal

※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.

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

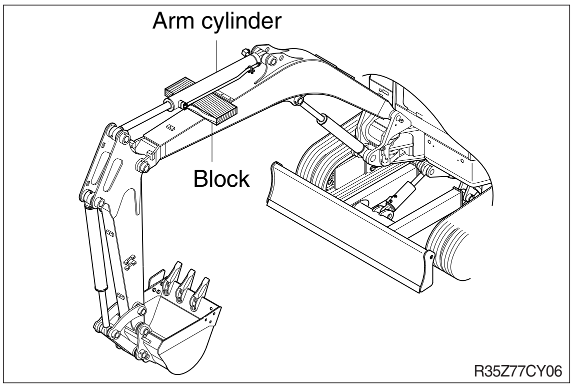
13031GE18

⚠ **Loosen the breather slowly to release the pressure inside the hydraulic tank.**

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

※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Set block between arm cylinder and boom.

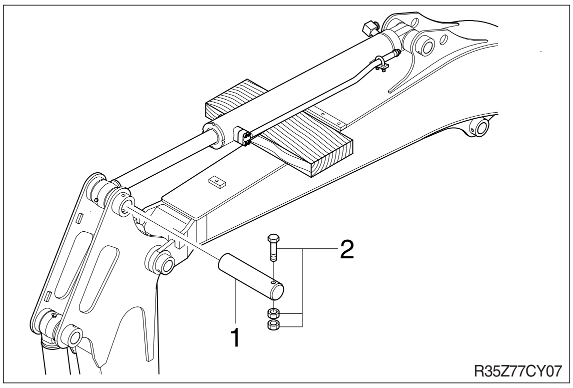


R35Z77CY06

② Remove bolt and nut (2) and pull out pin (1).

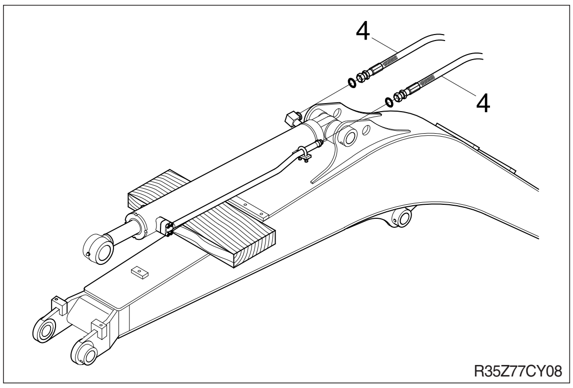
· Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)

※ Tie the rod with wire to prevent it from coming out.



R35Z77CY07

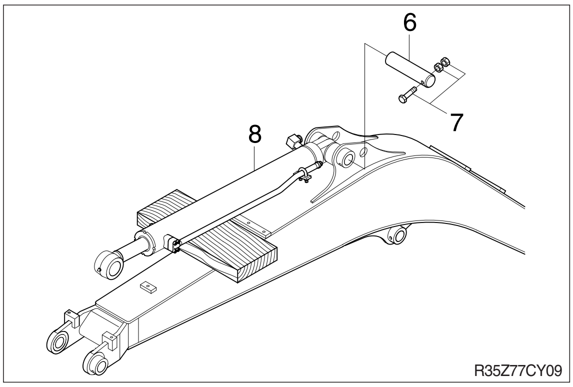
③ Disconnect arm cylinder hoses (4) and put plugs on cylinder pipe.



R35Z77CY08

⑤ Sling arm assembly (8) and remove bolt and nut (7) then pull out pin (6).
  · Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)

⑥ Remove arm cylinder assembly (8).
  · Weight : 43 kg (95 lb)



(2) Install

① Carry out installation in the reverse order to removal.

⚠ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.

※ Bleed the air from the arm cylinder.

※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

3) BOOM CYLINDER

(1) Removal

※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.

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

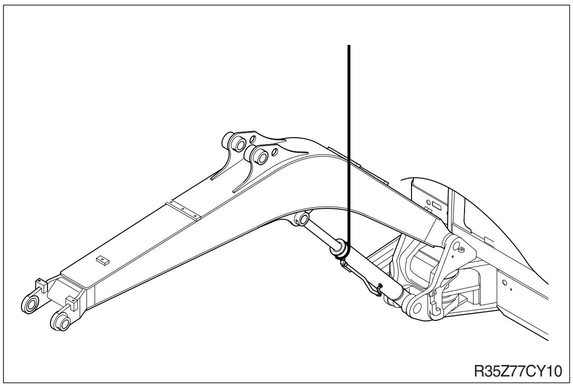
13031GE18

⚠ Loosen the breather slowly to release the pressure inside the hydraulic tank.

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

※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Sling boom cylinder assembly.

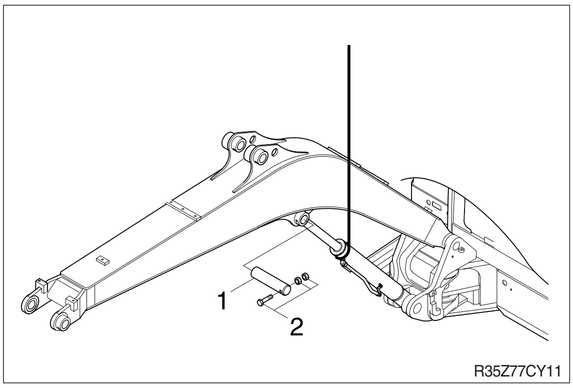


R35Z77CY10

③ Remove bolt and nut (2) and pull out pin (1).

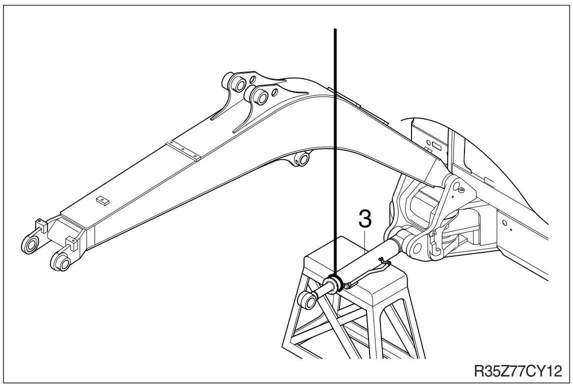
· Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)

※ Tie the rod with wire to prevent it from coming out.



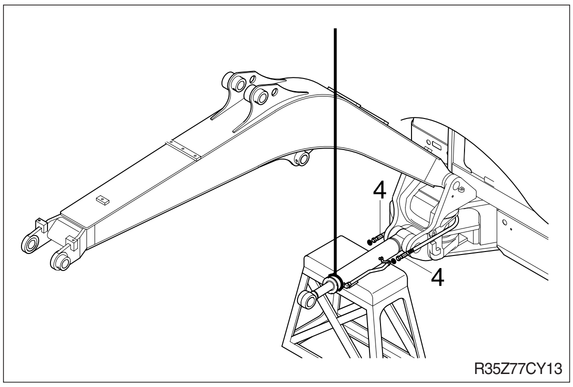
R35Z77CY11

④ Lower the boom cylinder assembly (3) on a stand.



R35Z77CY12

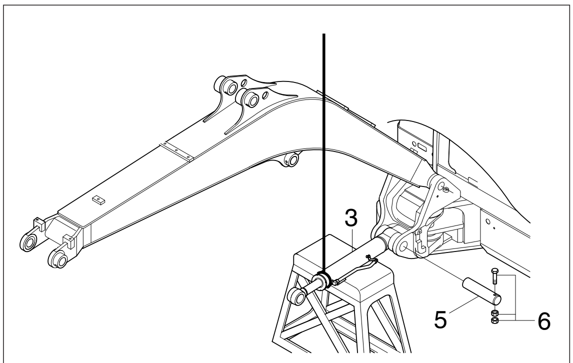
⑤ Disconnect boom cylinder hoses(4) and put plugs on cylinder pipe.



R35Z77CY13

⑥ Remove bolt (6) and pull out pin (5).
  · Tightening torque : 6.9±1.4 kgf·m (49.9±10.1 lbf·ft)

⑦ Remove boom cylinder assembly (3).
  · Weight : 49 kg (108 lb)



R35Z77CY14

(2) Install

① Carry out installation in the reverse order to removal.

⚠ **When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**

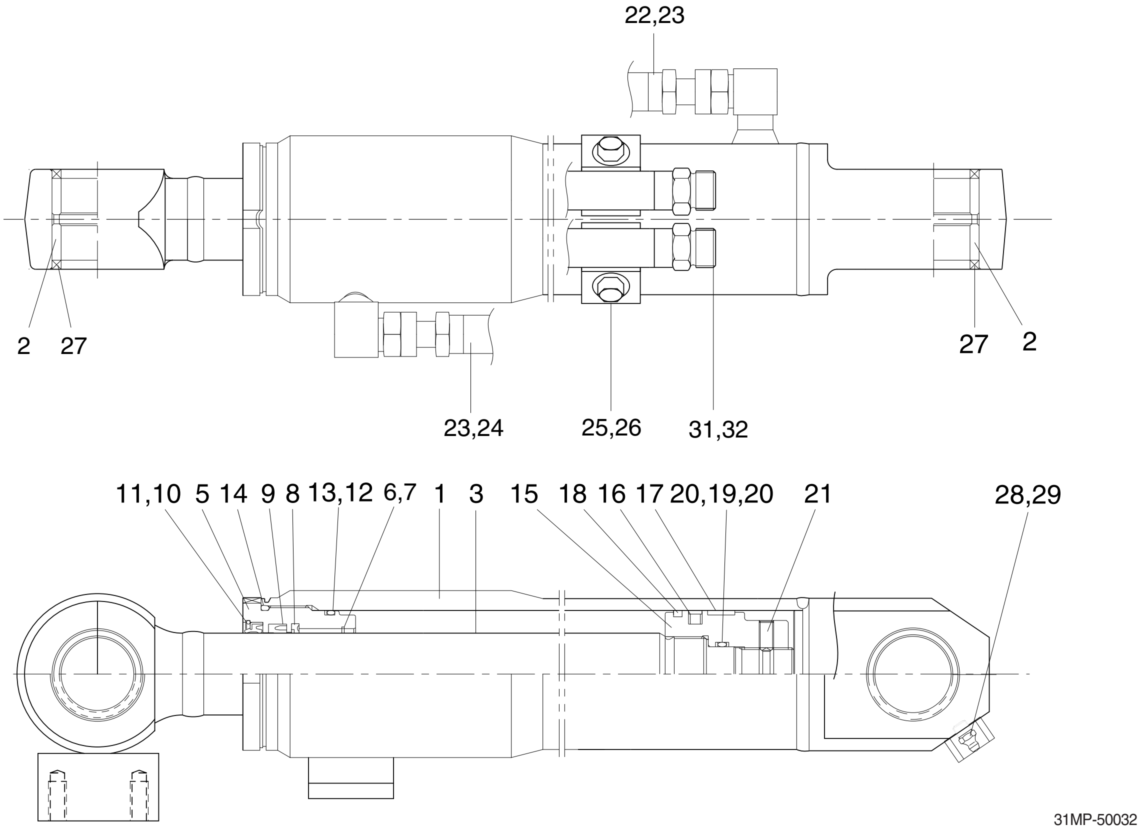
※ Bleed the air from the boom cylinder.

※ Conformed the hydraulic oil level and check the hydraulic oil leak or not.

2. DISASSEMBLY AND ASSEMBLY

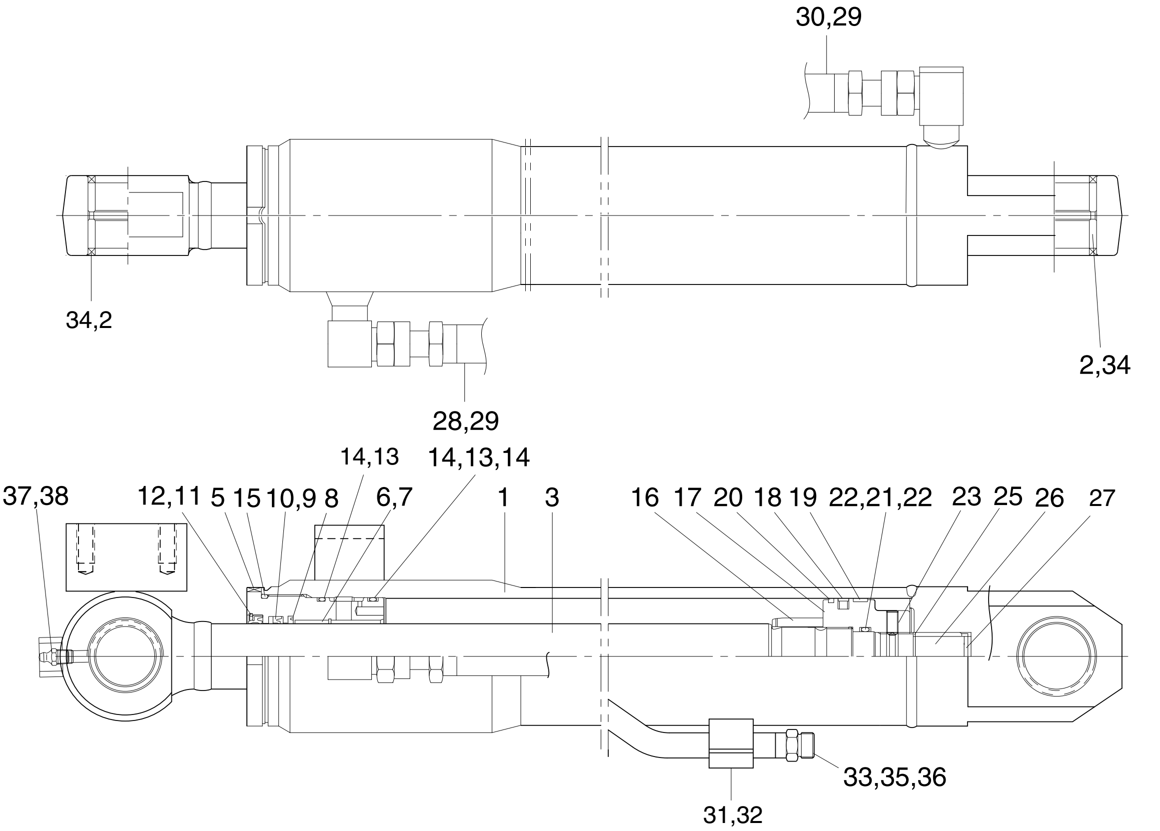
1) STRUCTURE

(1) Bucket cylinder



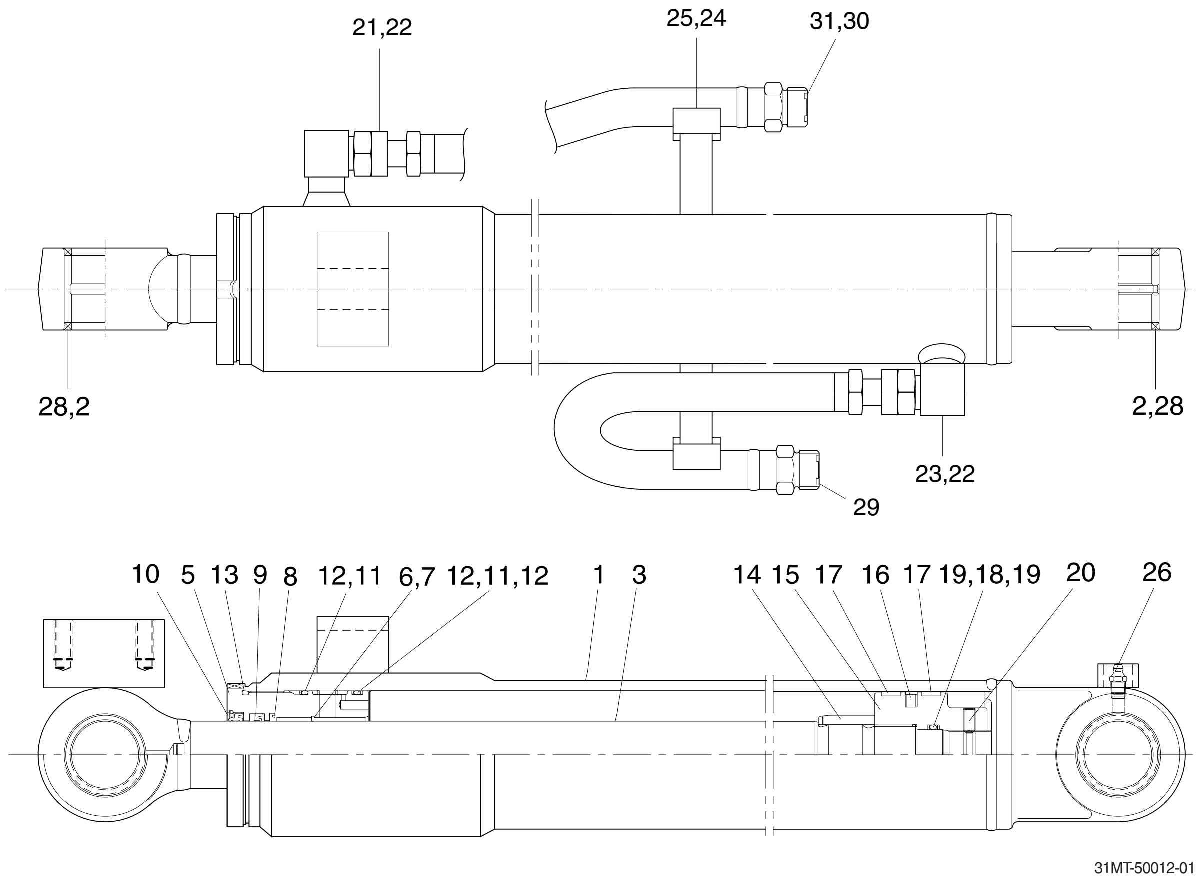
1	Tube assembly	13	Back up ring	24	Pipe assy
2	Pin bushing	14	O-ring	25	Hex bolt
3	Rod assembly	15	Piston	26	Washer
5	Rod cover	16	Piston seal	27	Pin wiper
6	Rod bushing	17	Wear ring	28	Grease nipple
7	Retainer ring	18	Dust ring	29	Cap
8	Buffer seal	19	O-ring	30	O-ring
9	U-packing	20	Back up ring	31	Dust cap
10	Dust wiper	21	Set screw	32	O-ring
11	Retaining ring	22	Pipe assy		
12	O-ring	23	O-ring		

(2) Arm cylinder



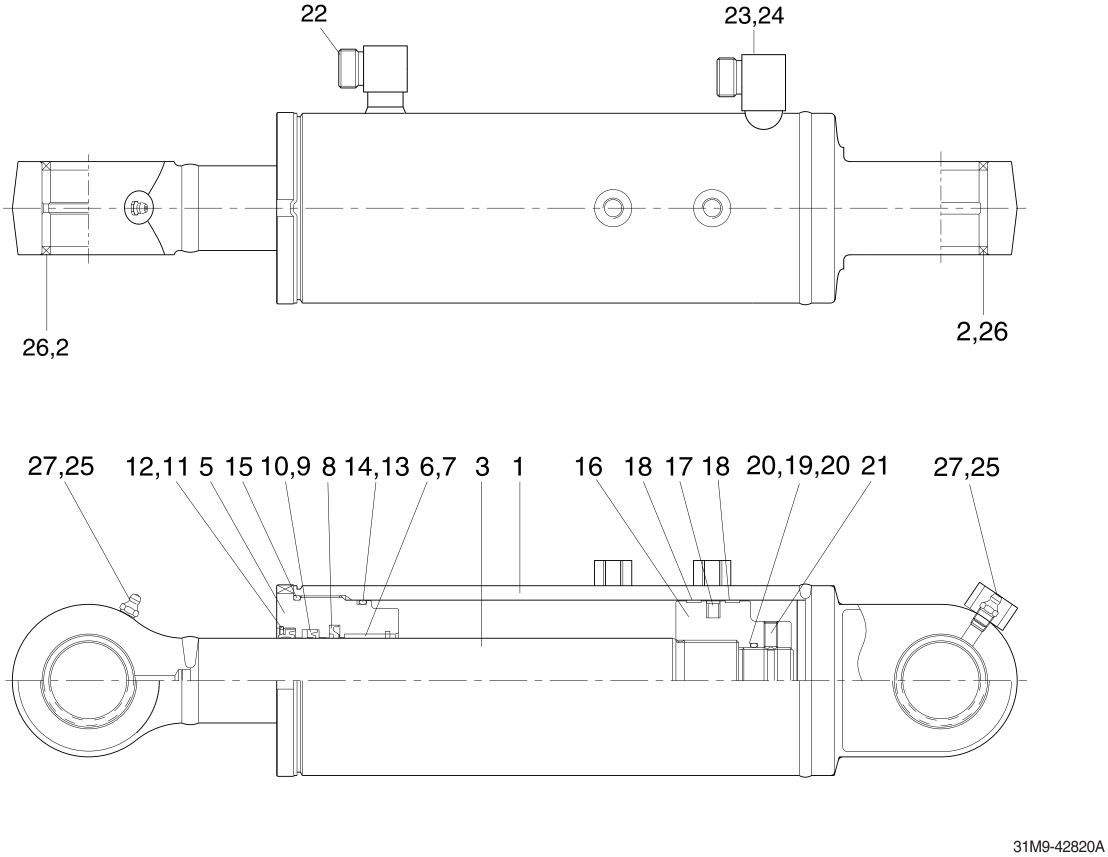
1	Tube assembly	14	Back up ring	27	Stop ring
2	Pin bushing	15	O-ring	28	Pipe assy
3	Rod assembly	16	Cushion ring	29	O-ring
5	Rod cover	17	Piston	30	Pipe assy
6	Rod bushing	18	Piston seal	31	Washer
7	Retainer ring	19	Wear ring	32	Hex bolt
8	Buffer seal	21	O-ring	33	O-ring
9	U-packing	22	Back up ring	34	Pin wiper
10	Back up ring	23	Set screw	36	O-ring
11	Dust wiper	24	Retainer ring	37	Grease nipple
12	Retaining ring	25	Cushion ring	38	Cap
13	O-ring	26	Retaining ring		

(3) Boom cylinder



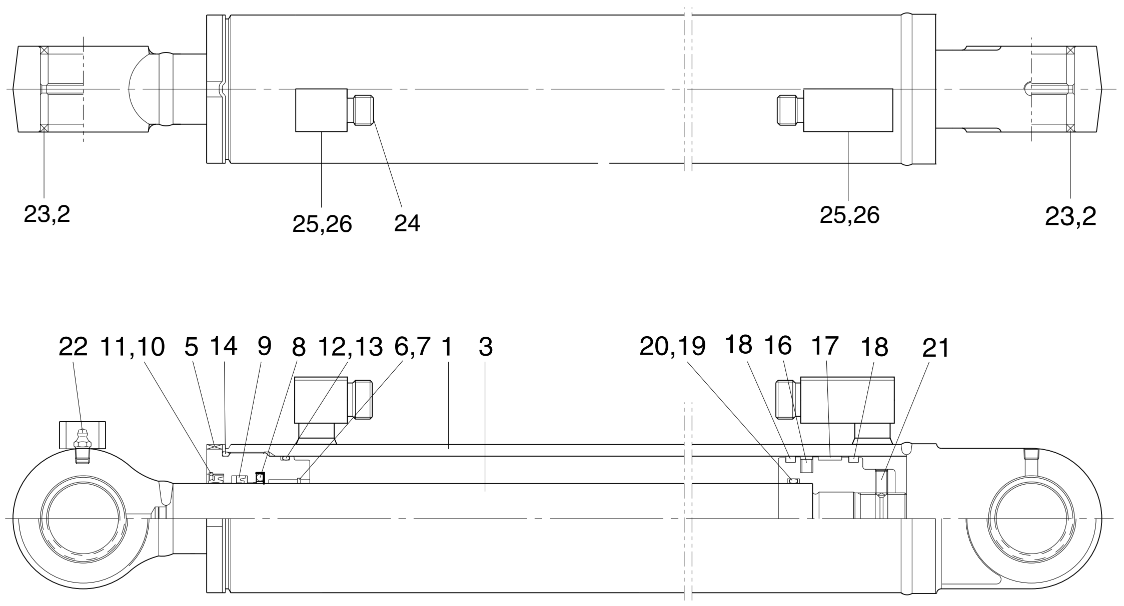
1	Tube assembly	12	Back up ring	22	O-ring
2	Pin bushing	13	O-ring	23	Pipe assy
3	Rod assembly	14	Cushion ring	24	Washer
5	Rod cover	15	Piston	25	Hex bolt
6	Rod bushing	16	Piston seal	26	Grease nipple
7	Retainer ring	17	Wear ring	27	Cap
8	Buffer seal	18	O-ring	28	Pin wiper
9	U-packing	19	Back up ring	29	O-ring
10	Dust wiper	20	Set screw	30	Dust cap
11	O-ring	21	Pipe assy	31	O-ring

(4) Dozer cylinder



1	Tube assembly	11	Dust wiper	20	Back up ring
2	Pin bushing	12	Retainer ring	21	Set screw
3	Rod assembly	13	O-ring	22	O-ring
5	Rod cover	14	Back up ring	23	Dust cap
6	Rod bushing	15	O-ring	24	O-ring
7	Retainer ring	16	Piston	25	Grease nipple
8	Buffer seal	17	Piston seal	26	Pin wiper
9	U-packing	18	Wear ring	27	Cap
10	Back up ring	19	O-ring		

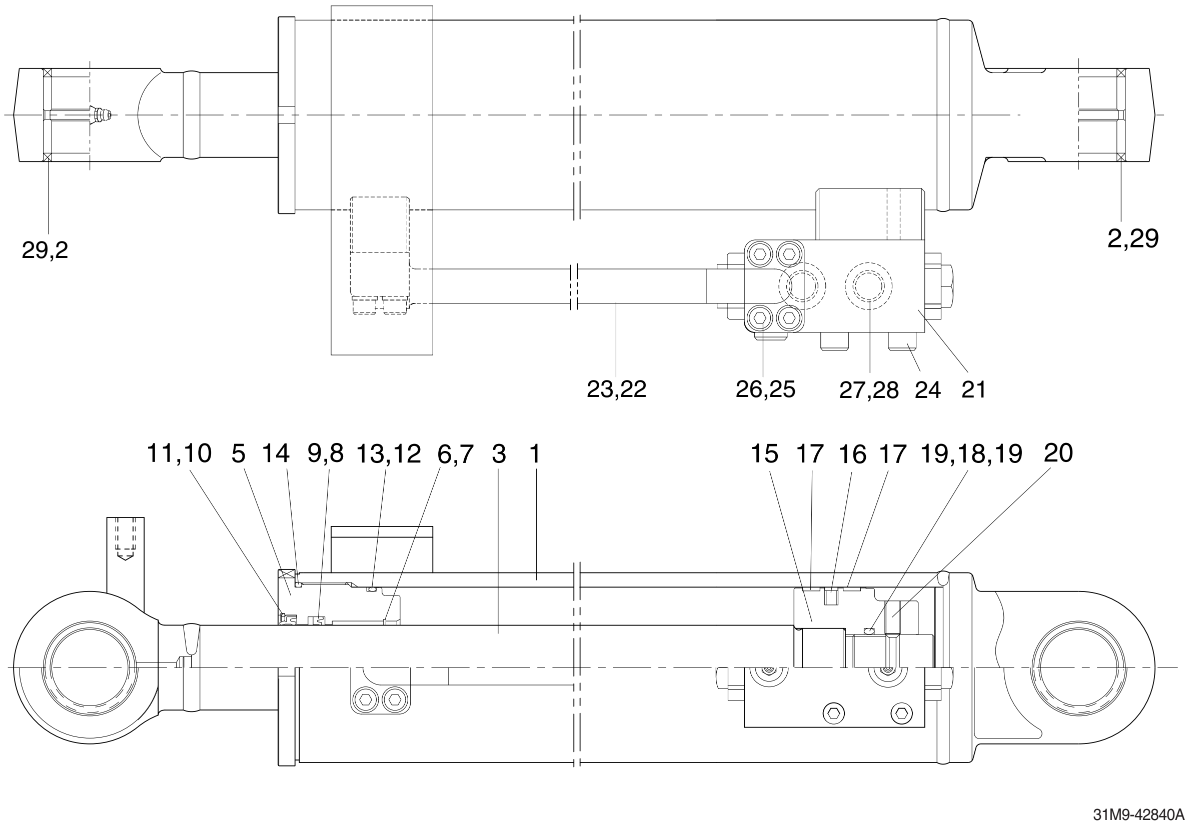
(5) Boom swing cylinder



31MT-11211

1	Tube assembly	11	Retainer ring	20	Back up ring
2	Dimple bushing	12	O-ring	21	Set screw
3	Rod assembly	13	Back up ring	22	Grease nipple
5	Rod cover	14	O-ring	23	Dust seal
6	Rod bushing	15	Piston	24	O-ring
7	Retainer ring	16	Piston seal	25	Dust cap
8	Buffer ring	17	Wear ring	26	O-ring
9	U-packing	18	Dust ring		
10	Wiper ring	19	O-ring		

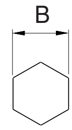
(6) Angle dozer cylinder



1	Tube assembly	12	O-ring	22	Pipe assy
2	Pin bushing	13	Back up ring	23	O-ring
3	Rod assembly	14	O-ring	24	Hex socket bolt
5	Rod cover	15	Piston	25	Spring washer
6	Rod bushing	16	Piston seal	26	Hex socket bolt
7	Retainer ring	17	Wear ring	27	O-ring
8	U-packing	18	O-ring	28	Dust cap
9	Back up ring	19	Back up ring	29	Pin wiper
10	Dust wiper	20	Set screw		
11	Retainer ring	21	Check valve		

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	4	
	5	
	6	
Spanner	22	
Hook spanner	Suitable size (80~120 mm)	
(-) Driver	Small and large sizes	
Torque wrench	Capable of tightening with the specified torques	

(2) Tightening torque

Part name		Item	Size	Torque	
				kgf · m	lbf · ft
Gland	Boom cylinder	5	M100	70±7.0	506±50.6
	Arm cylinder	5	M90	75±7.5	542±54.2
	Bucket cylinder	5	M85	75±7.5	542±54.2
	Dozer cylinder	5	M120	95±9.5	687±68.7
	Boom swing cylinder	5	M85	75±7.5	542±54.2
	Angle dozer cylinder	5	M100	70±7.0	506±50.6
Piston	Boom cylinder	15	M48	75±7.5	542±54.2
	Arm cylinder	17	M48	160±16	1157±116
	Bucket cylinder	15	M48	160±16	1157±116
	Dozer cylinder	16	M48	75±7.5	542±54.2
	Boom swing cylinder	15	M42	75±7.5	542±54.2
	Angle dozer cylinder	15	M42	75±7.5	542±54.2
Set screw	Boom cylinder	20	M8	1.5	10.8
	Arm cylinder	23	M8	1.5	10.8
	Bucket cylinder	21	M8	1.5	10.8
	Dozer cylinder	21	M12	4~5	28.9~36.2
	Boom swing cylinder	21	M8	1.5	10.8
	Angle dozer cylinder	20	M12	4~5	28.9~36.2
Hex socket bolt (check valve)	Angle dozer cylinder	24	M10	5.5~6.0	39.8~43.4

3) DISASSEMBLY

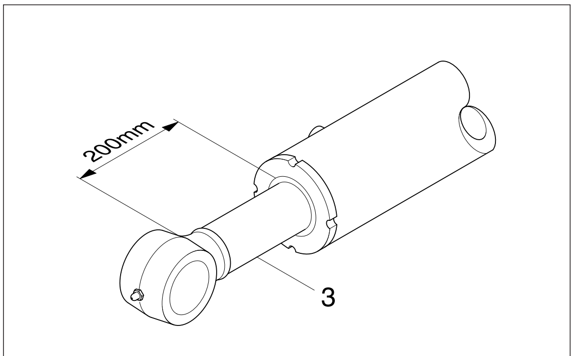
※ Procedures are based on the boom cylinder.

(1) Remove cylinder head and piston rod

① Hold the clevis section of the tube in a vise.

※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

② Pull out rod assembly (3) about 200 mm (7.1 in). Because the rod assembly is rather heavy, finish extending it with air pressure after the oil draining operation.



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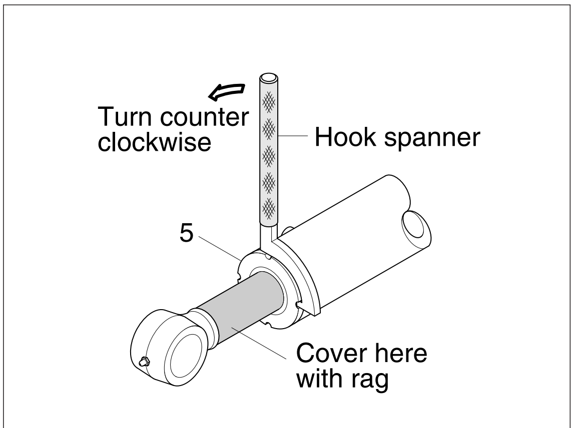
③ Loosen and remove the rod cover (5) by hook spanner.

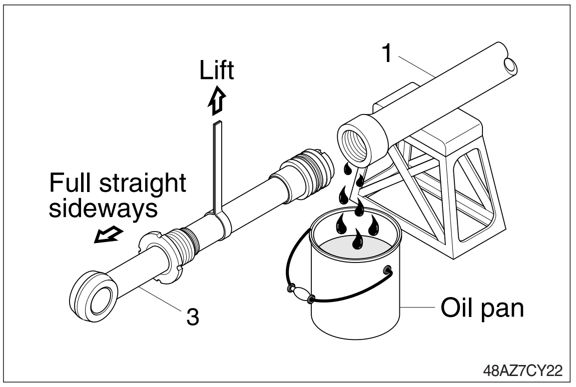
※ Cover the extracted rod assembly (3) with rag to prevent it from being accidentally damaged during operation.



48AZ7CY21

④ Draw out cylinder head and rod assembly together from tube assembly (1).

※ Since the rod assembly is heavy in this case, lift the tip of the rod assembly (3) with a crane or some means and draw it out. However, when rod assembly (3) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.

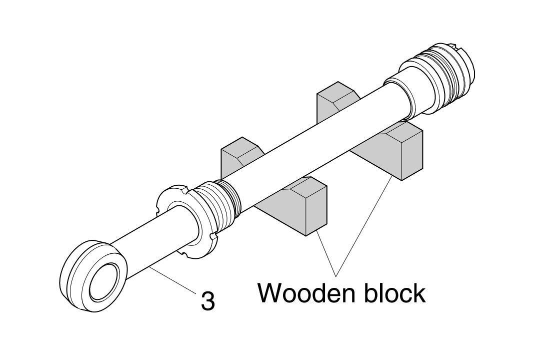


48AZ7CY22

Note that the plated surface of rod assembly (3) is to be lifted. For this reason, do not use a wire sling and others that may damage it, but use a strong cloth belt or a rope.

⑤ Place the removed rod assembly on a wooden V-block that is set level.

※ Cover a V-block with soft rag.

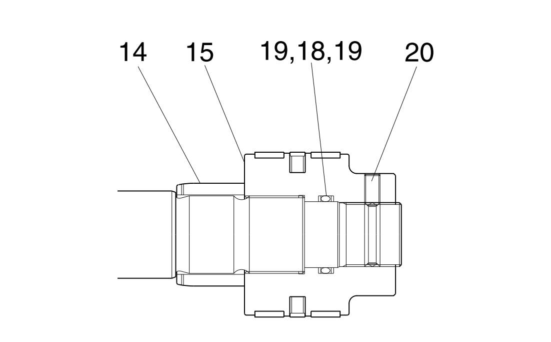


48AZ7CY23

(2) Remove piston and rod cover

① Remove set screw (20)

② Remove piston assembly (15), back up ring (19), O-ring (18) and cushion ring (14).



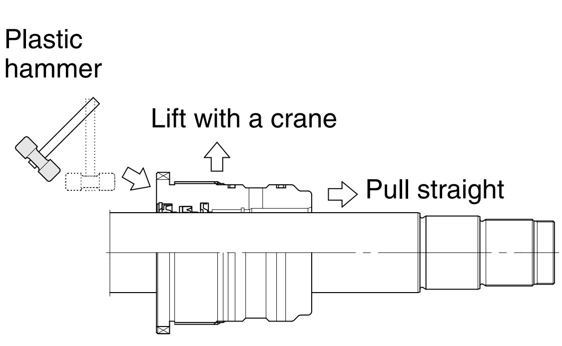
48AZ7CY24

③ Remove the rod cover assembly from rod assembly (3).

※ If it is too heavy to move, move it by striking the flanged part of rod cover with a plastic hammer.

※ Pull it straight with rod cover assembly lifted with a crane.

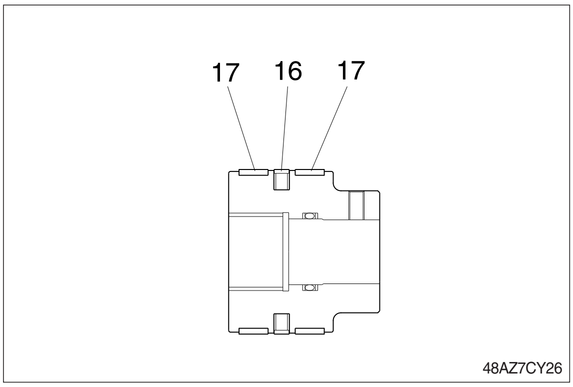
Exercise care so as not to damage the lip of rod bushing (6) and packing (8, 9, 10) by the threads of rod assembly (2).



48AZ7CY25

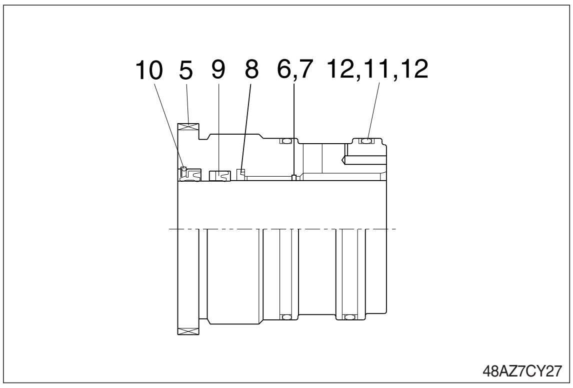
(3) Disassemble the piston assembly

① Remove wear ring (17).
② Remove piston seal (16).
※ Exercise care in this operation not to damage the grooves.



(4) Disassemble rod cover assembly

① Remove back up ring (12) and O-ring (11).
② Remove dust seal (10).
③ Remove U-packing (9).
④ Remove back up ring (7) and rod bushing (6).
※ Exercise care in this operation not to damage the grooves.
※ Do not remove seal and ring, if does not damaged.

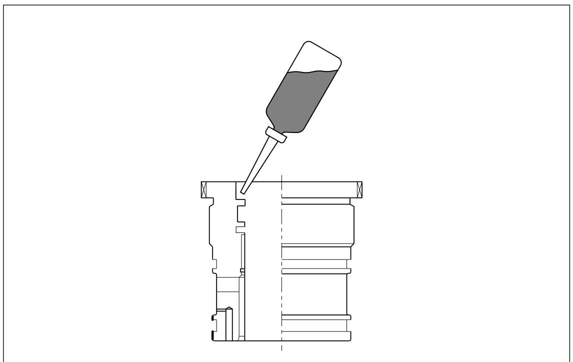


4) ASSEMBLY

(1) Assemble cylinder head assembly

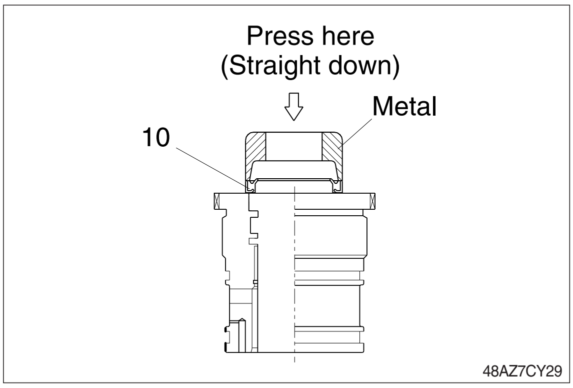
※ Check for scratches or rough surfaces if found smooth with an oil stone.

① Coat the inner face of rod cover (5) with hydraulic oil.



48AZ7CY28

② Coat dust seal (10) with grease and fit dust seal (10) to the bottom of the hole of dust seal.
At this time, press a pad metal to the metal ring of dust seal.

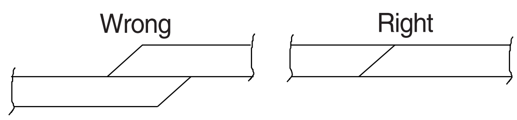


48AZ7CY29

③ Fit U-packing (9) to the groove..

※ Coat each packing with hydraulic oil before fitting it.

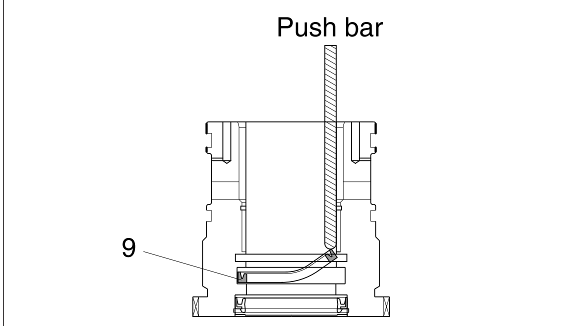
※ Insert the backup ring until one side of it is inserted into groove.



8-157(3) 210-7

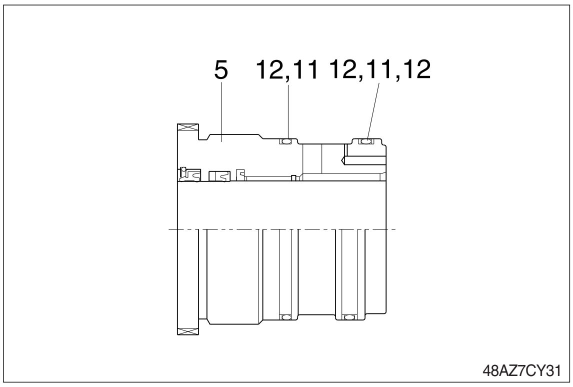
※ U-packing (9) has its own fitting direction. Therefore, confirm it before fitting them.

※ Fitting U-packing (9) upside down may damage its lip. Therefore check the correct direction that is shown in fig.



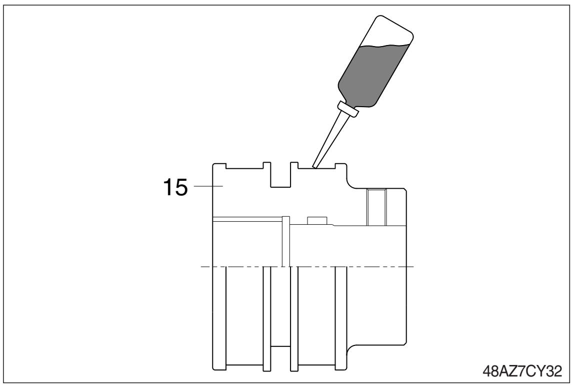
48AZ7CY30

④ Fit back up ring (12) to rod cover (5).
※ Put the backup ring in the warm water of 30~50°C .
⑤ Fit O-ring (11) to rod cover (5).

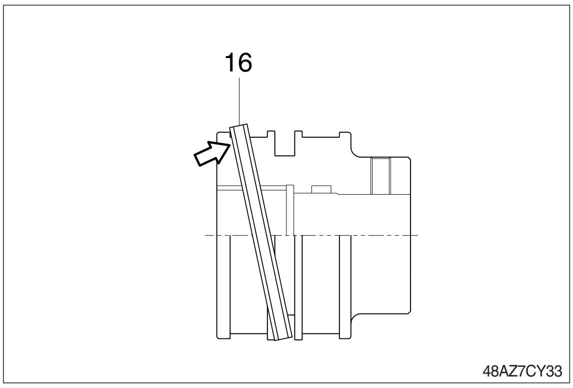


(2) Assemble piston assembly

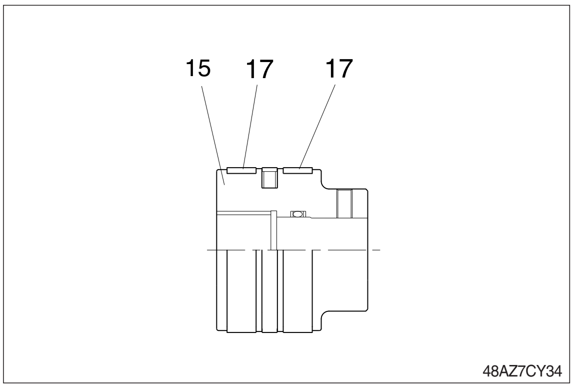
※ Check for scratches or rough surfaces. If found smooth with an oil stone.
① Coat the outer face of piston (15) with hydraulic oil.



② Fit piston seal (16) to piston.
※ Put the piston seal in the warm water of 60~100°C for more than 5 minutes.
※ After assembling the piston seal, press its outer diameter to fit in.



③ Fit wear ring (17) to piston (15).

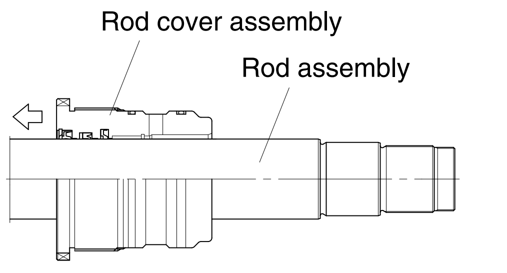


(3) Install piston and cylinder head

① Fix the rod assembly to the work bench.

② Apply hydraulic oil to the outer surface of rod assembly (3), the inner surface of piston and gland.

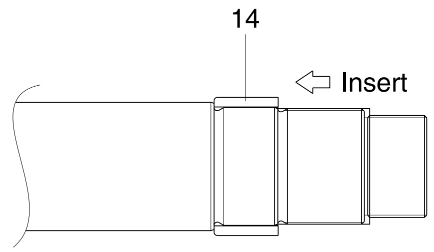
③ Insert rod cover assembly to rod assembly.



48AZ7CY35

④ Insert cushion ring (14) to rod assembly.

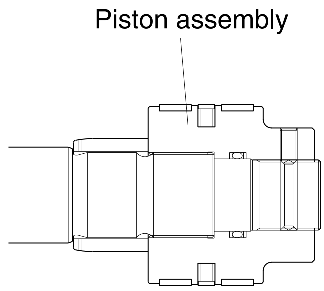
※ Note that cushion ring (14) has a direction in which it should be fitted.



48AZ7CY36

⑤ Fit piston assembly to rod assembly.

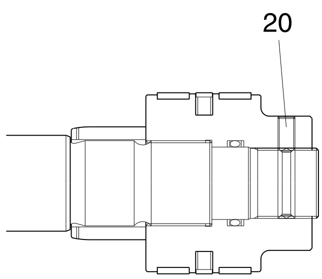
※ Tightening torque : refer to page 7-132



48AZ7CY37

⑥ Fit piston nut (18) and set screw (20).

· Tightening torque : refer to page 7-132



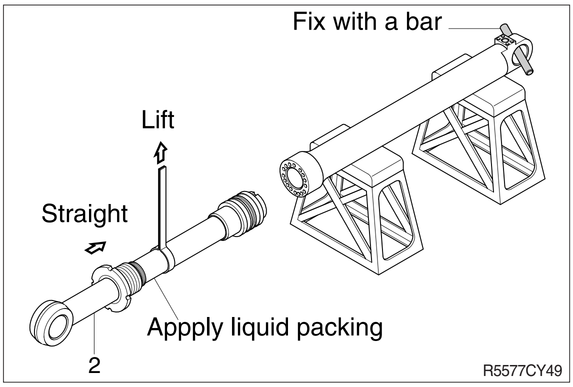
48AZ7CY38

(4) Overall assemble

① Place a V-block on a rigid work bench. Mount the tube assembly (1) on it and fix the assembly by passing a bar through the clevis pin hole to lock the assembly.

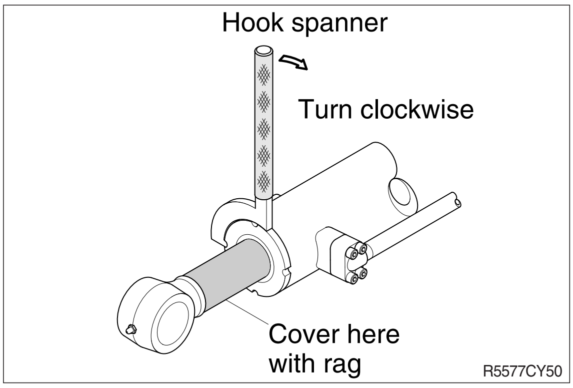
② Insert the rod assembly in to the tube assembly, while lifting and moving the rod assembly with a crane.

※ Be careful not to damage piston seal by thread of tube assembly.



③ Match the bolt holes in the cylinder head flange to the tapped holes in the tube assembly and tighten socket bolts to a specified torque.

※ Refer to the table of tightening torque.

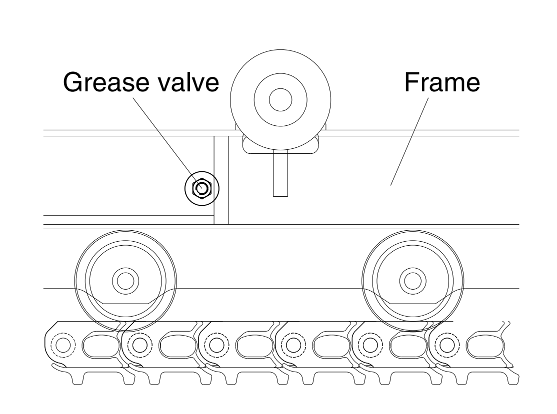


1. RUBBER TRACK

1) REMOVAL

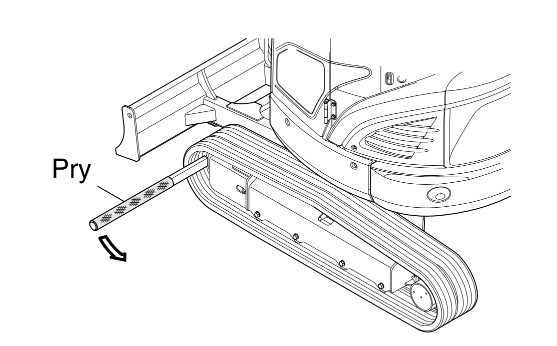
(1) Loosen tension of the rubber track.

※ If track tension is not relieved when the grease valve is loosened, move the machine backwards and forwards.



R35Z77TR04

(2) Remove the rubber track from lower frame using pry.

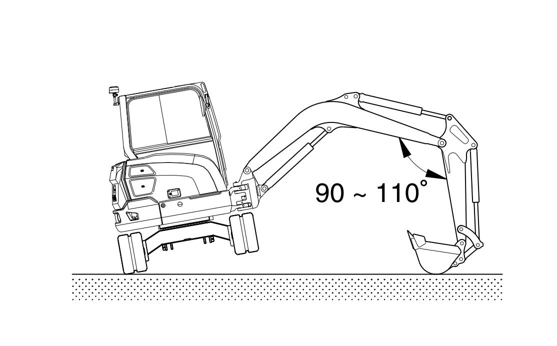


R35Z77TR22

2) INSTALL

(1) Carry out installation in the reverse order to removal.

※ Adjust the tension of the rubber track.



48AZ4OP19

2. TRACK LINK

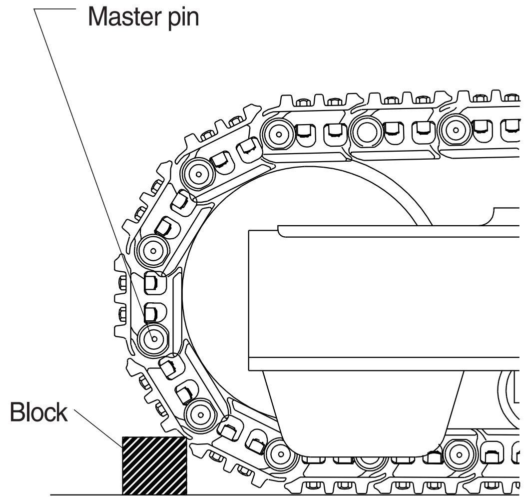
1) REMOVAL

(1) Move track link until master pin is over front idler in the position put wooden block as shown.

(2) Loosen tension of the track link.

※ If track tension is not relieved when the grease valve is loosened, move the machine backwards and forwards.

(3) Push out master pin by using a suitable tool.

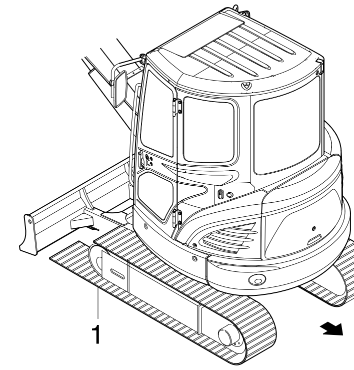


8-161(1) 140-7

(4) Move the machine slowly in reverse, and lay out track link assembly (1).

※ Jack up the machine and put wooden block under the machine.

※ Don't get close to the sprocket side as the track shoe plate may fall down on your feet.

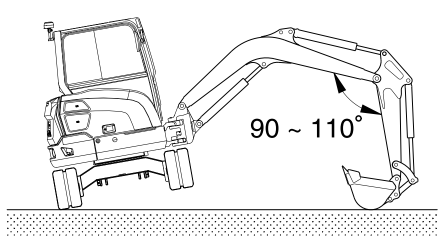


R35Z77TR01

2) INSTALL

(1) Carry out installation in the reverse order to removal.

※ Adjust the tension of the track link.

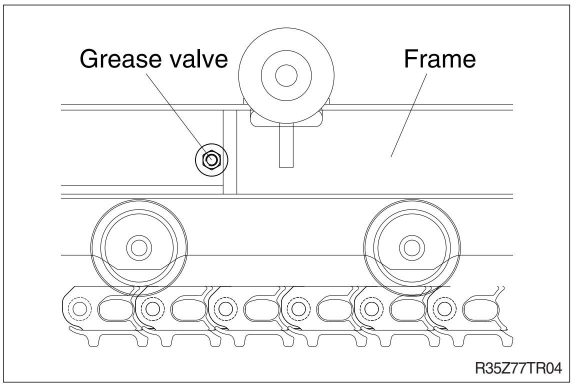


48AZ4OP19

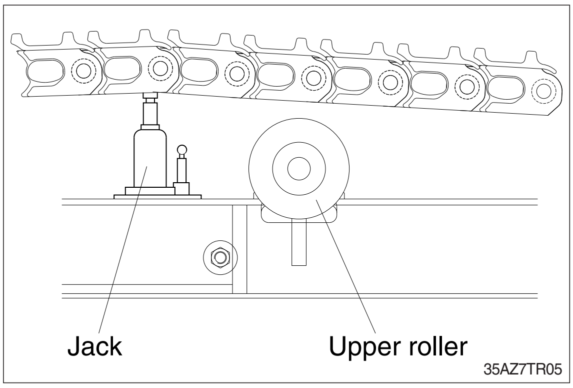
3. UPPER ROLLER

1) REMOVAL

(1) Loosen tension of the track link.

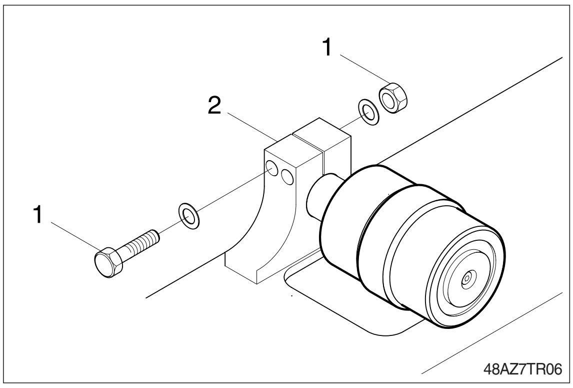


(2) Jack up the track link height enough to permit upper roller removal.



(3) Loosen the bolt and nut (1)
  · Tightening torque : 29.7±3.0 kgf·m
    (215±32.5 lbf·ft)

(4) Open bracket (2) with a screwdriver, push out from inside, and remove upper roller assembly.
  · Weight : 5.5 kg (12 lb)



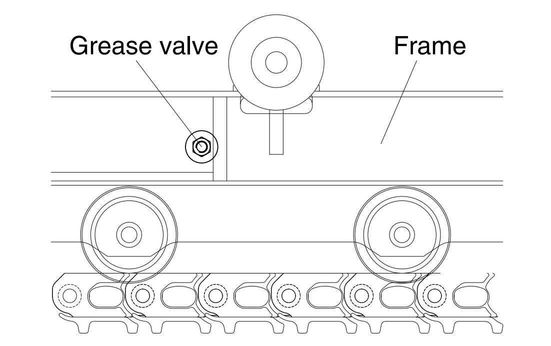
2) INSTALL

(1) Carry out installation in the reverse order to removal.

4. LOWER ROLLER

1) REMOVAL

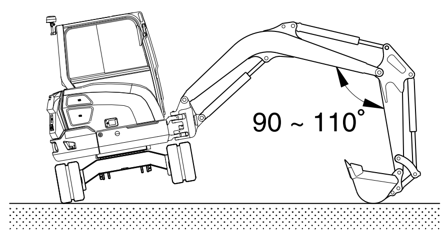
(1) Loosen tension of the rubber track.



R35Z77TR04

(2) Using the work equipment, push up track frame on side which is to be removed.

※ After jack up the machine, set a block under the unit.

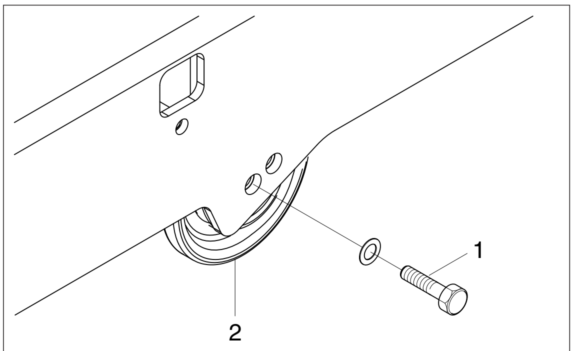


48AZ4OP19

(3) Remove the mounting bolt (1) and draw out the lower roller (2).

· Weight : 12.4 kg (27.3 lb)

· Tightening torque : 31.3±3.0 kgf·m (226±21.7 lbf·ft)



48AZ7TR07

2) INSTALL

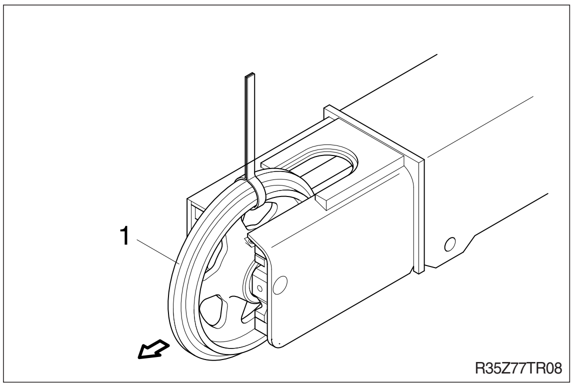
(1) Carry out installation in the reverse order to removal.

5. IDLER AND RECOIL SPRING

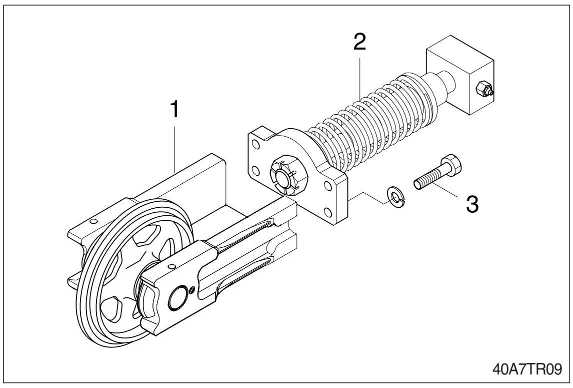
1) REMOVAL

(1) Remove the track link.
For detail, see removal of track link.

(2) Sling the idler (1) and pull out idler and recoil spring assembly from track frame, using a pry.
· Weight : 67.5 kg (149 lb)



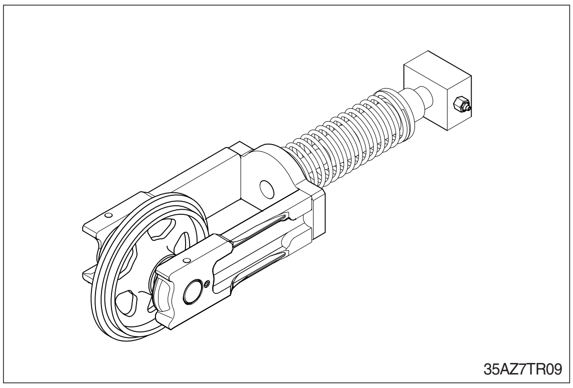
(3) Loosen the hexagon bolt (3) and remove the idler (1) from the recoil spring assembly (2).
· Tightening torque : 11.3±1.1 kgf·m
(81.9±8.0 lbf·ft)



2) INSTALL

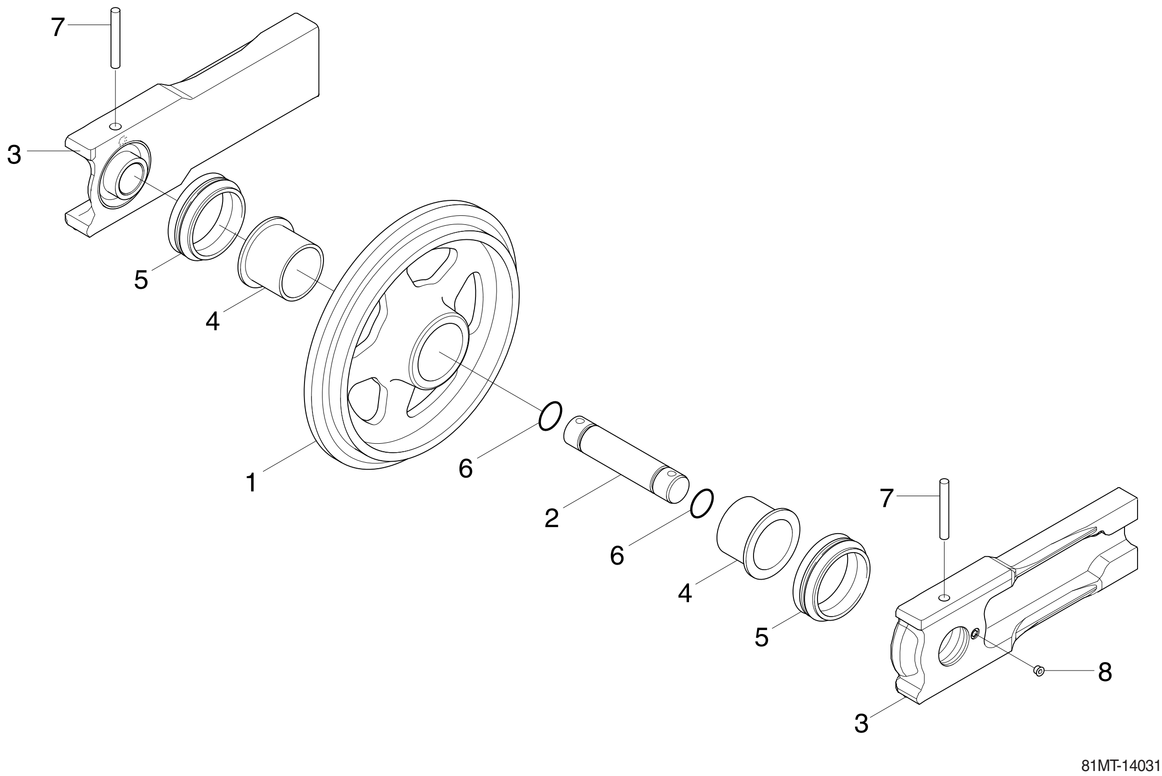
(1) Carry out installation in the reverse order to removal.

※ Make sure that the boss on the end face of the recoil cylinder rod is in the hole of the track frame.



3) DISASSEMBLY AND ASSEMBLY OF IDLER

(1) Structure

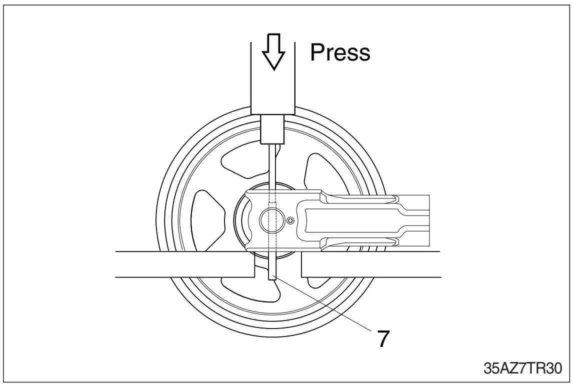


1	Idler shell	4	Bushing	7	Spring pin
2	Shaft	5	Floating seal	8	Plug
3	Bracket	6	O-ring		

(2) Disassembly

① Remove plug (8) and drain oil.

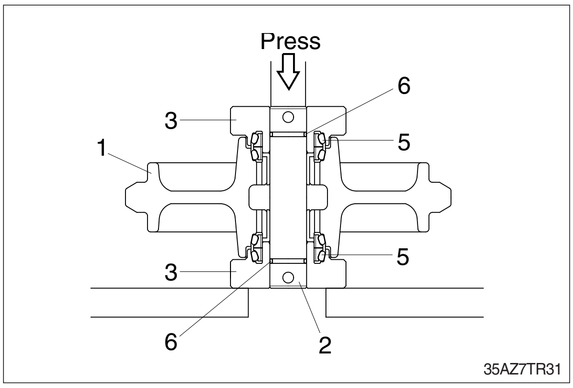
② Draw out the spring pin (7), using a press.



③ Pull out the shaft (2) with a press.

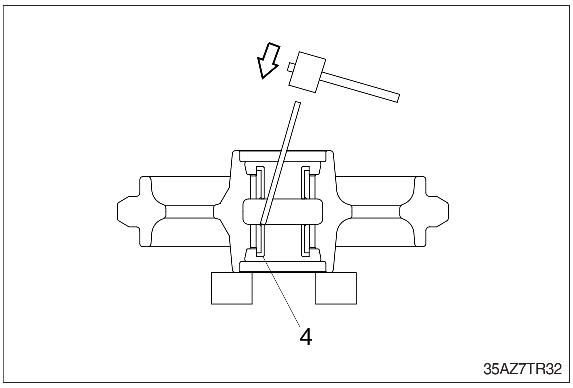
④ Remove floating seal (5) from idler shell (1) and bracket (3).

⑤ Remove O-ring (6) from shaft.



⑥ Remove the bushing (4) from idler, using a special tool.

※ Only remove bushing if replacement is necessity.

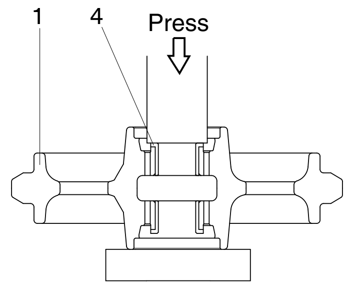


(3) **Assembly**

※ Before assembly, clean the parts.

※ Coat the sliding surfaces of all parts with oil.

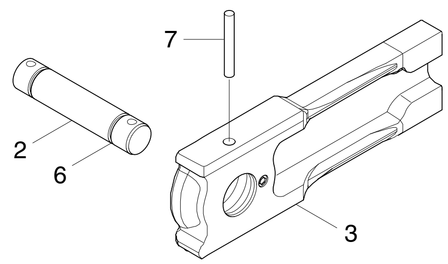
① Cool up bushing (4) fully by some dry ice and press it into idler shell (1).
Do not press it at the normal temperature, or not knock in with a hammer even after the cooling.



35AZ7TR33

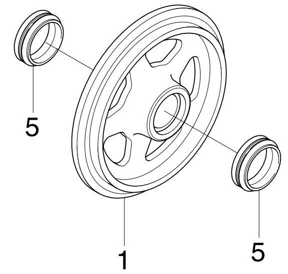
② Coat O-ring (6) with grease thinly, and install it to shaft (2).

③ Insert shaft (2) into brakcet (3) and drive in the spring pin (7).



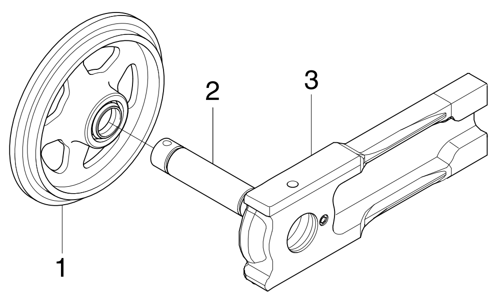
35AZ7TR34

④ Install floating seal (5) to idler shell (1).



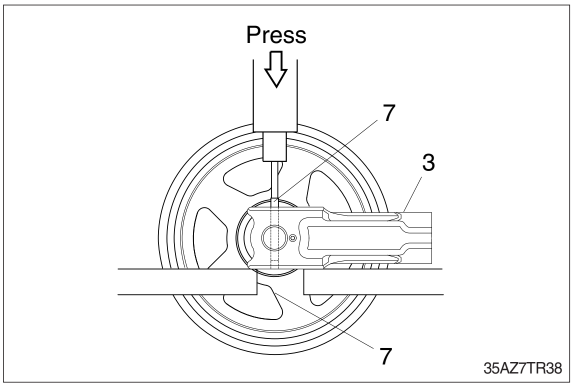
35AZ7TR35

⑤ Install shaft (2) and bracket (3) to idler shell (1).

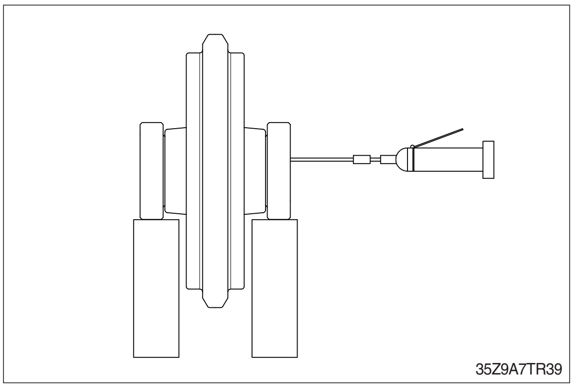


35AZ7TR36

⑥ Lay bracket (3) on its side. Knock in the spring pin (7) with a hammer.

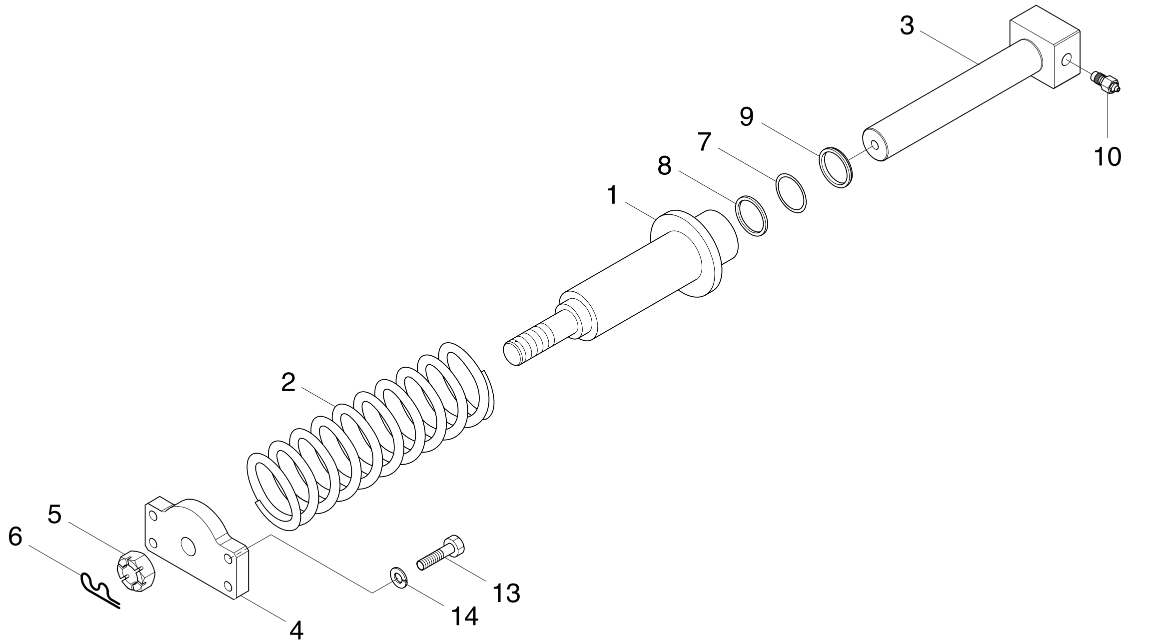


⑦ Supply engine oil to the specified level, and tighten plug.



4) DISASSEMBLY AND ASSEMBLY OF RECOIL SPRING

(1) Structure



81MT-15021

1	Tension cylinder	5	Castle nut	9	Dust seal
2	Tension spring	6	Split pin	10	Grease
3	Piston	7	Rod seal	13	Hexagon bolt
4	Yoke plate	8	Back up ring	14	Spring washer

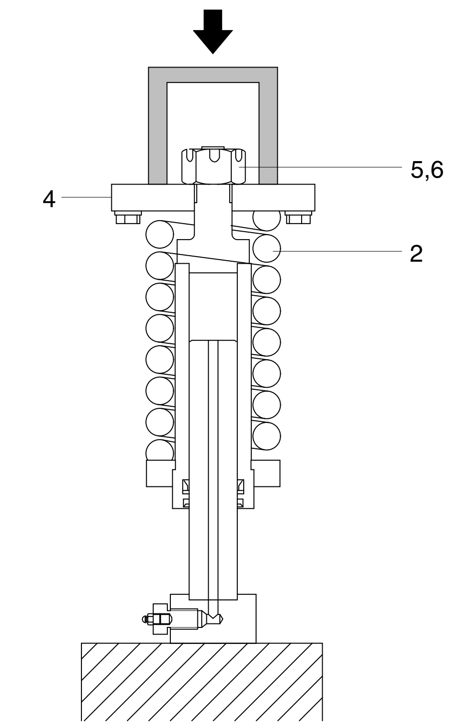
(2) Disassembly

① Apply pressure on yoke plate (4) with a press.

※ The spring is under a large installed load. This is dangerous, so be sure to set properly.

② Remove split pin (6) and castle nut (5). Take enough notice so that the press which pushes down the spring, should not be slipped out in its operation.

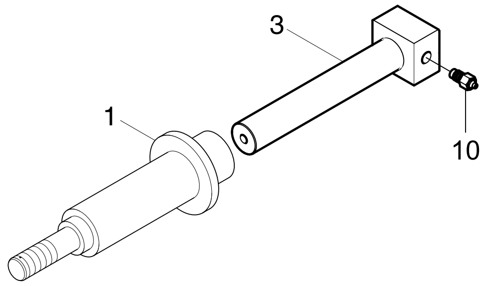
③ Lighten the press load slowly and remove yoke plate (4) and spring (2).



48AZ7TR13

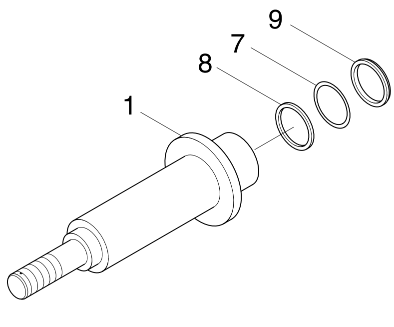
⑤ Remove piston (3) from tension cylinder (1).

⑥ Remove grease valve (10) from piston (3).



48AZ7TR14

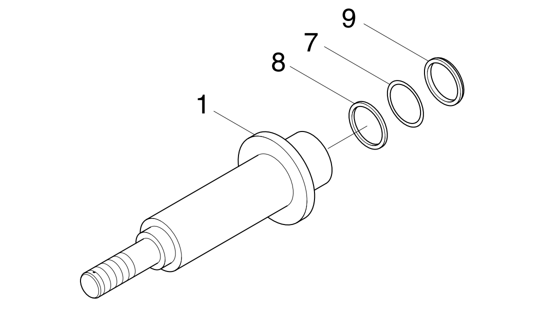
⑦ Remove dust seal (9), rod seal (8) and snap ring (7) from tension cylinder (1).



35AZ7TR15

(3) Assembly

① Install dust seal (9), rod seal (8) and snap ring (7) from tension cylinder (1).

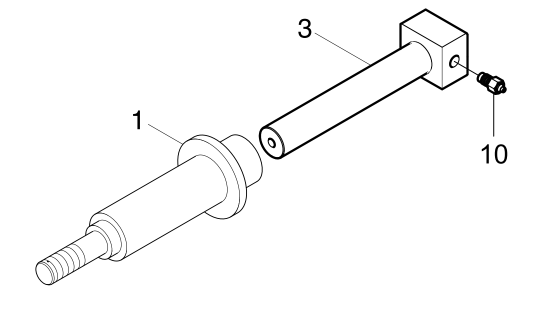


35AZ7TR15

② Pour grease into tension cylinder (1), then push in piston (3) by hand.
After take grease out of grease valve mounting hole, let air out.

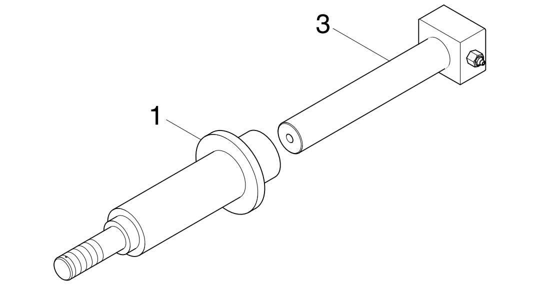
※ If air letting is not sufficient, it may be difficult to adjust the tension of crawler.

③ Fit grease valve (10) to piston (3).
· Tightening torque : 8 kgf · m (57.9 lbf · ft)



48AZ7TR14

④ Install piston (3) to tension cylinder (1).



48AZ7TR23

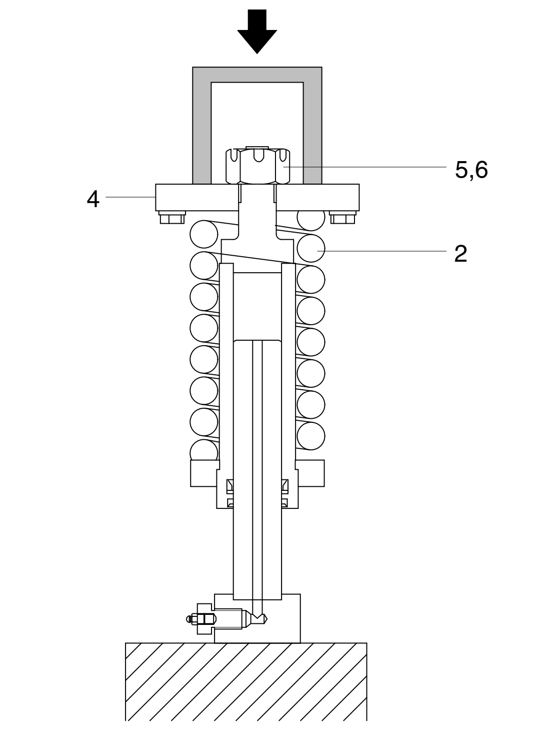
⑤ Install tension spring (2) and yoke plate (4) to tension cylinder (1).

⑥ Apply pressure to tension spring (2) with a press and tighten castle nut (5).

※ During the operation, pay attention specially to prevent the press from slipping out.

⑦ Tighten castle nut (5) and insert split pin (6).

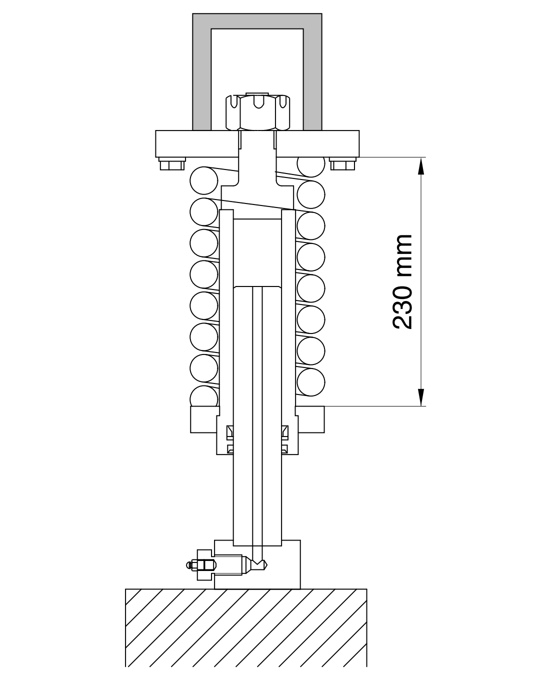
· Tightening torque : 10.3±1.1 kgf·m (74.5±8.0 lbf·ft)



48AZ7TR13

⑧ Lighten the press load and confirm the set length of tension spring (2).

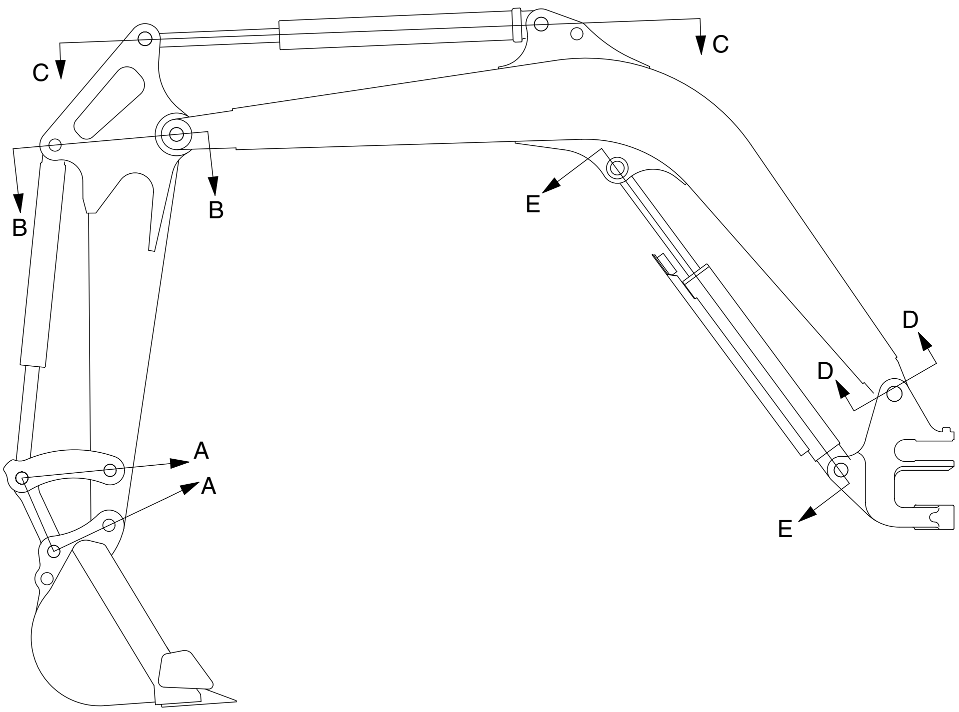
· Spring length : 230 mm

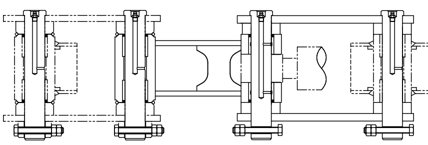


48AZ7TR16

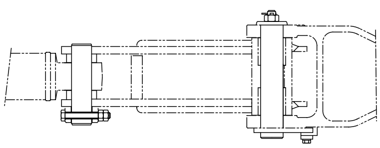
GROUP 11 WORK EQUIPMENT

1. STRUCTURE

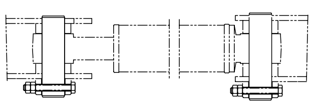




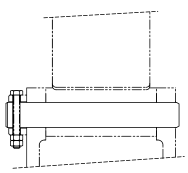
SECTION A-A



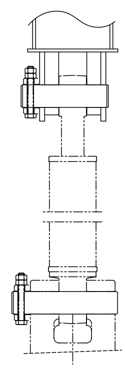
SECTION B-B



SECTION C-C



SECTION D-D



SECTION E-E

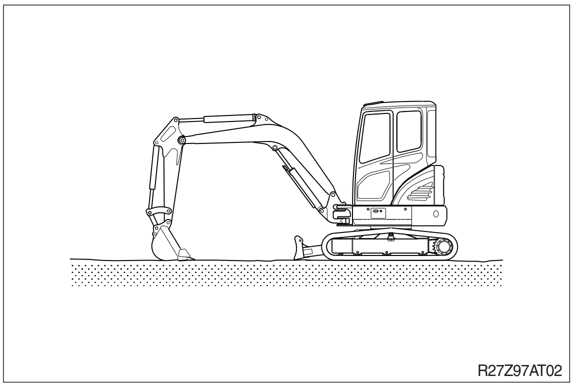
35Z9A7AT01

2. REMOVAL AND INSTALL

1) BUCKET ASSEMBLY

(1) Removal

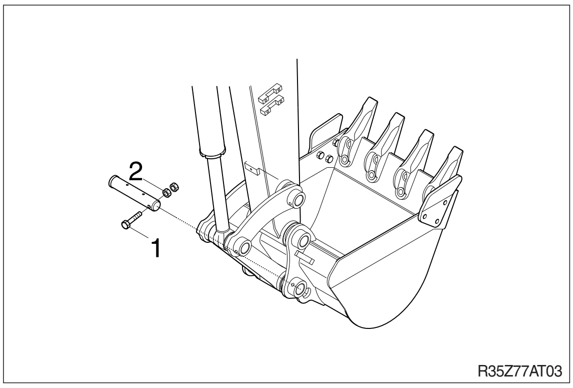
① Lower the work equipment completely to ground with back of bucket facing down.



R27Z97AT02

② Remove nut (1), bolt (2) and draw out the pin (4).

· Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)

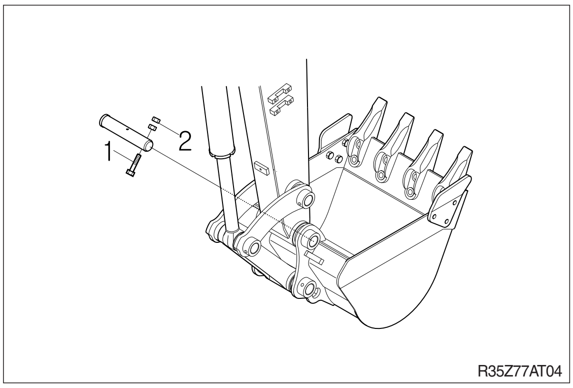


R35Z77AT03

③ Remove nut (1), bolt (2) and draw out the pin (3) then remove the bucket assembly (0.11 m^3).

· Weight : 134 kg (290 lb)

· Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)



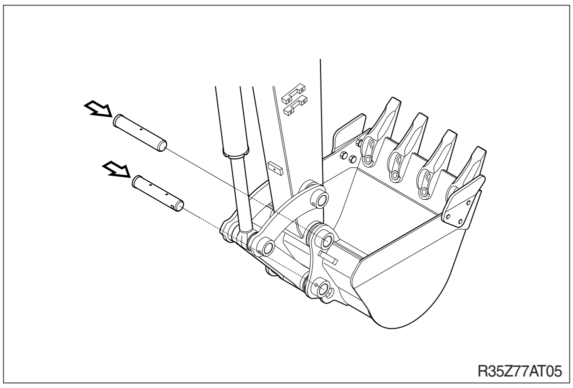
R35Z77AT04

(2) Install

① Carry out installation in the reverse order to removal.

⚠ **When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**

※ Adjust the bucket clearance.
For detail, see operator's manual.



R35Z77AT05

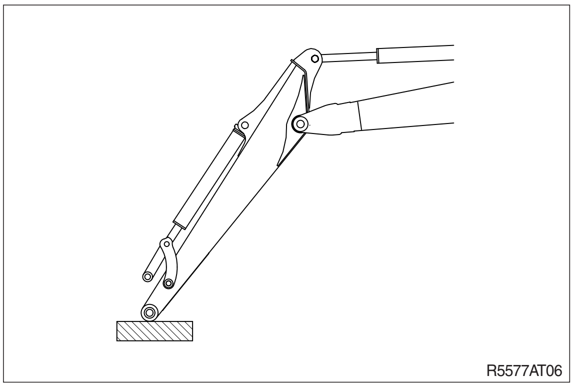
2) ARM ASSEMBLY

(1) Removal

※ Loosen the breather slowly to release the pressure inside the hydraulic tank.

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

① Remove bucket assembly.
For details, see removal of bucket assembly.



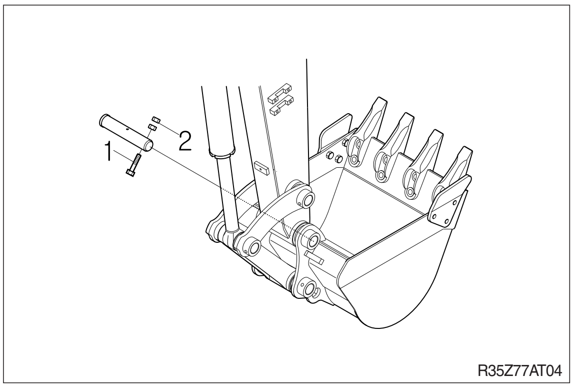
R5577AT06

② Disconnect bucket cylinder hose (4).

⚠ **Fit blind plugs (5) in the piping at the chassis end securely to prevent oil from spurting out when the engine is started.**

③ Sling arm cylinder assembly, remove spring, pin stopper and pull out pin.

※ Tie the rod with wire to prevent it from coming out.



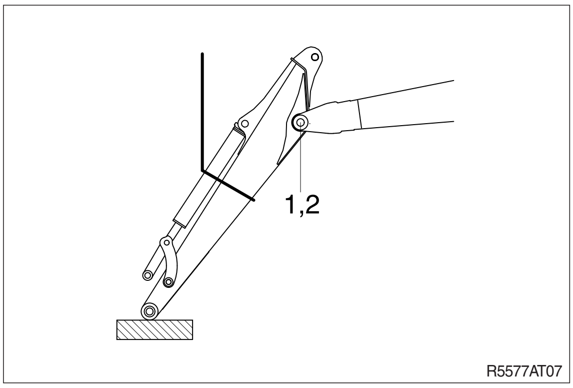
R35Z77AT04

④ For details, see removal of arm cylinder assembly.
Place a wooden block under the cylinder and bring the cylinder down to it.

⑤ Remove bolt (1) and pull out the pin (2) then remove the arm assembly (1.3 ㎙).

· Weight : 132 ㎏ (290 ℔)
· Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)

※ When lifting the arm assembly, always lift the center of gravity.



R5577AT07

(2) Install

① Carry out installation in the reverse order to removal.

⚠ **When lifting the arm assembly, always lift the center of gravity.**

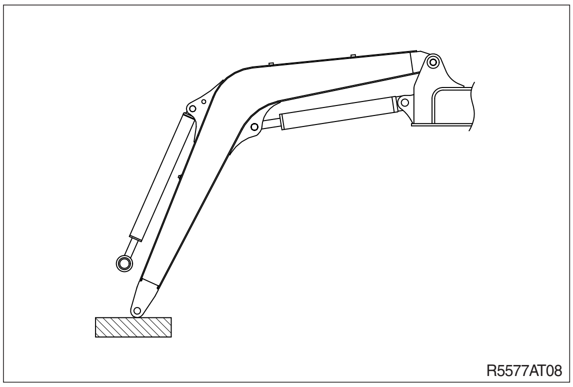
※ Bleed the air from the cylinder.

3) BOOM ASSEMBLY

(1) Removal

① Remove arm and bucket assembly.
For details, see removal of arm and bucket assembly.

② Remove boom cylinder assembly from boom.
For details, see removal of arm cylinder assembly.



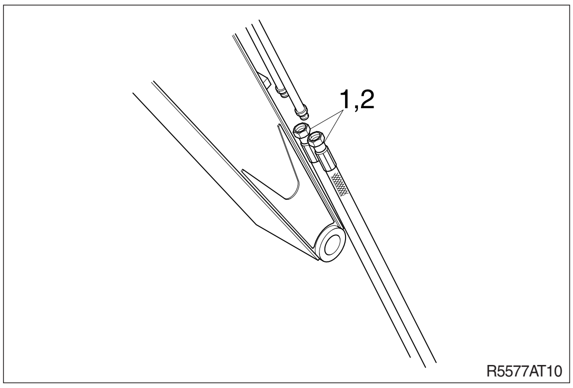
R5577AT08

③ Disconnect head lamp wiring.

④ Disconnect bucket cylinder hose (2) and arm cylinder hose (1).

※ When the hose are disconnected, oil may spurt out.

⑤ Sling boom assembly (3).



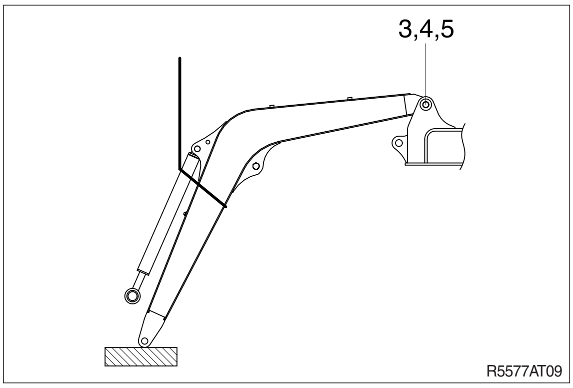
R5577AT10

⑥ Remove bolt (3), nut (4) and pull out the pin (5) then remove boom assembly (2.8 ㎜).

· Weight : 269 ㎏ (590 ㏐)

· Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)

※ When lifting the boom assembly always lift the center of gravity.



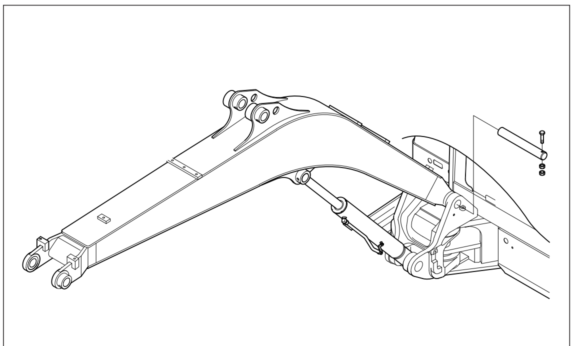
R5577AT09

(2) Install

① Carry out installation in the reverse order to removal.

⚠ When lifting the arm assembly, always lift the center of gravity.

※ Bleed the air from the cylinder.



R35Z77AT06