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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 HD Hyundai Construction Equipment 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 HD Hyundai Construction Equipment 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
   10 - 4 - 2 Added pages
   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

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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

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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/cm^2 to lbf/in^2

1 kgf / cm^2 = 14.2233 lbf / in^2

	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

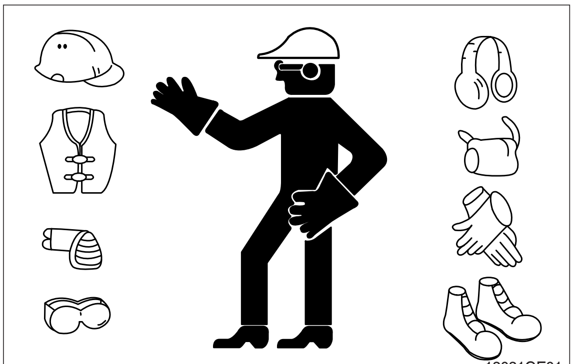
GROUP 1 SAFETY

FOLLOW SAFE PROCEDURE

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

WEAR PROTECTIVE CLOTHING

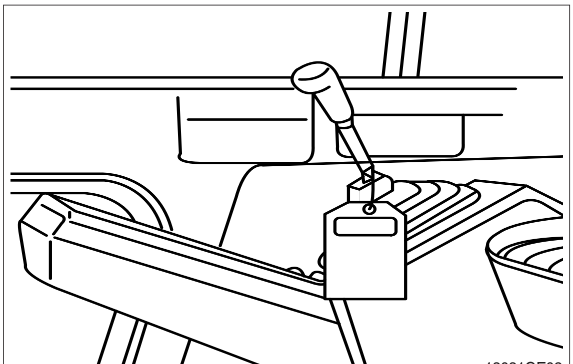
Wear close fitting clothing and safety equipment appropriate to the job.



13031GE01

WARN OTHERS OF SERVICE WORK

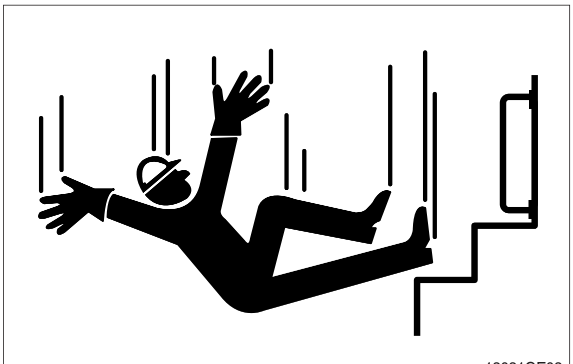
Unexpected machine movement can cause serious injury.
Before performing any work on the excavator, attach a「**Do Not Operate**」tag on the right side control lever.



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.



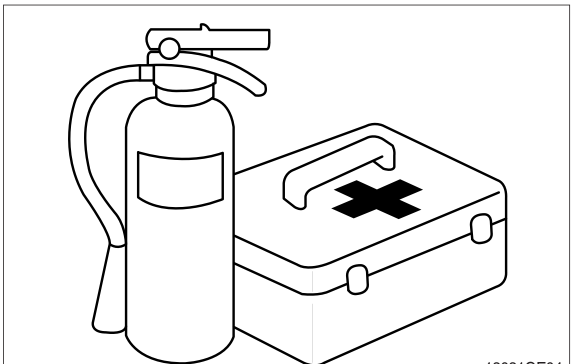
13031GE03

PREPARE FOR EMERGENCIES

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

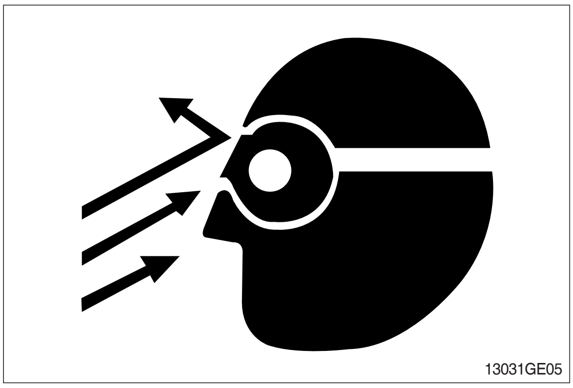
Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



13031GE04

PROTECT AGAINST FLYING DEBRIS

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

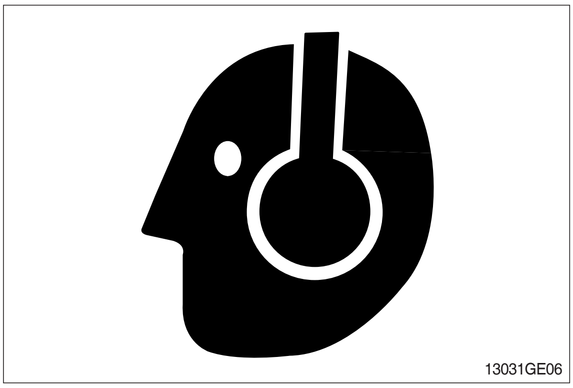


13031GE05

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.

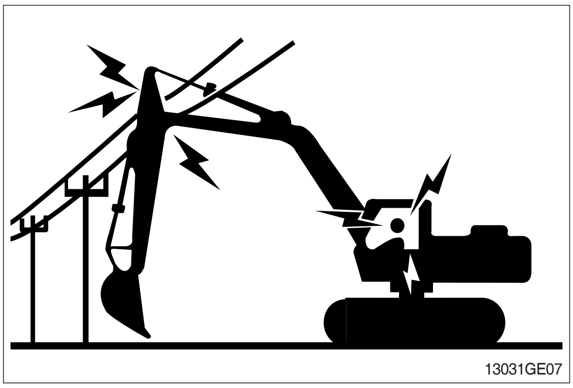


13031GE06

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.

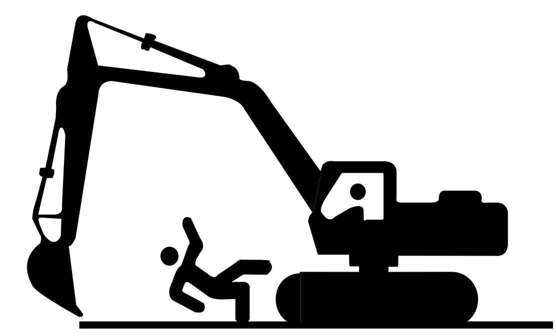


13031GE07

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.



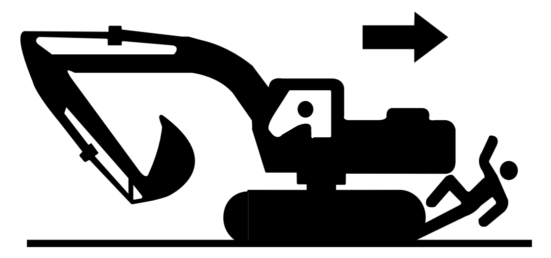
13031GE08

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.

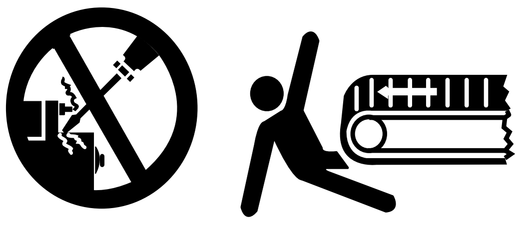


13031GE09

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

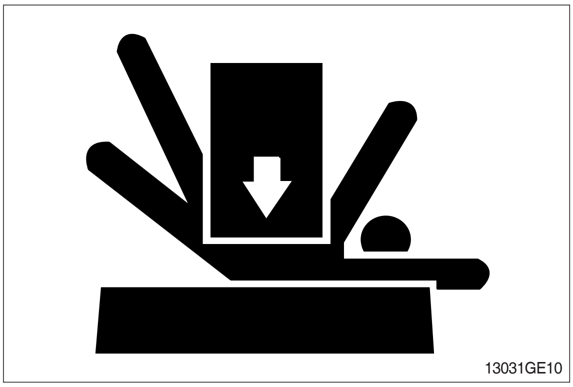
Before working on the machine:

· 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.

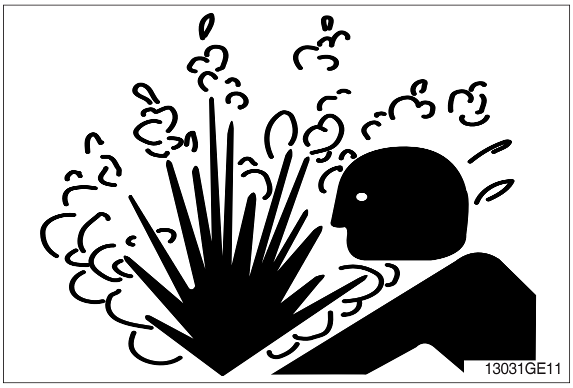


13031GE10

SERVICE COOLING SYSTEM SAFELY

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

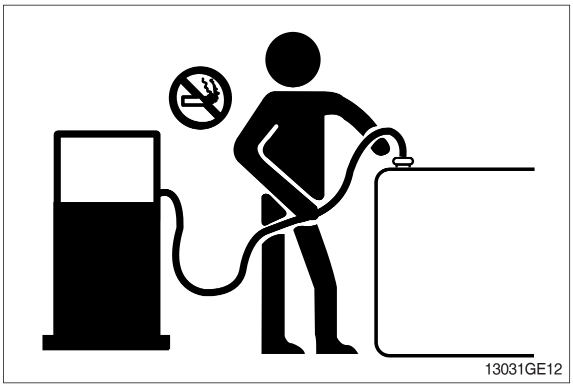
Shut off engine. Only remove filler cap when cool enough to touch with bare hands.



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.

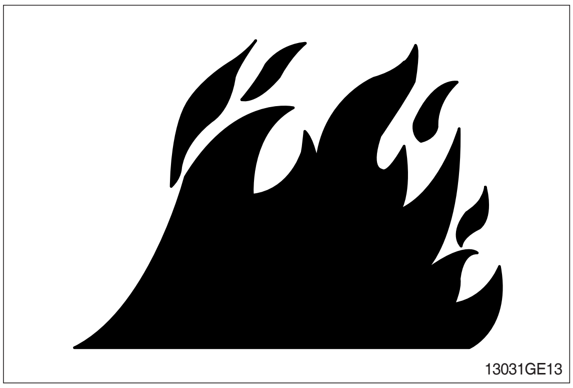


13031GE12

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.

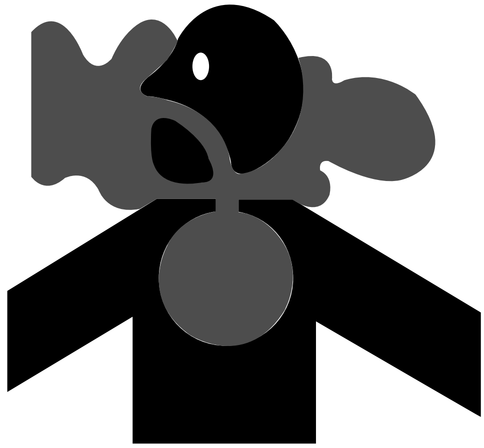


13031GE13

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.

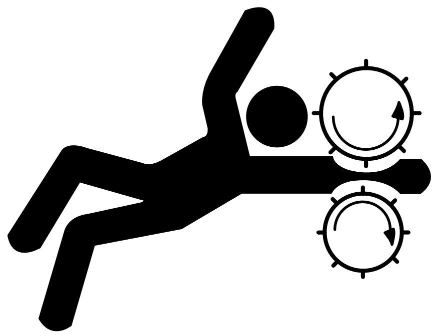
Remove paint before welding or heating:

- 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

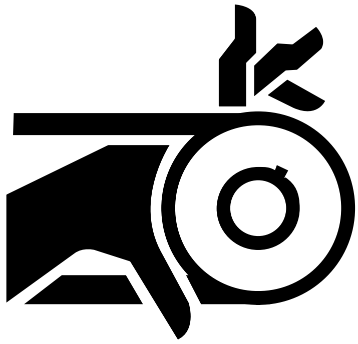


13031GE16

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

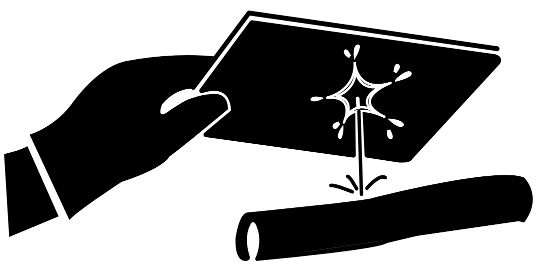
Escaping fluid under pressure can penetrate the skin causing serious injury.

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

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.

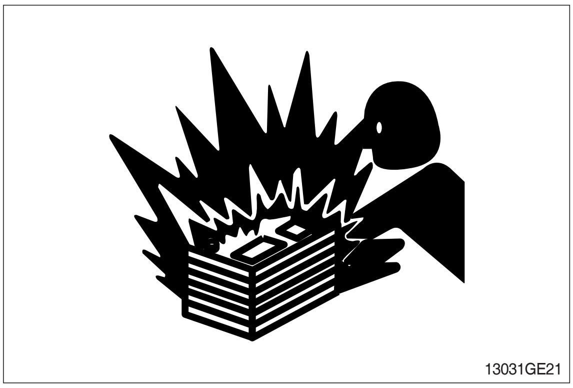
Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area. Install fire resisting guards to protect hoses or other materials.

PREVENT BATTERY EXPLOSIONS

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).



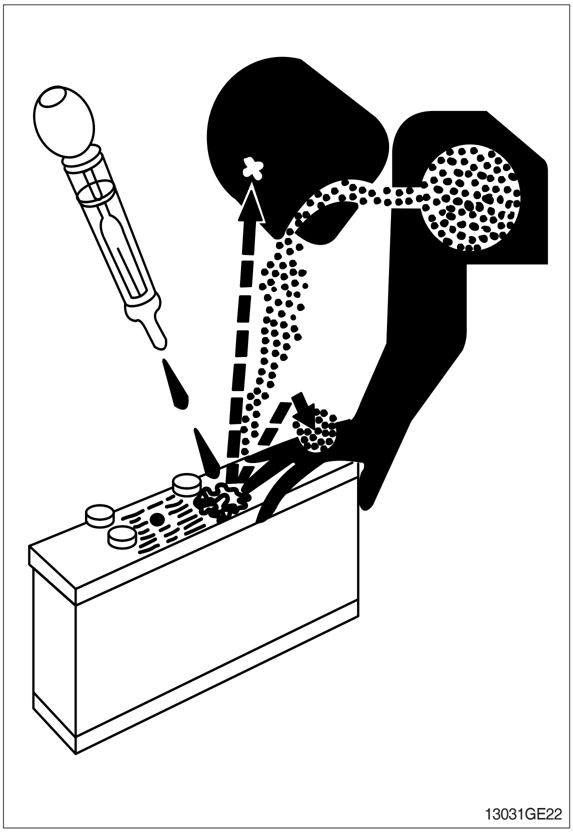
PREVENT ACID BURNS

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.)

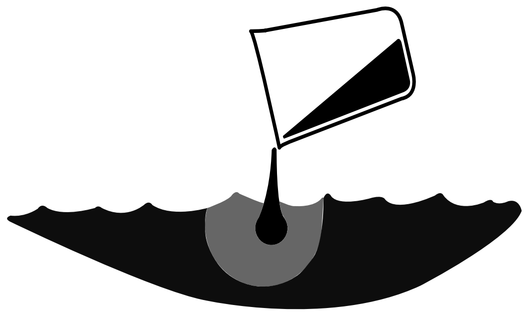
13031GE23

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.

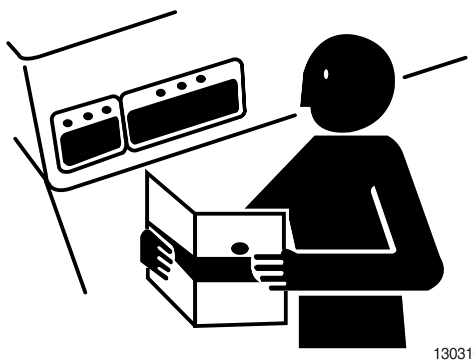
DO NOT pour oil into the ground, down a drain, or into a stream, pond, or lake. Observe relevant environmental protection regulations when disposing of oil, fuel, coolant, brake fluid, filters, batteries, and other harmful waste.



13031GE24

REPLACE SAFETY SIGNS

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



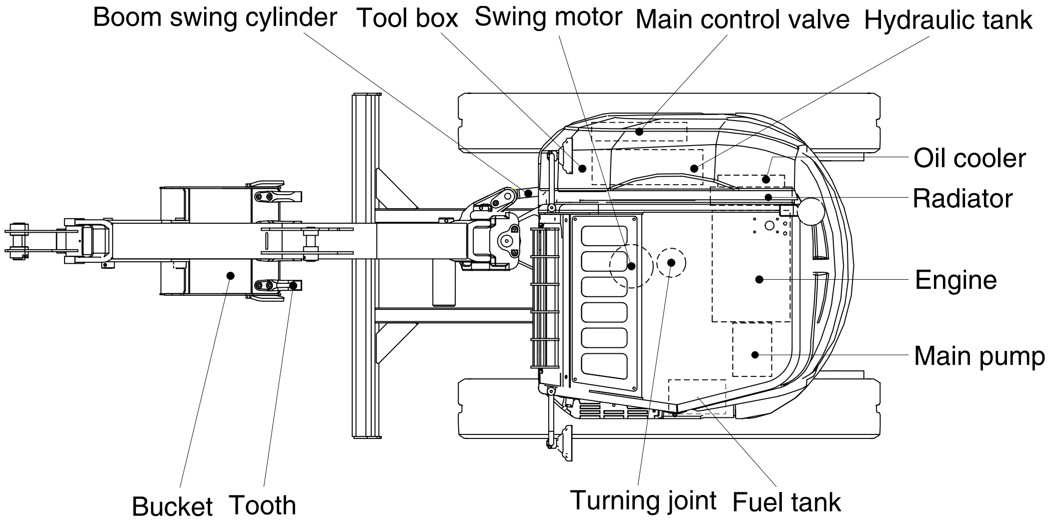
13031GE25

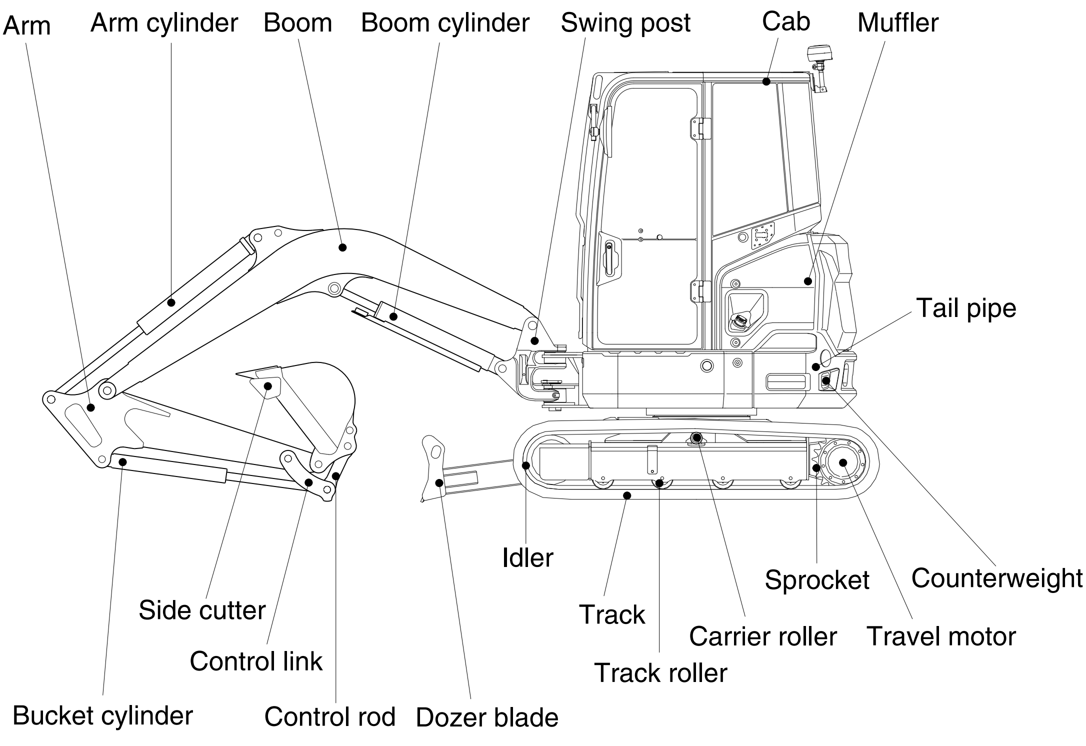
LIVE WITH SAFETY

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



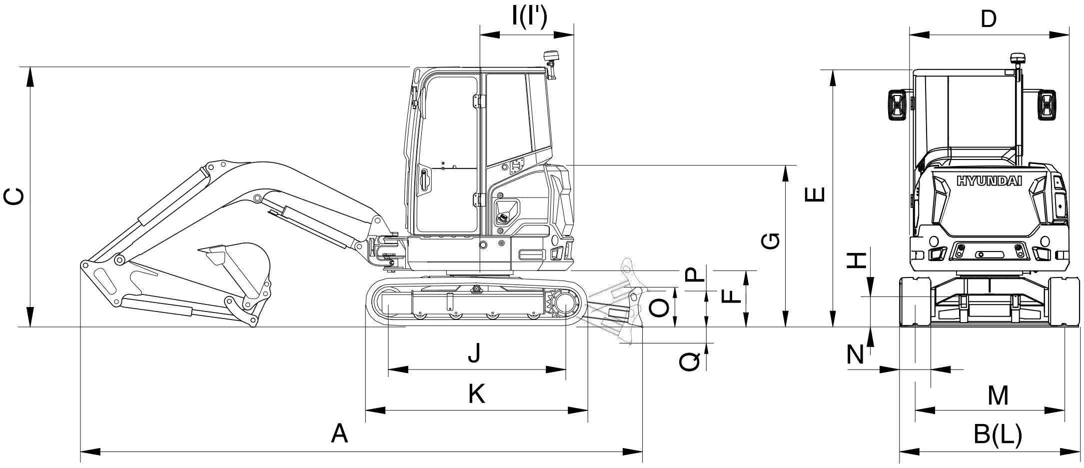


35AZ2SP01

2. SPECIFICATIONS

1) CAB TYPE

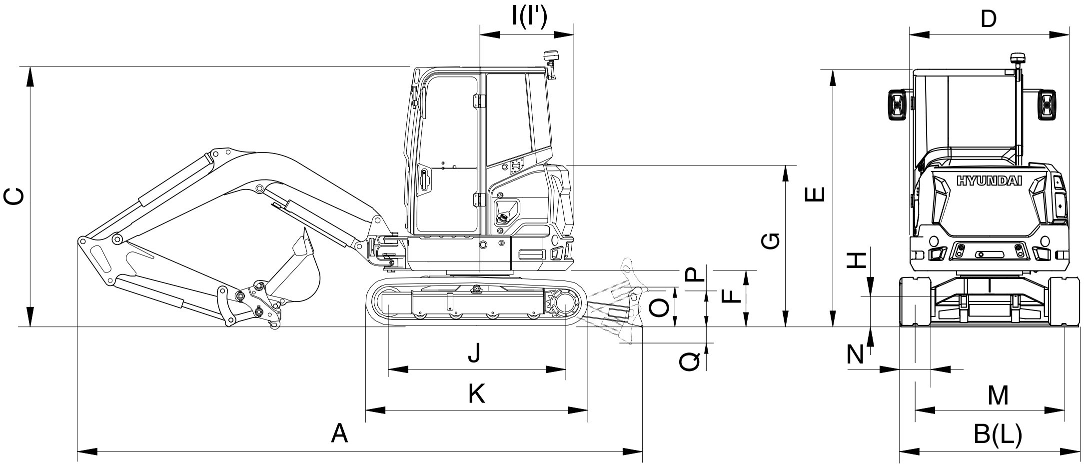
(1) 2.4 m (7' 10") boom, 1.3 m (4' 3") arm, rubber track, without quick coupler



35AZ2SP02

Description		Unit	Specification
Operating weight		kg (lb)	3880 (8550)
Bucket capacity (SAE heaped), standard		m3 (yd3)	0.11 (0.14)
Overall length	A		4783 (15' 8")
Overall width, with 300 mm shoe	B		1740 (5' 9")
Overall width, with dozer	-		1740 (5' 9")
Overall height	C		2505 (8' 3")
Overall width of upper structure	D		1540 (5' 1")
Overall height of cab	E		2505 (8' 3")
Ground clearance of counterweight	F		525 (1' 9")
Overall height of engine hood	G		1545 (5' 1")
Minimum ground clearance	H		175 (0' 7")
Rear-end distance	I	mm (ft-in)	900 (2' 11")
Rear-end swing radius	I'		900 (2' 11")
Distance between tumblers	J		1690 (5' 7")
Undercarriage length (without grouser)	K		2128 (7' 0")
Undercarriage width	L		1740 (5' 9")
Track gauge	M		1440 (4' 9")
Track shoe width, standard	N		300 (1' 0")
Height of blade	O		371 (1' 3")
Ground clearance of blade up	P		383 (1' 3")
Depth of blade down	Q		447 (1' 6")
Travel speed (low/high)		km/hr (mph)	2.56/4.41
Swing speed		rpm	9.4
Gradeability		Degree (%)	35
Ground pressure		kgf/cm² (psi)	0.36 (5.09)
Max traction force		kg (lb)	3039 (6700)

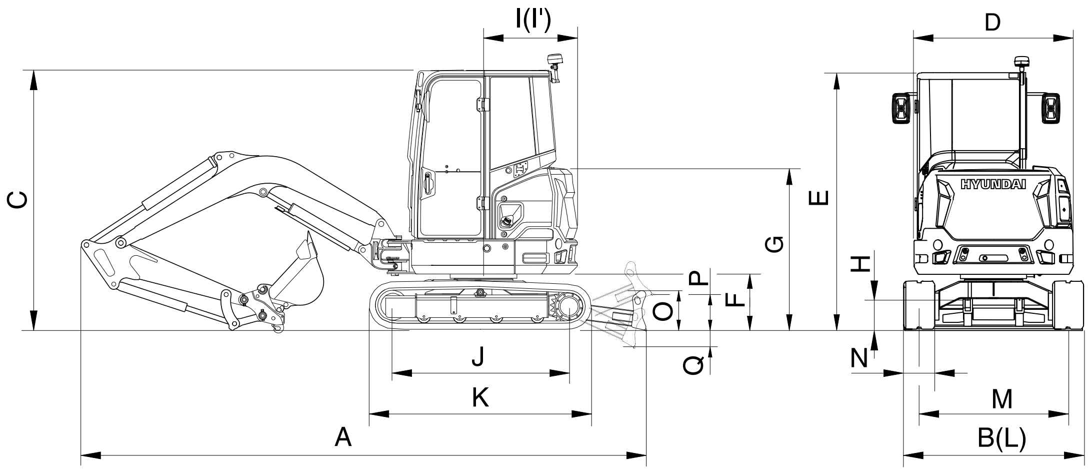
(2) 2.4 m (7' 10") boom, 1.3 m (4' 3") arm, rubber track, quick coupler



35AZ2SP03

Description		Unit	Specification
Operating weight		kg (lb)	3920 (8640)
Bucket capacity (SAE heaped), standard		m3 (yd3)	0.11 (0.14)
Overall length	A		4783 (15' 8")
Overall width, with 300 mm shoe	B		1740 (5' 9")
Overall width, with dozer	-		1740 (5' 9")
Overall height	C		2505 (8' 3")
Overall width of upper structure	D		1540 (5' 1")
Overall height of cab	E		2505 (8' 3")
Ground clearance of counterweight	F		525 (1' 9")
Overall height of engine hood	G		1545 (5' 1")
Minimum ground clearance	H		175 (0' 7")
Rear-end distance	I	mm (ft-in)	900 (2' 11")
Rear-end swing radius	I'		900 (2' 11")
Distance between tumblers	J		1690 (5' 7")
Undercarriage length (without grouser)	K		2128 (7' 0")
Undercarriage width	L		1740 (5' 9")
Track gauge	M		1440 (4' 9")
Track shoe width, standard	N		300 (1' 0")
Height of blade	O		371 (1' 3")
Ground clearance of blade up	P		383 (1' 3")
Depth of blade down	Q		447 (1' 6")
Travel speed (low/high)		km/hr (mph)	2.56/4.41
Swing speed		rpm	9.4
Gradeability		Degree (%)	35
Ground pressure		kgf/cm^2 (psi)	0.36 (5.13)
Max traction force		kg (lb)	3039 (6700)

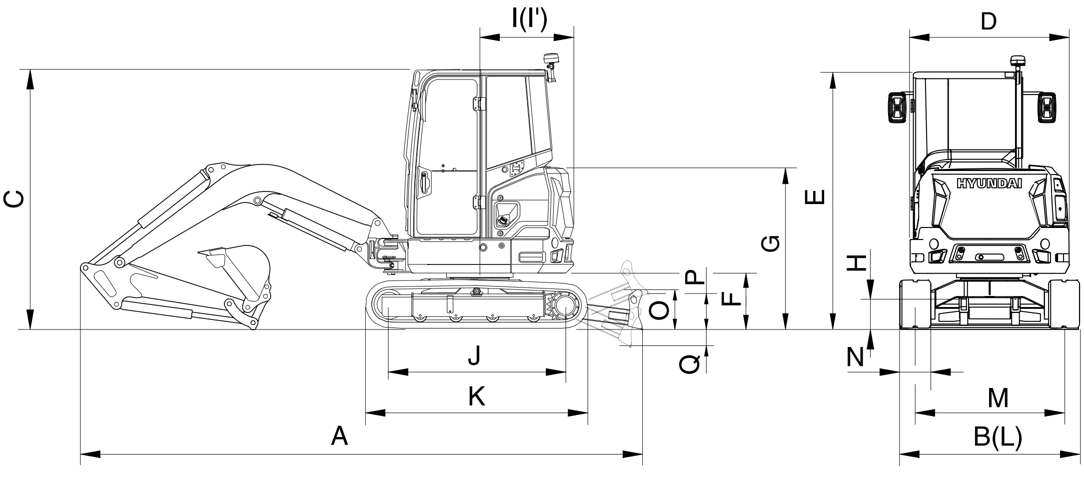
(3) 2.4 m (7' 10") boom, 1.6 m (5' 3") long thumb arm, rubber track, quick coupler, angle dozer, add counterweight



35AZ2SP03

Description		Unit	Specification
Operating weight		kg (lb)	4240 (9350)
Bucket capacity (SAE heaped), standard		m3 (yd3)	0.11 (0.14)
Overall length	A	mm (ft-in)	4783 (15' 8")
Overall width, with 300 mm shoe	B		1740 (5' 9")
Overall width, with dozer	-		1740 (5' 9")
Overall height	C		2505 (8' 3")
Overall width of upper structure	D		1540 (5' 1")
Overall height of cab	E		2505 (8' 3")
Ground clearance of counterweight	F		525 (1' 9")
Overall height of engine hood	G		1545 (5' 1")
Minimum ground clearance	H		175 (0' 7")
Rear-end distance	I		985 (3' 3")
Rear-end swing radius	I'		985 (3' 3")
Distance between tumblers	J		1690 (5' 7")
Undercarriage length (without grouser)	K		2128 (7' 0")
Undercarriage width	L		1740 (5' 9")
Track gauge	M		1440 (4' 9")
Track shoe width, standard	N		300 (1' 0")
Height of blade	O		394 (1' 4")
Ground clearance of blade up	P		408 (1' 4")
Depth of blade down	Q		460 (1' 6")
Travel speed (low/high)		km/hr (mph)	2.56/4.41
Swing speed		rpm	9.4
Gradeability		Degree (%)	35
Ground pressure		kgf/cm^2 (psi)	0.39 (5.55)
Max traction force		kg (lb)	3039 (6700)

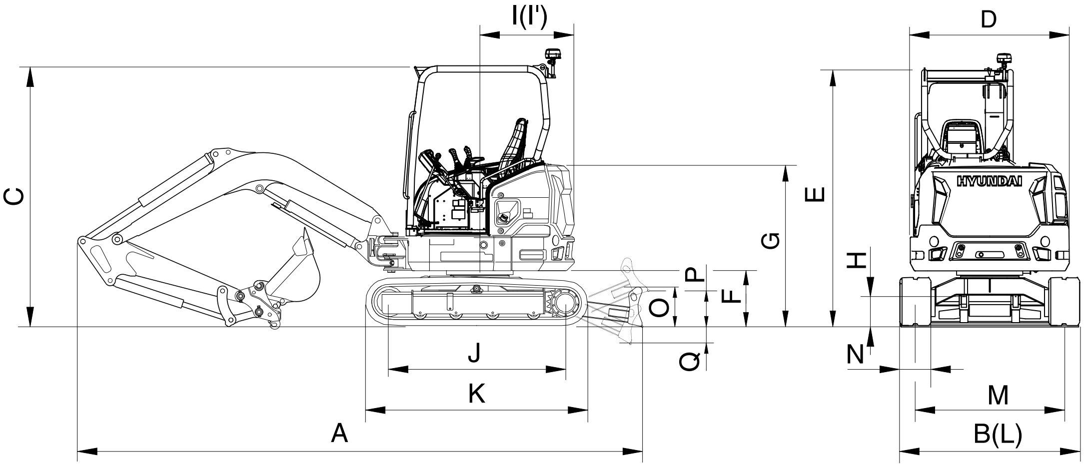
(4) 2.4 m (7' 10") boom, 1.3 m (4' 3") thumb arm, rubber track, without quick coupler (europe option)



Description		Unit	Specification
Operating weight		kg (lb)	3880 (8550)
Bucket capacity (SAE heaped), standard		m3 (yd3)	0.11 (0.14)
Overall length	A	mm (ft-in)	4783 (15' 8")
Overall width, with 300 mm shoe	B		1740 (5' 9")
Overall width, with dozer	-		1740 (5' 9")
Overall height	C		2490 (8' 2")
Overall width of upper structure	D		1540 (5' 1")
Overall height of cab	E		2490 (8' 2")
Ground clearance of counterweight	F		525 (1' 9")
Overall height of engine hood	G		1545 (5' 1")
Minimum ground clearance	H		175 (0' 7")
Rear-end distance	I		900 (2' 11")
Rear-end swing radius	I'		900 (2' 11")
Distance between tumblers	J		1690 (5' 7")
Undercarriage length (without grouser)	K		2128 (7' 0")
Undercarriage width	L		1740 (5' 9")
Track gauge	M		1440 (4' 9")
Track shoe width, standard	N		300 (1' 0")
Height of blade	O		371 (1' 3")
Ground clearance of blade up	P		383 (1' 3")
Depth of blade down	Q		447 (1' 6")
Travel speed (low/high)		km/hr (mph)	2.56/4.41
Swing speed		rpm	9.4
Gradeability		Degree (%)	35
Ground pressure		kgf/cm^2 (psi)	0.36 (5.09)
Max traction force		kg (lb)	3039 (6700)

2) CANOPY TYPE

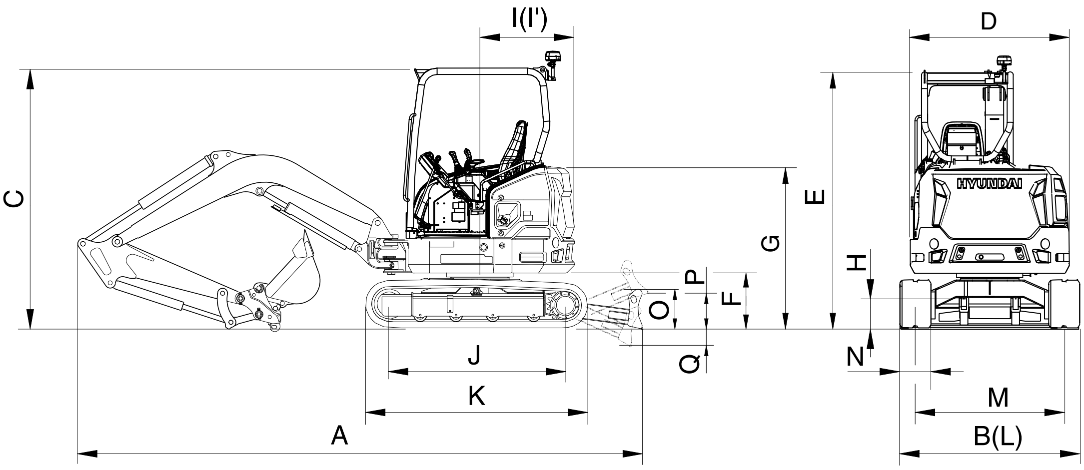
(1) 2.4 m (7' 10") boom, 1.3 m (4' 3") thumb arm, rubber track, quick coupler



35AZ2SP05

Description		Unit	Specification
Operating weight		kg (lb)	3760 (8290)
Bucket capacity (SAE heaped), standard		m3 (yd3)	0.11 (0.14)
Overall length	A	mm (ft-in)	4772 (15' 8")
Overall width, with 300 mm shoe	B		1740 (5' 9")
Overall width, with dozer	-		1740 (5' 9")
Overall height	C		2490 (8' 2")
Overall width of upper structure	D		1540 (5' 1")
Overall height of cab	E		2490 (8' 2")
Ground clearance of counterweight	F		525 (1' 9")
Overall height of engine hood	G		1545 (5' 1")
Minimum ground clearance	H		175 (0' 7")
Rear-end distance	I		900 (2' 11")
Rear-end swing radius	I'		900 (2' 11")
Distance between tumblers	J		1690 (5' 7")
Undercarriage length (without grouser)	K		2128 (7' 0")
Undercarriage width	L		1740 (5' 9")
Track gauge	M		1440 (4' 9")
Track shoe width, standard	N		300 (1' 0")
Height of blade	O		371 (1' 3")
Ground clearance of blade up	P		383 (1' 3")
Depth of blade down	Q		447 (1' 6")
Travel speed (low/high)		km/hr (mph)	2.56/4.41
Swing speed		rpm	9.4
Gradeability		Degree (%)	35
Ground pressure		kgf/cm^2 (psi)	0.35 (4.94)
Max traction force		kg (lb)	3039 (6700)

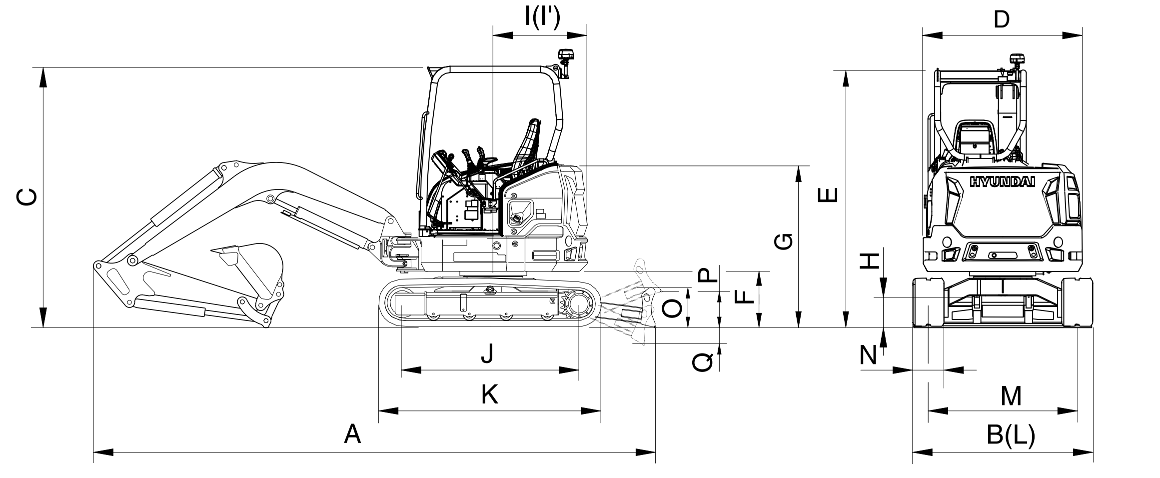
(2) 2.4 m (7' 10") boom, 1.6 m (5' 3") long thumb arm, rubber track, quick coupler, add counter-weight



35AZ2SP05

Description		Unit	Specification
Operating weight		kg (lb)	3930 (8660)
Bucket capacity (SAE heaped), standard		m3 (yd3)	0.11 (0.14)
Overall length	A	mm (ft-in)	4783 (15' 8")
Overall width, with 300 mm shoe	B		1740 (5' 9")
Overall width, with dozer	-		1740 (5' 9")
Overall height	C		2490 (8' 2")
Overall width of upper structure	D		1540 (5' 1")
Overall height of cab	E		2490 (8' 2")
Ground clearance of counterweight	F		525 (1' 9")
Overall height of engine hood	G		1545 (5' 1")
Minimum ground clearance	H		175 (0' 7")
Rear-end distance	I		985 (3' 3")
Rear-end swing radius	I'		985 (3' 3")
Distance between tumblers	J		1690 (5' 7")
Undercarriage length (without grouser)	K		2128 (7' 0")
Undercarriage width	L		1740 (5' 9")
Track gauge	M		1440 (4' 9")
Track shoe width, standard	N		300 (1' 0")
Height of blade	O		371 (1' 3")
Ground clearance of blade up	P		383 (1' 3")
Depth of blade down	Q		447 (1' 6")
Travel speed (low/high)		km/hr (mph)	2.56/4.41
Swing speed		rpm	9.4
Gradeability		Degree (%)	35
Ground pressure		kgf/cm² (psi)	0.36 (5.15)
Max traction force		kg (lb)	3039 (6700)

(3) 2.4 m (7' 10") boom, 1.3 m (4' 3") arm, steel truck, without quick coupler

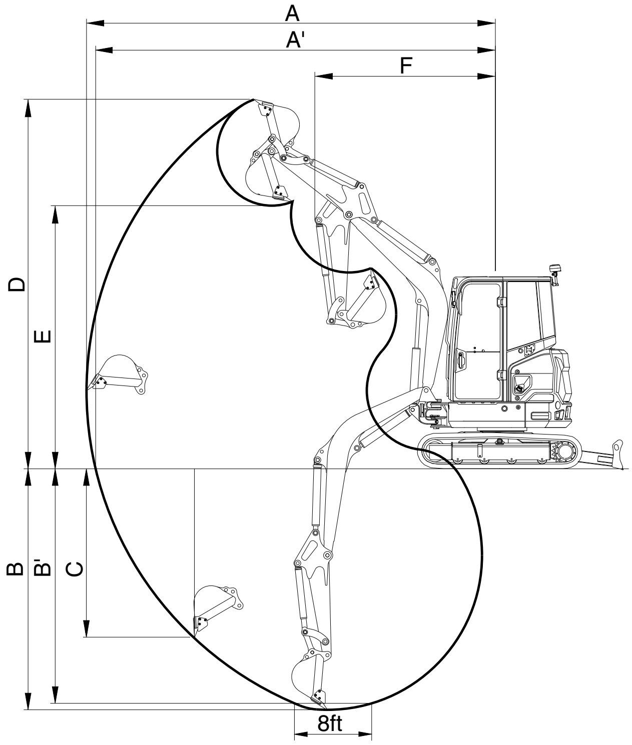


35AZ2SP04

Description		Unit	Specification
Operating weight		kg (lb)	3790 (8360)
Bucket capacity (SAE heaped), standard		m3 (yd3)	0.11 (0.14)
Overall length	A	mm (ft-in)	4783 (15' 8")
Overall width, with 300 mm shoe	B		1740 (5' 9")
Overall width, with dozer	-		1740 (5' 9")
Overall height	C		2495 (8' 2")
Overall width of upper structure	D		1540 (5' 1")
Overall height of cab	E		2495 (8' 2")
Ground clearance of counterweight	F		525 (1' 9")
Overall height of engine hood	G		1550 (5' 1")
Minimum ground clearance	H		180 (0' 7")
Rear-end distance	I		900 (2' 11")
Rear-end swing radius	I'		900 (2' 11")
Distance between tumblers	J		1680 (5' 6")
Undercarriage length (without grouser)	K		2104 (6' 11")
Undercarriage length (with grouser)			2137 (7' 0")
Undercarriage width	L		1740 (5' 9")
Track gauge	M		1440 (4' 9")
Track shoe width, standard	N		300 (1' 0")
Height of blade	O		371 (1' 3")
Ground clearance of blade up	P		383 (1' 3")
Depth of blade down	Q		447 (1' 6")
Track shoe link quantity			44
Travel speed (low/high)		km/hr (mph)	2.56/4.41
Swing speed		rpm	9.4
Gradeability		Degree (%)	35
Ground pressure		kgf/cm2 (psi)	0.35 (5.01)
Max traction force		kg (lb)	3039 (6700)

3. WORKING RANGE

1) 2.4 m (7' 10") BOOM, WITHOUT QUICK COUPLER

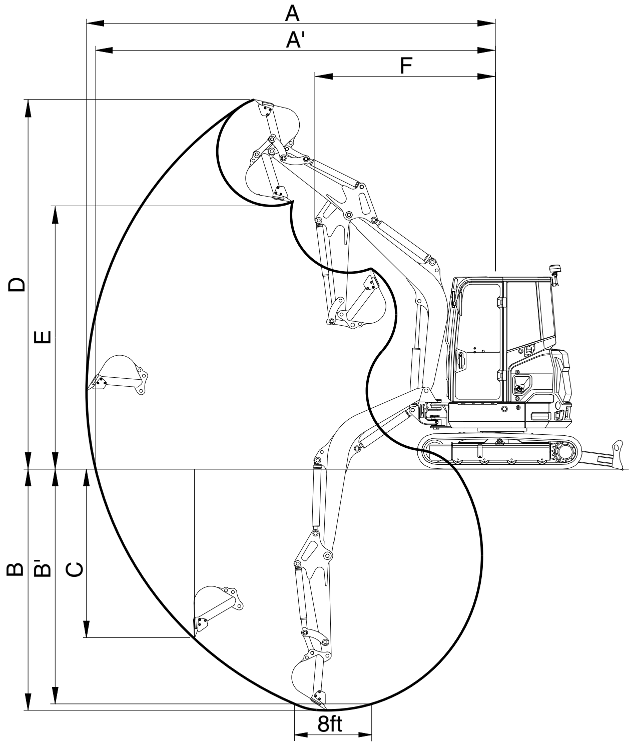


35AZ2SP10

Description		Unit	1.3 m (4' 3") Arm
Max digging reach	A	mm (ft-in)	5290 (17' 4")
Max digging reach on ground	A'		5170 (17' 0")
Max digging depth	B		2980 (9' 9")
Max digging depth (8ft level)	B'		2500 (8' 2")
Max vertical wall digging depth	C		2250 (7' 5")
Max digging height	D		4820 (15' 10")
Max dumping height	E		3415 (11' 2")
Min swing radius	F		2350 (7' 9")
Boom swing radius (left/right)		degree	75°/50°
Bucket digging force	SAE	kN	29 [31]
		kgf	2914 [3160]
		lbf	6423 [6967]
	ISO	kN	32 [34.8]
		kgf	3281 [3550]
		lbf	7232 [7826]
Arm crowd force	SAE	kN	19 [20.9]
		kgf	1963 [2130]
		lbf	4327 [4696]
	ISO	kN	20 [21.5]
		kgf	2025 [2190]
		lbf	4465 [4828]

[ ] : Power boost

2) 2.4 m (7' 10") BOOM, WITH QUICK COUPLER

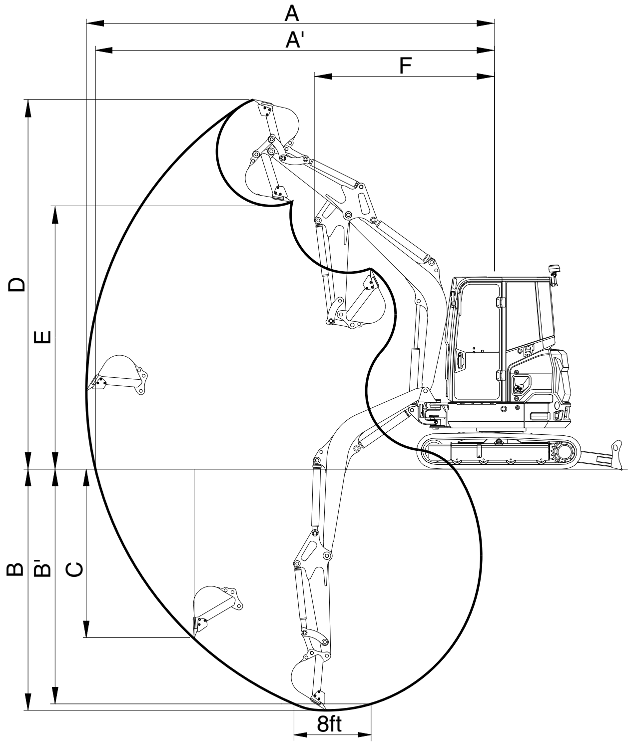


35AZ2SP10

Description		Unit	1.3 m (4' 3") Arm
Max digging reach	A	mm (ft-in)	5450 (17' 11")
Max digging reach on ground	A'		5340 (17' 6")
Max digging depth	B		3140 (10' 4")
Max digging depth (8ft level)	B'		2700 (8' 10")
Max vertical wall digging depth	C		2100 (6' 11")
Max digging height	D		4990 (16' 4")
Max dumping height	E		3250 (10' 8")
Min swing radius	F		2350 (7' 9")
Boom swing radius (left/right)		degree	75°/50°
Bucket digging force	SAE	kN	24 [26.3]
		kgf	2469 [2680]
		lbf	5444 [5908]
	ISO	kN	26 [28.5]
		kgf	2686 [2910]
		lbf	5922 [6415]
Arm crowd force	SAE	kN	18 [26.3]
		kgf	1804 [2680]
		lbf	3976 [5908]
	ISO	kN	18 [28.5]
		kgf	1855 [2910]
		lbf	4089 [6415]

[ ] : Power boost

3) 2.4 m (7' 10") BOOM, WITH QUICK COUPLER



35AZ2SP10

Description		Unit	1.6 m (5' 3") Long arm
Max digging reach	A	mm (ft-in)	5740 (18' 10")
Max digging reach on ground	A'		5630 (18' 6")
Max digging depth	B		3440 (11' 3")
Max digging depth (8ft level)	B'		3050 (10' 0")
Max vertical wall digging depth	C		2390 (7' 10")
Max digging height	D		5190 (17' 0")
Max dumping height	E		3450 (11' 4")
Min swing radius	F		2425 (7' 11")
Boom swing radius (left/right)		degree	75°/50°
Bucket digging force	SAE	kN	24 [26.2]
		kgf	2468 [2670]
		lbf	5441 [5886]
	ISO	kN	26 [28.5]
		kgf	2685 [2910]
		lbf	5919 [6415]
Arm crowd force	SAE	kN	16 [16.9]
		kgf	1583 [1720]
		lbf	3491 [3792]
	ISO	kN	16 [17.3]
		kgf	1623 [1760]
		lbf	3577 [3880]

[ ] : Power boost

4. WEIGHT

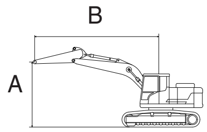
Item	kg	lb
Upperstructure assembly		
· Main frame weld assembly	453	999
· Engine assembly (including DFP)	148	326
· Main pump assembly	19	42
· Main control valve assembly	27	60
· Swing motor assembly	39	86
· Hydraulic oil tank wa	56	123
· Fuel tank wa	7	15
· Counterweight	410	904
· Counterweight-add	560	1235
· Cab assembly	455	1003
Lower chassis assembly		
· Track frame weld assembly	413	910
· Dozer blade assembly	152	335
· Angle dozer blade assembly	243	536
· Swing bearing	47	104
· Travel motor assembly	37	82
· Turning joint	27	60
· Sprocket	14	30
· Track recoil spring	34	74
· Idler	51	113
· Upper roller	5	10
· Lower roller	58	127
· Track-chain assembly-steel	382	842
· Track-chain assembly-rubber	299	659
Front attachment assembly		
· Boom assembly-2.4m	146	321
· Arm assembly-1.3 m	63	138
· Arm assembly-1.6 m	87	191
· Arm assembly-1.3 m, thumb	66	146
· Arm assembly-1.6 m, thumb	90	198
· Bucket assembly (with side cutter-611 mm)	87	192
· Bucket assembly (with side cutter-606 mm)	88	190
· Boom cylinder assembly	32	71
· Arm cylinder assembly	32	71
· Bucket cylinder assembly	23	51
· Swing cylinder assembly	26	57
· Cylinder assy-dozer	24	54
· Cylinder assy--dozer DPC	26	57
· Cylinder assy--dozer (angle)	23	51
· Cylinder assy-- angle dozer	10	22
· Bucket control linkage total	28	62

5. LIFTING CAPACITIES

1) RUBBER TRACK WITH DOZER BLADE

Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	410	300	-	Up	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)						At max. reach		
		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
										m (ft)
4.0 m	kg							*960	900	2.99
(13.1 ft)	lb							*2120	1980	(9.8)
3.5 m	kg							*880	670	3.58
(11.5 ft)	lb							*1940	1480	(11.8)
3.0 m	kg							*850	570	3.98
(9.8 ft)	lb							*1870	1260	(13.1)
2.5 m	kg			*930	890	*840	560	*830	510	4.26
(8.2 ft)	lb			*2050	1960	*1850	1230	*1830	1120	(14.0)
2.0 m	kg			*1070	870	*870	560	*830	470	4.44
(6.6 ft)	lb			*2360	1920	*1920	1230	*1830	1040	(14.6)
1.5 m	kg			*1240	840	*910	550	*830	450	4.54
(4.9 ft)	lb			*2730	1850	*2010	1210	*1830	990	(14.9)
1.0 m	kg			*1400	810	*960	540	*830	440	4.58
(3.3 ft)	lb			*3090	1790	*2120	1190	*1830	970	(15.0)
0.5 m	kg			*1490	790	*990	530	*830	440	4.54
(1.6 ft)	lb			*3280	1740	*2180	1170	*1830	970	(14.9)
Ground	kg			*1510	780	*990	520	*830	450	4.43
Line	lb			*3330	1720	*2180	1150	*1830	990	(14.5)
-0.5 m	kg	*1770	1470	*1460	780	*940	520	*830	480	4.24
(-1.6 ft)	lb	*3900	3240	*3220	1720	*2070	1150	*1830	1060	(13.9)
-1.0 m	kg	*2190	1480	*1330	780			*810	530	3.96
(-3.3 ft)	lb	*4830	3260	*2930	1720			*1790	1170	(13.0)
-1.5 m	kg	*1760	1500	*1090	790			*770	620	3.55
(-4.9 ft)	lb	*3880	3310	*2400	1740			*1700	1370	(11.7)
-2.0 m	kg	*1100	*1100					*640	*640	2.94
(-6.6 ft)	lb	*2430	*2430					*1410	*1410	(9.6)

Note 1. Lifting capacity are based on ISO 10567.
2. Lifting capacity of the HX series does not exceed 75% of tipping load with the machine on firm, level ground or 87% of full hydraulic capacity.
3. The lift-point is bucket pivot mounting pin on the arm (without bucket mass).
4. *Indicates load limited by hydraulic capacity.

※ Lifting capacities are based upon a standard machine conditions.
Lifting capacities will vary with different work tools, ground conditions and attachments.
The difference between the weight of a work tool attachment must be subtracted.
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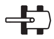
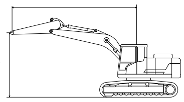
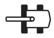
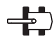
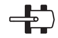
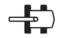
⚠ Failure to comply to the rated load can cause serious injury, death, or property damage. Make adjustments to the rated load as necessary for non-standard configurations.

Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	410	300	-	Down	-	-	-

·  : Rating over-front ·  : Rating over-side or 360 degree



Load point height (A)		Load radius (B)						At max. reach		
		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
										m (ft)
4.0 m	kg							*960	860	2.99
(13.1 ft)	lb							*2120	1900	(9.8)
3.5 m	kg							*880	640	3.58
(11.5 ft)	lb							*1940	1410	(11.8)
3.0 m	kg							*850	540	3.98
(9.8 ft)	lb							*1870	1190	(13.1)
2.5 m	kg			*930	850	*840	540	*830	480	4.26
(8.2 ft)	lb			*2050	1870	*1850	1190	*1830	1060	(14.0)
2.0 m	kg			*1070	830	*870	530	*830	450	4.44
(6.6 ft)	lb			*2360	1830	*1920	1170	*1830	990	(14.6)
1.5 m	kg			*1240	800	*910	520	*830	430	4.54
(4.9 ft)	lb			*2730	1760	*2010	1150	*1830	950	(14.9)
1.0 m	kg			*1400	780	*960	510	*830	420	4.58
(3.3 ft)	lb			*3090	1720	*2120	1120	*1830	930	(15.0)
0.5 m	kg			*1490	760	*990	500	*830	420	4.54
(1.6 ft)	lb			*3280	1680	*2180	1100	*1830	930	(14.9)
Ground	kg			*1510	750	*990	500	*830	430	4.43
Line	lb			*3330	1650	*2180	1100	*1830	950	(14.5)
-0.5 m	kg	*1770	1410	*1460	740	*940	500	*830	460	4.24
(-1.6 ft)	lb	*3900	3110	*3220	1630	*2070	1100	*1830	1010	(13.9)
-1.0 m	kg	*2190	1420	*1330	740			*810	510	3.96
(-3.3 ft)	lb	*4830	3130	*2930	1630			*1790	1120	(13.0)
-1.5 m	kg	*1760	1430	*1090	750			*770	600	3.55
(-4.9 ft)	lb	*3880	3150	*2400	1650			*1700	1320	(11.7)
-2.0 m	kg	*1100	*1100					*640	*640	2.94
(-6.6 ft)	lb	*2430	*2430					*1410	*1410	(9.6)

Note 1. Lifting capacity are based on ISO 10567.
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3. The lift-point is bucket pivot mounting pin on the arm (without bucket mass).
4. *Indicates load limited by hydraulic capacity.

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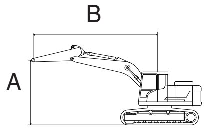
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	560	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)						At max. reach		
		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
										m (ft)
4.0 m	kg							*960	*960	2.99
(13.1 ft)	lb							*2120	*2120	(9.8)
3.5 m	kg							*880	740	3.58
(11.5 ft)	lb							*1940	1630	(11.8)
3.0 m	kg							*850	630	3.98
(9.8 ft)	lb							*1870	1390	(13.1)
2.5 m	kg			*930	*930	*840	620	*830	560	4.26
(8.2 ft)	lb			*2050	*2050	*1850	1370	*1830	1230	(14.0)
2.0 m	kg			*1070	950	*870	610	*830	520	4.44
(6.6 ft)	lb			*2360	2090	*1920	1340	*1830	1150	(14.6)
1.5 m	kg			*1240	920	*910	610	*830	500	4.54
(4.9 ft)	lb			*2730	2030	*2010	1340	*1830	1100	(14.9)
1.0 m	kg			*1400	900	*960	600	*830	490	4.58
(3.3 ft)	lb			*3090	1980	*2120	1320	*1830	1080	(15.0)
0.5 m	kg			*1490	880	*990	590	*830	490	4.54
(1.6 ft)	lb			*3280	1940	*2180	1300	*1830	1080	(14.9)
Ground	kg			*1510	870	*990	580	*830	510	4.43
Line	lb			*3330	1920	*2180	1280	*1830	1120	(14.5)
-0.5 m	kg	*1770	1630	*1460	860	*940	580	*830	540	4.24
(-1.6 ft)	lb	*3900	3590	*3220	1900	*2070	1280	*1830	1190	(13.9)
-1.0 m	kg	*2190	1640	*1330	860			*810	590	3.96
(-3.3 ft)	lb	*4830	3620	*2930	1900			*1790	1300	(13.0)
-1.5 m	kg	*1760	1660	*1090	870			*770	690	3.55
(-4.9 ft)	lb	*3880	3660	*2400	1920			*1700	1520	(11.7)
-2.0 m	kg	*1100	*1100					*640	*640	2.94
(-6.6 ft)	lb	*2430	*2430					*1410	*1410	(9.6)

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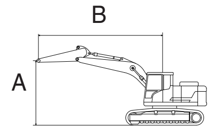
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	560	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)						At max. reach		
		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
										m (ft)
4.0 m	kg							*960	950	2.99
(13.1 ft)	lb							*2120	2090	(9.8)
3.5 m	kg							*880	710	3.58
(11.5 ft)	lb							*1940	1570	(11.8)
3.0 m	kg							*850	600	3.98
(9.8 ft)	lb							*1870	1320	(13.1)
2.5 m	kg			*930	*930	*840	600	*830	540	4.26
(8.2 ft)	lb			*2050	*2050	*1850	1320	*1830	1190	(14.0)
2.0 m	kg			*1070	920	*870	590	*830	500	4.44
(6.6 ft)	lb			*2360	2030	*1920	1300	*1830	1100	(14.6)
1.5 m	kg			*1240	890	*910	580	*830	480	4.54
(4.9 ft)	lb			*2730	1960	*2010	1280	*1830	1060	(14.9)
1.0 m	kg			*1400	860	*960	570	*830	470	4.58
(3.3 ft)	lb			*3090	1900	*2120	1260	*1830	1040	(15.0)
0.5 m	kg			*1490	840	*990	560	*830	470	4.54
(1.6 ft)	lb			*3280	1850	*2180	1230	*1830	1040	(14.9)
Ground	kg			*1510	830	*990	560	*830	480	4.43
Line	lb			*3330	1830	*2180	1230	*1830	1060	(14.5)
-0.5 m	kg	*1770	1570	*1460	830	*940	560	*830	510	4.24
(-1.6 ft)	lb	*3900	3460	*3220	1830	*2070	1230	*1830	1120	(13.9)
-1.0 m	kg	*2190	1580	*1330	830			*810	570	3.96
(-3.3 ft)	lb	*4830	3480	*2930	1830			*1790	1260	(13.0)
-1.5 m	kg	*1760	1590	*1090	840			*770	660	3.55
(-4.9 ft)	lb	*3880	3510	*2400	1850			*1700	1460	(11.7)
-2.0 m	kg	*1100	*1100					*640	*640	2.94
(-6.6 ft)	lb	*2430	*2430					*1410	*1410	(9.6)

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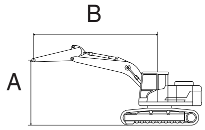
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	410	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m	kg									*810	710	3.46
(13.1 ft)	lb									*1790	1570	(11.4)
3.5 m	kg									*770	570	3.96
(11.5 ft)	lb									*1700	1260	(13.0)
3.0 m	kg							*740	570	*760	500	4.32
(9.8 ft)	lb							*1630	1260	*1680	1100	(14.2)
2.5 m	kg							*750	560	*750	450	4.57
(8.2 ft)	lb							*1650	1230	*1650	990	(15.0)
2.0 m	kg					*930	870	*790	560	*750	420	4.74
(6.6 ft)	lb					*2050	1920	*1740	1230	*1650	930	(15.5)
1.5 m	kg					*1110	840	*850	540	*750	400	4.83
(4.9 ft)	lb					*2450	1850	*1870	1190	*1650	880	(15.9)
1.0 m	kg					*1290	810	*910	530	*750	400	4.86
(3.3 ft)	lb					*2840	1790	*2010	1170	*1650	880	(16.0)
0.5 m	kg					*1430	790	*960	520	*760	400	4.83
(1.6 ft)	lb					*3150	1740	*2120	1150	*1680	880	(15.8)
Ground	kg			*1130	*1130	*1490	770	*980	510	*760	410	4.73
Line	lb			*2490	*2490	*3280	1700	*2160	1120	*1680	900	(15.5)
-0.5 m	kg	*1040	*1040	*1610	1450	*1480	760	*970	510	*760	430	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	3200	*3260	1680	*2140	1120	*1680	950	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1450	*1400	760	*890	510	*760	460	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3200	*3090	1680	*1960	1120	*1680	1010	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1470	*1230	770			*740	530	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3240	*2710	1700			*1630	1170	(12.9)
-2.0 m	kg			*1570	1490	*930	780			*680	650	3.43
(-6.6 ft)	lb			*3460	3280	*2050	1720			*1500	1430	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

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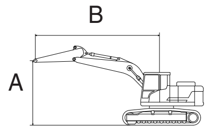
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	410	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
		over-front	over-side	over-front	over-side	over-front	over-side	over-front	over-side	over-front	over-side	m (ft)
4.0 m	kg									*810	680	3.46
(13.1 ft)	lb									*1790	1500	(11.4)
3.5 m	kg									*770	550	3.96
(11.5 ft)	lb									*1700	1210	(13.0)
3.0 m	kg							*740	540	*760	470	4.32
(9.8 ft)	lb							*1630	1190	*1680	1040	(14.2)
2.5 m	kg							*750	540	*750	430	4.57
(8.2 ft)	lb							*1650	1190	*1650	950	(15.0)
2.0 m	kg					*930	840	*790	530	*750	400	4.74
(6.6 ft)	lb					*2050	1850	*1740	1170	*1650	880	(15.5)
1.5 m	kg					*1110	810	*850	520	*750	380	4.83
(4.9 ft)	lb					*2450	1790	*1870	1150	*1650	840	(15.9)
1.0 m	kg					*1290	780	*910	510	*750	380	4.86
(3.3 ft)	lb					*2840	1720	*2010	1120	*1650	840	(16.0)
0.5 m	kg					*1430	750	*960	500	*760	380	4.83
(1.6 ft)	lb					*3150	1650	*2120	1100	*1680	840	(15.8)
Ground	kg			*1130	*1130	*1490	740	*980	490	*760	390	4.73
Line	lb			*2490	*2490	*3280	1630	*2160	1080	*1680	860	(15.5)
-0.5 m	kg	*1040	*1040	*1610	1380	*1480	730	*970	480	*760	410	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	3040	*3260	1610	*2140	1060	*1680	900	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1390	*1400	730	*890	480	*760	440	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3060	*3090	1610	*1960	1060	*1680	970	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1400	*1230	730			*740	500	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3090	*2710	1610			*1630	1100	(12.9)
-2.0 m	kg			*1570	1420	*930	750			*680	620	3.43
(-6.6 ft)	lb			*3460	3130	*2050	1650			*1500	1370	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

Note 1. Lifting capacity are based on ISO 10567.
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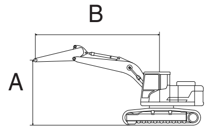
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	560	300	-	Down	-	-	-



· : Rating over-front · : Rating over-side or 360 degree

Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m	kg									*810	780	3.46
(13.1 ft)	lb									*1790	1720	(11.4)
3.5 m	kg									*770	630	3.96
(11.5 ft)	lb									*1700	1390	(13.0)
3.0 m	kg							*740	630	*760	550	4.32
(9.8 ft)	lb							*1630	1390	*1680	1210	(14.2)
2.5 m	kg							*750	620	*750	500	4.57
(8.2 ft)	lb							*1650	1370	*1650	1100	(15.0)
2.0 m	kg					*930	*930	*790	610	*750	470	4.74
(6.6 ft)	lb					*2050	*2050	*1740	1340	*1650	1040	(15.5)
1.5 m	kg					*1110	930	*850	600	*750	450	4.83
(4.9 ft)	lb					*2450	2050	*1870	1320	*1650	990	(15.9)
1.0 m	kg					*1290	900	*910	590	*750	440	4.86
(3.3 ft)	lb					*2840	1980	*2010	1300	*1650	970	(16.0)
0.5 m	kg					*1430	880	*960	580	*760	440	4.83
(1.6 ft)	lb					*3150	1940	*2120	1280	*1680	970	(15.8)
Ground	kg			*1130	*1130	*1490	860	*980	570	*760	450	4.73
Line	lb			*2490	*2490	*3280	1900	*2160	1260	*1680	990	(15.5)
-0.5 m	kg	*1040	*1040	*1610	1600	*1480	850	*970	570	*760	480	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	3530	*3260	1870	*2140	1260	*1680	1060	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1610	*1400	850	*890	570	*760	520	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3550	*3090	1870	*1960	1260	*1680	1150	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1620	*1230	850			*740	590	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3570	*2710	1870			*1630	1300	(12.9)
-2.0 m	kg			*1570	*1570	*930	870			*680	*680	3.43
(-6.6 ft)	lb			*3460	*3460	*2050	1920			*1500	*1500	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

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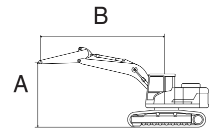
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	560	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m	kg									*810	750	3.46
(13.1 ft)	lb									*1790	1650	(11.4)
3.5 m	kg									*770	610	3.96
(11.5 ft)	lb									*1700	1340	(13.0)
3.0 m	kg							*740	600	*760	530	4.32
(9.8 ft)	lb							*1630	1320	*1680	1170	(14.2)
2.5 m	kg							*750	600	*750	480	4.57
(8.2 ft)	lb							*1650	1320	*1650	1060	(15.0)
2.0 m	kg					*930	930	*790	590	*750	450	4.74
(6.6 ft)	lb					*2050	2050	*1740	1300	*1650	990	(15.5)
1.5 m	kg					*1110	900	*850	580	*750	430	4.83
(4.9 ft)	lb					*2450	1980	*1870	1280	*1650	950	(15.9)
1.0 m	kg					*1290	870	*910	570	*750	420	4.86
(3.3 ft)	lb					*2840	1920	*2010	1260	*1650	930	(16.0)
0.5 m	kg					*1430	840	*960	560	*760	420	4.83
(1.6 ft)	lb					*3150	1850	*2120	1230	*1680	930	(15.8)
Ground	kg			*1130	*1130	*1490	820	*980	550	*760	430	4.73
Line	lb			*2490	*2490	*3280	1810	*2160	1210	*1680	950	(15.5)
-0.5 m	kg	*1040	*1040	*1610	1540	*1480	820	*970	540	*760	460	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	3400	*3260	1810	*2140	1190	*1680	1010	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1550	*1400	810	*890	540	*760	500	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3420	*3090	1790	*1960	1190	*1680	1100	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1560	*1230	820			*740	560	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3440	*2710	1810			*1630	1230	(12.9)
-2.0 m	kg			*1570	*1570	*930	830			*680	*680	3.43
(-6.6 ft)	lb			*3460	*3460	*2050	1830			*1500	*1500	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

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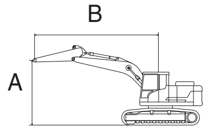
2) RUBBER TRACK WITH ANGLE DOZER BLADE

Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	410	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B) 2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		At max. reach Capacity		Reach m (ft)
4.0 m	kg							*960	920	2.99
(13.1 ft)	lb							*2120	2030	(9.8)
3.5 m	kg							*880	690	3.58
(11.5 ft)	lb							*1940	1520	(11.8)
3.0 m	kg							*850	580	3.98
(9.8 ft)	lb							*1870	1280	(13.1)
2.5 m	kg			*930	910	*840	580	*830	520	4.26
(8.2 ft)	lb			*2050	2010	*1850	1280	*1830	1150	(14.0)
2.0 m	kg			*1070	890	*870	570	*830	480	4.44
(6.6 ft)	lb			*2360	1960	*1920	1260	*1830	1060	(14.6)
1.5 m	kg			*1240	860	*910	560	*830	460	4.54
(4.9 ft)	lb			*2730	1900	*2010	1230	*1830	1010	(14.9)
1.0 m	kg			*1400	830	*960	550	*830	450	4.58
(3.3 ft)	lb			*3090	1830	*2120	1210	*1830	990	(15.0)
0.5 m	kg			*1490	810	*990	540	*830	450	4.54
(1.6 ft)	lb			*3280	1790	*2180	1190	*1830	990	(14.9)
Ground	kg			*1510	800	*990	540	*830	470	4.43
Line	lb			*3330	1760	*2180	1190	*1830	1040	(14.5)
-0.5 m	kg	*1770	1510	*1460	800	*940	530	*830	500	4.24
(-1.6 ft)	lb	*3900	3330	*3220	1760	*2070	1170	*1830	1100	(13.9)
-1.0 m	kg	*2190	1520	*1330	800			*810	550	3.96
(-3.3 ft)	lb	*4830	3350	*2930	1760			*1790	1210	(13.0)
-1.5 m	kg	*1760	1540	*1090	810			*770	640	3.55
(-4.9 ft)	lb	*3880	3400	*2400	1790			*1700	1410	(11.7)
-2.0 m	kg	*1100	*1100					*640	*640	2.94
(-6.6 ft)	lb	*2430	*2430					*1410	*1410	(9.6)

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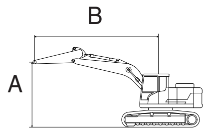
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	410	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)						At max. reach		
		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
										m (ft)
4.0 m	kg							*960	880	2.99
(13.1 ft)	lb							*2120	1940	(9.8)
3.5 m	kg							*880	660	3.58
(11.5 ft)	lb							*1940	1460	(11.8)
3.0 m	kg							*850	560	3.98
(9.8 ft)	lb							*1870	1230	(13.1)
2.5 m	kg			*930	870	*840	550	*830	500	4.26
(8.2 ft)	lb			*2050	1920	*1850	1210	*1830	1100	(14.0)
2.0 m	kg			*1070	850	*870	550	*830	460	4.44
(6.6 ft)	lb			*2360	1870	*1920	1210	*1830	1010	(14.6)
1.5 m	kg			*1240	820	*910	540	*830	440	4.54
(4.9 ft)	lb			*2730	1810	*2010	1190	*1830	970	(14.9)
1.0 m	kg			*1400	800	*960	530	*830	430	4.58
(3.3 ft)	lb			*3090	1760	*2120	1170	*1830	950	(15.0)
0.5 m	kg			*1490	780	*990	520	*830	430	4.54
(1.6 ft)	lb			*3280	1720	*2180	1150	*1830	950	(14.9)
Ground	kg			*1510	770	*990	510	*830	450	4.43
Line	lb			*3330	1700	*2180	1120	*1830	990	(14.5)
-0.5 m	kg	*1770	1450	*1460	760	*940	510	*830	470	4.24
(-1.6 ft)	lb	*3900	3200	*3220	1680	*2070	1120	*1830	1040	(13.9)
-1.0 m	kg	*2190	1460	*1330	760			*810	520	3.96
(-3.3 ft)	lb	*4830	3220	*2930	1680			*1790	1150	(13.0)
-1.5 m	kg	*1760	1470	*1090	770			*770	610	3.55
(-4.9 ft)	lb	*3880	3240	*2400	1700			*1700	1340	(11.7)
-2.0 m	kg	*1100	*1100					*640	*640	2.94
(-6.6 ft)	lb	*2430	*2430					*1410	*1410	(9.6)

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Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	560	300	-	Down	-	-	-

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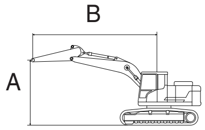

Load point height (A)		Load radius (B)						At max. reach		
		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
										m (ft)
4.0 m	kg							*960	*960	2.99
(13.1 ft)	lb							*2120	*2120	(9.8)
3.5 m	kg							*880	760	3.58
(11.5 ft)	lb							*1940	1680	(11.8)
3.0 m	kg							*850	640	3.98
(9.8 ft)	lb							*1870	1410	(13.1)
2.5 m	kg			*930	*930	*840	640	*830	570	4.26
(8.2 ft)	lb			*2050	*2050	*1850	1410	*1830	1260	(14.0)
2.0 m	kg			*1070	970	*870	630	*830	530	4.44
(6.6 ft)	lb			*2360	2140	*1920	1390	*1830	1170	(14.6)
1.5 m	kg			*1240	950	*910	620	*830	510	4.54
(4.9 ft)	lb			*2730	2090	*2010	1370	*1830	1120	(14.9)
1.0 m	kg			*1400	920	*960	610	*830	500	4.58
(3.3 ft)	lb			*3090	2030	*2120	1340	*1830	1100	(15.0)
0.5 m	kg			*1490	900	*990	600	*830	500	4.54
(1.6 ft)	lb			*3280	1980	*2180	1320	*1830	1100	(14.9)
Ground	kg			*1510	890	*990	600	*830	520	4.43
Line	lb			*3330	1960	*2180	1320	*1830	1150	(14.5)
-0.5 m	kg	*1770	1670	*1460	880	*940	590	*830	550	4.24
(-1.6 ft)	lb	*3900	3680	*3220	1940	*2070	1300	*1830	1210	(13.9)
-1.0 m	kg	*2190	1680	*1330	890			*810	610	3.96
(-3.3 ft)	lb	*4830	3700	*2930	1960			*1790	1340	(13.0)
-1.5 m	kg	*1760	1690	*1090	890			*770	710	3.55
(-4.9 ft)	lb	*3880	3730	*2400	1960			*1700	1570	(11.7)
-2.0 m	kg	*1100	*1100					*640	*640	2.94
(-6.6 ft)	lb	*2430	*2430					*1410	*1410	(9.6)

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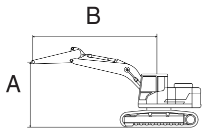
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	560	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)						At max. reach		
		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
										m (ft)
4.0 m	kg							*960	*960	2.99
(13.1 ft)	lb							*2120	*2120	(9.8)
3.5 m	kg							*880	730	3.58
(11.5 ft)	lb							*1940	1610	(11.8)
3.0 m	kg							*850	620	3.98
(9.8 ft)	lb							*1870	1370	(13.1)
2.5 m	kg			*930	*930	*840	610	*830	550	4.26
(8.2 ft)	lb			*2050	*2050	*1850	1340	*1830	1210	(14.0)
2.0 m	kg			*1070	940	*870	610	*830	510	4.44
(6.6 ft)	lb			*2360	2070	*1920	1340	*1830	1120	(14.6)
1.5 m	kg			*1240	910	*910	600	*830	490	4.54
(4.9 ft)	lb			*2730	2010	*2010	1320	*1830	1080	(14.9)
1.0 m	kg			*1400	880	*960	590	*830	480	4.58
(3.3 ft)	lb			*3090	1940	*2120	1300	*1830	1060	(15.0)
0.5 m	kg			*1490	860	*990	580	*830	480	4.54
(1.6 ft)	lb			*3280	1900	*2180	1280	*1830	1060	(14.9)
Ground	kg			*1510	850	*990	570	*830	500	4.43
Line	lb			*3330	1870	*2180	1260	*1830	1100	(14.5)
-0.5 m	kg	*1770	1610	*1460	850	*940	570	*830	530	4.24
(-1.6 ft)	lb	*3900	3550	*3220	1870	*2070	1260	*1830	1170	(13.9)
-1.0 m	kg	*2190	1610	*1330	850			*810	580	3.96
(-3.3 ft)	lb	*4830	3550	*2930	1870			*1790	1280	(13.0)
-1.5 m	kg	*1760	1630	*1090	860			*770	680	3.55
(-4.9 ft)	lb	*3880	3590	*2400	1900			*1700	1500	(11.7)
-2.0 m	kg	*1100	*1100					*640	*640	2.94
(-6.6 ft)	lb	*2430	*2430					*1410	*1410	(9.6)

Note 1. Lifting capacity are based on ISO 10567.
2. Lifting capacity of the HX series does not exceed 75% of tipping load with the machine on firm, level ground or 87% of full hydraulic capacity.
3. The lift-point is bucket pivot mounting pin on the arm (without bucket mass).
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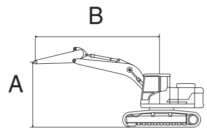
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	410	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m	kg									*810	730	3.46
(13.1 ft)	lb									*1790	1610	(11.4)
3.5 m	kg									*770	590	3.96
(11.5 ft)	lb									*1700	1300	(13.0)
3.0 m	kg							*740	580	*760	510	4.32
(9.8 ft)	lb							*1630	1280	*1680	1120	(14.2)
2.5 m	kg							*750	580	*750	460	4.57
(8.2 ft)	lb							*1650	1280	*1650	1010	(15.0)
2.0 m	kg					*930	900	*790	570	*750	430	4.74
(6.6 ft)	lb					*2050	1980	*1740	1260	*1650	950	(15.5)
1.5 m	kg					*1110	870	*850	560	*750	420	4.83
(4.9 ft)	lb					*2450	1920	*1870	1230	*1650	930	(15.9)
1.0 m	kg					*1290	840	*910	550	*750	410	4.86
(3.3 ft)	lb					*2840	1850	*2010	1210	*1650	900	(16.0)
0.5 m	kg					*1430	810	*960	540	*760	410	4.83
(1.6 ft)	lb					*3150	1790	*2120	1190	*1680	900	(15.8)
Ground	kg			*1130	*1130	*1490	790	*980	530	*760	420	4.73
Line	lb			*2490	*2490	*3280	1740	*2160	1170	*1680	930	(15.5)
-0.5 m	kg	*1040	*1040	*1610	1480	*1480	790	*970	520	*760	440	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	3260	*3260	1740	*2140	1150	*1680	970	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1490	*1400	780	*890	520	*760	480	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3280	*3090	1720	*1960	1150	*1680	1060	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1500	*1230	790			*740	540	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3310	*2710	1740			*1630	1190	(12.9)
-2.0 m	kg			*1570	1530	*930	800			*680	670	3.43
(-6.6 ft)	lb			*3460	3370	*2050	1760			*1500	1480	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

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Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	410	300	-	Down	-	-	-

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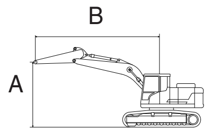

Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m (13.1 ft)	kg lb									*810 *1790	700 1540	3.46 (11.4)
3.5 m (11.5 ft)	kg lb									*770 *1700	560 1230	3.96 (13.0)
3.0 m (9.8 ft)	kg lb							*740 *1630	560 1230	*760 *1680	490 1080	4.32 (14.2)
2.5 m (8.2 ft)	kg lb							*750 *1650	550 1210	*750 *1650	440 970	4.57 (15.0)
2.0 m (6.6 ft)	kg lb					*930 *2050	860 1900	*790 *1740	550 1210	*750 *1650	410 900	4.74 (15.5)
1.5 m (4.9 ft)	kg lb					*1110 *2450	830 1830	*850 *1870	540 1190	*750 *1650	400 880	4.83 (15.9)
1.0 m (3.3 ft)	kg lb					*1290 *2840	800 1760	*910 *2010	520 1150	*750 *1650	390 860	4.86 (16.0)
0.5 m (1.6 ft)	kg lb					*1430 *3150	780 1720	*960 *2120	510 1120	*760 *1680	390 860	4.83 (15.8)
Ground Line	kg lb			*1130 *2490	*1130 *2490	*1490 *3280	760 1680	*980 *2160	500 1100	*760 *1680	400 880	4.73 (15.5)
-0.5 m (-1.6 ft)	kg lb	*1040 *2290	*1040 *2290	*1610 *3550	1420 3130	*1480 *3260	750 1650	*970 *2140	500 1100	*760 *1680	420 930	4.55 (14.9)
-1.0 m (-3.3 ft)	kg lb	*1460 *3220	*1460 *3220	*2210 *4870	1430 3150	*1400 *3090	750 1650	*890 *1960	500 1100	*760 *1680	450 990	4.30 (14.1)
-1.5 m (-4.9 ft)	kg lb	*1950 *4300	*1950 *4300	*2110 *4650	1440 3170	*1230 *2710	750 1650			*740 *1630	520 1150	3.94 (12.9)
-2.0 m (-6.6 ft)	kg lb			*1570 *3460	1460 3220	*930 *2050	770 1700			*680 *1500	640 1410	3.43 (11.2)
-2.5 m (-8.2 ft)	kg lb			*730 *1610	*730 *1610					*480 *1060	*480 *1060	2.63 (8.6)

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Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	560	300	-	Down	-	-	-

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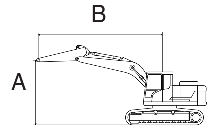

Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m	kg									*810	800	3.46
(13.1 ft)	lb									*1790	1760	(11.4)
3.5 m	kg									*770	650	3.96
(11.5 ft)	lb									*1700	1430	(13.0)
3.0 m	kg							*740	640	*760	560	4.32
(9.8 ft)	lb							*1630	1410	*1680	1230	(14.2)
2.5 m	kg							*750	640	*750	510	4.57
(8.2 ft)	lb							*1650	1410	*1650	1120	(15.0)
2.0 m	kg					*930	*930	*790	630	*750	480	4.74
(6.6 ft)	lb					*2050	*2050	*1740	1390	*1650	1060	(15.5)
1.5 m	kg					*1110	950	*850	620	*750	460	4.83
(4.9 ft)	lb					*2450	2090	*1870	1370	*1650	1010	(15.9)
1.0 m	kg					*1290	920	*910	610	*750	450	4.86
(3.3 ft)	lb					*2840	2030	*2010	1340	*1650	990	(16.0)
0.5 m	kg					*1430	900	*960	600	*760	460	4.83
(1.6 ft)	lb					*3150	1980	*2120	1320	*1680	1010	(15.8)
Ground	kg			*1130	*1130	*1490	880	*980	590	*760	470	4.73
Line	lb			*2490	*2490	*3280	1940	*2160	1300	*1680	1040	(15.5)
-0.5 m	kg	*1040	*1040	*1610	*1610	*1480	870	*970	580	*760	490	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	*3550	*3260	1920	*2140	1280	*1680	1080	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1650	*1400	870	*890	580	*760	530	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3640	*3090	1920	*1960	1280	*1680	1170	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1660	*1230	880			*740	600	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3660	*2710	1940			*1630	1320	(12.9)
-2.0 m	kg			*1570	*1570	*930	890			*680	*680	3.43
(-6.6 ft)	lb			*3460	*3460	*2050	1960			*1500	*1500	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

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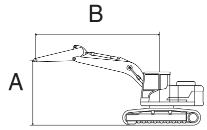
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	560	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m	kg									*810	770	3.46
(13.1 ft)	lb									*1790	1700	(11.4)
3.5 m	kg									*770	620	3.96
(11.5 ft)	lb									*1700	1370	(13.0)
3.0 m	kg							*740	620	*760	540	4.32
(9.8 ft)	lb							*1630	1370	*1680	1190	(14.2)
2.5 m	kg							*750	610	*750	490	4.57
(8.2 ft)	lb							*1650	1340	*1650	1080	(15.0)
2.0 m	kg					*930	*930	*790	610	*750	460	4.74
(6.6 ft)	lb					*2050	*2050	*1740	1340	*1650	1010	(15.5)
1.5 m	kg					*1110	920	*850	590	*750	440	4.83
(4.9 ft)	lb					*2450	2030	*1870	1300	*1650	970	(15.9)
1.0 m	kg					*1290	890	*910	580	*750	440	4.86
(3.3 ft)	lb					*2840	1960	*2010	1280	*1650	970	(16.0)
0.5 m	kg					*1430	860	*960	570	*760	440	4.83
(1.6 ft)	lb					*3150	1900	*2120	1260	*1680	970	(15.8)
Ground	kg			*1130	*1130	*1490	850	*980	560	*760	450	4.73
Line	lb			*2490	*2490	*3280	1870	*2160	1230	*1680	990	(15.5)
-0.5 m	kg	*1040	*1040	*1610	1580	*1480	840	*970	560	*760	470	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	3480	*3260	1850	*2140	1230	*1680	1040	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1580	*1400	840	*890	560	*760	510	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3480	*3090	1850	*1960	1230	*1680	1120	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1600	*1230	840			*740	580	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3530	*2710	1850			*1630	1280	(12.9)
-2.0 m	kg			*1570	*1570	*930	850			*680	*680	3.43
(-6.6 ft)	lb			*3460	*3460	*2050	1870			*1500	*1500	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

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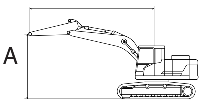
3) STEEL TRACK WITH DOZER BLADE

Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	410	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B) 2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		At max. reach Capacity		Reach m (ft)
4.0 m	kg							*960	920	2.99
(13.1 ft)	lb							*2120	2030	(9.8)
3.5 m	kg							*880	690	3.58
(11.5 ft)	lb							*1940	1520	(11.8)
3.0 m	kg							*850	580	3.98
(9.8 ft)	lb							*1870	1280	(13.1)
2.5 m	kg			*930	910	*840	580	*830	520	4.26
(8.2 ft)	lb			*2050	2010	*1850	1280	*1830	1150	(14.0)
2.0 m	kg			*1070	890	*870	570	*830	480	4.44
(6.6 ft)	lb			*2360	1960	*1920	1260	*1830	1060	(14.6)
1.5 m	kg			*1240	860	*910	560	*830	460	4.54
(4.9 ft)	lb			*2730	1900	*2010	1230	*1830	1010	(14.9)
1.0 m	kg			*1400	830	*960	550	*830	450	4.58
(3.3 ft)	lb			*3090	1830	*2120	1210	*1830	990	(15.0)
0.5 m	kg			*1490	820	*990	540	*830	450	4.54
(1.6 ft)	lb			*3280	1810	*2180	1190	*1830	990	(14.9)
Ground	kg			*1510	800	*990	540	*830	470	4.43
Line	lb			*3330	1760	*2180	1190	*1830	1040	(14.5)
-0.5 m	kg	*1770	1520	*1460	800	*940	540	*830	500	4.24
(-1.6 ft)	lb	*3900	3350	*3220	1760	*2070	1190	*1830	1100	(13.9)
-1.0 m	kg	*2190	1520	*1330	800			*810	550	3.96
(-3.3 ft)	lb	*4830	3350	*2930	1760			*1790	1210	(13.0)
-1.5 m	kg	*1760	1540	*1090	810			*770	640	3.55
(-4.9 ft)	lb	*3880	3400	*2400	1790			*1700	1410	(11.7)
-2.0 m	kg	*1100	*1100					*640	*640	2.94
(-6.6 ft)	lb	*2430	*2430					*1410	*1410	(9.6)

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Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	410	300	-	Down	-	-	-

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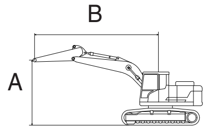

Load point height (A)		Load radius (B)						At max. reach		
		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
										m (ft)
4.0 m	kg							*960	880	2.99
(13.1 ft)	lb							*2120	1940	(9.8)
3.5 m	kg							*880	660	3.58
(11.5 ft)	lb							*1940	1460	(11.8)
3.0 m	kg							*850	560	3.98
(9.8 ft)	lb							*1870	1230	(13.1)
2.5 m	kg			*930	880	*840	550	*830	500	4.26
(8.2 ft)	lb			*2050	1940	*1850	1210	*1830	1100	(14.0)
2.0 m	kg			*1070	850	*870	550	*830	460	4.44
(6.6 ft)	lb			*2360	1870	*1920	1210	*1830	1010	(14.6)
1.5 m	kg			*1240	830	*910	540	*830	440	4.54
(4.9 ft)	lb			*2730	1830	*2010	1190	*1830	970	(14.9)
1.0 m	kg			*1400	800	*960	530	*830	430	4.58
(3.3 ft)	lb			*3090	1760	*2120	1170	*1830	950	(15.0)
0.5 m	kg			*1490	780	*990	520	*830	430	4.54
(1.6 ft)	lb			*3280	1720	*2180	1150	*1830	950	(14.9)
Ground	kg			*1510	770	*990	510	*830	450	4.43
Line	lb			*3330	1700	*2180	1120	*1830	990	(14.5)
-0.5 m	kg	*1770	1450	*1460	760	*940	510	*830	470	4.24
(-1.6 ft)	lb	*3900	3200	*3220	1680	*2070	1120	*1830	1040	(13.9)
-1.0 m	kg	*2190	1460	*1330	770			*810	520	3.96
(-3.3 ft)	lb	*4830	3220	*2930	1700			*1790	1150	(13.0)
-1.5 m	kg	*1760	1480	*1090	780			*770	610	3.55
(-4.9 ft)	lb	*3880	3260	*2400	1720			*1700	1340	(11.7)
-2.0 m	kg	*1100	*1100					*640	*640	2.94
(-6.6 ft)	lb	*2430	*2430					*1410	*1410	(9.6)

Note 1. Lifting capacity are based on ISO 10567.
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3. The lift-point is bucket pivot mounting pin on the arm (without bucket mass).
4. *Indicates load limited by hydraulic capacity.

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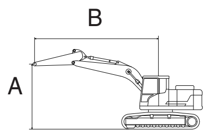
Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	560	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)						At max. reach		
		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
										m (ft)
4.0 m	kg							*960	*960	2.99
(13.1 ft)	lb							*2120	*2120	(9.8)
3.5 m	kg							*880	760	3.58
(11.5 ft)	lb							*1940	1680	(11.8)
3.0 m	kg							*850	640	3.98
(9.8 ft)	lb							*1870	1410	(13.1)
2.5 m	kg			*930	*930	*840	640	*830	580	4.26
(8.2 ft)	lb			*2050	*2050	*1850	1410	*1830	1280	(14.0)
2.0 m	kg			*1070	980	*870	630	*830	540	4.44
(6.6 ft)	lb			*2360	2160	*1920	1390	*1830	1190	(14.6)
1.5 m	kg			*1240	950	*910	620	*830	510	4.54
(4.9 ft)	lb			*2730	2090	*2010	1370	*1830	1120	(14.9)
1.0 m	kg			*1400	920	*960	610	*830	500	4.58
(3.3 ft)	lb			*3090	2030	*2120	1340	*1830	1100	(15.0)
0.5 m	kg			*1490	900	*990	600	*830	510	4.54
(1.6 ft)	lb			*3280	1980	*2180	1320	*1830	1120	(14.9)
Ground	kg			*1510	890	*990	600	*830	520	4.43
Line	lb			*3330	1960	*2180	1320	*1830	1150	(14.5)
-0.5 m	kg	*1770	1670	*1460	890	*940	600	*830	550	4.24
(-1.6 ft)	lb	*3900	3680	*3220	1960	*2070	1320	*1830	1210	(13.9)
-1.0 m	kg	*2190	1680	*1330	890			*810	610	3.96
(-3.3 ft)	lb	*4830	3700	*2930	1960			*1790	1340	(13.0)
-1.5 m	kg	*1760	1700	*1090	900			*770	710	3.55
(-4.9 ft)	lb	*3880	3750	*2400	1980			*1700	1570	(11.7)
-2.0 m	kg	*1100	*1100					*640	*640	2.94
(-6.6 ft)	lb	*2430	*2430					*1410	*1410	(9.6)

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Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HX35A Z	Canopy	2400	1300	560	300	-	Down	-	-	-

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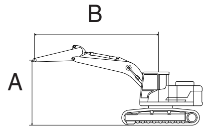

Load point height (A)		Load radius (B)						At max. reach		
		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
										m (ft)
4.0 m	kg							*960	*960	2.99
(13.1 ft)	lb							*2120	*2120	(9.8)
3.5 m	kg							*880	730	3.58
(11.5 ft)	lb							*1940	1610	(11.8)
3.0 m	kg							*850	620	3.98
(9.8 ft)	lb							*1870	1370	(13.1)
2.5 m	kg			*930	*930	*840	610	*830	550	4.26
(8.2 ft)	lb			*2050	*2050	*1850	1340	*1830	1210	(14.0)
2.0 m	kg			*1070	940	*870	610	*830	510	4.44
(6.6 ft)	lb			*2360	2070	*1920	1340	*1830	1120	(14.6)
1.5 m	kg			*1240	910	*910	600	*830	490	4.54
(4.9 ft)	lb			*2730	2010	*2010	1320	*1830	1080	(14.9)
1.0 m	kg			*1400	890	*960	590	*830	480	4.58
(3.3 ft)	lb			*3090	1960	*2120	1300	*1830	1060	(15.0)
0.5 m	kg			*1490	870	*990	580	*830	480	4.54
(1.6 ft)	lb			*3280	1920	*2180	1280	*1830	1060	(14.9)
Ground	kg			*1510	860	*990	570	*830	500	4.43
Line	lb			*3330	1900	*2180	1260	*1830	1100	(14.5)
-0.5 m	kg	*1770	1610	*1460	850	*940	570	*830	530	4.24
(-1.6 ft)	lb	*3900	3550	*3220	1870	*2070	1260	*1830	1170	(13.9)
-1.0 m	kg	*2190	1620	*1330	850			*810	580	3.96
(-3.3 ft)	lb	*4830	3570	*2930	1870			*1790	1280	(13.0)
-1.5 m	kg	*1760	1630	*1090	860			*770	680	3.55
(-4.9 ft)	lb	*3880	3590	*2400	1900			*1700	1500	(11.7)
-2.0 m	kg	*1100	*1100					*640	*640	2.94
(-6.6 ft)	lb	*2430	*2430					*1410	*1410	(9.6)

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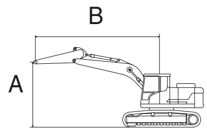
Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	410	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
		Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	m (ft)
4.0 m	kg									*810	730	3.46
(13.1 ft)	lb									*1790	1610	(11.4)
3.5 m	kg									*770	590	3.96
(11.5 ft)	lb									*1700	1300	(13.0)
3.0 m	kg							*740	580	*760	510	4.32
(9.8 ft)	lb							*1630	1280	*1680	1120	(14.2)
2.5 m	kg							*750	580	*750	460	4.57
(8.2 ft)	lb							*1650	1280	*1650	1010	(15.0)
2.0 m	kg					*930	900	*790	570	*750	430	4.74
(6.6 ft)	lb					*2050	1980	*1740	1260	*1650	950	(15.5)
1.5 m	kg					*1110	870	*850	560	*750	420	4.83
(4.9 ft)	lb					*2450	1920	*1870	1230	*1650	930	(15.9)
1.0 m	kg					*1290	840	*910	550	*750	410	4.86
(3.3 ft)	lb					*2840	1850	*2010	1210	*1650	900	(16.0)
0.5 m	kg					*1430	810	*960	540	*760	410	4.83
(1.6 ft)	lb					*3150	1790	*2120	1190	*1680	900	(15.8)
Ground	kg			*1130	*1130	*1490	800	*980	530	*760	420	4.73
Line	lb			*2490	*2490	*3280	1760	*2160	1170	*1680	930	(15.5)
-0.5 m	kg	*1040	*1040	*1610	1490	*1480	790	*970	520	*760	440	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	3280	*3260	1740	*2140	1150	*1680	970	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1490	*1400	790	*890	520	*760	480	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3280	*3090	1740	*1960	1150	*1680	1060	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1510	*1230	790			*740	540	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3330	*2710	1740			*1630	1190	(12.9)
-2.0 m	kg			*1570	1530	*930	800			*680	670	3.43
(-6.6 ft)	lb			*3460	3370	*2050	1760			*1500	1480	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

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Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	410	300	-	Down	-	-	-

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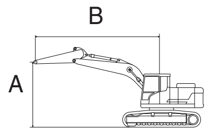

Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m	kg									*810	700	3.46
(13.1 ft)	lb									*1790	1540	(11.4)
3.5 m	kg									*770	560	3.96
(11.5 ft)	lb									*1700	1230	(13.0)
3.0 m	kg							*740	560	*760	490	4.32
(9.8 ft)	lb							*1630	1230	*1680	1080	(14.2)
2.5 m	kg							*750	560	*750	440	4.57
(8.2 ft)	lb							*1650	1230	*1650	970	(15.0)
2.0 m	kg					*930	860	*790	550	*750	410	4.74
(6.6 ft)	lb					*2050	1900	*1740	1210	*1650	900	(15.5)
1.5 m	kg					*1110	830	*850	540	*750	400	4.83
(4.9 ft)	lb					*2450	1830	*1870	1190	*1650	880	(15.9)
1.0 m	kg					*1290	800	*910	520	*750	390	4.86
(3.3 ft)	lb					*2840	1760	*2010	1150	*1650	860	(16.0)
0.5 m	kg					*1430	780	*960	510	*760	390	4.83
(1.6 ft)	lb					*3150	1720	*2120	1120	*1680	860	(15.8)
Ground	kg			*1130	*1130	*1490	760	*980	510	*760	400	4.73
Line	lb			*2490	*2490	*3280	1680	*2160	1120	*1680	880	(15.5)
-0.5 m	kg	*1040	*1040	*1610	1420	*1480	750	*970	500	*760	420	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	3130	*3260	1650	*2140	1100	*1680	930	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1430	*1400	750	*890	500	*760	460	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3150	*3090	1650	*1960	1100	*1680	1010	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1440	*1230	760			*740	520	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3170	*2710	1680			*1630	1150	(12.9)
-2.0 m	kg			*1570	1470	*930	770			*680	640	3.43
(-6.6 ft)	lb			*3460	3240	*2050	1700			*1500	1410	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

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HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	560	300	-	Down	-	-	-

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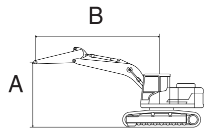

Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m	kg									*810	800	3.46
(13.1 ft)	lb									*1790	1760	(11.4)
3.5 m	kg									*770	650	3.96
(11.5 ft)	lb									*1700	1430	(13.0)
3.0 m	kg							*740	640	*760	560	4.32
(9.8 ft)	lb							*1630	1410	*1680	1230	(14.2)
2.5 m	kg							*750	640	*750	510	4.57
(8.2 ft)	lb							*1650	1410	*1650	1120	(15.0)
2.0 m	kg					*930	*930	*790	630	*750	480	4.74
(6.6 ft)	lb					*2050	*2050	*1740	1390	*1650	1060	(15.5)
1.5 m	kg					*1110	950	*850	620	*750	460	4.83
(4.9 ft)	lb					*2450	2090	*1870	1370	*1650	1010	(15.9)
1.0 m	kg					*1290	920	*910	610	*750	460	4.86
(3.3 ft)	lb					*2840	2030	*2010	1340	*1650	1010	(16.0)
0.5 m	kg					*1430	900	*960	600	*760	460	4.83
(1.6 ft)	lb					*3150	1980	*2120	1320	*1680	1010	(15.8)
Ground	kg			*1130	*1130	*1490	880	*980	590	*760	470	4.73
Line	lb			*2490	*2490	*3280	1940	*2160	1300	*1680	1040	(15.5)
-0.5 m	kg	*1040	*1040	*1610	*1610	*1480	870	*970	580	*760	490	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	*3550	*3260	1920	*2140	1280	*1680	1080	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1650	*1400	870	*890	580	*760	530	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3640	*3090	1920	*1960	1280	*1680	1170	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1670	*1230	880			*740	600	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3680	*2710	1940			*1630	1320	(12.9)
-2.0 m	kg			*1570	*1570	*930	890			*680	*680	3.43
(-6.6 ft)	lb			*3460	*3460	*2050	1960			*1500	*1500	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

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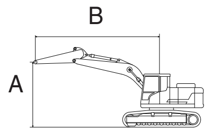
Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	560	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m	kg									*810	770	3.46
(13.1 ft)	lb									*1790	1700	(11.4)
3.5 m	kg									*770	620	3.96
(11.5 ft)	lb									*1700	1370	(13.0)
3.0 m	kg							*740	620	*760	540	4.32
(9.8 ft)	lb							*1630	1370	*1680	1190	(14.2)
2.5 m	kg							*750	620	*750	490	4.57
(8.2 ft)	lb							*1650	1370	*1650	1080	(15.0)
2.0 m	kg					*930	*930	*790	610	*750	460	4.74
(6.6 ft)	lb					*2050	*2050	*1740	1340	*1650	1010	(15.5)
1.5 m	kg					*1110	920	*850	600	*750	440	4.83
(4.9 ft)	lb					*2450	2030	*1870	1320	*1650	970	(15.9)
1.0 m	kg					*1290	890	*910	580	*750	440	4.86
(3.3 ft)	lb					*2840	1960	*2010	1280	*1650	970	(16.0)
0.5 m	kg					*1430	860	*960	570	*760	440	4.83
(1.6 ft)	lb					*3150	1900	*2120	1260	*1680	970	(15.8)
Ground	kg			*1130	*1130	*1490	850	*980	570	*760	450	4.73
Line	lb			*2490	*2490	*3280	1870	*2160	1260	*1680	990	(15.5)
-0.5 m	kg	*1040	*1040	*1610	1580	*1480	840	*970	560	*760	470	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	3480	*3260	1850	*2140	1230	*1680	1040	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1590	*1400	840	*890	560	*760	510	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3510	*3090	1850	*1960	1230	*1680	1120	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1600	*1230	840			*740	580	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3530	*2710	1850			*1630	1280	(12.9)
-2.0 m	kg			*1570	*1570	*930	850			*680	*680	3.43
(-6.6 ft)	lb			*3460	*3460	*2050	1870			*1500	*1500	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

Note 1. Lifting capacity are based on ISO 10567.
2. Lifting capacity of the HX series does not exceed 75% of tipping load with the machine on firm, level ground or 87% of full hydraulic capacity.
3. The lift-point is bucket pivot mounting pin on the arm (without bucket mass).
4. *Indicates load limited by hydraulic capacity.

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Lifting capacities will vary with different work tools, ground conditions and attachments.
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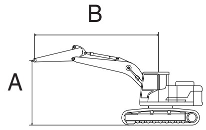
4) STEEL TRACK WITH ANGLE DOZER BLADE

Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	410	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)						At max. reach		
		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
										m (ft)
4.0 m (13.1 ft)	kg lb							*960 *2120	940 2070	2.99 (9.8)
3.5 m (11.5 ft)	kg lb							*880 *1940	710 1570	3.58 (11.8)
3.0 m (9.8 ft)	kg lb							*850 *1870	600 1320	3.98 (13.1)
2.5 m (8.2 ft)	kg lb			*930 *2050	*930 *2050	*840 *1850	590 1300	*830 *1830	530 1170	4.26 (14.0)
2.0 m (6.6 ft)	kg lb			*1070 *2360	910 2010	*870 *1920	590 1300	*830 *1830	500 1100	4.44 (14.6)
1.5 m (4.9 ft)	kg lb			*1240 *2730	880 1940	*910 *2010	580 1280	*830 *1830	480 1060	4.54 (14.9)
1.0 m (3.3 ft)	kg lb			*1400 *3090	860 1900	*960 *2120	570 1260	*830 *1830	470 1040	4.58 (15.0)
0.5 m (1.6 ft)	kg lb			*1490 *3280	840 1850	*990 *2180	560 1230	*830 *1830	470 1040	4.54 (14.9)
Ground Line	kg lb			*1510 *3330	830 1830	*990 *2180	550 1210	*830 *1830	480 1060	4.43 (14.5)
-0.5 m (-1.6 ft)	kg lb	*1770 *3900	1550 3420	*1460 *3220	820 1810	*940 *2070	550 1210	*830 *1830	510 1120	4.24 (13.9)
-1.0 m (-3.3 ft)	kg lb	*2190 *4830	1560 3440	*1330 *2930	820 1810			*810 *1790	560 1230	3.96 (13.0)
-1.5 m (-4.9 ft)	kg lb	*1760 *3880	1580 3480	*1090 *2400	830 1830			*770 *1700	660 1460	3.55 (11.7)
-2.0 m (-6.6 ft)	kg lb	*1100 *2430	*1100 *2430					*640 *1410	*640 *1410	2.94 (9.6)

Note 1. Lifting capacity are based on ISO 10567.
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3. The lift-point is bucket pivot mounting pin on the arm (without bucket mass).
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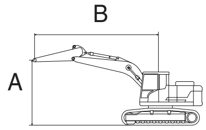
Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	410	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B) 2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		At max. reach Capacity		Reach
										m (ft)
4.0 m (13.1 ft)	kg lb							*960 *2120	910 2010	2.99 (9.8)
3.5 m (11.5 ft)	kg lb							*880 *1940	680 1500	3.58 (11.8)
3.0 m (9.8 ft)	kg lb							*850 *1870	570 1260	3.98 (13.1)
2.5 m (8.2 ft)	kg lb			*930 *2050	900 1980	*840 *1850	570 1260	*830 *1830	510 1120	4.26 (14.0)
2.0 m (6.6 ft)	kg lb			*1070 *2360	880 1940	*870 *1920	560 1230	*830 *1830	480 1060	4.44 (14.6)
1.5 m (4.9 ft)	kg lb			*1240 *2730	850 1870	*910 *2010	550 1210	*830 *1830	450 990	4.54 (14.9)
1.0 m (3.3 ft)	kg lb			*1400 *3090	820 1810	*960 *2120	540 1190	*830 *1830	450 990	4.58 (15.0)
0.5 m (1.6 ft)	kg lb			*1490 *3280	800 1760	*990 *2180	530 1170	*830 *1830	450 990	4.54 (14.9)
Ground Line	kg lb			*1510 *3330	790 1740	*990 *2180	530 1170	*830 *1830	460 1010	4.43 (14.5)
-0.5 m (-1.6 ft)	kg lb	*1770 *3900	1490 3280	*1460 *3220	790 1740	*940 *2070	530 1170	*830 *1830	490 1080	4.24 (13.9)
-1.0 m (-3.3 ft)	kg lb	*2190 *4830	1500 3310	*1330 *2930	790 1740			*810 *1790	540 1190	3.96 (13.0)
-1.5 m (-4.9 ft)	kg lb	*1760 *3880	1520 3350	*1090 *2400	800 1760			*770 *1700	630 1390	3.55 (11.7)
-2.0 m (-6.6 ft)	kg lb	*1100 *2430	*1100 *2430					*640 *1410	*640 *1410	2.94 (9.6)

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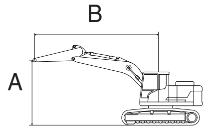
Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	560	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)						At max. reach		
		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
										m (ft)
4.0 m	kg							*960	*960	2.99
(13.1 ft)	lb							*2120	*2120	(9.8)
3.5 m	kg							*880	780	3.58
(11.5 ft)	lb							*1940	1720	(11.8)
3.0 m	kg							*850	660	3.98
(9.8 ft)	lb							*1870	1460	(13.1)
2.5 m	kg			*930	*930	*840	650	*830	590	4.26
(8.2 ft)	lb			*2050	*2050	*1850	1430	*1830	1300	(14.0)
2.0 m	kg			*1070	1000	*870	650	*830	550	4.44
(6.6 ft)	lb			*2360	2200	*1920	1430	*1830	1210	(14.6)
1.5 m	kg			*1240	970	*910	640	*830	530	4.54
(4.9 ft)	lb			*2730	2140	*2010	1410	*1830	1170	(14.9)
1.0 m	kg			*1400	940	*960	630	*830	520	4.58
(3.3 ft)	lb			*3090	2070	*2120	1390	*1830	1150	(15.0)
0.5 m	kg			*1490	920	*990	620	*830	520	4.54
(1.6 ft)	lb			*3280	2030	*2180	1370	*1830	1150	(14.9)
Ground	kg			*1510	910	*990	610	*830	530	4.43
Line	lb			*3330	2010	*2180	1340	*1830	1170	(14.5)
-0.5 m	kg	*1770	1710	*1460	910	*940	610	*830	570	4.24
(-1.6 ft)	lb	*3900	3770	*3220	2010	*2070	1340	*1830	1260	(13.9)
-1.0 m	kg	*2190	1720	*1330	910			*810	620	3.96
(-3.3 ft)	lb	*4830	3790	*2930	2010			*1790	1370	(13.0)
-1.5 m	kg	*1760	1740	*1090	920			*770	730	3.55
(-4.9 ft)	lb	*3880	3840	*2400	2030			*1700	1610	(11.7)
-2.0 m	kg	*1100	*1100					*640	*640	2.94
(-6.6 ft)	lb	*2430	*2430					*1410	*1410	(9.6)

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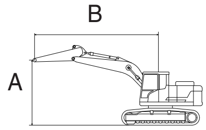
Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1300	560	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)						At max. reach		
		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
										m (ft)
4.0 m (13.1 ft)	kg lb							*960 *2120	*960 *2120	2.99 (9.8)
3.5 m (11.5 ft)	kg lb							*880 *1940	750 1650	3.58 (11.8)
3.0 m (9.8 ft)	kg lb							*850 *1870	630 1390	3.98 (13.1)
2.5 m (8.2 ft)	kg lb			*930 *2050	*930 *2050	*840 *1850	630 1390	*830 *1830	570 1260	4.26 (14.0)
2.0 m (6.6 ft)	kg lb			*1070 *2360	960 2120	*870 *1920	620 1370	*830 *1830	530 1170	4.44 (14.6)
1.5 m (4.9 ft)	kg lb			*1240 *2730	930 2050	*910 *2010	610 1340	*830 *1830	510 1120	4.54 (14.9)
1.0 m (3.3 ft)	kg lb			*1400 *3090	910 2010	*960 *2120	600 1320	*830 *1830	500 1100	4.58 (15.0)
0.5 m (1.6 ft)	kg lb			*1490 *3280	890 1960	*990 *2180	590 1300	*830 *1830	500 1100	4.54 (14.9)
Ground Line	kg lb			*1510 *3330	880 1940	*990 *2180	590 1300	*830 *1830	510 1120	4.43 (14.5)
-0.5 m (-1.6 ft)	kg lb	*1770 *3900	1650 3640	*1460 *3220	870 1920	*940 *2070	590 1300	*830 *1830	540 1190	4.24 (13.9)
-1.0 m (-3.3 ft)	kg lb	*2190 *4830	1660 3660	*1330 *2930	870 1920			*810 *1790	600 1320	3.96 (13.0)
-1.5 m (-4.9 ft)	kg lb	*1760 *3880	1670 3680	*1090 *2400	880 1940			*770 *1700	700 1540	3.55 (11.7)
-2.0 m (-6.6 ft)	kg lb	*1100 *2430	*1100 *2430					*640 *1410	*640 *1410	2.94 (9.6)

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Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	410	300	-	Down	-	-	-

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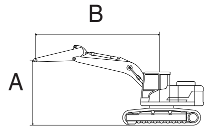

Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m	kg									*810	750	3.46
(13.1 ft)	lb									*1790	1650	(11.4)
3.5 m	kg									*770	600	3.96
(11.5 ft)	lb									*1700	1320	(13.0)
3.0 m	kg							*740	600	*760	520	4.32
(9.8 ft)	lb							*1630	1320	*1680	1150	(14.2)
2.5 m	kg							*750	590	*750	480	4.57
(8.2 ft)	lb							*1650	1300	*1650	1060	(15.0)
2.0 m	kg					*930	920	*790	590	*750	450	4.74
(6.6 ft)	lb					*2050	2030	*1740	1300	*1650	990	(15.5)
1.5 m	kg					*1110	890	*850	580	*750	430	4.83
(4.9 ft)	lb					*2450	1960	*1870	1280	*1650	950	(15.9)
1.0 m	kg					*1290	860	*910	560	*750	420	4.86
(3.3 ft)	lb					*2840	1900	*2010	1230	*1650	930	(16.0)
0.5 m	kg					*1430	830	*960	550	*760	420	4.83
(1.6 ft)	lb					*3150	1830	*2120	1210	*1680	930	(15.8)
Ground	kg			*1130	*1130	*1490	820	*980	540	*760	430	4.73
Line	lb			*2490	*2490	*3280	1810	*2160	1190	*1680	950	(15.5)
-0.5 m	kg	*1040	*1040	*1610	1530	*1480	810	*970	540	*760	450	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	3370	*3260	1790	*2140	1190	*1680	990	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1530	*1400	810	*890	540	*760	490	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3370	*3090	1790	*1960	1190	*1680	1080	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1550	*1230	810			*740	560	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3420	*2710	1790			*1630	1230	(12.9)
-2.0 m	kg			*1570	1570	*930	830			*680	*680	3.43
(-6.6 ft)	lb			*3460	3460	*2050	1830			*1500	*1500	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

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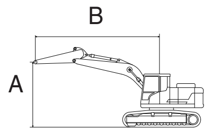
Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	410	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m	kg									*810	720	3.46
(13.1 ft)	lb									*1790	1590	(11.4)
3.5 m	kg									*770	580	3.96
(11.5 ft)	lb									*1700	1280	(13.0)
3.0 m	kg							*740	570	*760	500	4.32
(9.8 ft)	lb							*1630	1260	*1680	1100	(14.2)
2.5 m	kg							*750	570	*750	460	4.57
(8.2 ft)	lb							*1650	1260	*1650	1010	(15.0)
2.0 m	kg					*930	880	*790	560	*750	430	4.74
(6.6 ft)	lb					*2050	1940	*1740	1230	*1650	950	(15.5)
1.5 m	kg					*1110	860	*850	550	*750	410	4.83
(4.9 ft)	lb					*2450	1900	*1870	1210	*1650	900	(15.9)
1.0 m	kg					*1290	820	*910	540	*750	400	4.86
(3.3 ft)	lb					*2840	1810	*2010	1190	*1650	880	(16.0)
0.5 m	kg					*1430	800	*960	530	*760	400	4.83
(1.6 ft)	lb					*3150	1760	*2120	1170	*1680	880	(15.8)
Ground	kg			*1130	*1130	*1490	780	*980	520	*760	410	4.73
Line	lb			*2490	*2490	*3280	1720	*2160	1150	*1680	900	(15.5)
-0.5 m	kg	*1040	*1040	*1610	1460	*1480	770	*970	520	*760	430	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	3220	*3260	1700	*2140	1150	*1680	950	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1470	*1400	770	*890	520	*760	470	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3240	*3090	1700	*1960	1150	*1680	1040	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1480	*1230	780			*740	530	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3260	*2710	1720			*1630	1170	(12.9)
-2.0 m	kg			*1570	1510	*930	790			*680	660	3.43
(-6.6 ft)	lb			*3460	3330	*2050	1740			*1500	1460	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

Note 1. Lifting capacity are based on ISO 10567.
2. Lifting capacity of the HX series does not exceed 75% of tipping load with the machine on firm, level ground or 87% of full hydraulic capacity.
3. The lift-point is bucket pivot mounting pin on the arm (without bucket mass).
4. *Indicates load limited by hydraulic capacity.

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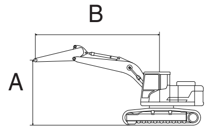
Lifting capacities will vary with different work tools, ground conditions and attachments.
The difference between the weight of a work tool attachment must be subtracted.
Consult with your local HD Hyundai Construction Equipment dealer regarding the lifting capacities for specific work tools and attachments.

※ Please be aware of the local regulations and instructions for lifting operations.

⚠ Failure to comply to the rated load can cause serious injury, death, or property damage. Make adjustments to the rated load as necessary for non-standard configurations.

Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	560	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m	kg									*810	*810	3.46
(13.1 ft)	lb									*1790	*1790	(11.4)
3.5 m	kg									*770	660	3.96
(11.5 ft)	lb									*1700	1460	(13.0)
3.0 m	kg							*740	660	*760	580	4.32
(9.8 ft)	lb							*1630	1460	*1680	1280	(14.2)
2.5 m	kg							*750	650	*750	530	4.57
(8.2 ft)	lb							*1650	1430	*1650	1170	(15.0)
2.0 m	kg					*930	*930	*790	650	*750	490	4.74
(6.6 ft)	lb					*2050	*2050	*1740	1430	*1650	1080	(15.5)
1.5 m	kg					*1110	980	*850	630	*750	480	4.83
(4.9 ft)	lb					*2450	2160	*1870	1390	*1650	1060	(15.9)
1.0 m	kg					*1290	950	*910	620	*750	470	4.86
(3.3 ft)	lb					*2840	2090	*2010	1370	*1650	1040	(16.0)
0.5 m	kg					*1430	920	*960	610	*760	470	4.83
(1.6 ft)	lb					*3150	2030	*2120	1340	*1680	1040	(15.8)
Ground	kg			*1130	*1130	*1490	900	*980	600	*760	480	4.73
Line	lb			*2490	*2490	*3280	1980	*2160	1320	*1680	1060	(15.5)
-0.5 m	kg	*1040	*1040	*1610	*1610	*1480	900	*970	600	*760	500	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	*3550	*3260	1980	*2140	1320	*1680	1100	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1690	*1400	890	*890	600	*760	550	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3730	*3090	1960	*1960	1320	*1680	1210	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1700	*1230	900			*740	620	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3750	*2710	1980			*1630	1370	(12.9)
-2.0 m	kg			*1570	*1570	*930	910			*680	*680	3.43
(-6.6 ft)	lb			*3460	*3460	*2050	2010			*1500	*1500	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

Note
1. Lifting capacity are based on ISO 10567.
2. Lifting capacity of the HX series does not exceed 75% of tipping load with the machine on firm, level ground or 87% of full hydraulic capacity.
3. The lift-point is bucket pivot mounting pin on the arm (without bucket mass).
4. *Indicates load limited by hydraulic capacity.

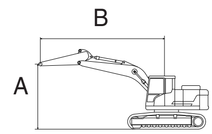
※ Lifting capacities are based upon a standard machine conditions.
Lifting capacities will vary with different work tools, ground conditions and attachments.
The difference between the weight of a work tool attachment must be subtracted.
Consult with your local HD Hyundai Construction Equipment dealer regarding the lifting capacities for specific work tools and attachments.

※ Please be aware of the local regulations and instructions for lifting operations.

▲ Failure to comply to the rated load can cause serious injury, death, or property damage. Make adjustments to the rated load as necessary for non-standard configurations.

Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX35A Z	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2400	1600	560	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)								At max. reach		
		1.0 m (3.3 ft)		2.0 m (6.6 ft)		3.0 m (9.8 ft)		4.0 m (13.1 ft)		Capacity		Reach
												m (ft)
4.0 m	kg									*810	790	3.46
(13.1 ft)	lb									*1790	1740	(11.4)
3.5 m	kg									*770	640	3.96
(11.5 ft)	lb									*1700	1410	(13.0)
3.0 m	kg							*740	630	*760	560	4.32
(9.8 ft)	lb							*1630	1390	*1680	1230	(14.2)
2.5 m	kg							*750	630	*750	510	4.57
(8.2 ft)	lb							*1650	1390	*1650	1120	(15.0)
2.0 m	kg					*930	*930	*790	620	*750	480	4.74
(6.6 ft)	lb					*2050	*2050	*1740	1370	*1650	1060	(15.5)
1.5 m	kg					*1110	940	*850	610	*750	460	4.83
(4.9 ft)	lb					*2450	2070	*1870	1340	*1650	1010	(15.9)
1.0 m	kg					*1290	910	*910	600	*750	450	4.86
(3.3 ft)	lb					*2840	2010	*2010	1320	*1650	990	(16.0)
0.5 m	kg					*1430	890	*960	590	*760	450	4.83
(1.6 ft)	lb					*3150	1960	*2120	1300	*1680	990	(15.8)
Ground	kg			*1130	*1130	*1490	870	*980	580	*760	460	4.73
Line	lb			*2490	*2490	*3280	1920	*2160	1280	*1680	1010	(15.5)
-0.5 m	kg	*1040	*1040	*1610	*1610	*1480	860	*970	580	*760	480	4.55
(-1.6 ft)	lb	*2290	*2290	*3550	*3550	*3260	1900	*2140	1280	*1680	1060	(14.9)
-1.0 m	kg	*1460	*1460	*2210	1630	*1400	860	*890	580	*760	520	4.30
(-3.3 ft)	lb	*3220	*3220	*4870	3590	*3090	1900	*1960	1280	*1680	1150	(14.1)
-1.5 m	kg	*1950	*1950	*2110	1640	*1230	860			*740	590	3.94
(-4.9 ft)	lb	*4300	*4300	*4650	3620	*2710	1900			*1630	1300	(12.9)
-2.0 m	kg			*1570	*1570	*930	880			*680	*680	3.43
(-6.6 ft)	lb			*3460	*3460	*2050	1940			*1500	*1500	(11.2)
-2.5 m	kg			*730	*730					*480	*480	2.63
(-8.2 ft)	lb			*1610	*1610					*1060	*1060	(8.6)

Note 1. Lifting capacity are based on ISO 10567.
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3. The lift-point is bucket pivot mounting pin on the arm (without bucket mass).
4. *Indicates load limited by hydraulic capacity.

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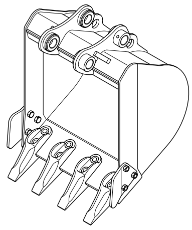
6. BUCKET SELECTION GUIDE



0.11 m^3
SAE heaped bucket

Capacity		Width		Weight	Recommendation 2.4 m (7' 0") boom	
SAE heaped	CECE heaped	Without side cutter	With side cutter		1.3 m (4' 3") arm	1.6 m (5' 3") arm
0.11 m^3 (0.14 yd^3)	0.09 m^3 (0.12 yd^3)	500 mm (19.7")	611 mm (24.0")	87 kg (192 lb)	●	●
0.11 m^3 (0.14 yd^3)	0.09 m^3 (0.12 yd^3)	510 mm (20.1")	606 mm (24.0")	88 kg (194 lb)	●	●

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

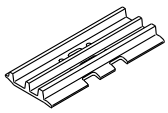
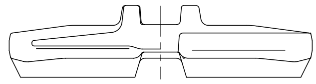
※ These recommendations are for general conditions and average use.
Work tools and ground conditions have effects on machine performance.
Select an optimum combination according to the working conditions and the type of work that is being done.
Consult with your local HD Hyundai Construction Equipment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

7. 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
				
HX35A Z	Shoe width	mm (in)	300 (12")	300 (12")
	Operating weight	kg (lb)	3790 (8360)	3920 (8640)
	Ground pressure	kgf/cm^2 (psi)	0.35 (5.01)	0.36 (5.03)
	Overall width	mm (ft-in)	1740 (5' 9")	1740 (5' 9")

(3) NUMBER OF ROLLERS AND SHOES ON EACH SIDE

Item	Quantity
Carrier rollers	1EA
Track rollers	4EA
Track shoes (steel grouser)	44EA

8. SPECIFICATIONS FOR MAJOR COMPONENTS

1) ENGINE

Item	Specification
Model	Kubota D1703-M-DI-E4B
Type	Vertical, water cooled 4-cycle, DI diesel engine
Cooling method	Water cooling
Number of cylinders and arrangement	3 cylinders, in-line
Firing order	1-3-2
Combustion chamber type	Reentrant type (direct Injection)
Cylinder bore × stroke	87.0 × 92.4 mm (3.43" × 3.64")
Piston displacement	1647 cc (101 cu in)
Compression ratio	20.0 : 1
Rated gross horse power (SAE J1995)	24.8 hp (18.5 kW)
Rated net horse power (SAE J1995)	23.9 hp (17.8 kW)
Maximum torque at 1320 rpm	9.9 kgf · m (72 lbf · ft)
Engine oil quantity	7.0 ℓ (1.8 U.S. gal)
Dry weight	148 kg (326 lb)
Starting motor	12V-1.2 kW
Alternator	12V-30 A

2) MAIN PUMP

Item	Specification
Type	Variable displacement tandem axis piston pumps
Capacity	2 ×17 cc/rev
Maximum pressure	230 kgf/cm^2 (3270 psi)
Rated oil flow	2 ×37.4 ℓ/min (2 ×9.9 U.S. gpm / 2 ×8.2 U.K. gpm)
Rated speed	2200 rpm

3) GEAR PUMP

Item	Specification
Type	Fixed displacement gear pump single stage
Capacity	10.5/4.5 cc/rev
Maximum pressure	205/40 kgf/cm^2 (2920/570 psi)
Rated oil flow	23.1/9.9 ℓ /min (6.1/2.6 U.S. gpm / 5.1/2.2 U.K. gpm)

4) MAIN CONTROL VALVE

Item	Specification
Type	Sectional, 10 spools
Operating method	Hydraulic pilot system
Main relief valve pressure	240 kgf/cm^2 (3414 psi)
Overload relief valve pressure	260 kgf/cm^2 (3699 psi)

5) SWING MOTOR

Item	Specification
Type	Fixed displacement axial piston motor
Capacity	22 cc/rev
Relief pressure	210 kgf/cm^2 (2990 psi)
Braking system	Automatic, spring applied hydraulic released
Braking torque	142.1 kgf · m (1028 lbf · ft)
Brake release pressure	20~65 kgf/cm^2 (284~925 psi)
Reduction gear type	2 - stage planetary

6) TRAVEL MOTOR

Item	Specification
Type	Two fixed displacement axial piston motor
Relief pressure	230 kgf/cm^2 (3270 psi)
Reduction gear type	2-stage planetary
Braking system	Automatic, spring applied hydraulic released
Brake release pressure	9.7 kgf/cm^2 (138 psi)
Braking torque	4.9 kgf · m (71.6 lbf · ft)

7) CYLINDER

Item		Specification
Boom cylinder	Bore dia × Rod dia × Stroke	Ø85 × Ø45 × 537 mm
	Cushion	Extend only
Arm cylinder	Bore dia × Rod dia × Stroke	Ø80 × Ø45 × 549 mm
	Cushion	Extend and retract
Bucket cylinder	Bore dia × Rod dia × Stroke	Ø70 × Ø45 × 520 mm
	Cushion	-
Boom swing cylinder	Bore dia × Rod dia × Stroke	Ø80 × Ø45 × 401 mm
	Cushion	-
Dozer cylinder	Bore dia × Rod dia × Stroke	Ø95 × Ø50 × 152 mm
	Cushion	-
Angle dozer cylinder	Bore dia × Rod dia × Stroke	Ø100 × Ø55 × 152 mm
	Cushion	-
Angle swing cylinder	Bore dia × Rod dia × Stroke	Ø55 × Ø30 × 331 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.

8) BUCKET

Item	Capacity		Tooth quantity	Width	
	SAE heaped	CECE heaped		Without side cutter	With side cutter
STD (korea)	0.11 m^3 (0.14 yd^3)	0.09 m^3 (0.12 yd^3)	4	500 mm (19.7")	611 mm (24.0")
STD (except korea)	0.11 m^3 (0.14 yd^3)	0.09 m^3 (0.12 yd^3)	4	510 mm (20.1")	606 mm (24.0")

9. RECOMMENDED OILS

HD Hyundai Construction Equipment 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 HD Hyundai Construction Equipment and, therefore, will meet the highest safety and quality requirements.
We recommend that you use only HD Hyundai Construction Equipment genuine lubricating oils and grease officially approved by HD Hyundai Construction Equipment.

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 (1.85)	★SAE 5W-40 SAE 30 SAE 10W SAE 10W-30 SAE 15W-40
Final drive	Gear oil	0.6×2 (0.16×2)	★SAE 75W-90 SAE 85W-140
Hydraulic tank	Hydraulic oil	Tank: 36 (9.5) System: 63 (16.6)	★ISO VG 15 ISO VG 46 ISO VG 68
Fuel tank	Diesel fuel★1	46.8 (12.4)	★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	9.5 (2.5)	Ethylene glycol base permanent type (50 : 50) ★Ethylene glycol base permanent type (60 : 40)

※ Using any lubricating oils other than HD Hyundai Construction Equipment genuine products may lead to a deterioration of performance and cause damage to major components.

※ Do not mix HD Hyundai Construction Equipment genuine oil with any other lubricating oil as it may result in damage to the systems of major components.

※ For HD Hyundai Construction Equipment genuine lubricating oils and grease for use in regions with extremely low temperatures, please contact your local HD Hyundai Construction Equipment 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

SECTION 2 STRUCTURE AND FUNCTION

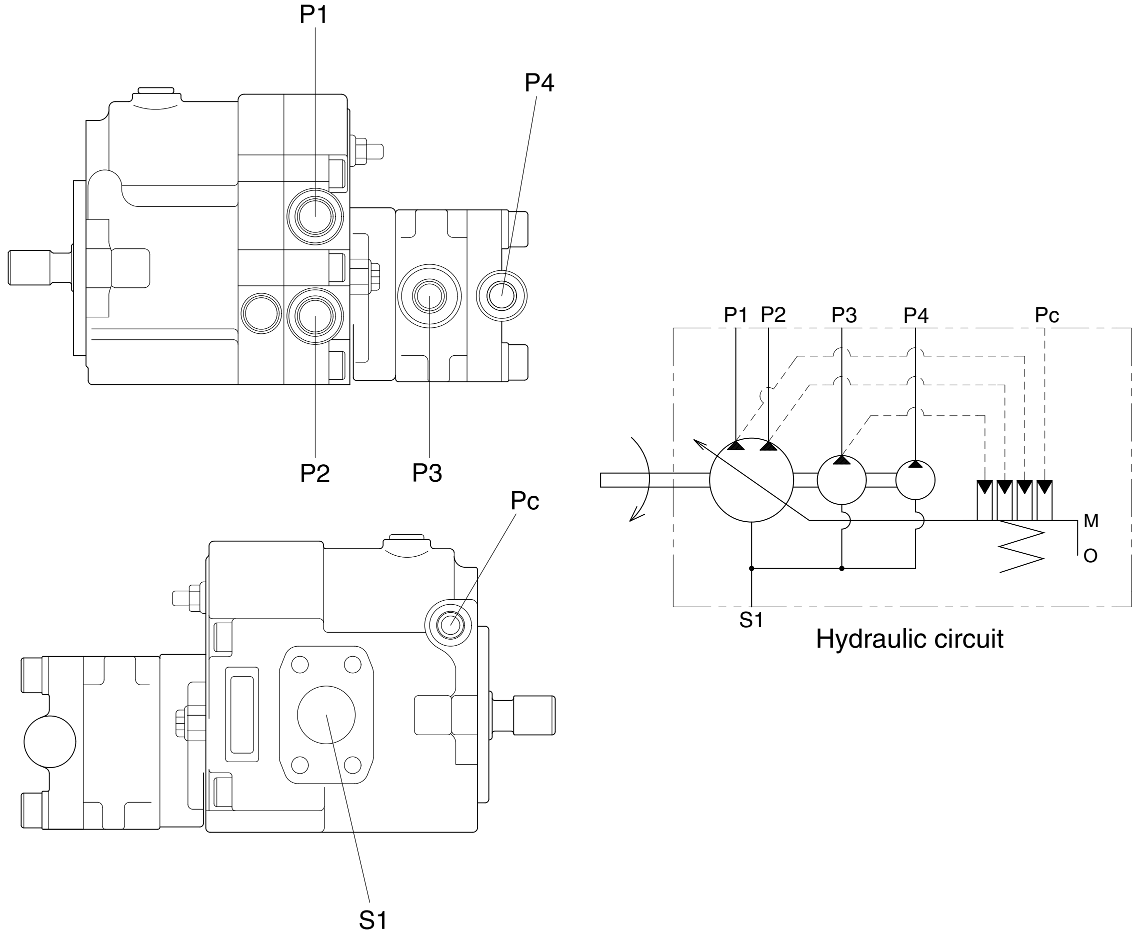
GROUP 1 HYDRAULIC PUMP

1. GENERAL

This is a variable displacement double-piston pump for discharge with equal displacements from one cylinder block. This pump is so compact as to appear a single pump though this is actually a double pump.

Because this pump has one swash plate, the tilting angle is the same for two pumps. Tilting of the pump changes in response to the total pressure of P1 + P2. Namely, the output is controlled to the constant value so that the relationship between the discharge pressure and flow rate Q becomes constant, (P1 + P2) * Q =Constant.

The third pump and pilot pump can be connected to the same shaft via a coupling.

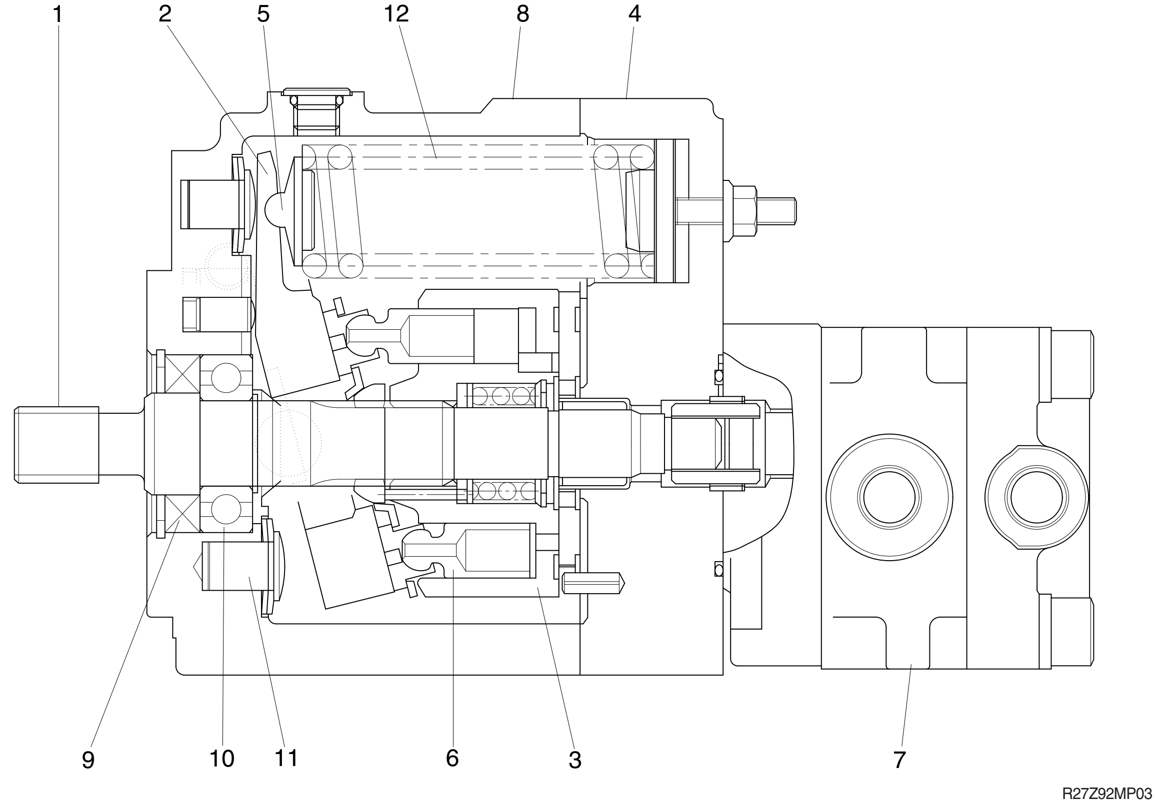


35Z9A2MP01

Description of the ports

Port	Port name	Port size
S1	Suction port	SAE 1 1/4
P1, P2, P3	Discharge port	PF 1/2
P4	Discharge port	PF 3/8
Pc	Pilot port	PF 1/4

2. MAJOR COMPONENTS AND FUNCTIONS



1	Drive shaft assembly	7	Gear pump
2	Swash plate assembly	8	Housing
3	Cylinder barrel	9	Oil seal
4	Port plate assembly	10	Bearing
5	Spring seat assembly	11	Stopper assembly
6	Piston	12	Spring

This is a variable displacement double-piston pump for discharge with two equal displacements from one cylinder block. Because this is one cylinder barrel, there is only one suction port.

The oil is divided into two equal flows by the control plate in the cover and directed to two discharge ports provided in the cover.

The discharge pressure directed to the piston tilts the hanger by overcoming the spring force.

Since the piston stroke changes according to the tilting angle of the hanger, the flow can be changed.

The simultaneous tilting angle constant-output control method is employed.

The pilot pump can be connected to the same shaft via a coupling.

1) PRINCIPLE OF OPERATION

(1) Function of pump

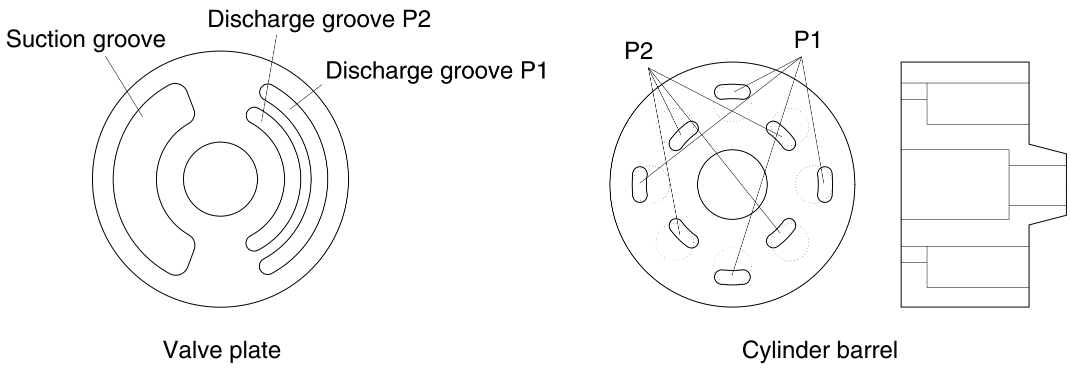


Figure 1 Working principle of PVD pump

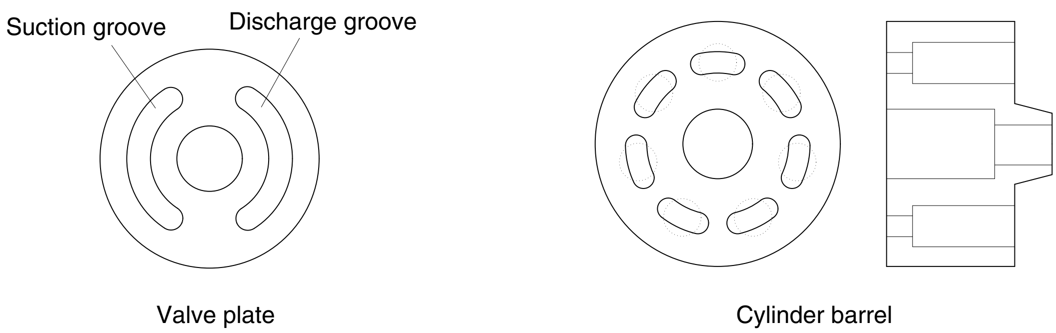


Figure 2 Working principle of Conventional type

35Z9A2MP05

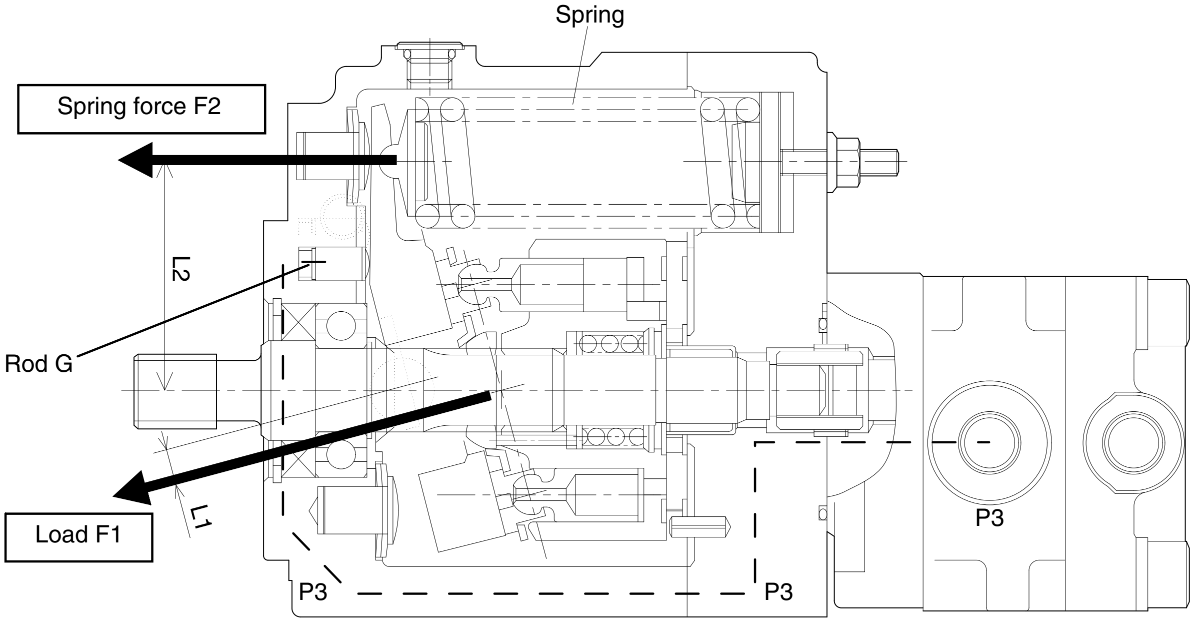
This pump adopts a new method using even numbered pistons to make functions of two same volume pumps available in one casing of a swash plate type variable volume piston pump.

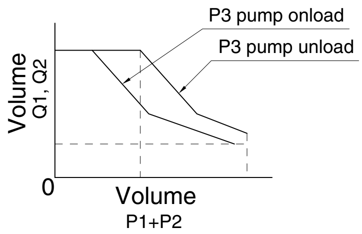
Conventional valve plate has one suction groove and one discharge groove respectively as shown in figure 2. But this method adopts one common suction groove and two discharge grooves on the outer side (P1) and the inner side (P2) as shown in figure 1, the piston room in the cylinder barrel opens to either the outer side (P1) or the inner side (P2) discharge groove of the valve plate alternately, and the discharges are performed independently on the inner side and the outer side.

Since this model has even numbered pistons, same No of pistons open to the outer side and the inner side of the valve plate. All pistons are of same swash plate, so the discharges from the outer side (P1) and the inner side (P2) are equal.

Also, since only one swash plate is used, the discharges from P1 and P2 ports changes equally when the swash plate angle of rake changes in variable controls. So, there is no difference between the two discharges.

2) CONTROL FUNCTIONS





P-Q characteristic

35Z9A2MP04

(1) Constant horse power variable structure

The pump output flow rate is variable depending on an angle of the swash plate which is controlled according to the pump output pressure. This control enables the pump consumption horse power to be sustained at the maximum. The tilt point of the swash plate is the balls located behind the swash plate. The load F1 from the pistons is in the direction shown in the illustration and generates a clockwise moment against the swash plate. Against this force the spring (force F2) is located in the opposite direction to keep the horse power constant and set at the appointed load. As the pressure increases, the above clockwise moment increases, and when it overcomes the counter-clockwise moment created by the spring force, the spring is sagged and the swash plate angle gets smaller. Then the output flow rate is reduced to keep the horse power constant.

This prevents engine stall and the engine horse power can be utilized at the maximum.

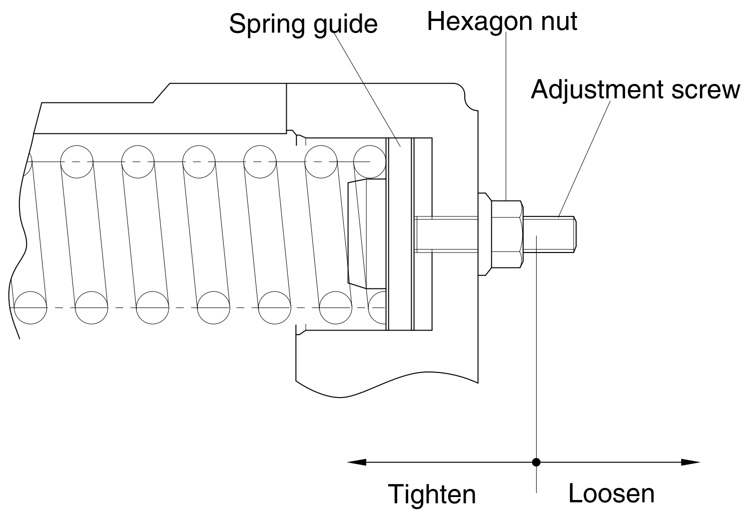
(2) Power shift mode (Reduced horse power control by P3 pressure)

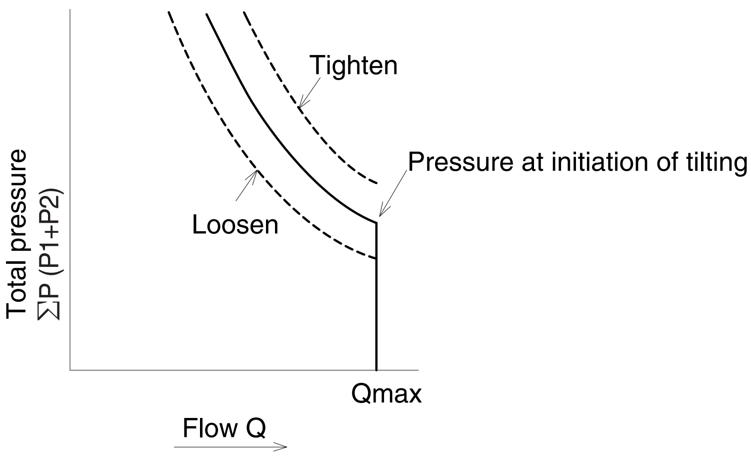
This control keeps the maximum value of the pump consumption horse power including the third pump (gear pump) constant. When the P3 (gear pump) pressure acts on the rod G, a clockwise moment proportion to the pressure acts on the swash plate and the P-Q characteristic shifts so that the total pump consumption horse power including the gear pump horse power is kept constant.

3) CONTROL / ADJUSTMENT PROCEDURE

(1) Loosen the hexagonal nut.

(2) Tighten or loosen the adjusting screw to set the power shifting line.

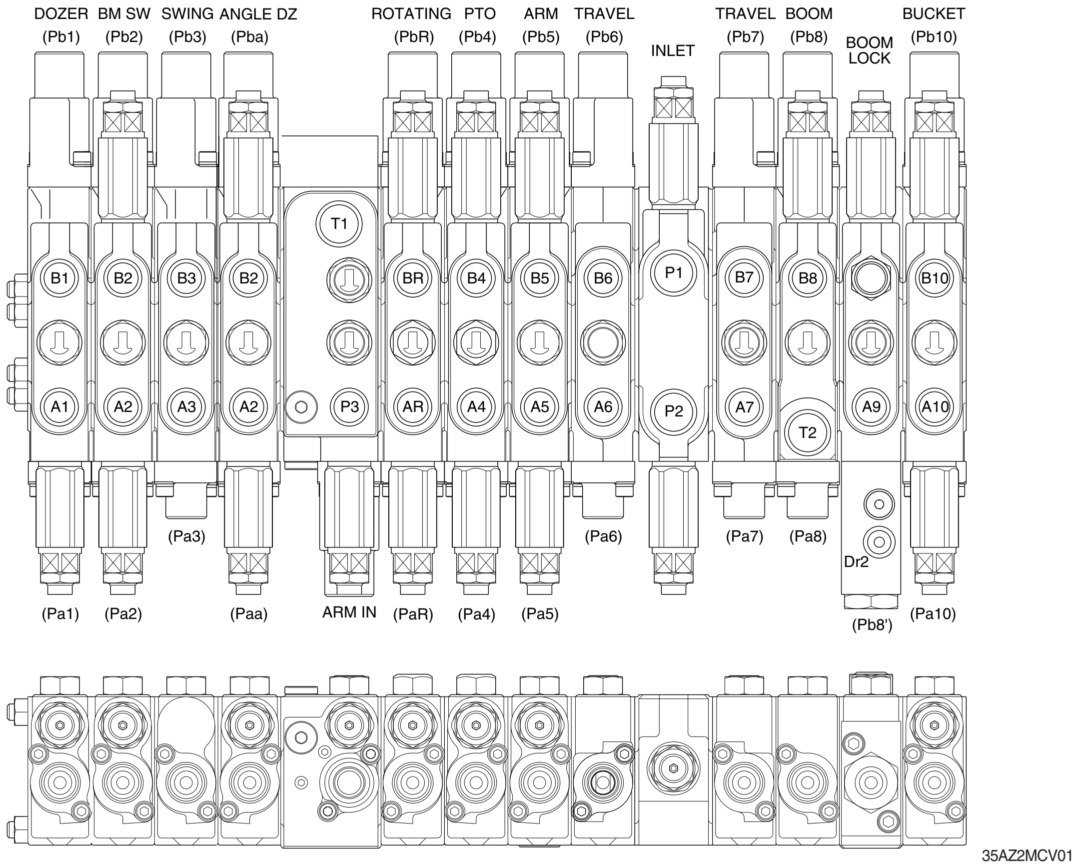




35Z9A2MP07

GROUP 2 MAIN CONTROL VALVE

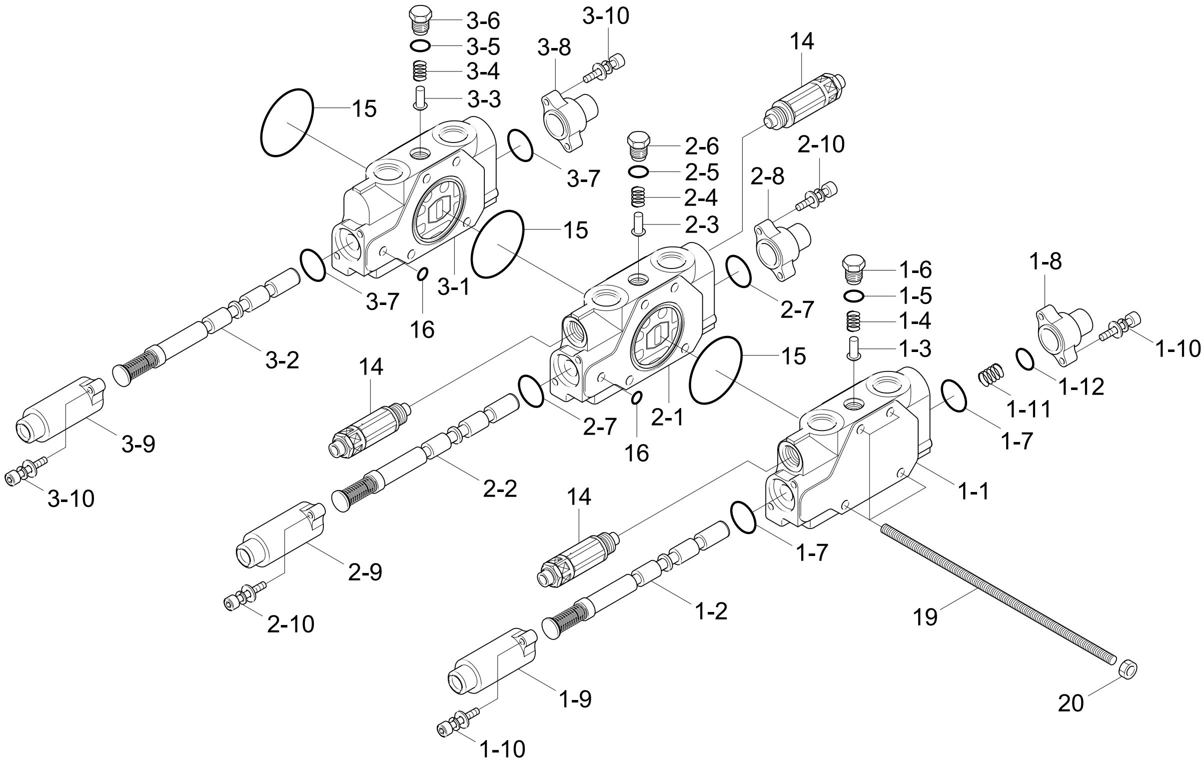
1. OUTLINE



Mark	Port name	Port size	Tightening torque
P1	P1 pump port	PF 1/2	6.0~7.0 kgf · m (43.4~50.6 lbf · ft)
P2	P2 pump port		
T1	Tank return port		
T2	Tank return port		
P3	P3 pump port	PF 3/8	4.0~5.0 kgf · m (28.9~36.2 lbf · ft)
A1	Dozer		
B1	Dozer		
A2	Boom swing (RH) port		
B2	Boom swing (LH) port		
A3	Swing (LH) port		
B3	Swing (RH) port		
AR/A4	Option port		
BR/B4	Option port		
A5	Arm out port		
B5	Arm in port		
A6	Travel [LH/RR] port		
B6	Travel [LH/FW] port		
A7	Travel [RH/RR] port		
B7	Travel [RH/FW] port		
A9	Boom up port		
B8	Boom down port		
Aa	Angle dozer-ccw		
Ba	Angle dozer-cw		

Mark	Port name	Port size	Tightening torque
A10	Bucket out port	PF 3/8	4.0~5.0 kgf · m
B10	Bucket in port		
Pa1	Dozer down pilot port	PF 1/4	2.5~3.0 kgf · m (18.1~21.7 lbf · ft)
Pb1	Dozer up pilot port		
Pa2	Boom swing (RH) pilot port		
Pb2	Boom swing (LH) pilot port		
Pa3	Swing (RH) pilot port		
Pb3	Swing (LH) pilot port		
Pa5	Arm out pilot port		
Pb5	Arm in pilot port		
Pa6	Travel [LH/RR] pilot port		
Pb6	Travel [LH/FW] pilot port		
Pa7	Travel [RH/RR] pilot port		
Pb7	Travel [RH/FW] pilot port		
Pa8	Boom up pilot port		
Pb8	Boom down pilot port		
Pa10	Bucket out pilot port		
Pb10	Bucket in pilot port		
Dr1, 2	Drain port		
PaR/Pa4	Option pilot port		
PbR/Pb4	Option pilot port		
Paa	Angle dozer pilot port-ccw		
Pba	Angle dozer pilot port-cw		

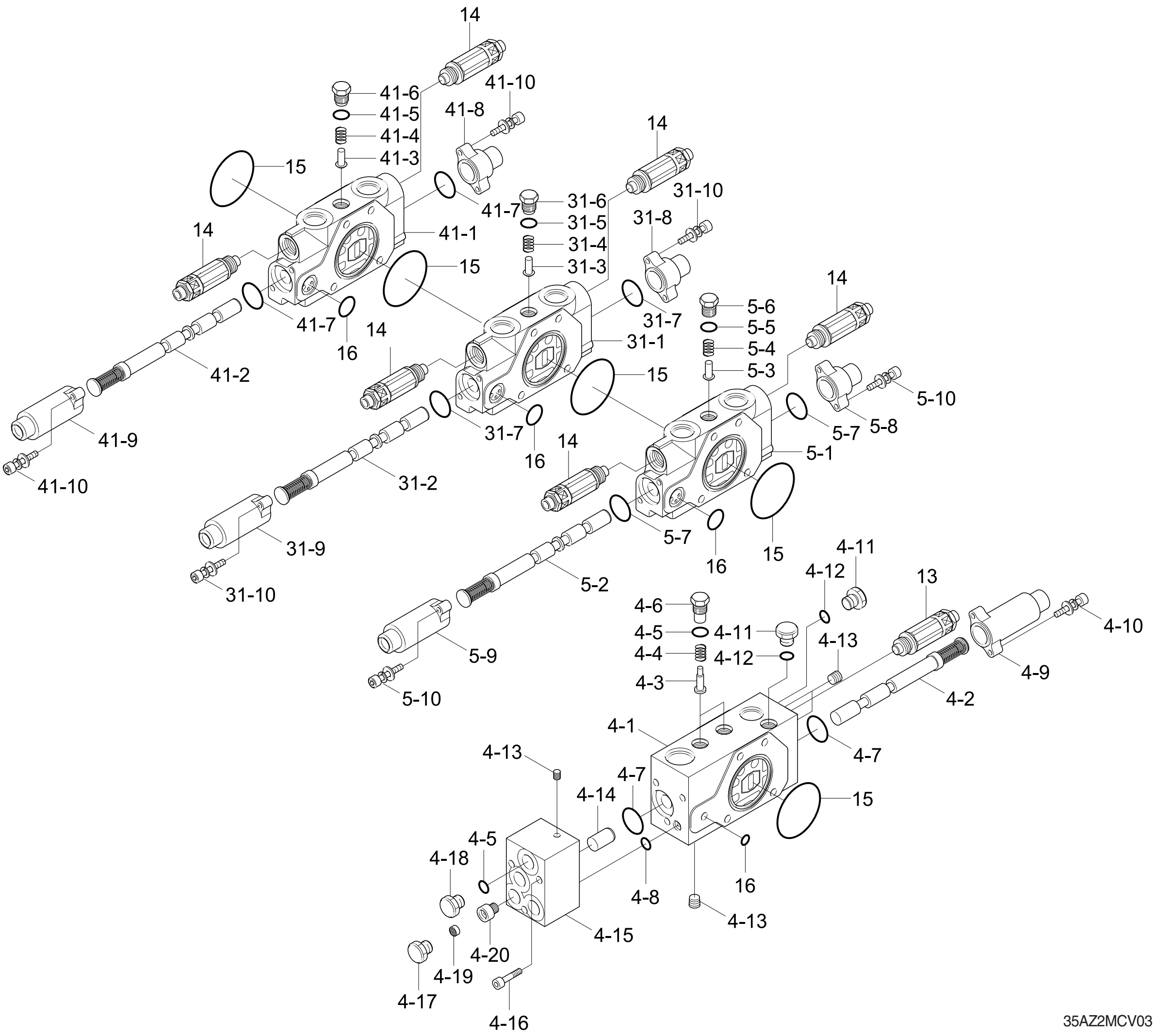
2. STRUCTURE (1/4)



35AZ2MCV02

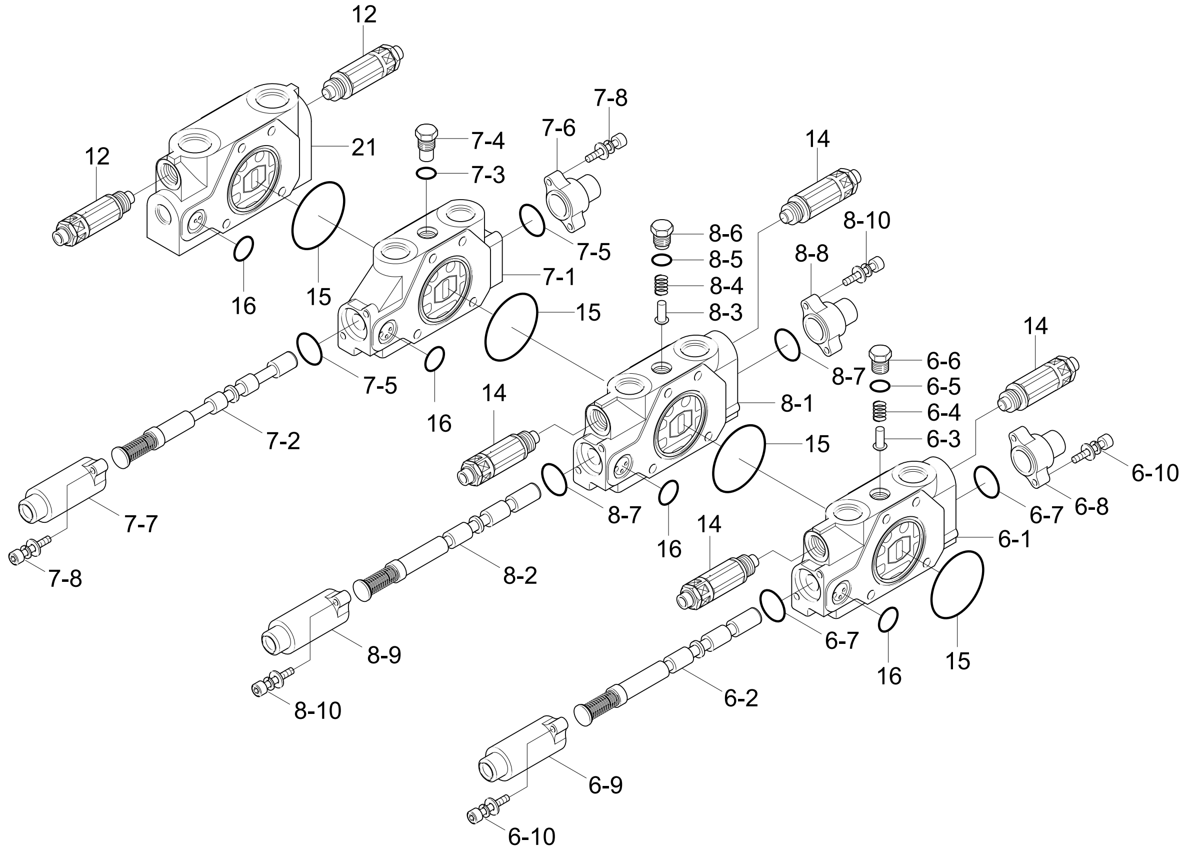
1	Dozer block assy	2-1	Body	3-4	Spring
1-1	Body	2-2	Boom swing spool assy	3-5	O-ring
1-2	Dozer spool assy	2-3	Poppet	3-6	Plug
1-3	Poppet	2-4	Spring	3-7	O-ring
1-4	Spring	2-5	O-ring	3-8	Pilot cover
1-5	O-ring	2-6	Plug	3-9	Pilot cover
1-6	Plug	2-7	O-ring	3-10	Bolt-soc head w/washer
1-7	O-ring	2-8	Pilot cover	14	Overload relief valve assy
1-8	Pilot cover	2-9	Pilot cover	15	O-ring
1-9	Pilot cover	2-10	Bolt-soc head w/washer	16	O-ring
1-10	Bolt-soc head w/washer	3	Swing block assy	19	Bolt-tie
1-11	Spring	3-1	Body	20	Nut-hex
1-12	Spring seat	3-2	Swing spool assy		
2	Boom swing block assy	3-3	Poppet		

STRUCTURE (2/4)



4	Connection block assy
4-1	Body
4-2	Spool assy
4-3	Poppet
4-4	Spring
4-5	O-ring
4-6	Plug
4-7	O-ring
4-8	O-ring
4-9	Pilot cover
4-10	Bolt-soc w/washer
4-11	Plug
4-12	O-ring
4-13	Plug
4-14	Piston
4-15	Body
4-16	Bolt-soc w/washer
4-17	Plug
4-18	Plug
4-19	Filter
4-20	Orifice
13	Relief valve assy
14	Overload relief vlv assy
15	O-ring
16	O-ring
5	PTO block assy
5-1	Body
5-2	PTO spool assy
5-3	Poppet
5-4	Spring
5-5	O-ring
5-6	Plug
5-7	O-ring
5-8	Pilot cover
5-9	Pilot cover
5-10	Bolt-soc w/washer
31	PTO block assy
31-1	Body
31-2	Spool assy
31-3	Poppet
31-4	Spring
31-5	O-ring
31-6	Plug
31-7	O-ring
31-8	Pilot cover
31-9	Pilot cover
31-10	Bolt-soc w/washer
41	Angle block assy
41-1	Body
41-2	Spool assy
41-3	Poppet
41-4	Spring
41-5	O-ring
41-6	Plug
41-7	O-ring
41-8	Pilot cover
41-9	Pilot cover
41-10	Bolt-soc w/washer

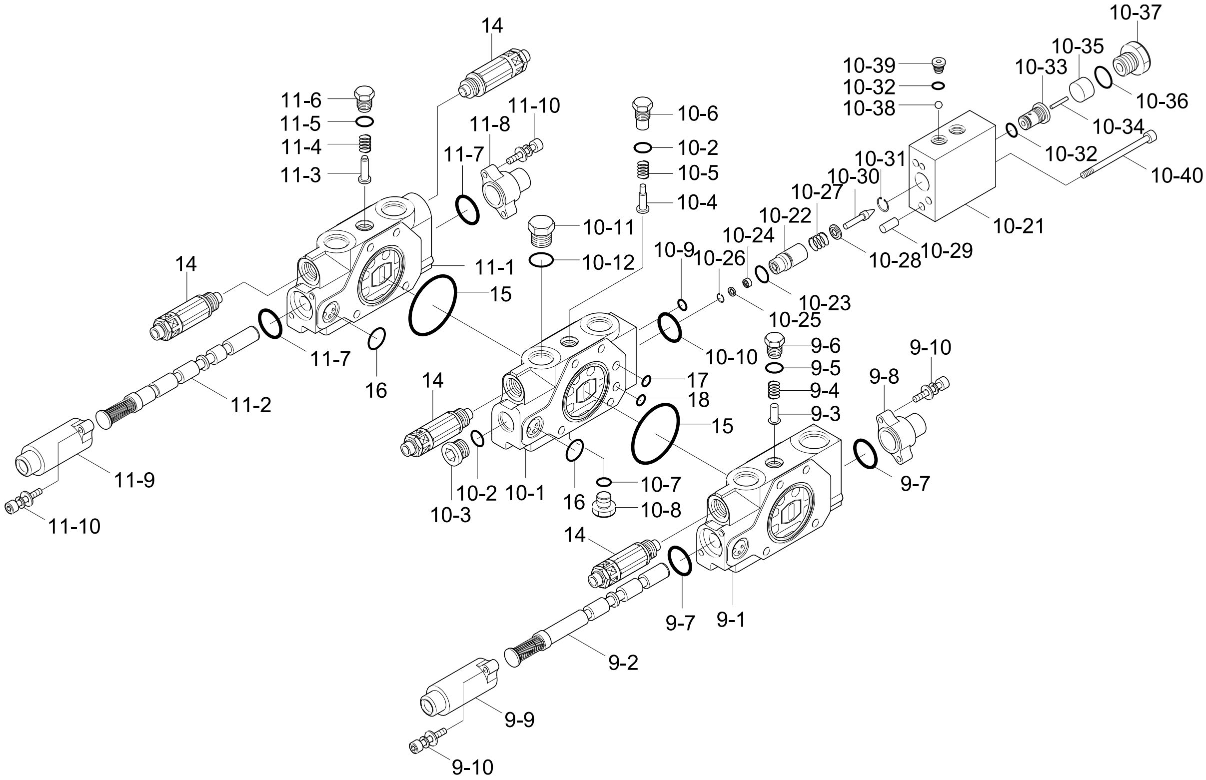
STRUCTURE (3/4)



35AZ2MCV04

6	Arm block assy	7-1	Body-block	8-4	Spring
6-1	Body	7-2	Travel spool assy	8-5	O-ring
6-2	Arm spool assy	7-3	O-ring	8-6	Plug
6-3	Poppet	7-4	Plug	8-7	O-ring
6-4	Spring	7-5	O-ring	8-8	Pilot cover
6-5	O-ring	7-6	Pilot cover	8-9	Pilot cover
6-6	Plug	7-7	Pilot cover	8-10	Bolt-soc head w/washer
6-7	O-ring	7-8	Bolt-soc head w/washer	12	Relief valve assy
6-8	Pilot cover	8	Travel block assy	14	Overload relief vlv assy
6-9	Pilot cover	8-1	Body	15	O-ring
6-10	Bolt-soc head w/washer	8-2	Travel spool assy	16	O-ring
7	Travel block assy	8-3	Poppet	21	Travel block assy

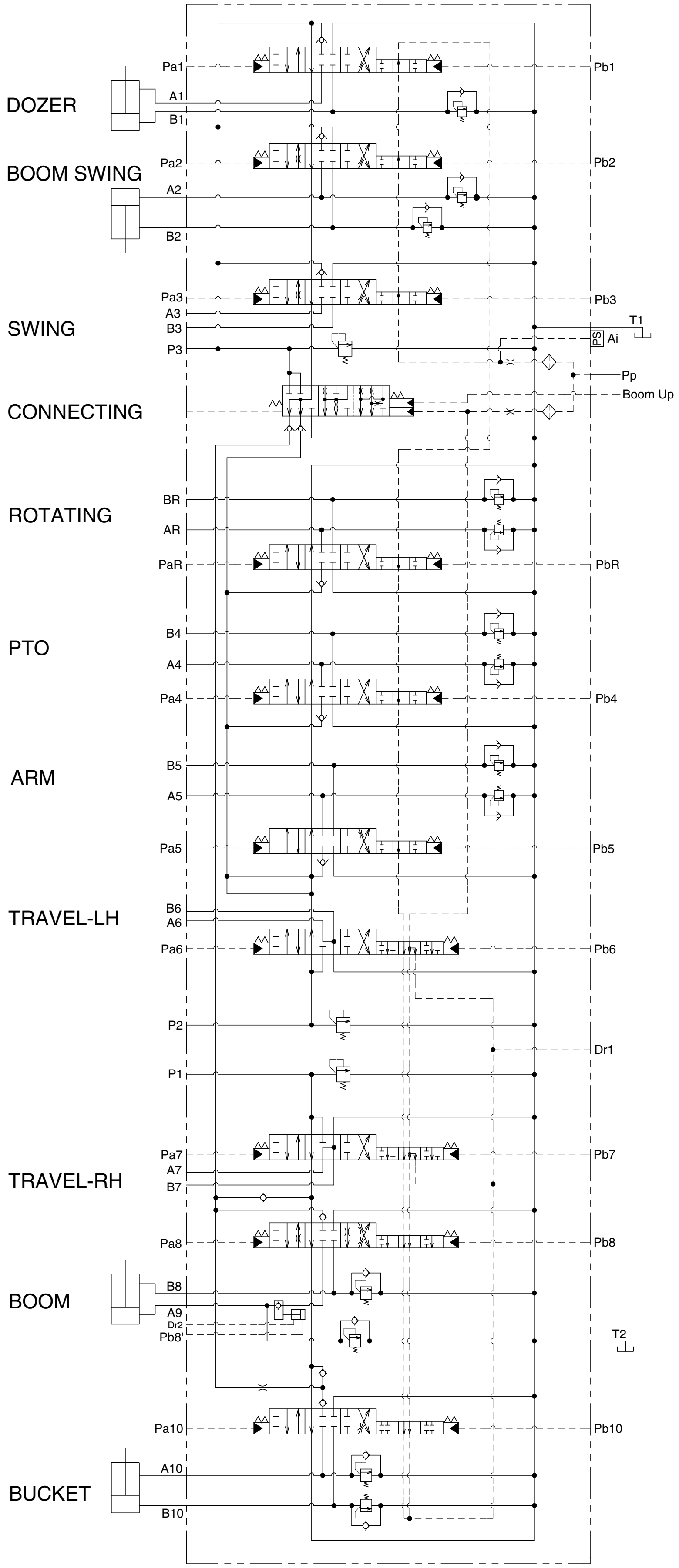
STRUCTURE (4/4)



35AZ2MCV05

9	Boom block assy	10-9	O-ring	10-37	Connector
9-1	Body	10-10	O-ring	10-38	Steel ball
9-2	Boom spool assy	10-11	Plug	10-39	Plug
9-3	Poppet	10-12	O-ring	10-40	Hex soc bolt
9-4	Spring	10-21	Lock valve cover	11	Bucket block assy
9-5	O-ring	10-22	Lock valve	11-1	Body
9-6	Plug	10-23	Seal	11-2	Bucket spool assy
9-7	O-ring	10-24	Filter	11-3	Poppet
9-8	Pilot cover	10-25	Spacer	11-4	Spring
9-9	Pilot cover	10-26	Retainer ring	11-5	O-ring
9-10	Bolt-soc head w/washer	10-27	Spring-A	11-6	Plug
10	Boom lock block assy	10-28	Spring seat	11-7	O-ring
10-1	Body	10-29	Pin	11-8	Pilot cover
10-2	O-ring	10-30	Poppet	11-9	Pilot cover
10-3	Plug	10-31	Retainer ring	11-10	Bolt-soc head w/washer
10-4	Poppet	10-32	O-ring	14	Overload relief vlv assy
10-5	Spring	10-33	Piston guide	15	O-ring
10-6	Plug	10-34	Piston-A1	16	O-ring
10-7	O-ring	10-35	Piston-B	17	O-ring
10-8	Plug	10-36	O-ring	18	O-ring

3. HYDRAULIC CIRCUIT



35AZ2MCV06

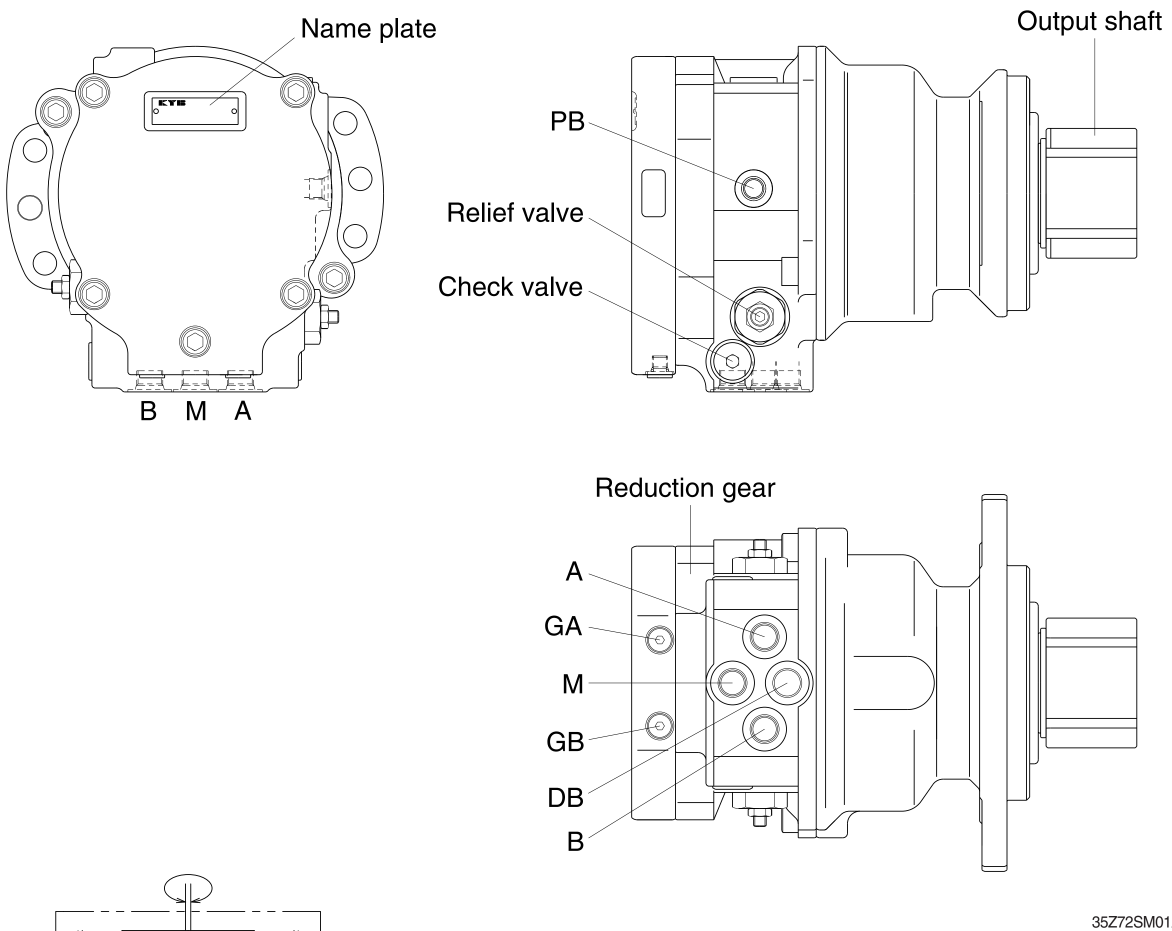
GROUP 3 SWING DEVICE

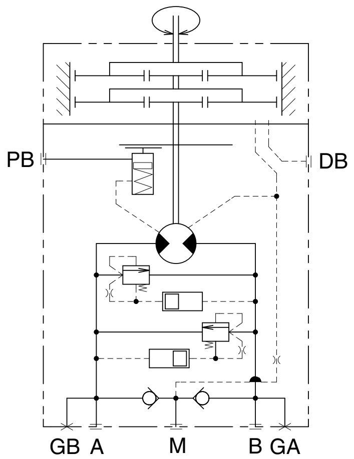
1. STRUCTURE

Swing device consists swing motor and swing reduction gear.

1) SWING MOTOR

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

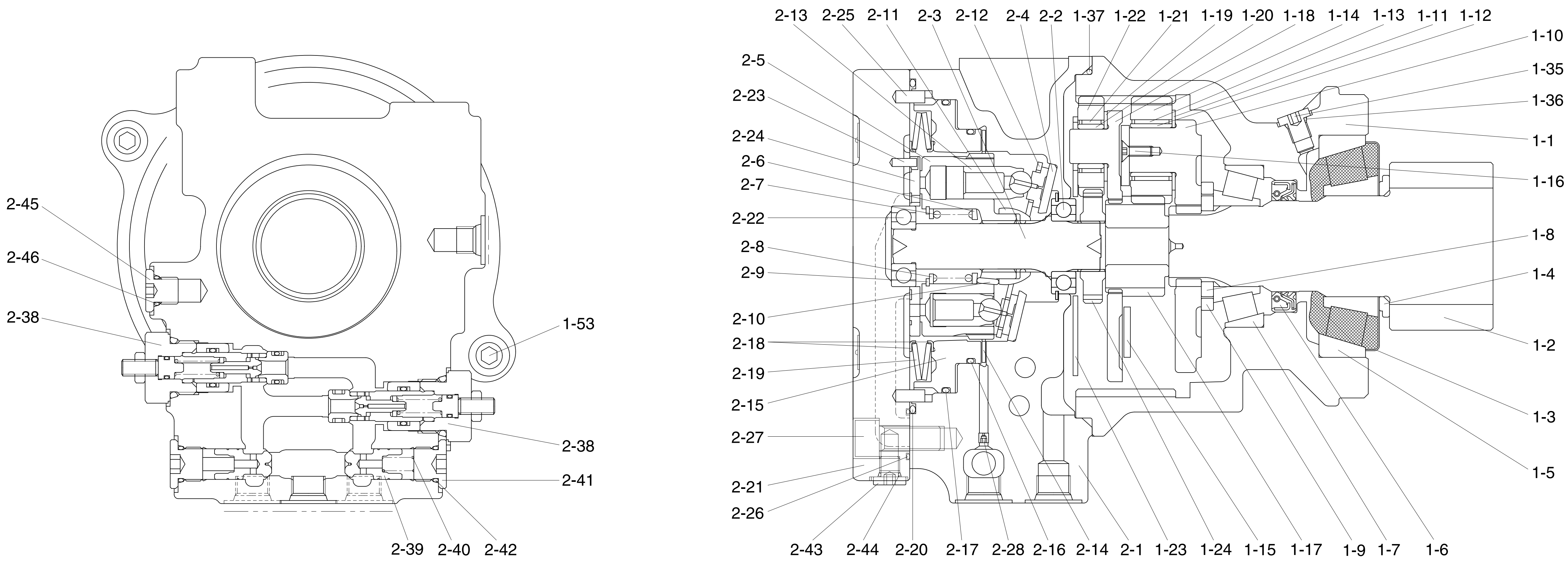




Hydraulic circuit

Port	Port name	Port size
A	Main port	PF 3/8
B	Main port	PF 3/8
DB	Drain port	PF 3/8
M	Make up port	PF 3/8
PB	Brake release port	PF 1/4
GA,GB	Gage port	PF 1/8

2) COMPONENTS



R35Z92SM12

1	Gear box	1-11	Thrust washer	1-22	Planetary gear	2-5	Cylinder block	2-16	O-ring	2-27	Socket head bolt
1-1	Housing	1-12	Inner race	1-23	Thrust plate	2-6	Collar	2-17	O-ring	2-28	Orifice
1-2	Pinion shaft	1-13	Needle bearing	1-24	Drive gear	2-7	Spring	2-18	Spring seat	2-38	Relief valve assy
1-3	Plate	1-14	Planetary gear B	1-35	Plug	2-8	Washer	2-19	Spring	2-39	Check valve
1-4	Collar	1-15	Thrust plate	1-36	O-ring	2-9	Ring-snap	2-20	O-ring	2-40	Spring
1-5	Tapper roller bearing	1-16	Screw	1-37	O-ring	2-10	Pin	2-21	Cover	2-41	Plug
1-6	Oil seal	1-17	Sun gear B	1-53	Socket bolt	2-11	Retainer holder	2-22	Ball bearing	2-42	O-ring
1-7	Tapper roller bearing	1-18	Holder	2	Axial piston motor	2-12	Retainer plate	2-23	Pin	2-43	Plug
1-8	Plate	1-19	Thrust washer	2-1	Case	2-13	Piston assy	2-24	Valve plate	2-44	O-ring
1-9	Collar	1-20	Inner race	2-2	Ball bearing	2-14	Disc	2-25	Pin	2-45	Plug
1-10	Holder	1-21	Needle bearing	2-3	Shaft	2-15	Brake piston	2-26	O-ring	2-46	O-ring
				2-4	Thrust plate						

2. DESCRIPTION OF FUNCTION AND OPERATION

1) SWASH PLATE MOTOR

The cylinder block incorporates nine pistons. The end face of the cylinder block is in contact with the valve plate having two woodruff ports B and C (distributing valve to change over between high and low pressure).

Principle of generation torque

When high pressure oil (pressure P) is introduced to the B port, the inclined surface is pushed by a force of "F = P×A, A : Piston sectional area" per piston and the piston receives a reaction force from the inclined surface. The piston that is restricted in the moving direction by the cylinder block due to the reaction force generates a rotating force. The total of rotating force by the reaction force of the high pressure side pistons works on the cylinder block. The generated rotating force is transmitted as a torque to the shaft via the spline to turn the shaft.

On the other hand, if the high pressure oil is introduced to the C port, the opposite rotation is caused.

The output torque and the revolution are calculated as follows :

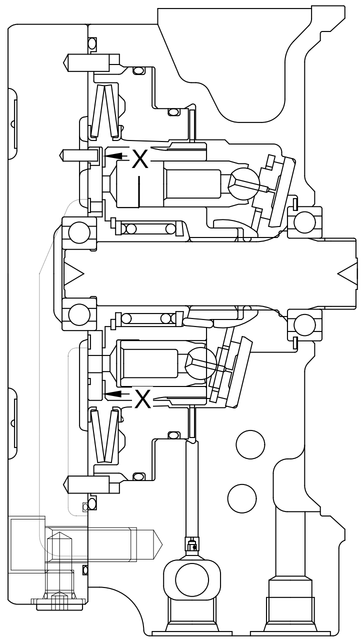
· Output torque (T)

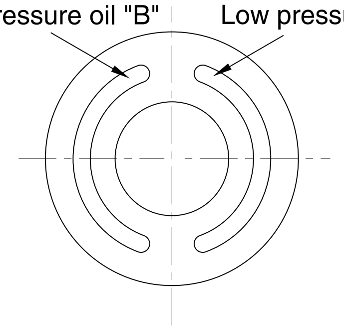
$$T = \frac{P \times D \times i \times \eta m \times \eta G}{2 \times \pi \times 100}$$

· Revolution (N)

$$N = \frac{Q \times 1000 \times \eta v}{D \times i}$$

D : Displacement (cm^3/rev)
P : Effective drive pressure (MPa)
Q : Inflow (L/min)
η m : Mechanical efficiency (motor) (%$\times 10^{-2}$)
η v : Volumetric efficiency (motor) (%$\times 10^{-2}$)
i : Speed ratio of reduction gear
η G : Efficiency of reduction gear (%$\times 10^{-2}$)





View X-X of valve plate(Outline)

R35Z72SM02

2) PARKING BRAKE

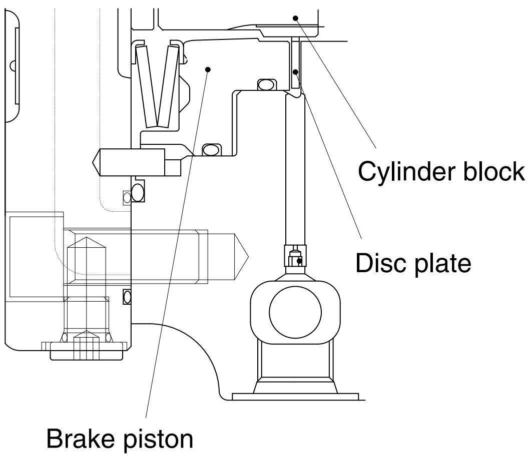
The parking brake is of wet type multi-plate construction of hydraulic release type and has a shaft lock mechanism that changes between ON and OFF of the brake by external signal pressures.

① Parking brake ON

When the hydraulic pressure for brake release is shut, the disc coupled to the periphery of the cylinder block via the spline is pushed by the spring force against the brake piston (pinned to the case so that it will not rotate) and the cylinder block and the case secured by the frictional force. Thus the shaft is locked.

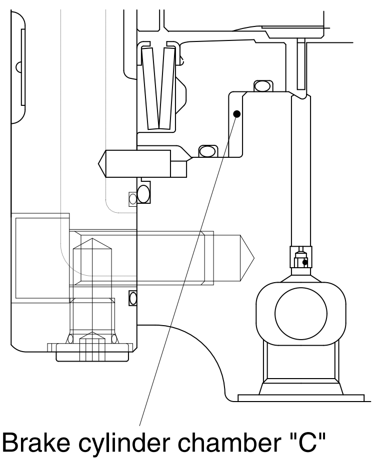
② Parking brake OFF

When the brake release pressure is introduced to the brake cylinder chamber (C) via the "PB" port, the brake piston is operated by the release pressure in opposition to the spring force to eliminate the force of friction with the disc, thus allowing the shaft to rotate freely.



"PB" (Brake releasing pressure) OFF

R35Z72SM03



"PB" (Brake releasing pressure) ON

R35Z72SM04

3) RELIEF VALVE

The relief valves determine the drive force and the brake force for hydraulic shovel swing and are installed in the main port A and B lines. The circuit is configured to return the relief valve return oil to the counterpart main low pressure line.

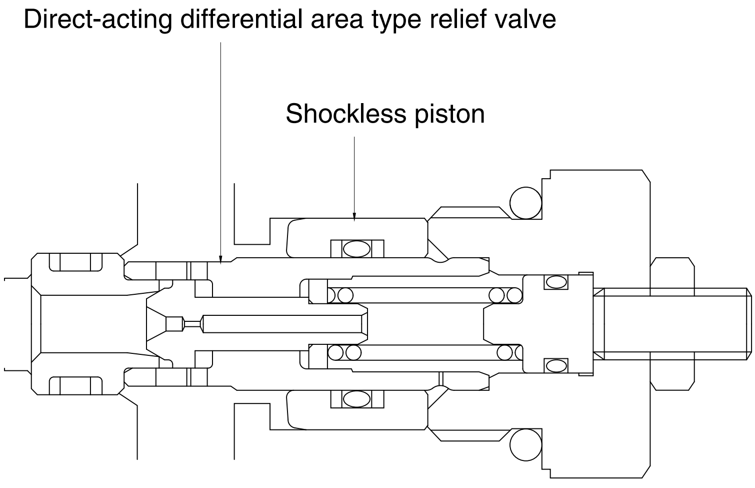
A shockless function is also incorporated to reduce shock produced at the start of both acceleration and deceleration.

(1) Construction of the relief valve

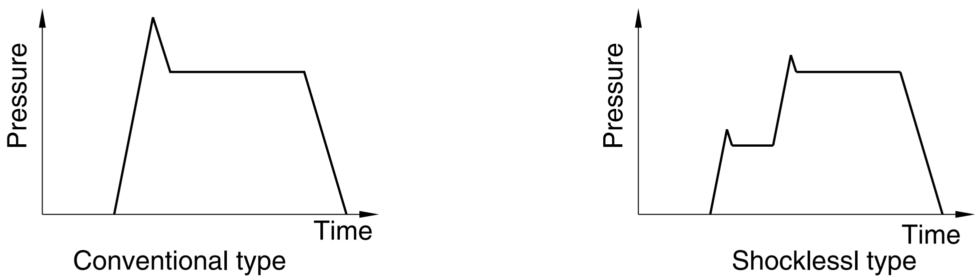
① A direct-acting differential area type relief valve

② A shockless piston

The installation of a shockless type relief valve helps reduce shock and stress produced in the strength members.



R35Z72SM05



Comparison of pressure wave forms

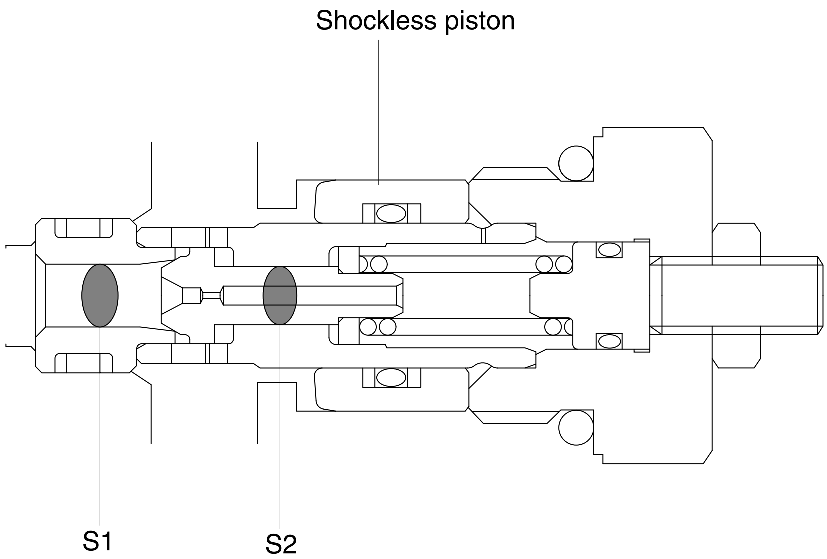
R35Z72SM08

(2) Relief valve operation

First stage

At the start of operation, the shockless piston moves to maintain the spring chamber at a low pressure. Thus, the pressure receiving area of the poppet becomes the poppet seat area (S1), a considerably larger area than the pressure receiving area (S1-S2) at the specified relief setting. For this reason, the relief operating pressure is kept at a low pressure until the shockless piston completes its movement.

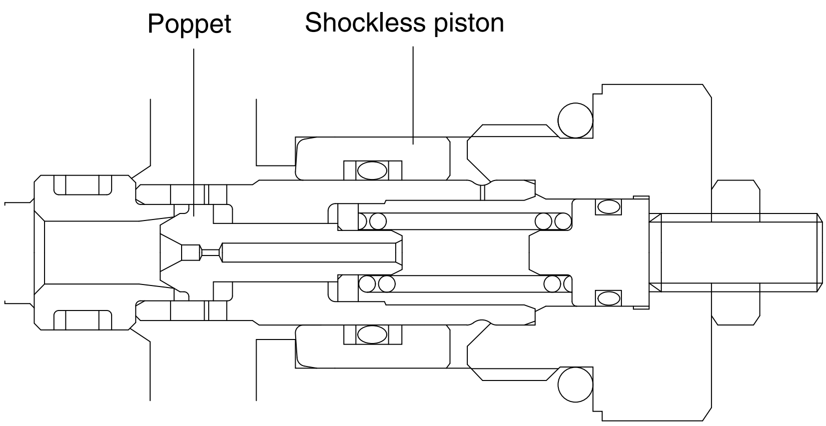
The low pressure holding time depends on the poppet orifice diameter, the free piston pressure receiving area and the free piston stroke.



R35Z72SM06

② Second stage

When the shockless piston completes its movement, the pressure inside the spring chamber increases to make the pressures before and after the poppet equal. Then the relief valve operates at the specified set pressure.



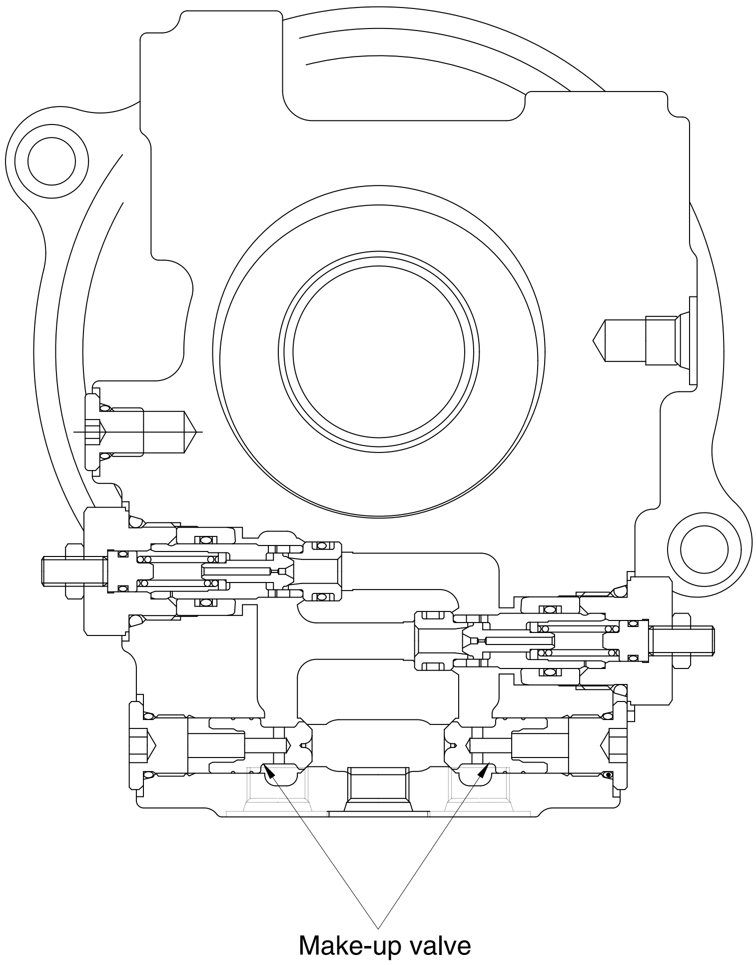
R35Z72SM07

4) MAKE-UP VALVE

The make-up valve has the following two functions.

One is to prevent cavitation produced by overrun of the piston motor in order to prevent the overrun of the upper body. When the motor is turned by the inertia of the upper body to cause the pumping action, which then causes the motor revolution to rise above the revolution equivalent to the amount of oil supplied to the motor, the amount of oil equivalent to the shortage is supplied to the motor main circuit via the make-up valve from outside to prevent occurrence of vacuum inside the circuit.

The other is a function to add the amount of motor drain and valve leak via the make-up valve to prevent vacuum inside the circuit to provide the braking capability in the normal circuit status when a closed circuit is formed between the control valve and the motor as when braking.

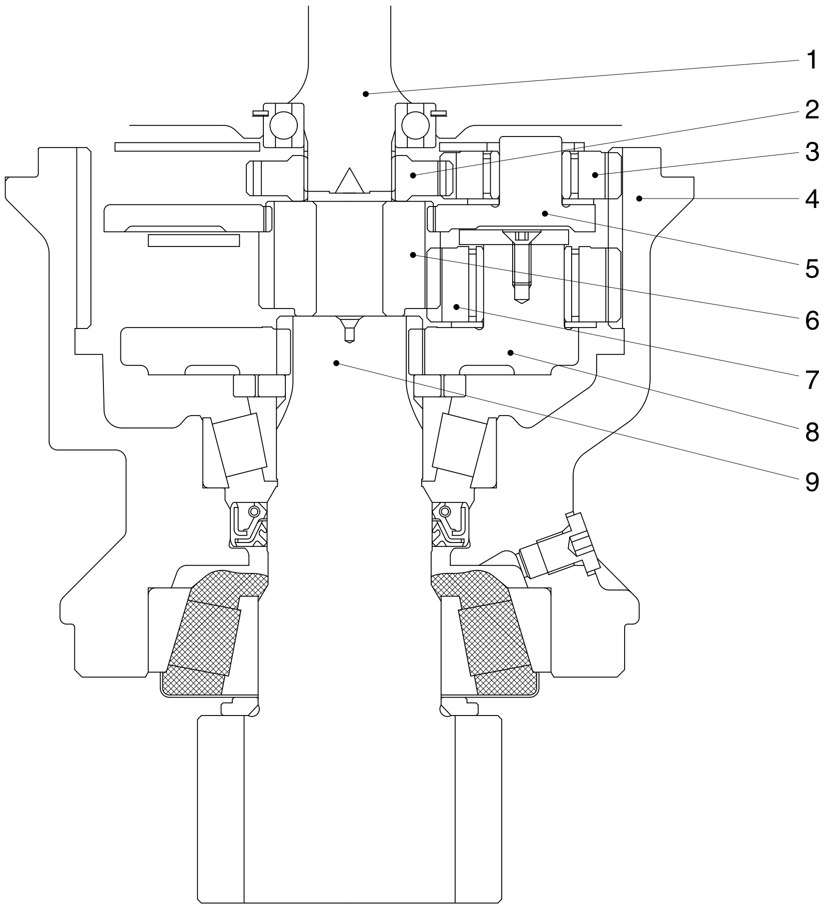


R35Z72SM09

5) REDUCTION GEAR (planetary two-stage)

Refer to the cross section.

The motor shaft (1) is coupled to the drive gear (2) via a spline. The drive force of the hydraulic motor is transmitted from the drive gear (2) to the engaged planetary gear (3). The planetary gear (3) is meshed with the ring gear of the reduction gear housing (4). Thus, while rotating, it revolves around the ring gear. The planetary gear (3) is held by the holder (5) via the bearing and the holder transmits the revolving motion of the planetary gear (3) to the sun gear (6) coupled via the spline. The sun gear (6) meshes with the planetary gear (7) and as with the first stage, transmits the rotary motion to the planetary gear (7). Since the planetary gear (7) is meshed with the ring gear of the housing (4), it revolves while rotating. Since the planetary gear (7) is held by the holder (8) via the bearing, the holder (8) transmits the revolving motion of the planetary gear (7) to the pinion shaft (9) coupled via the spline.



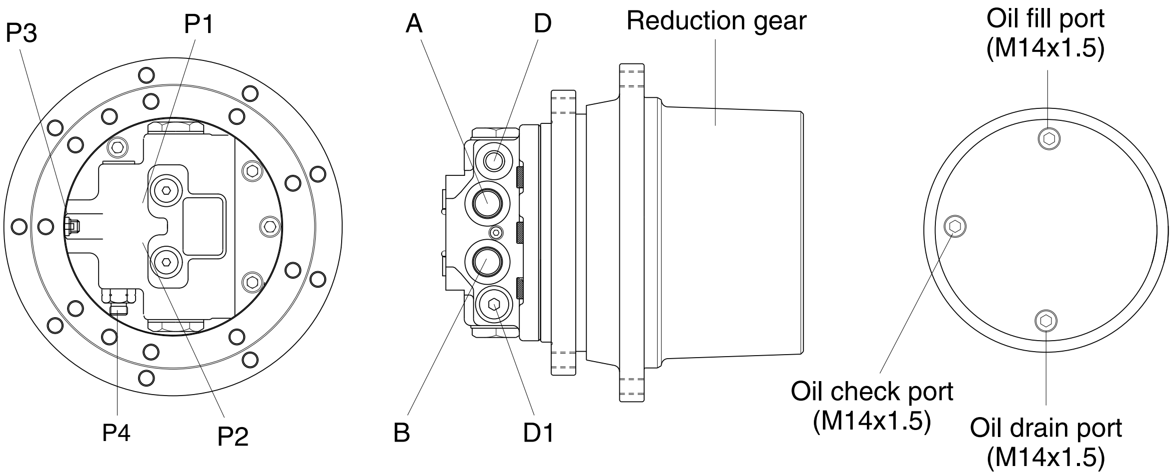
R35Z72SM10

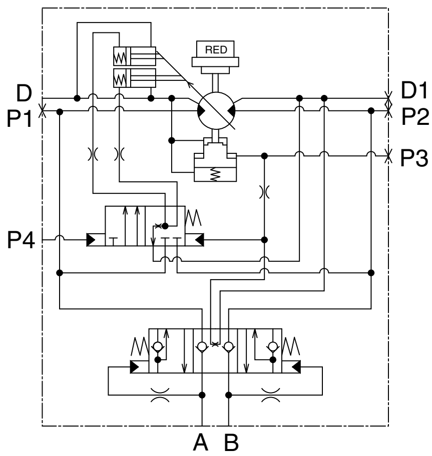
GROUP 4 TRAVEL DEVICE

1. CONSTRUCTION

Travel device consists travel motor and reduction gear box.

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



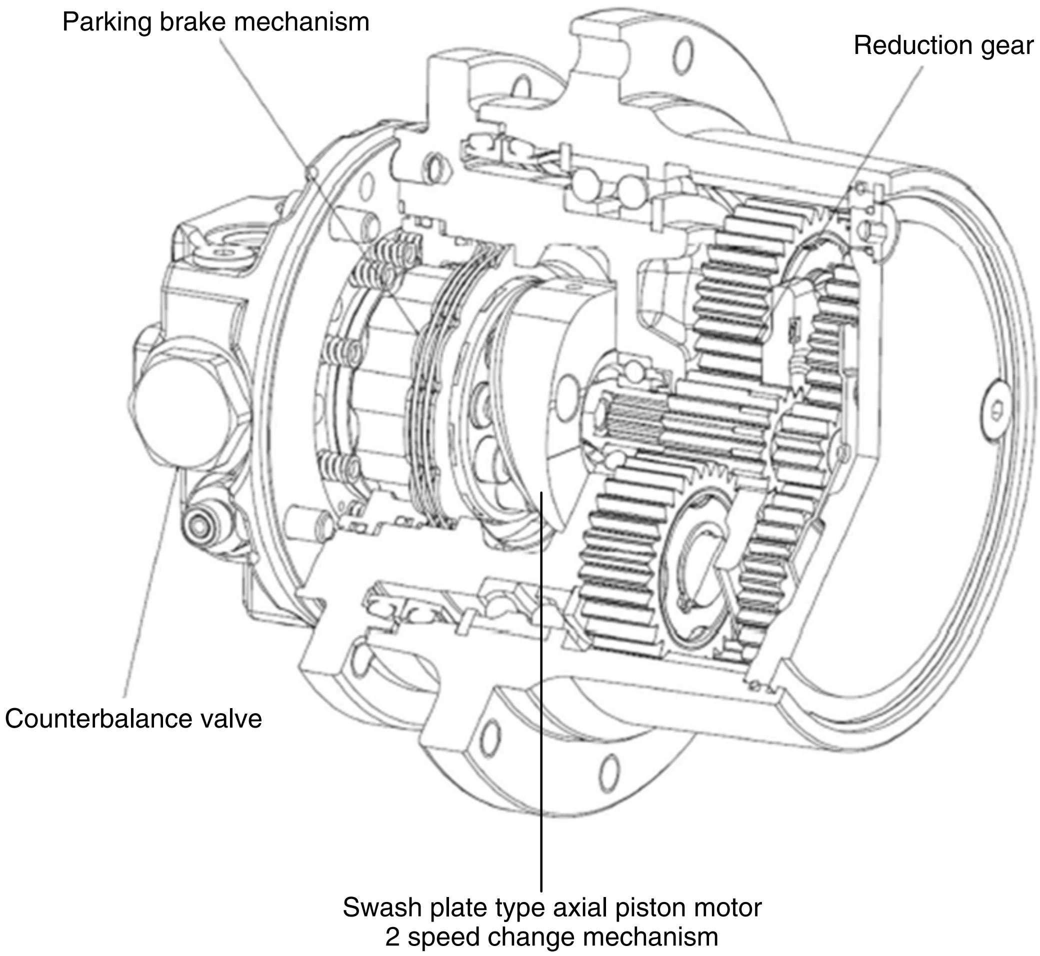


Hydraulic circuit

35AZ2TM01

Port	Port name	Port size
A	Main port	PF 1/2
B	Main port	PF 1/2
P1, P2	Gauge port	PF 1/4
D, D1	Drain port	PF 1/4
P4	2 speed control port	9/16-18 UNF
P3	Brake release port	PF 1/8

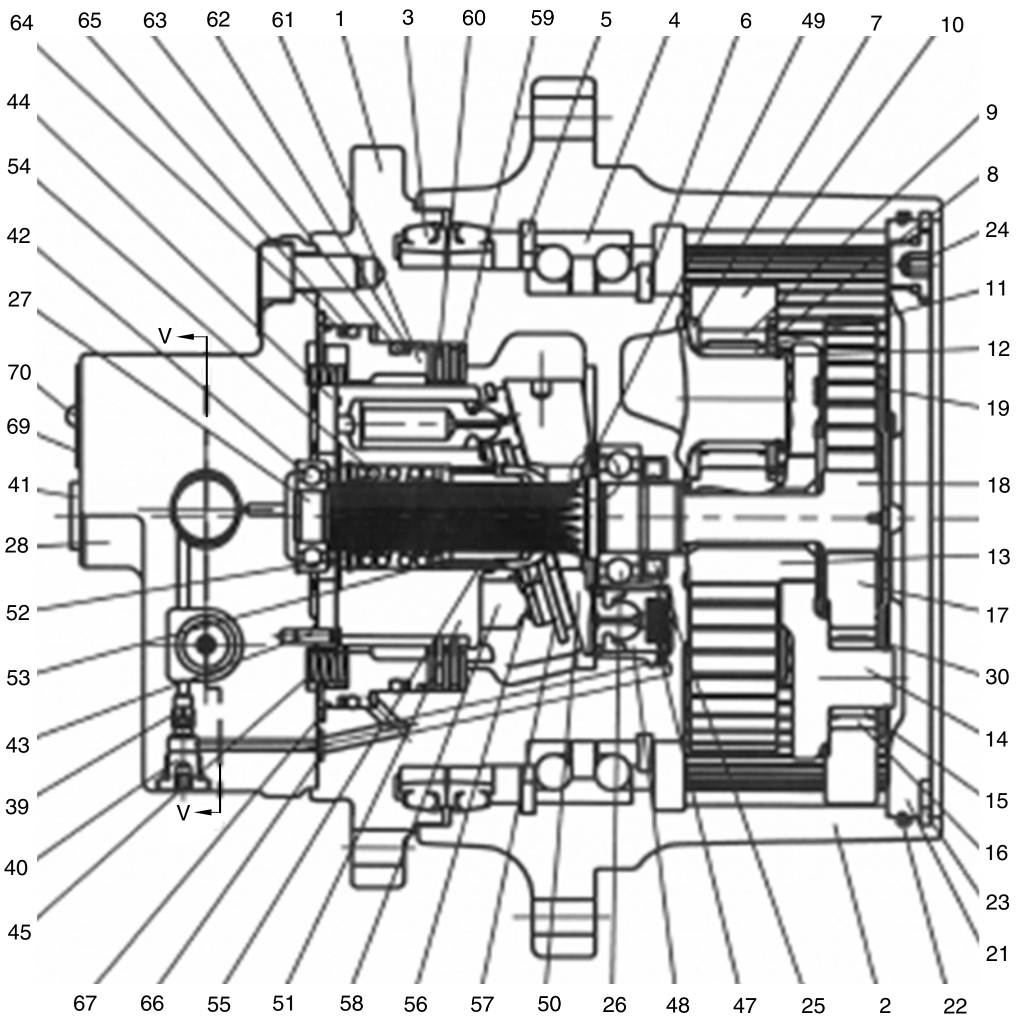
1) STRUCTURE (1/3)



35AZ2TM04

The travel motor is constituted with swash plate type axial piston motor, counterbalance valve, 2 speed change mechanism, parking brake, anti-cavitation valve and reduction gear unit.

STRUCTURE (2/3)

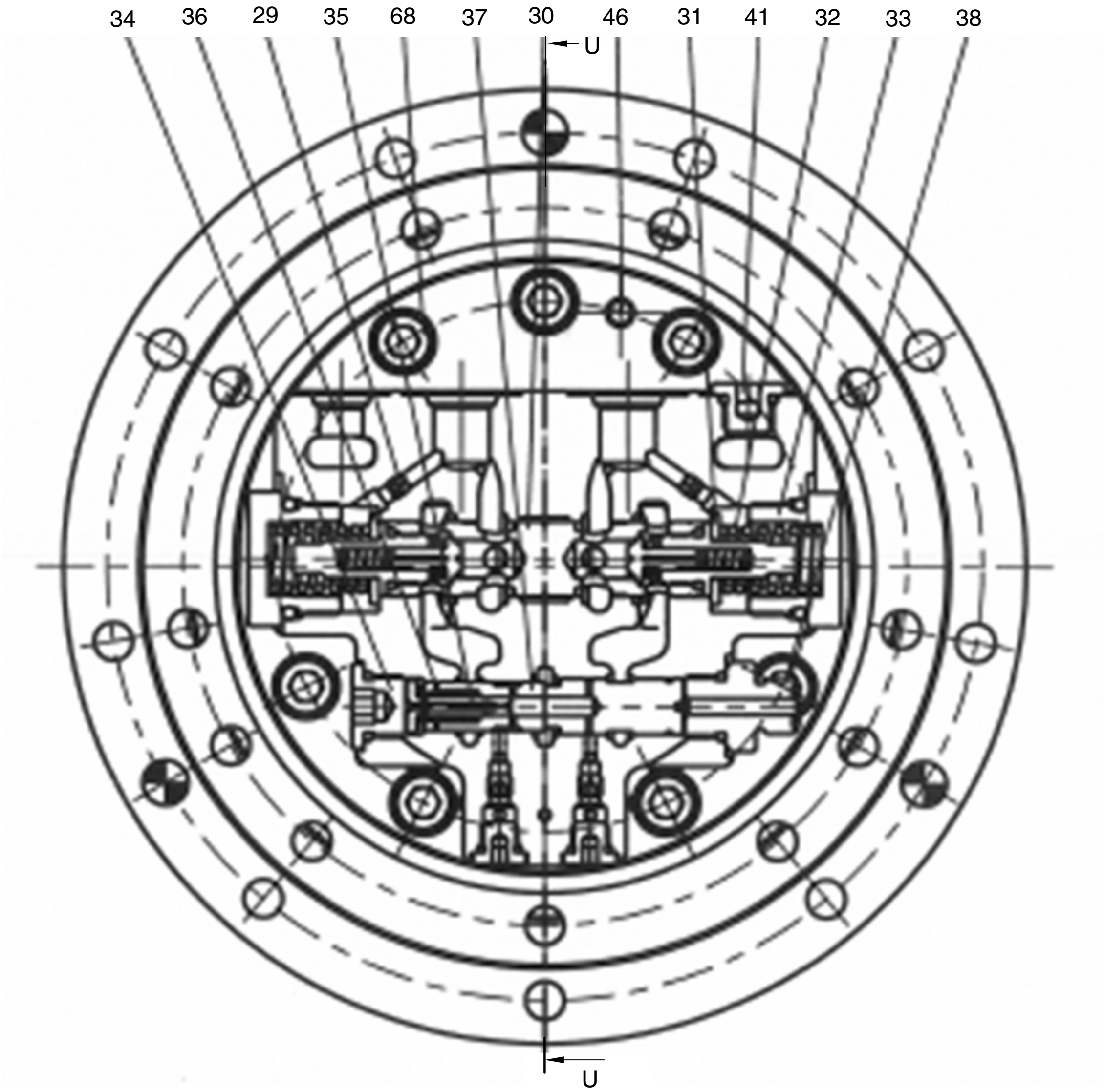


SECTION U-U

35AZ2TM02

1 Spindle
2 Hub
3 Floating seal
4 Angular ball bearing
5 Snap ring
6 Shim plate
7 Washer
8 Inner race
9 Needle bearing
10 Planet gear No.2
11 Thrust washer
12 Snap ring
13 Sun sear No.2
14 Carrier No.1
15 Inner race
16 Needle bearing
17 Planet gear No.1
18 Sun gear No.1
19 Thrust plate No.1
20 Snap ring
21 Cover
22 O-Ring
23 Clip
24 Plug
25 Oil seal
26 Ball bearing
27 Drive shaft
28 Valve casing
39 Orifice
40 Plug assy
41 Plug assy
42 Ball bearing
43 Parallel pin
44 Valve plate
45 Parking spring
47 Spring
48 2 speed piston assy
49 Steel ball
50 Swash plate
51 Cylinder block
52 Snap ring
53 Washer
54 Spring
55 Roller
56 Thrust ball
57 Retainer plate
58 Piston assembly
59 Separation plate
60 Friction plate
61 Parking piston
62 Back up ring
63 O-ring
64 Back up ring
65 O-ring
66 O-ring
67 O-ring
69 Name plate
70 Screw

STRUCTURE (3/3)



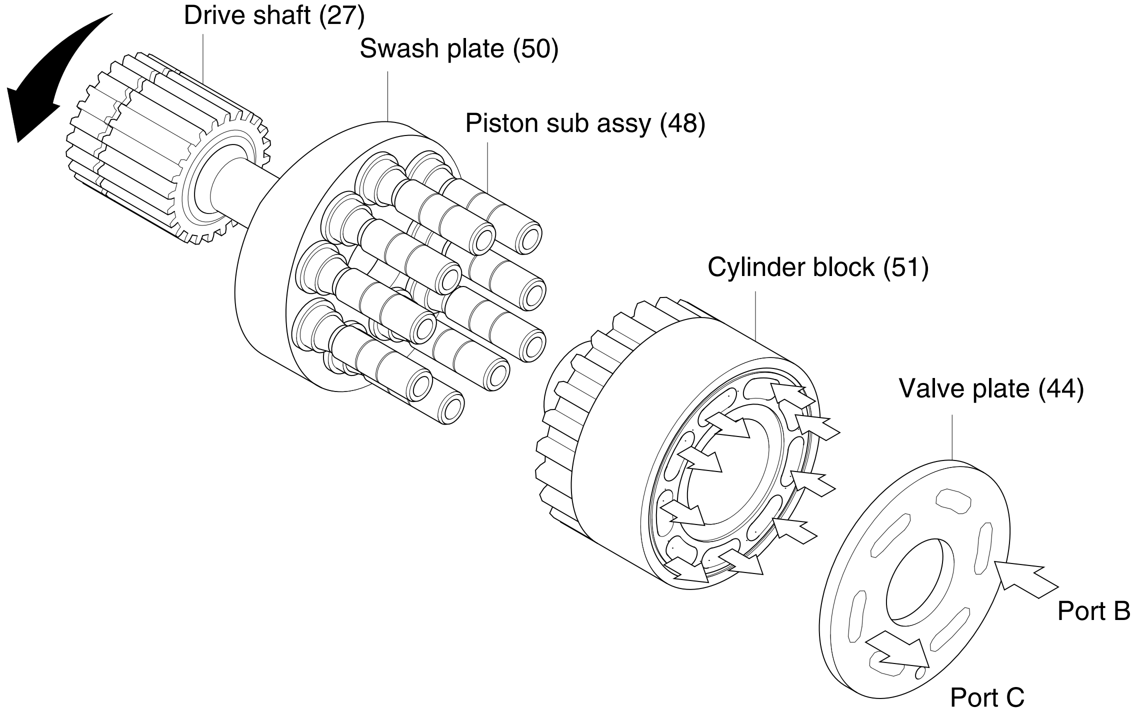
SECTION V-V

35AZ2TM03

29 Orifice
30 CB spool assy
31 Washer
32 Spring
33 Main plug assy
34 Plug assy
35 Speed shift guide spool
36 Spring
37 Speed shift spool
38 Plug assy
41 Plug assy
46 Parallel pin
68 Socket bolt

2. FUNCTION

1) HYDRAULIC MOTOR



35AZ2TM05

Nine piston sub assemblies (48) are assembled in cylinder block (51). The end face of cylinder block (51) is in contact with valve plate (44) having two crescent shaped ports, B and C (high and low pressure ports).

When supplying pressure fluid (pressure P) to B port, a swash plate (50) is pushed by the force of piston sub assemblies having F = P · A (A : piston pressure area). Piston sub assemblies receive the reaction force against it, and produce the reaction force (Ft) in rotating direction. The total force of high pressure side piston sub assemblies in rotating direction produces a rotating force in the cylinder block, and the torque is transmitted to drive shaft (27) through the spline resulting in the rotation of the shaft.

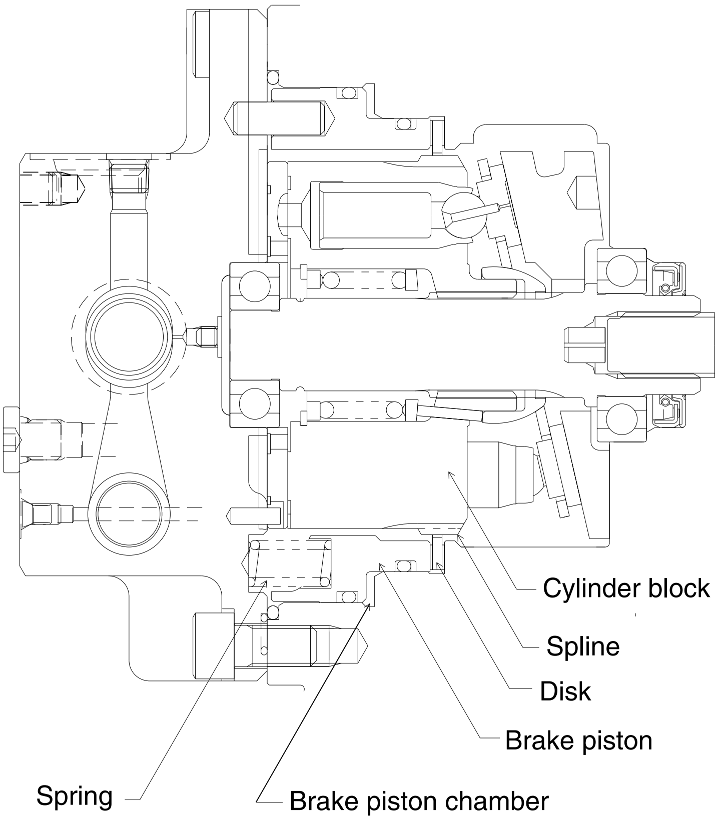
According to the above working principle, the output torque and rotating speed of the piston motor are determined by supply pressure (P) and flow rate (Q), and are calculated by the following equation.

$$T = \frac{P \times D \times \eta m}{2^* \pi}$$

$$N = \frac{Q \times 10^3 \times \eta v}{D}$$

T : Output torque [N · m]
N : Speed of rotation [rpm]
P : Working pressure [MPa]
Q : Flow rate [L/min]
D : Theoretical displacement [cm^3/rev]
η m : Mechanical efficiency
η v : Volumetric efficiency

2) PARKING BRAKE



The parking brake is a negative brake consisting of disk, brake piston and spring.

The cylinder block and the disk are combined with a spline, and friction material is bonded on both sides of disk. The disk generates frictional force between the flange holder and the brake piston by the force of spring and restricts the rotating force of the motor, achieving the best performance of the parking brake.

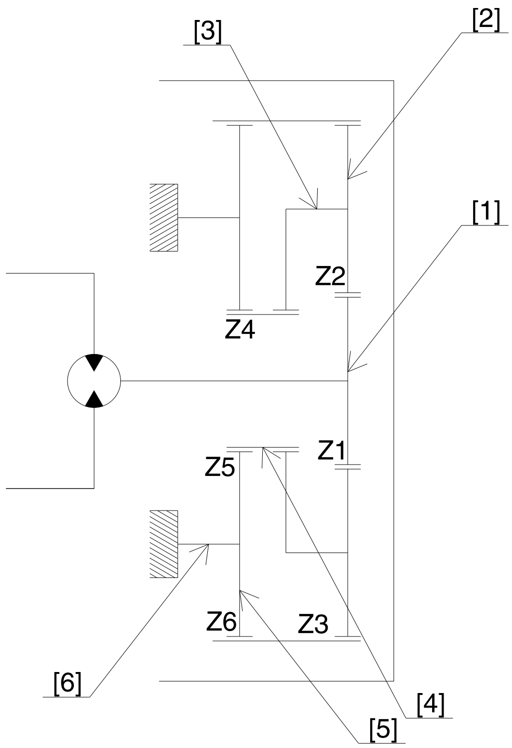
When the pressurized oil flows into the motor, the plunger moves and the parking brake release port is opened. After the oil flows into brake piston chamber, the thrust F is generated, corresponding to the pressure receiving area of brake piston and the thrust F becomes larger than the force of spring f, consequently the brake piston moves toward right.

Then, the disk rotates freely between the flange holder and brake piston, and parking brake is released.

When the motor is stopped, the plunger returns to the neutral position and the parking brake release port is closed. Consequently the pressurized oil in brake piston chamber flows into motor case, the parking brake acts by the force of spring.

3) REDUCTION UNIT

The reduction unit consists of double stage planetary gear mechanism.



R35Z72TM19

Drive gear[1] is engaged with the 1st planetary gear [2], 2nd stage sun gear [4] is engaged with the 2nd planetary gear [5]. The 2nd stage planetary carrier [6] is fixed machine body. Planetary gears [2], [5] are engaged with ring gear (housing).

The driving force form the piston motor is transmitted to drive gear [1], and the speed is reduced by each gear.

The reduced driving force is transmitted to ring gear through planetary gear [5] of planetary carrier [6] fixed on the machine body. (The driving force is also transferred from 1st stage planetary gear [2]). The direction of output rotation are reversed against that of input rotation.

The reduction gear ratio " i " is shown as follows.

※ Reduction gear ratio (i)

$$I = (i1 \times i2 - 1) = \left(\frac{Z1+Z3}{Z1} \times \frac{Z4+Z6}{Z4} - 1 \right)$$

※ Output torque of reduction unit (T)

$$T = TM \times i \times \eta M$$

Z1 : Drive gear teeth number
Z2 : Ring gear teeth number
Z4 : Sun gear teeth number
Z6 : Ring gear teeth number

※ Reduction gear output rotating speed (N)

$$N = \frac{NM}{i}$$

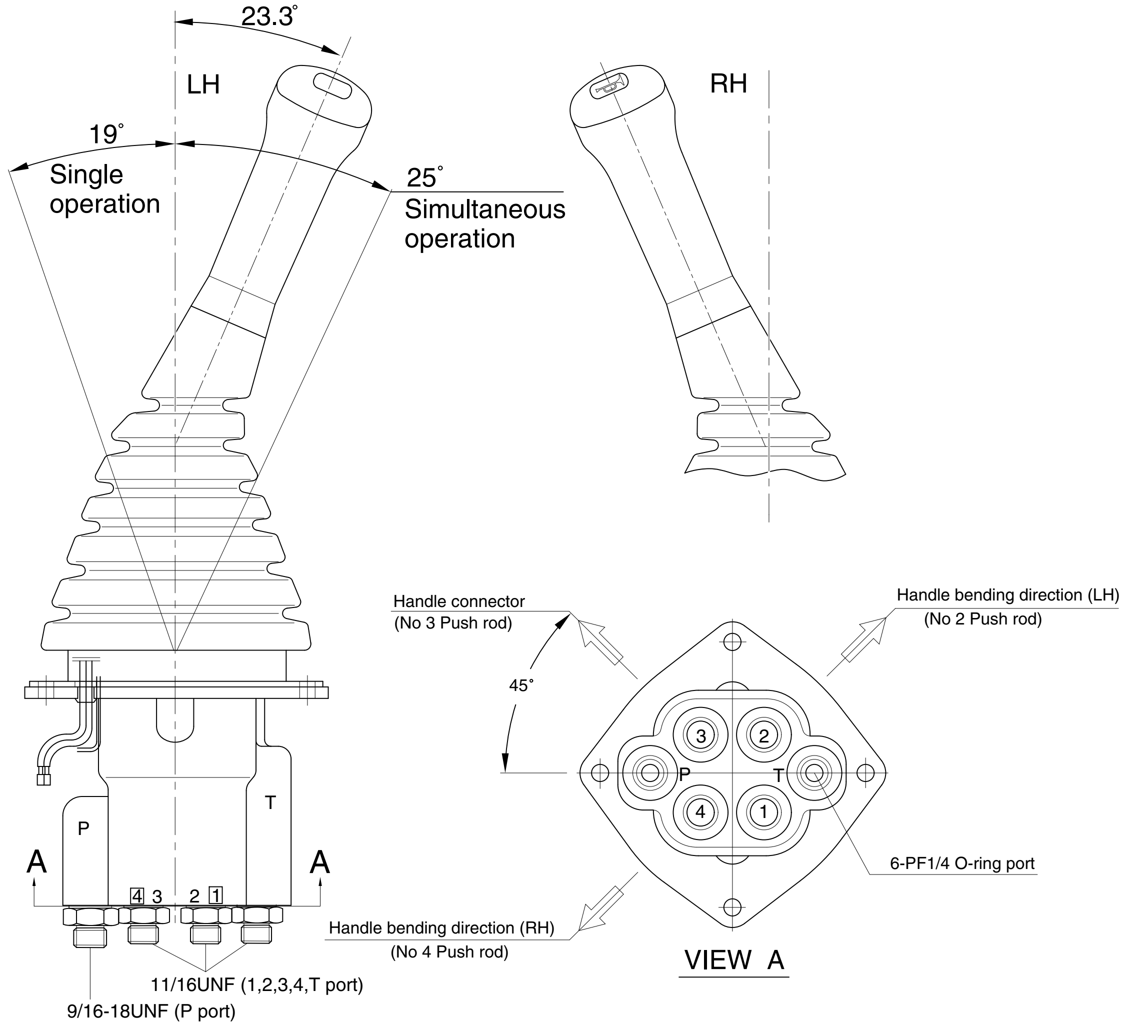
TM : Input torque (motor output torque)
i : Reduction gear ratio
η M : Mechanical efficiency
NM : Input speed of rotation (output motor speed)

GROUP 5 RCV LEVER

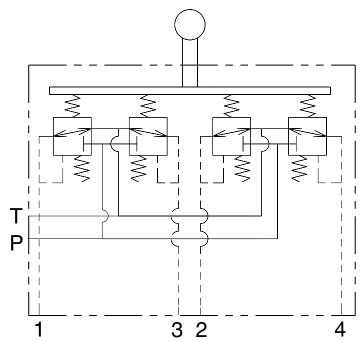
■ TYPE 1 (STD)

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.



R25Z9A2RL01



Hydraulic circuit

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

CROSS SECTION

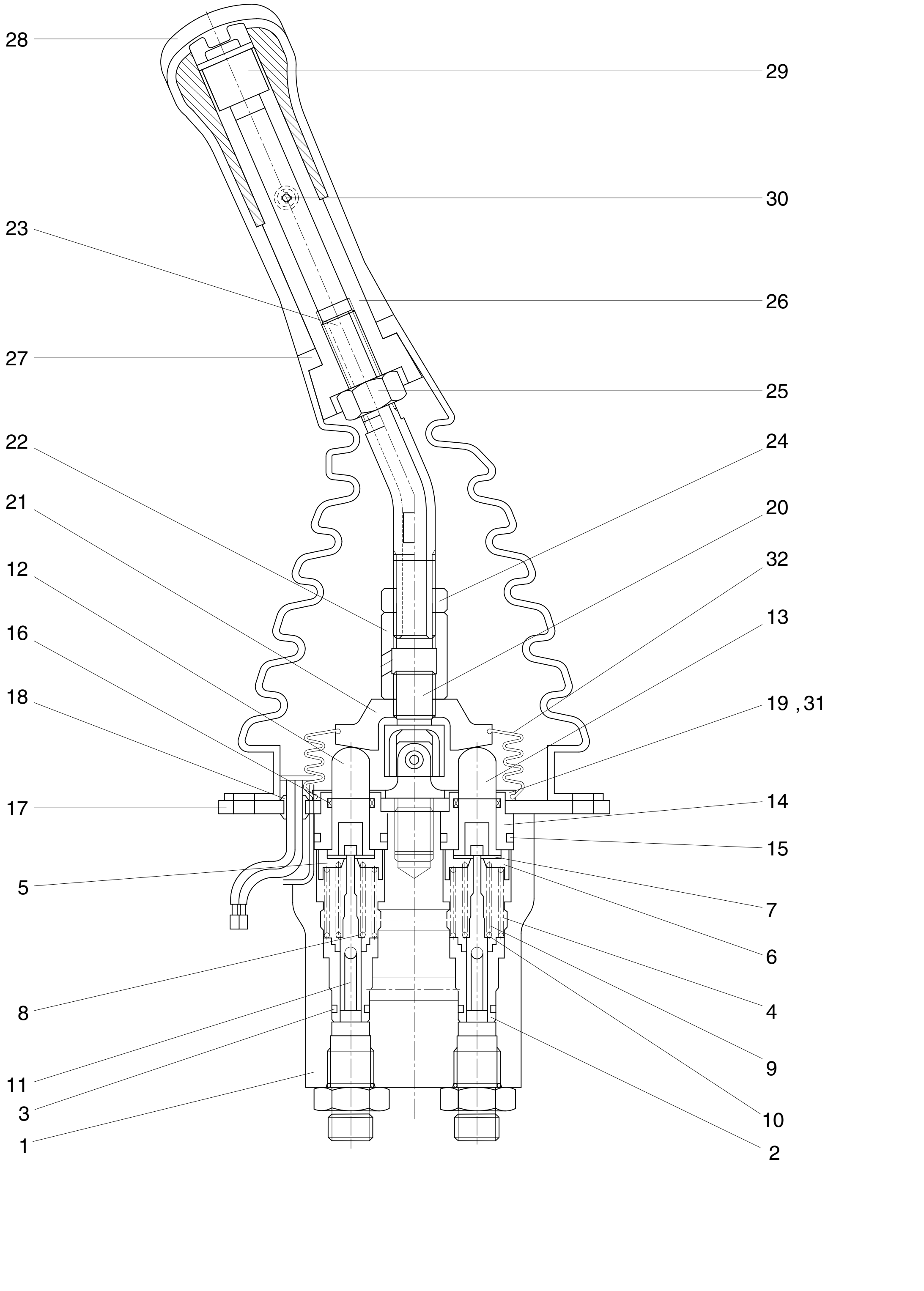
The construction of the pilot valve is shown in the attached cross section drawing. The casing has vertical holes in which reducing valves are assembled.

The pressure reducing section is composed of the spool (11), spring (8, 9) for setting secondary pressure, return spring (4), stopper (7), spring seat (5, 6) and spring seat (10). The spring for setting the secondary pressure has been generally so preset that the secondary pressure is 5 to 20.5 kgf/cm^2 (depending on the type). The spool is pushed against the push rod (12, 13) 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.

1	Case	12	Push rod (1, 3)	23	Connector
2	Plug	13	Push rod (2, 4)	24	Nut
3	O-ring	14	Plug	25	Nut
4	Spring	15	O-ring	26	Insert
5	Spring seat (1, 3)	16	Rod seal	27	Boot
6	Spring seat (2, 4)	17	Plate (A)	28	Handle
7	Stopper	18	Bushing	29	Switch assembly
8	Spring (1, 3)	19	Machine screw	30	Screw
9	Spring (2, 4)	20	Joint assembly	31	Plate
10	Spring seat	21	Swash plate	32	Boot
11	Spool	22	Hex nut		

CROSS SECTION



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

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 (8, 9) works on this spool to determine the output pressure.

The change the deflection of this spring, the push rod (12, 13) is inserted and can slide in the plug (14).

For the purpose of changing the displacement of the push rod through the switch plate (21) and adjusting nut (22) are provided the handle (28) that can be tilted in any direction around the fulcrum of the universal joint (20) center.

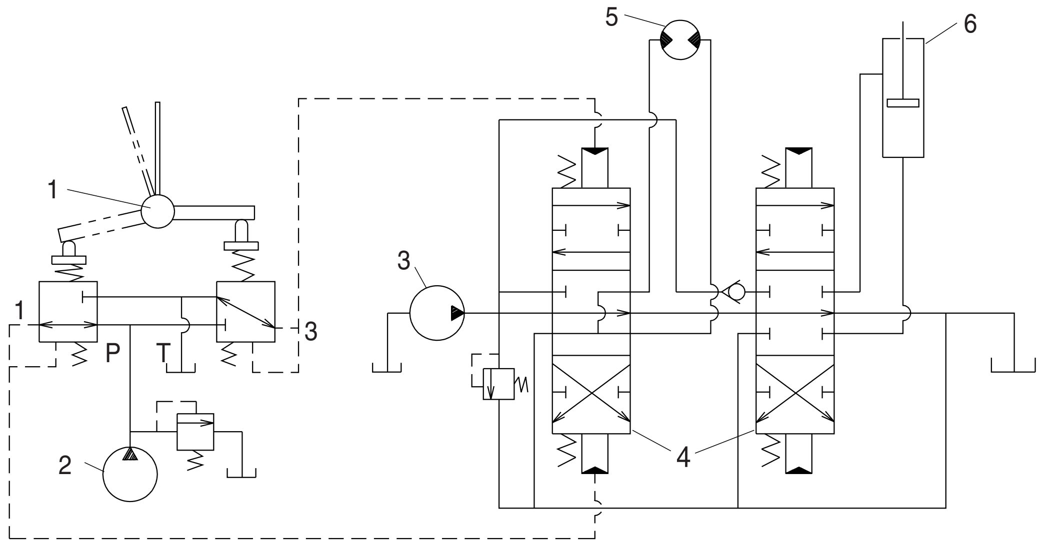
The spring (4) works on the case (1) and spring seat (5, 6) and tries to return the push rod (12, 13) to the zero-displacement position irrespective of the output pressure, securing its resetting to the center position.

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.

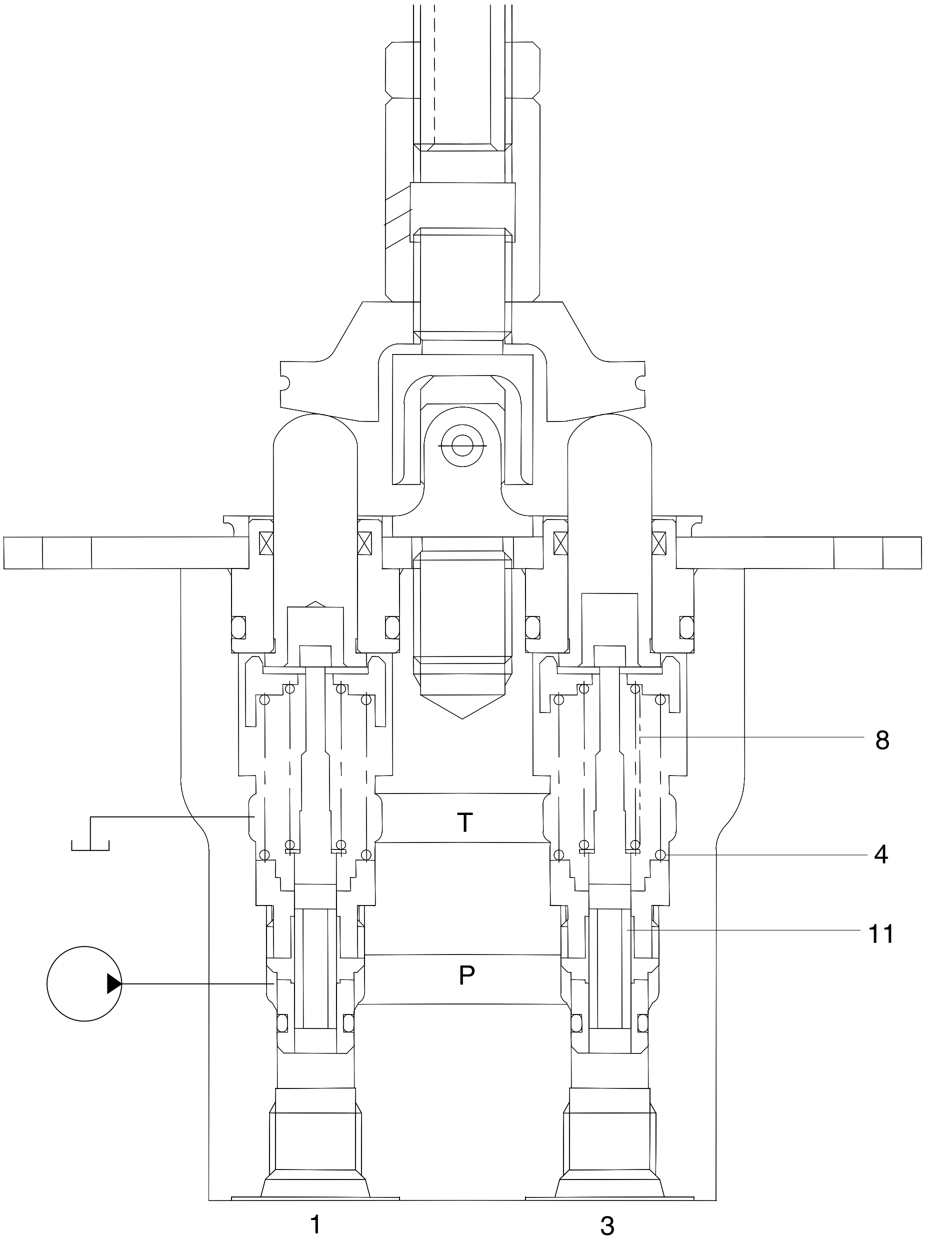
The diagram shown below is the typical application example of the pilot valve.



2-70 (140-7TIER)

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

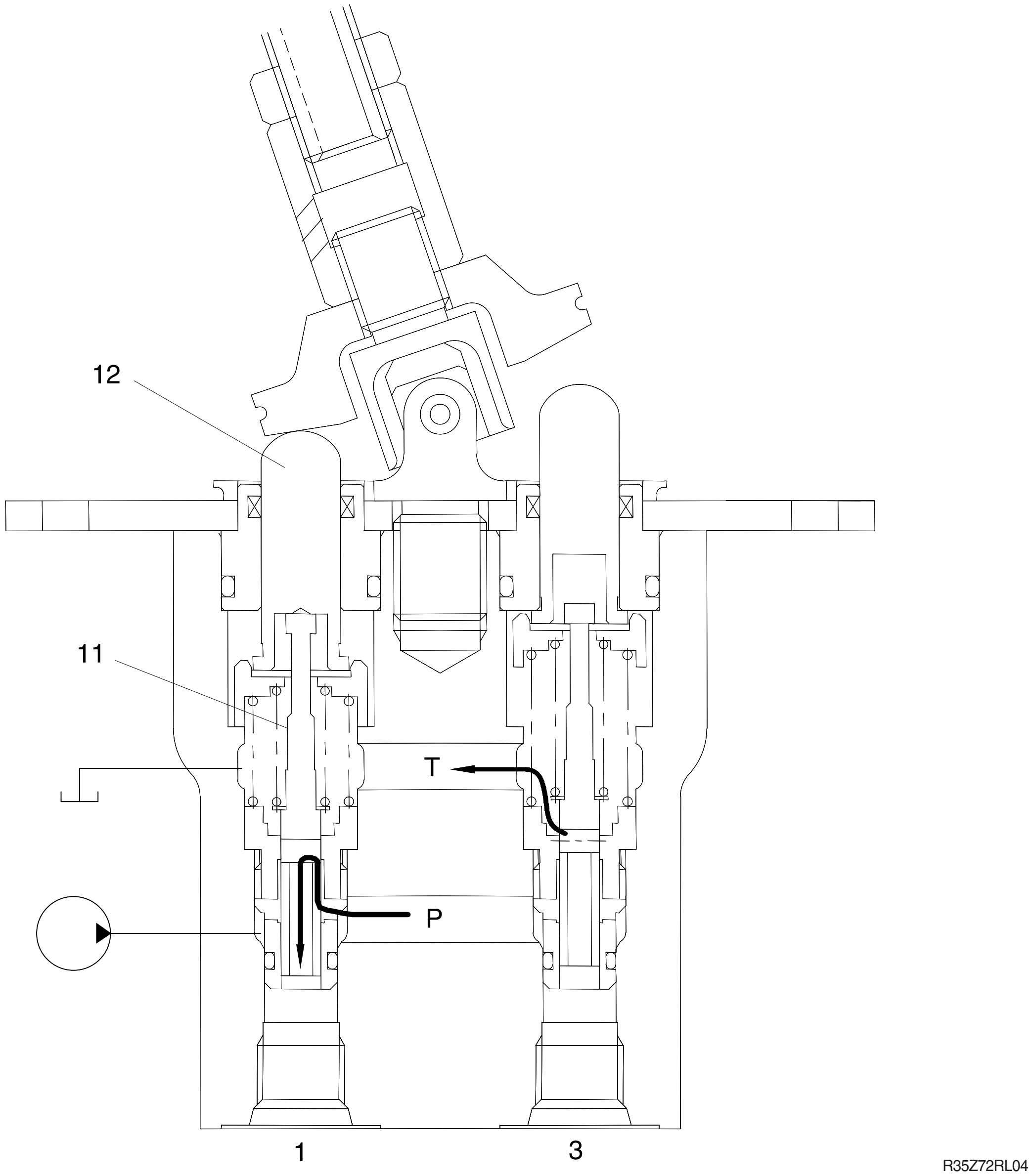
(1) Case where handle is in neutral position



R35Z72RL03

The force of the spring (8) that determines the output pressure of the pilot valve is not applied to the spool (11). Therefore, the spool is pushed up by the spring (4) 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

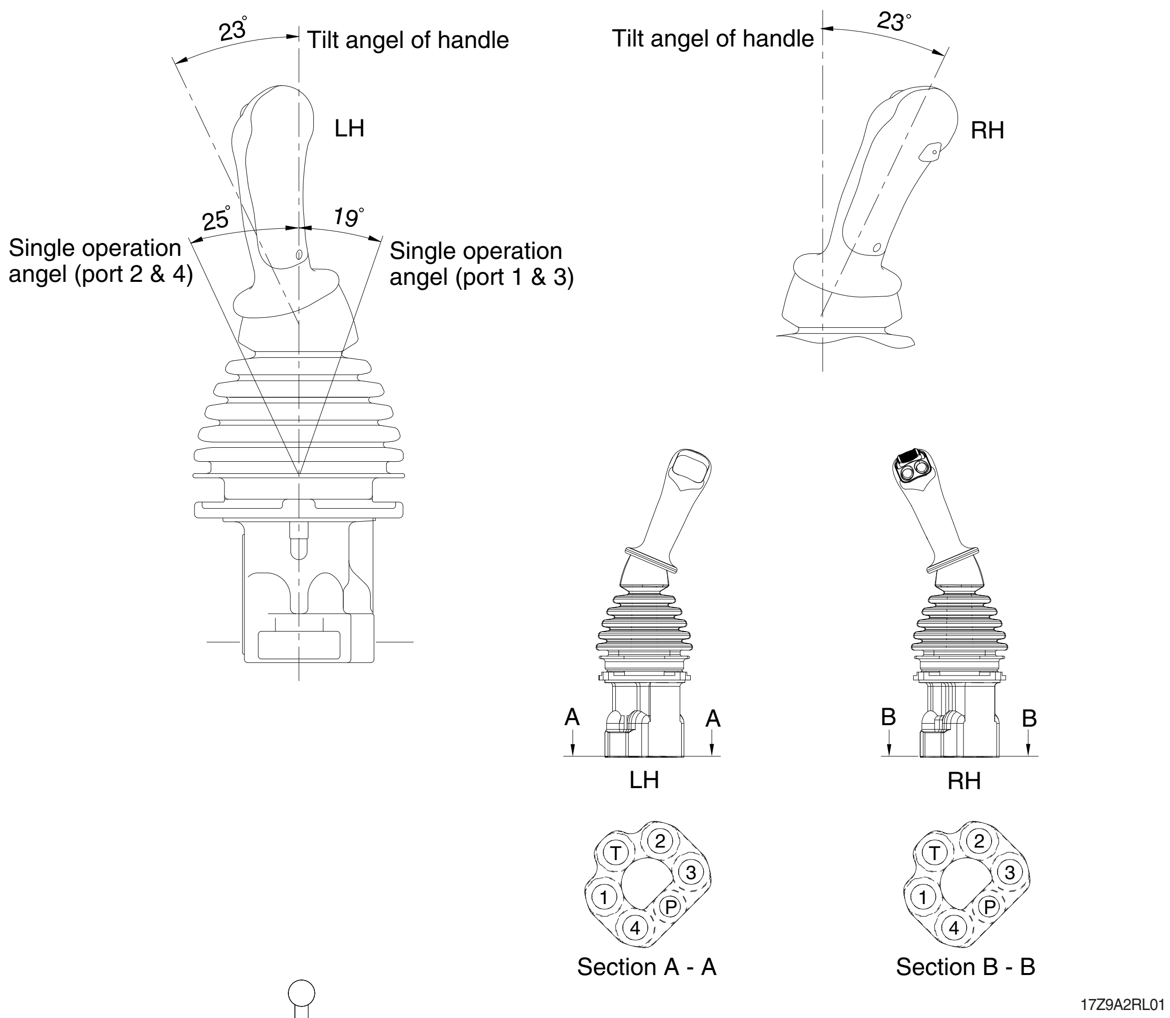


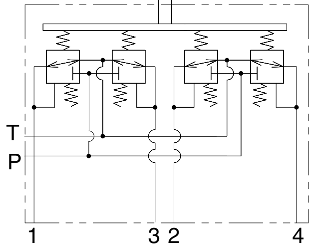
When the push rod (12) is stroked, the spool (11) moves downwards.
Then port P is connected with port (1) and the oil supplied from the pilot pump flows through port (1) to generate the pressure.
When the pressure at port (1) increases to the value corresponding to the spring force set by tilting the 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 2 (OPT)

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.

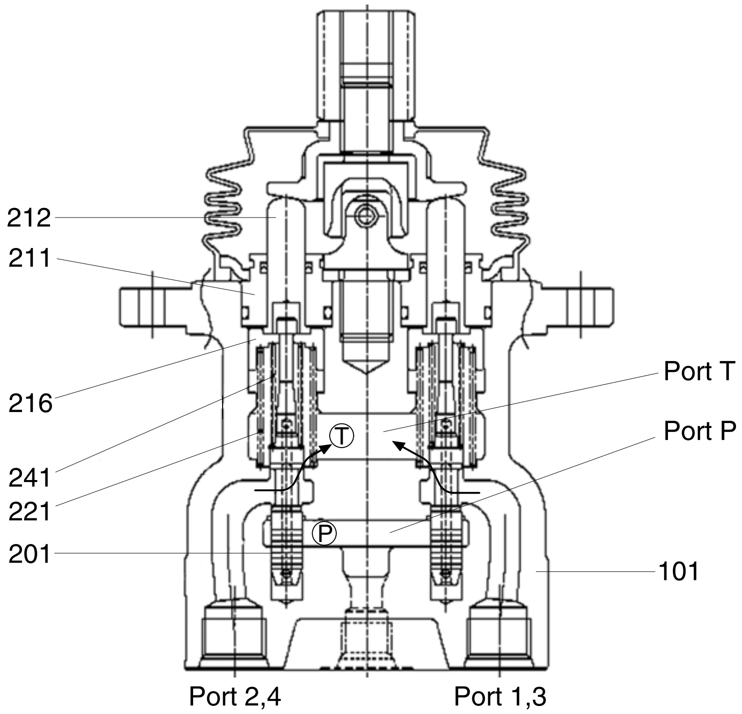




Hydraulic circuit

Port	LH	RH (with proportional)	Port size
P	Pilot oil inlet port	Pilot oil inlet port	PF 1/4
T	Pilot oil return port	Pilot oil return port	PF 3/8
1	Left swing port	Bucket out port	
2	Arm out port	Boom down port	
3	Right swing port	Bucket in port	
4	Arm in port	Boom up port	

CROSS SECTION



17Z9A2RL02

101 Casing
201 Spool
211 Plug
212 Push rod
216 Spring seat
221 Return spring
241 Secondary pressure setting spring

The structure of the remote control valve is as shown in the assembly. There is a vertical axial hole in the casing and the reduction valves are inserted into this.

The secondary pressure setting spring (241) is set such that the secondary pressure is calculated as 5.1~10.2 kgf/cm². Spool (201) is pushed onto the push rod (212) by return spring (221).
Tilting the control handle pushes down push rod (212), the spring seat (216) also moves down and the setting of the secondary pressure setting spring (241) is changed.
Port P, oil inlet (primary pressure) and port T outlet (tank) are in the casing (101).

2. PERFORMANCE

1) BASIC PERFORMANCE

The remote control valve controls the stroke and direction of the control valve spools. This is achieved by the output pressure of the remote control valve acting on the tip of the control valve spool.

To achieve satisfactory performance, the remote control valve comprises the following elements :

(1) An inlet port (P) for oil fed from the hydraulic pump.

(2) Multiple output ports (1, 2, 3 and 4) to allow pressure from the inlet port to act on the spool tips of the control valve.

(3) A tank port (T) to control the output pressure.

(4) A spool to connect the output port to the inlet port or tank port.

(5) A mechanical assembly, which contains a spring which acts on the spool and controls the output pressure.

2) PERFORMANCE OF THE MAIN PARTS

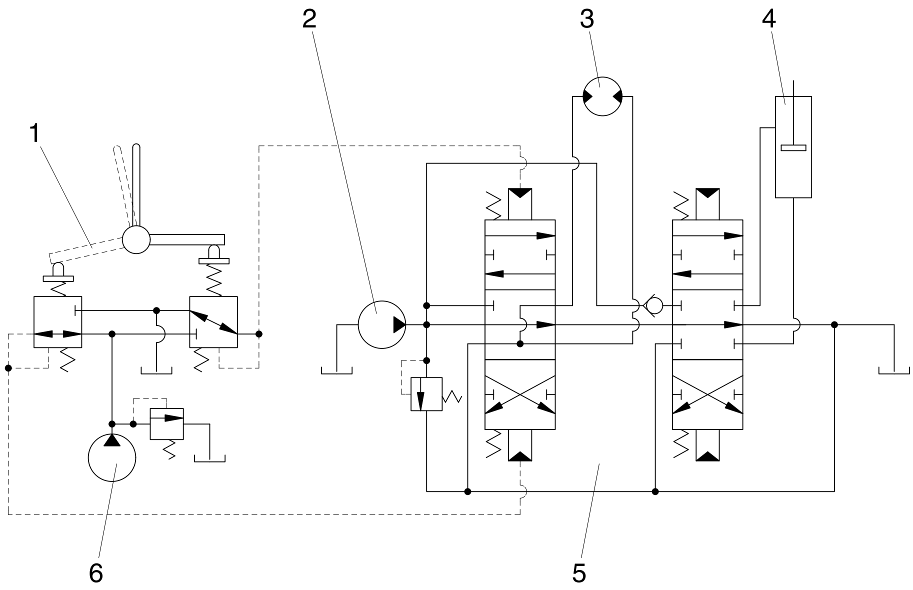
The spool (201) operates to take the supply oil pressure from the hydraulic pump. This switches the oil channel so that the port P oil pressure is directed to the output ports 1, 2, 3, 4 or to port T. The secondary pressure setting spring (241) determines the output pressure that acts on the spool (201).

The push-rod (212), which changes the strain of the secondary pressure setting spring (241), is inserted so that it can move smoothly into the plug (211).

The return spring (221) acts to return the push-rod (212) towards zero displacement without reference to the output pressure acting on the spring seat (216) and casing (101). This acts to ensure the return to neutral of the spool (201) and also acts as a resistance spring to provide the operator with an appropriate operating "feel".

3) OPERATION

The operation of the remote control valve is described in the hydraulic circuit plan and operation explanatory figures (see figures RL04, 05 and 06). The below figure shows a typical example of the use of the remote control valve.



17Z9A2RL03

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

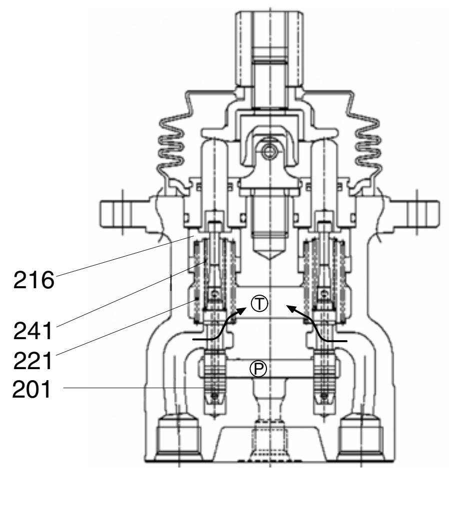
(1) Control handle neutral

The force of the secondary pressure setting spring (241) (which determines the output pressure of the pilot valve) does not act on the spool (201).

Spool (201) is pressed upward by the return spring (221) and spring seat (216) .

Output ports (2, 4) and port T are open.

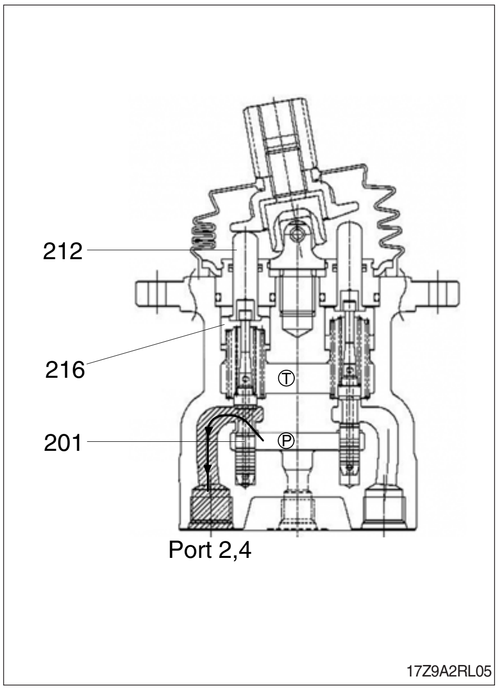
The output pressure is the same as the tank pressure.



17Z9A2RL04

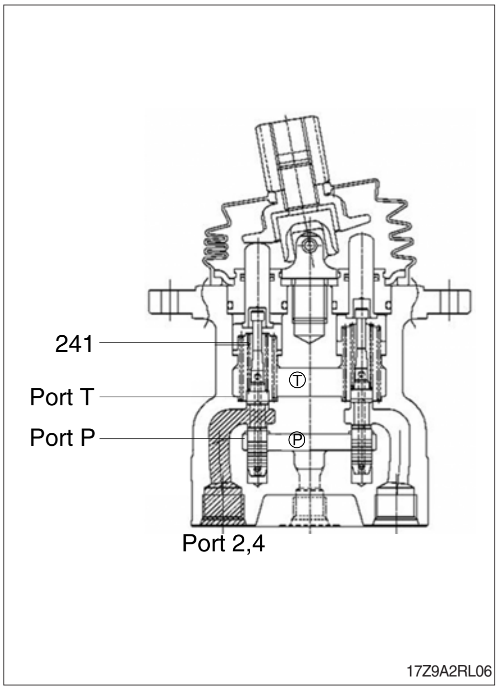
(2) Control handle tilted

The push-rod moves, (spring seat (216)), spool (201) moves downward, port P and ports (2, 4) are open and the oil fed from the pilot pump flows to ports (2, 4) and generates pressure.



(3) Control handle held

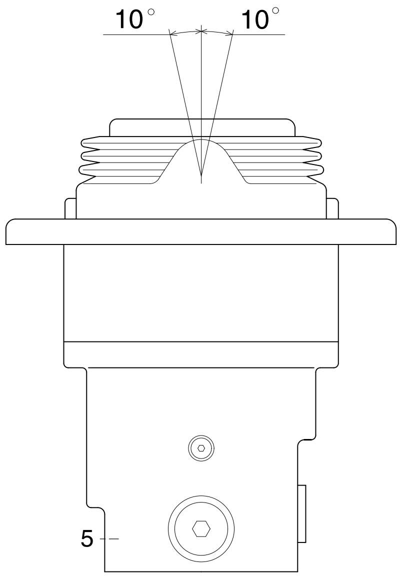
The pressure of ports (2, 4) rises to become equal to the spring (241) force; the oil pressure and spring pressures become balanced. If the pressure of ports (2, 4) exceeds the set pressure, ports (2, 4) and port P close, ports (2, 4) and port T open. If the pressure of ports (2, 4) falls below the set pressure, ports (2, 4) and port P open and ports (2, 4) and port T close. The secondary pressure is kept constant.

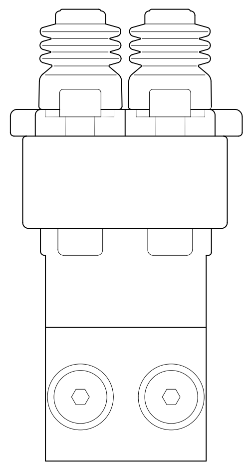


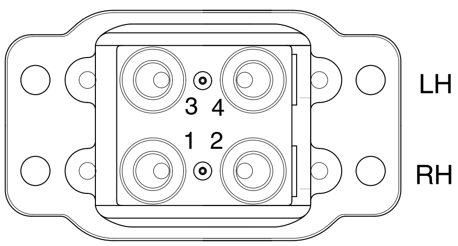
GROUP 6 RCV PEDAL

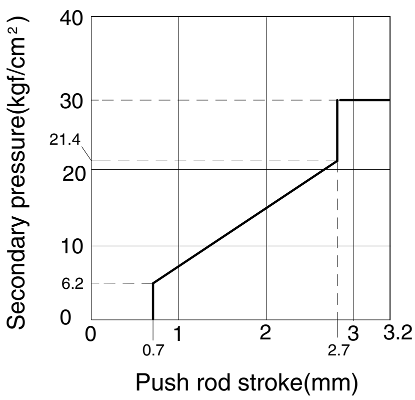
1. STRUCTURE

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.

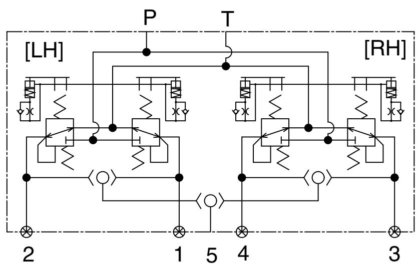








35AZ2RCP01



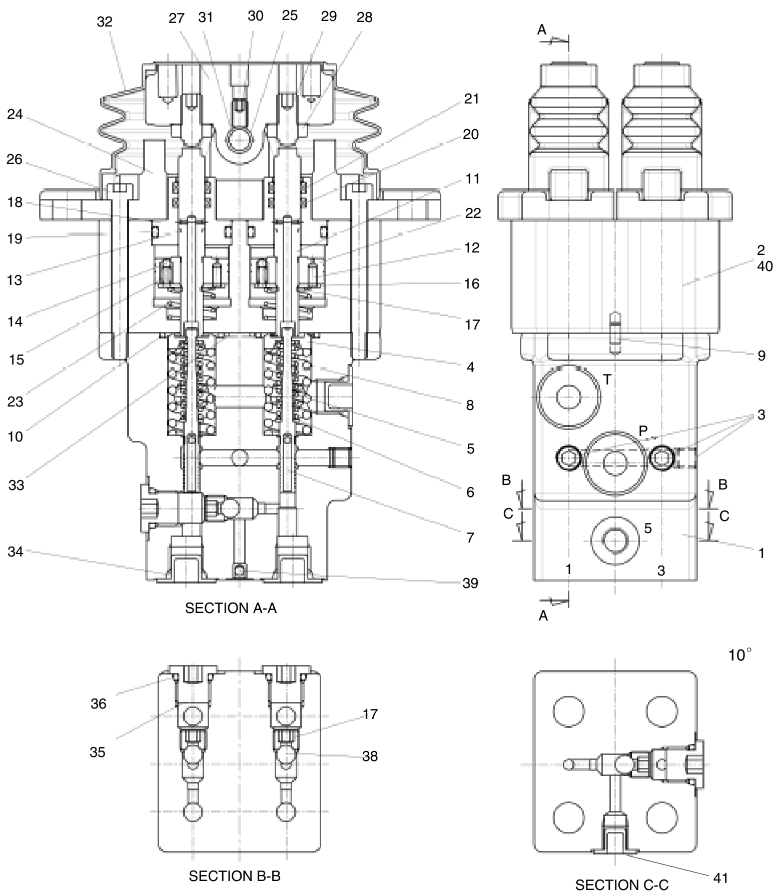
Port	Port name	Port size
P	Pilot oil inlet port	PF 1/4
T	Pilot oil return port	
1	Travel (LH, backward)	
2	Travel (LH, forward)	
3	Travel (RH, backward)	
4	Travel (RH, forward)	
5	Travel alarm	PT 1/8

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 6.2 to 21.4 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.



35AZ2RCP02

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.

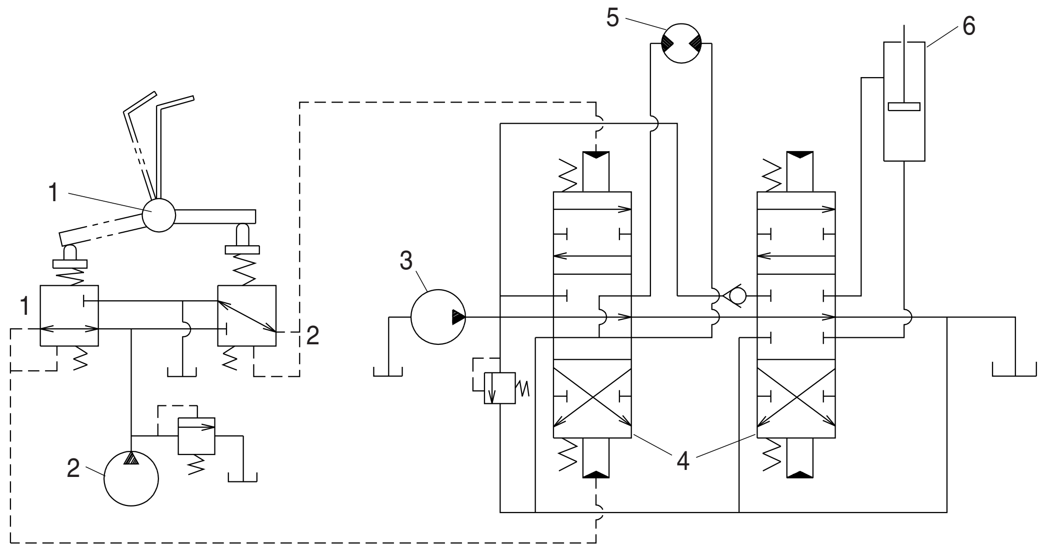
2) FUNCTIONS OF MAJOR SECTIONS

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 cam shaft (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.

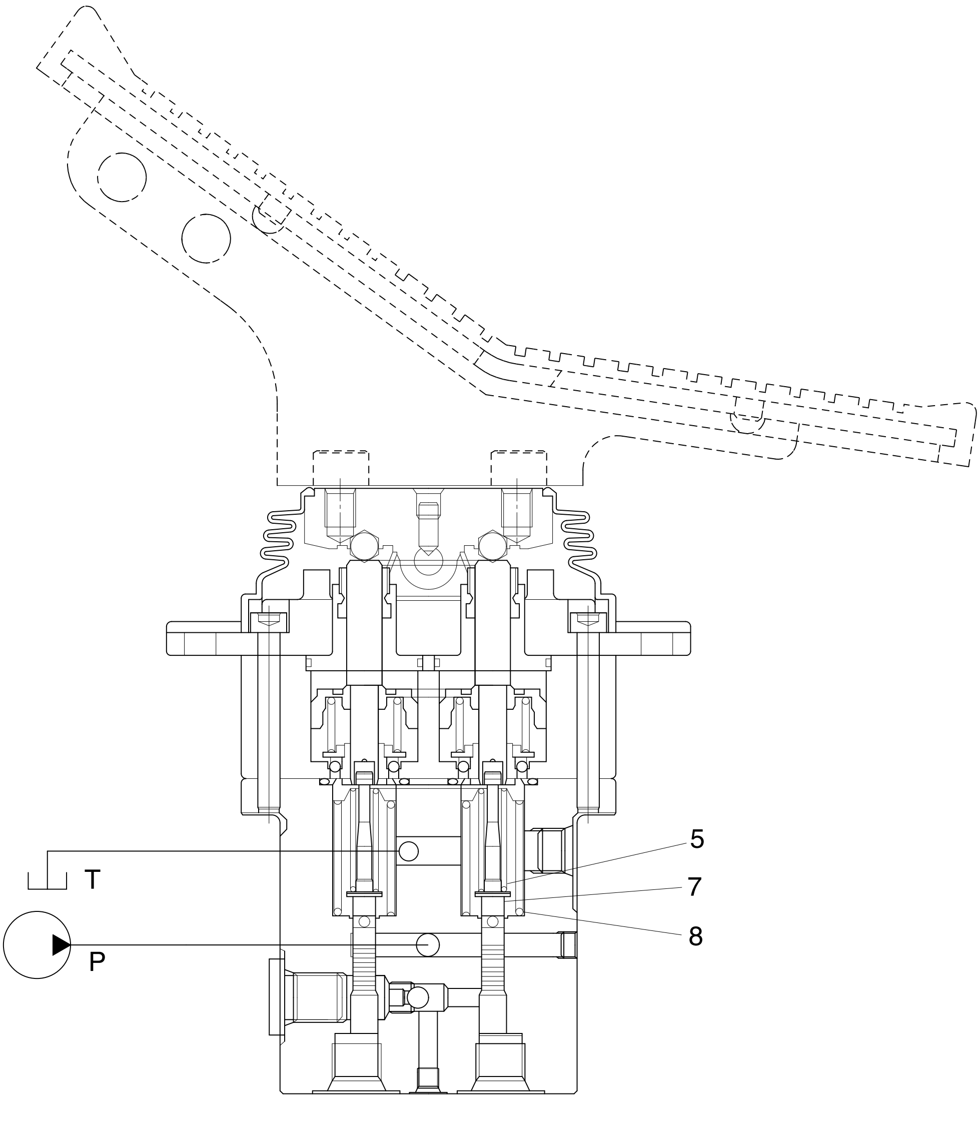
The diagram shown below is the typical application example of the pilot valve.



140LC-7 기타2-76

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

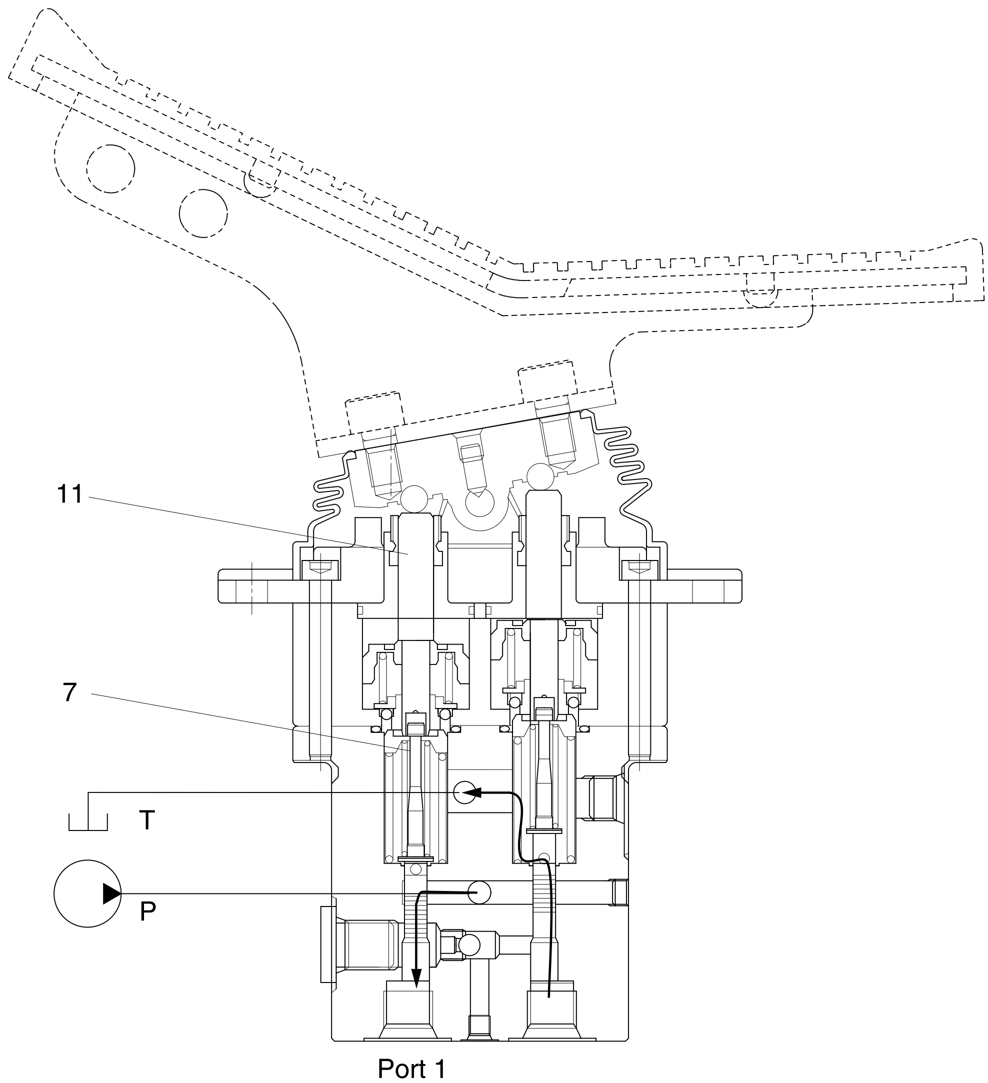
(1) Case where pedal is in neutral position



35AZ2RCP04

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

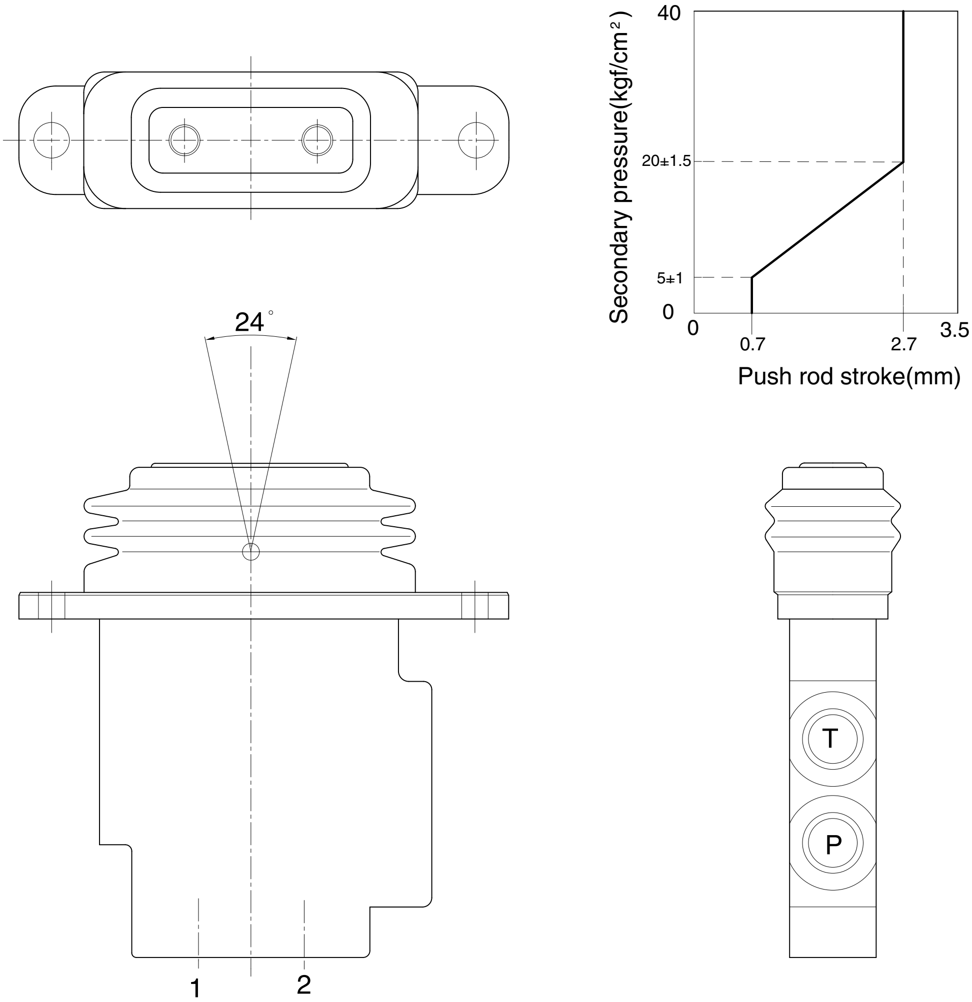
When the push rod (11) is stroked, the spool (7) moves downwards.
Then port P is connected with port 1, and the oil supplied from the pilot pump flows through port 1 to generate the pressure.
When the pressure at port 1 increases to the value corresponding to the spring force set by tilting the handle, 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

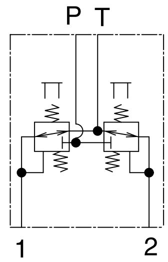
1) STRUCTURE

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.



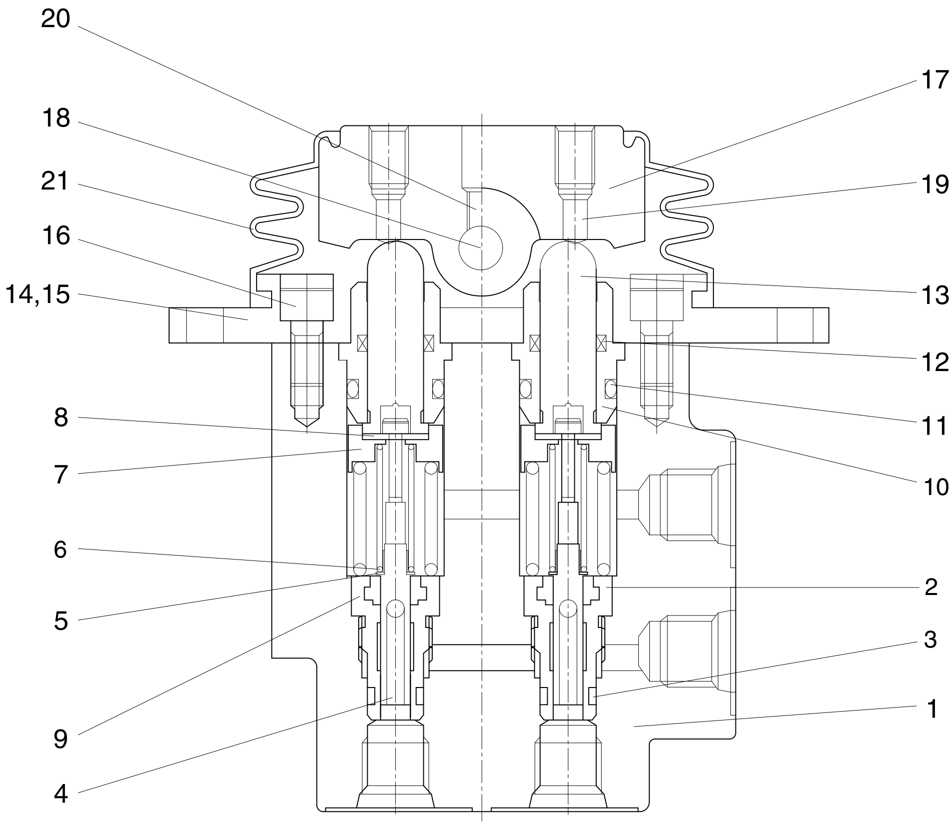
35AZ2BS01



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



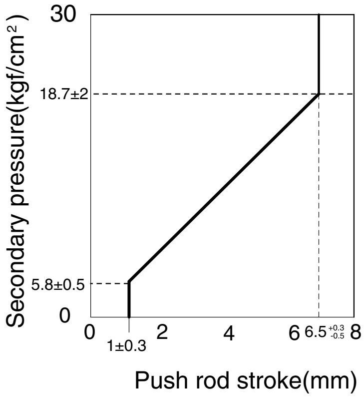
31MH-20050

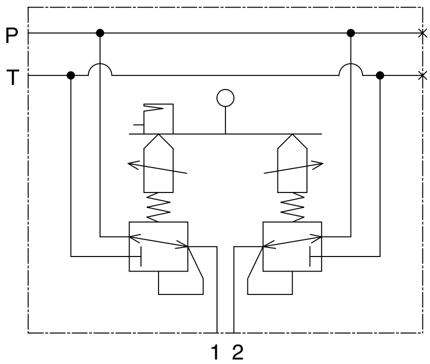
1	Body	8	Stopper	15	DU bush
2	Plug	9	Spring	16	Wrench bolt
3	O-ring	10	Plug	17	Cam
4	Spool	11	O-ring	18	Pin
5	Spring seat	12	Rod seal	19	Adjust screw
6	Spring	13	Push rod	20	Socket bolt
7	Spring seat	14	Cover	21	Bellows

4. DOZER LEVER

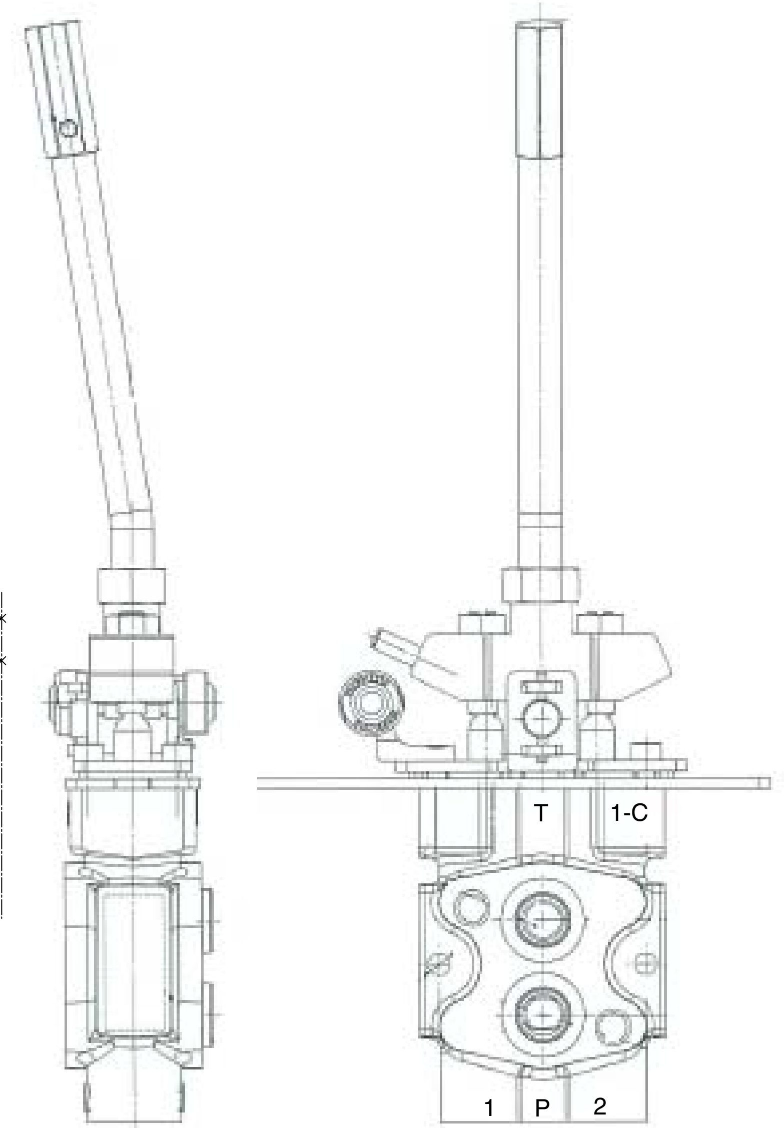
1) STRUCTURE

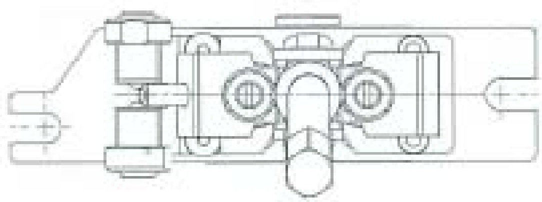
The casing has the oil inlet P (primary pressure) and the oil return port (tank).
In addition the secondary pressure is taken out through port 1 and port 2 provided at the housing bottom face.





Hydraulic circuit

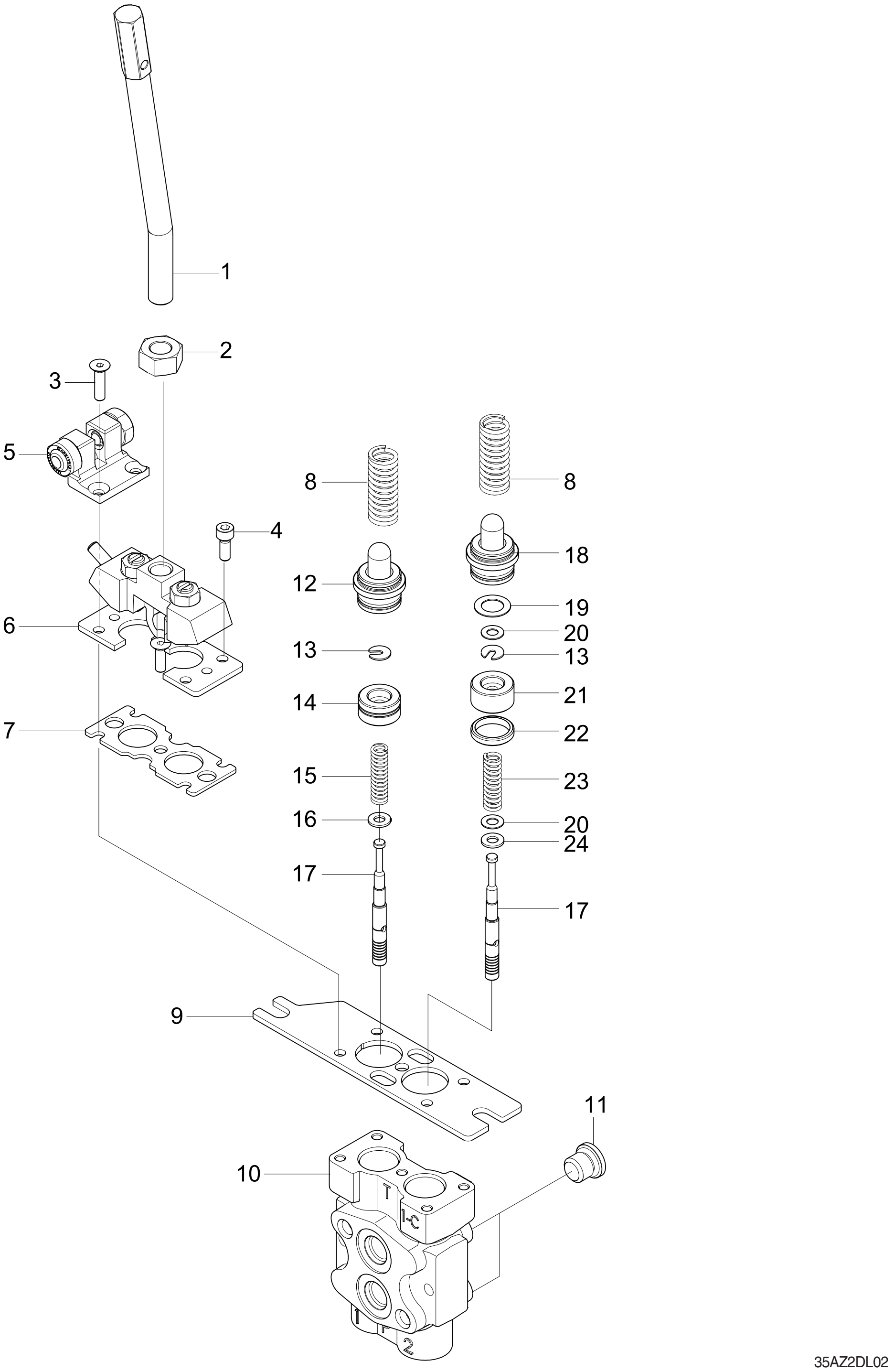




Port	Port	Port size
P	Pilot oil inlet port	PF 1/4
T	Pilot oil return port	PF 1/4
1	Dozer blade up port	PF 1/4
2	Dozer blade down port	PF 1/4

35AZ2DL01

2) COMPONENT

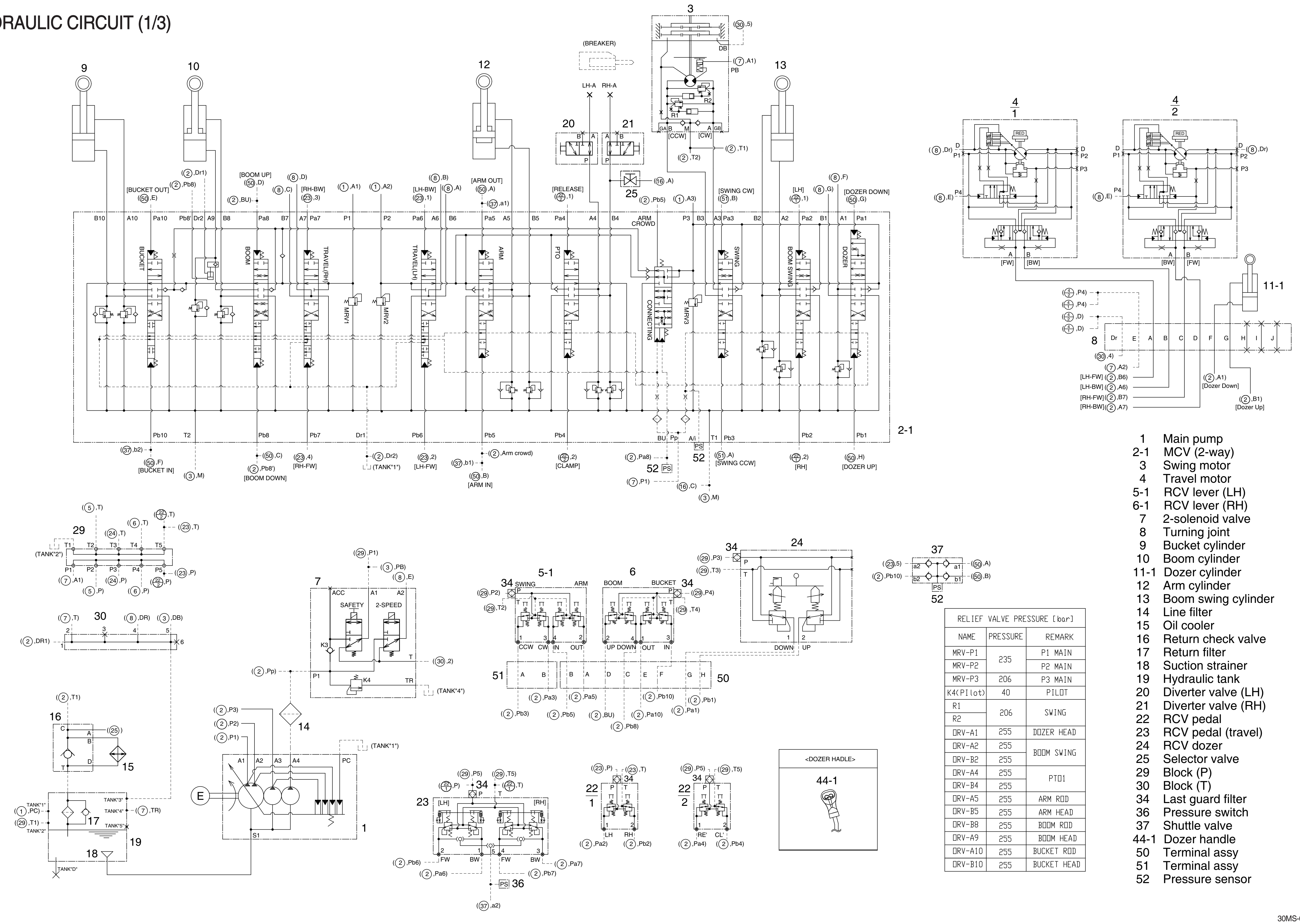


1	RCV lever	9	Lower plate	17	Rod
2	Lever nut	10	Lower body	18	Plunger
3	Screw	11	Plug	19	Spacer
4	Screw	12	Plunger	20	Spacer
5	Bracket	13	Retainer	21	Bushing
6	Upper body	14	Bushing	22	Spacer
7	Upper plate	15	Spring	23	Spring
8	Spring	16	Seal washer	24	Gasket

SECTION 3 HYDRAULIC SYSTEM

GROUP 1 HYDRAULIC CIRCUIT

1. HYDRAULIC CIRCUIT (1/3)



1	Main pump
2-1	MCV (2-way)
3	Swing motor
4	Travel motor
5-1	RCV lever (LH)
6-1	RCV lever (RH)
7	2-solenoid valve
8	Turning joint
9	Bucket cylinder
10	Boom cylinder
11-1	Dozer cylinder
12	Arm cylinder
13	Boom swing cylinder
14	Line filter
15	Oil cooler
16	Return check valve
17	Return filter
18	Suction strainer
19	Hydraulic tank
20	Diverter valve (LH)
21	Diverter valve (RH)
22	RCV pedal
23	RCV pedal (travel)
24	RCV dozer
25	Selector valve
29	Block (P)
30	Block (T)
34	Last guard filter
36	Pressure switch
37	Shuttle valve
44-1	Dozer handle
50	Terminal assy
51	Terminal assy
52	Pressure sensor

RELIEF VALVE PRESSURE [bar]

NAME	PRESSURE	REMARK
MRV-P1	235	P1 MAIN
MRV-P2		P2 MAIN
MRV-P3	206	P3 MAIN
K4(PIlot)	40	PILOT
R1	206	SWING
R2		
ORV-A1	255	DOZER HEAD
ORV-A2	255	BOOM SWING
ORV-B2	255	
ORV-A4	255	PTO1
ORV-B4	255	
ORV-A5	255	ARM ROD
ORV-B5	255	ARM HEAD
ORV-B8	255	BOOM ROD
ORV-A9	255	BOOM HEAD
ORV-A10	255	BUCKET ROD
ORV-B10	255	BUCKET HEAD

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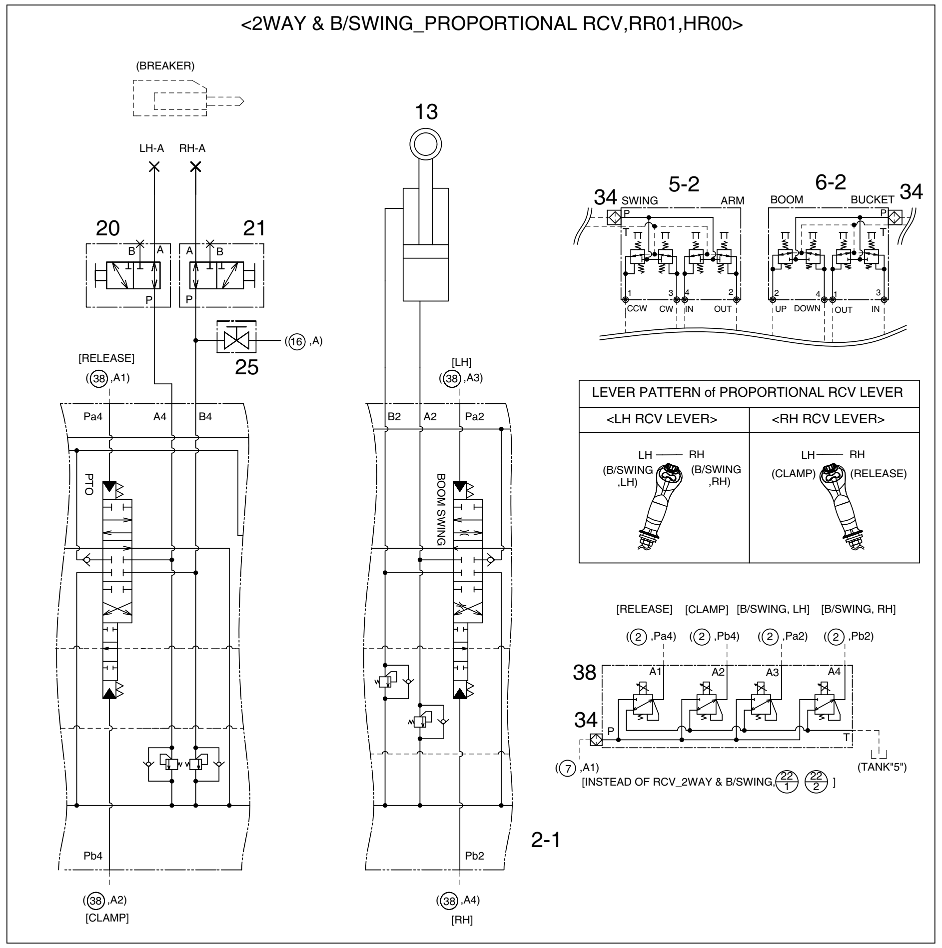
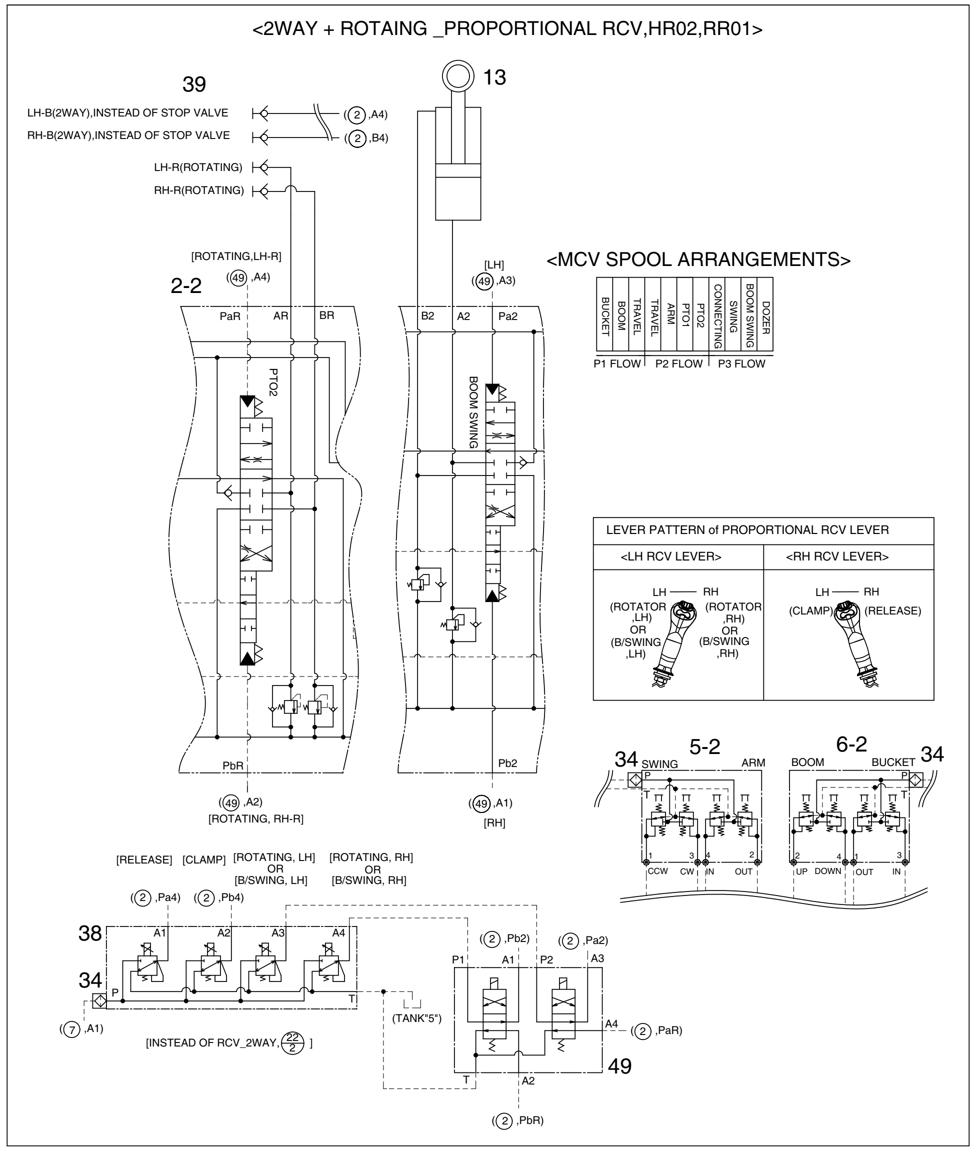
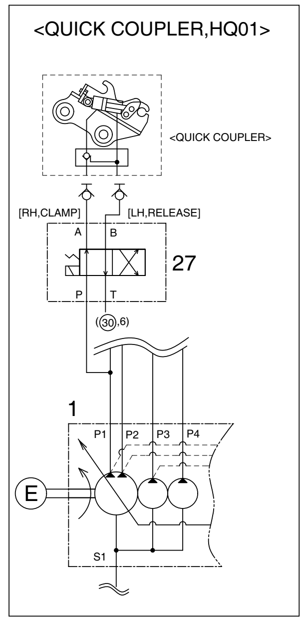
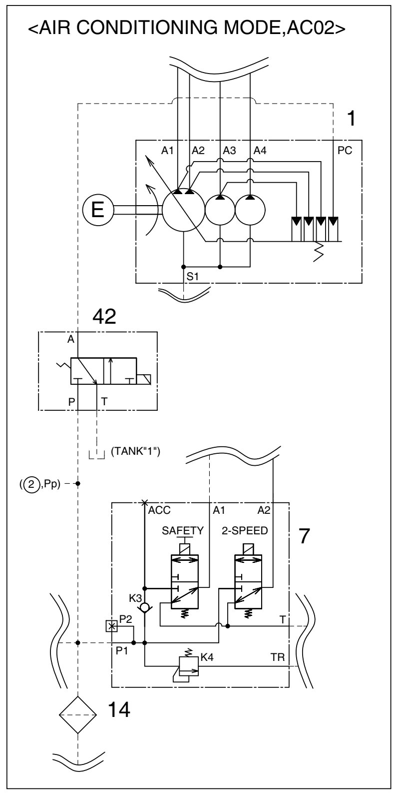
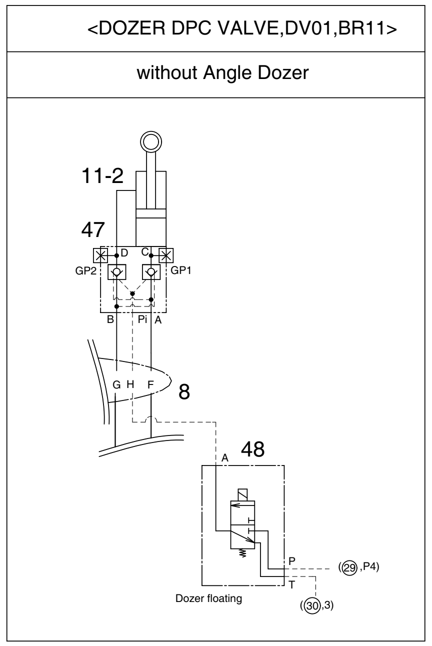
2. HYDRAULIC CIRCUIT (2/3)

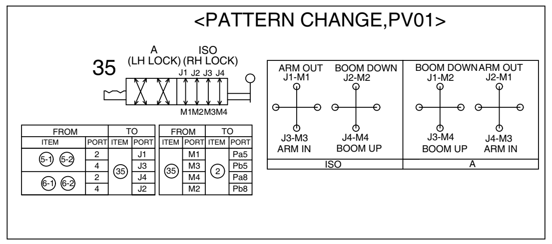


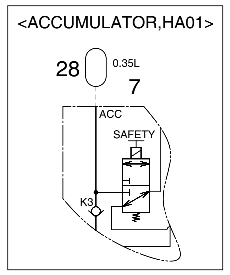


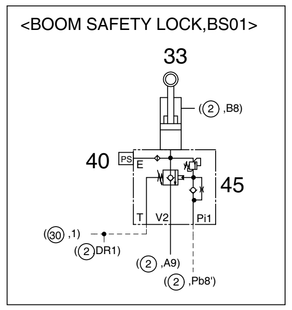


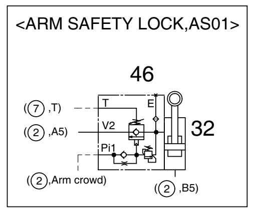








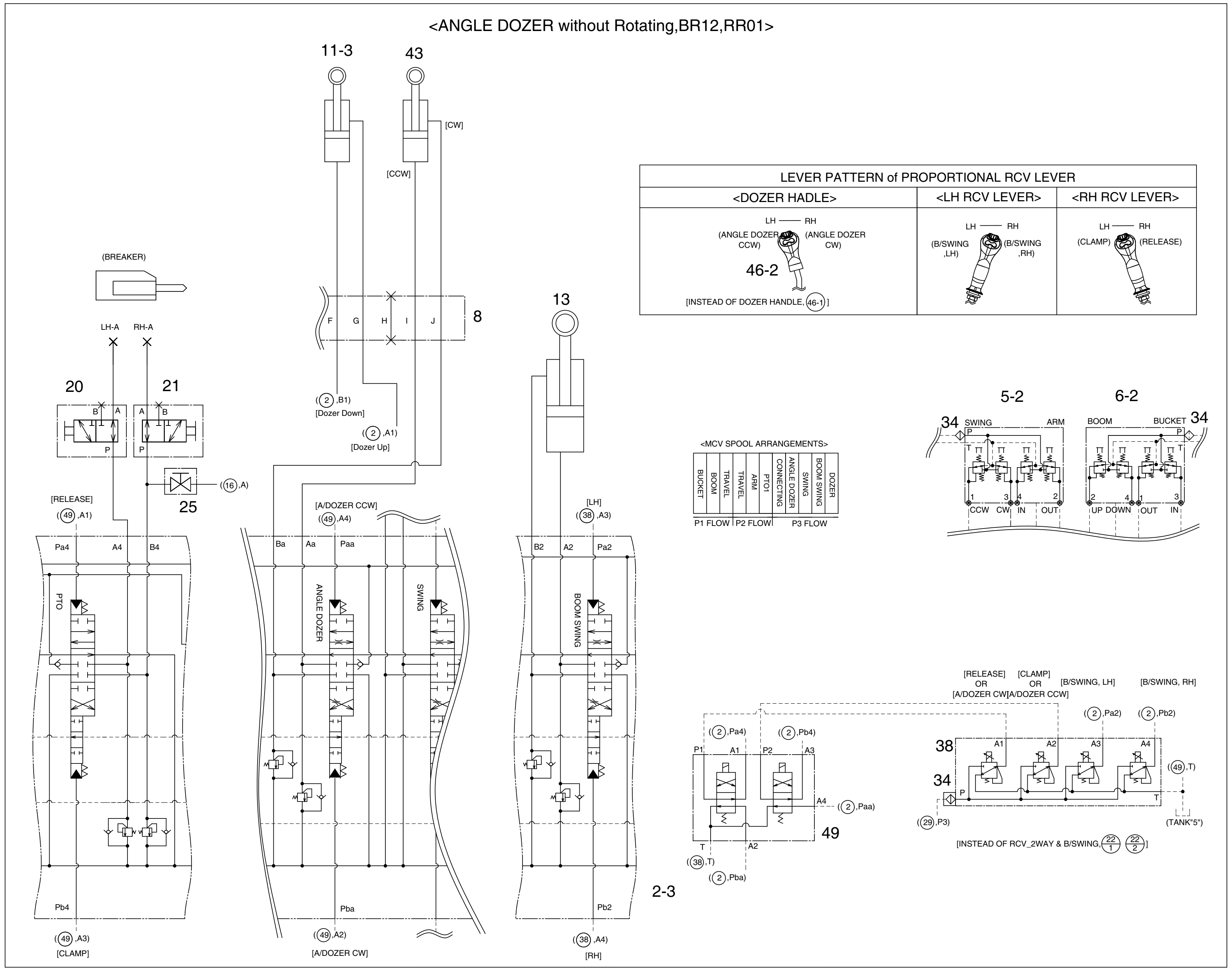




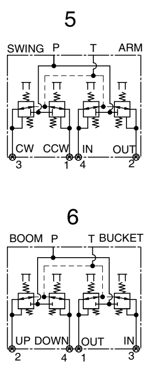
2-2 MCV (2-way+rotating)
5-2 RCV (proportional, LH)
6-2 RCV (proportional, RH)
11-2 Dozer cylinder with DPC
27 Solenoid valve
28 Accumulator
32 Arm cylinder with SLV
33 Boom cylinder with SLV
35 Selector valve
38-1 4-EPPR valve
38-2 4-EPPR valve
39 Male coupling
40 Pressure sensor
42 Solenoid valve
45 Safety lock vavle
46 Safety lock vavle
47 DPC valve
48 Solenoid valve
49-1 Solenoid vlave

30MS-00001-03 2OF3

3. HYDRAULIC CIRCUIT (3/3)



<RCV LEVER (LH/RH)>



PART NO (5 :LH / 6 : RH)				OPTION CODE	REMARKS	
					PRODUCER	MODULATION
5-1	31MS-20010	6-1	31MS-20020	RR00 JA01	EATON	-
5-2	31MS-21110	6-2	31MS-21120	RR01 JA01	EATON	LH,RH
5-3	31K1-22410	6-3	31K1-22420	RR00 JA21	KPM	-
5-4	31K1-22430	6-4	31K1-22440	RR01 JA21	KPM	LH,RH

2-3 MCV (angle dozer)
5-2 RCV (proportional, LH)
6-2 RCV (proportional, RH)
11-3 Dozer cylinder
38-3 4-EPPR valve
43 Angle dozer cylinder
44-2 Dozer handle
49-2 Solenoid valve

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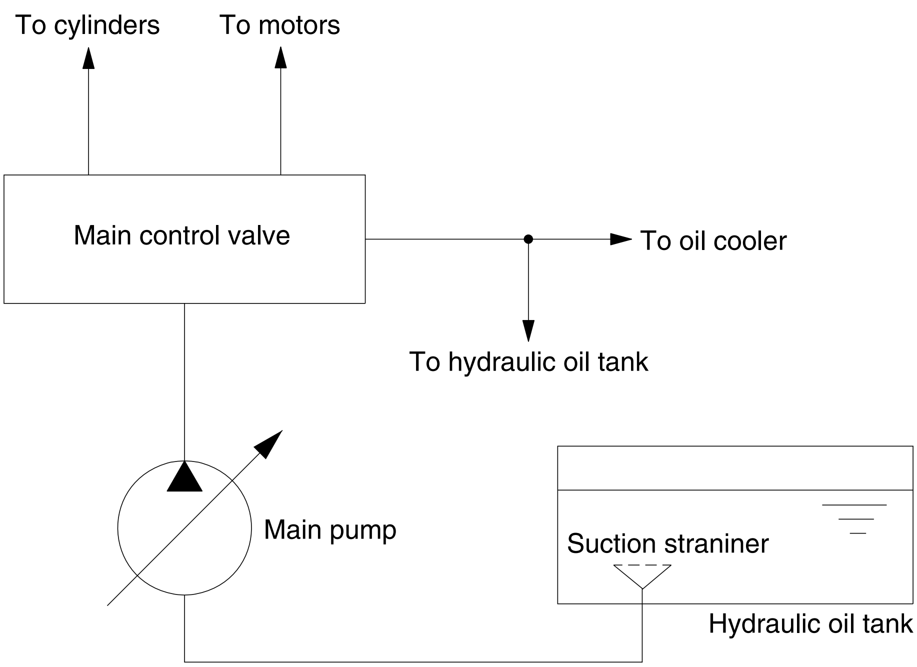
GROUP 2 MAIN CIRCUIT

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

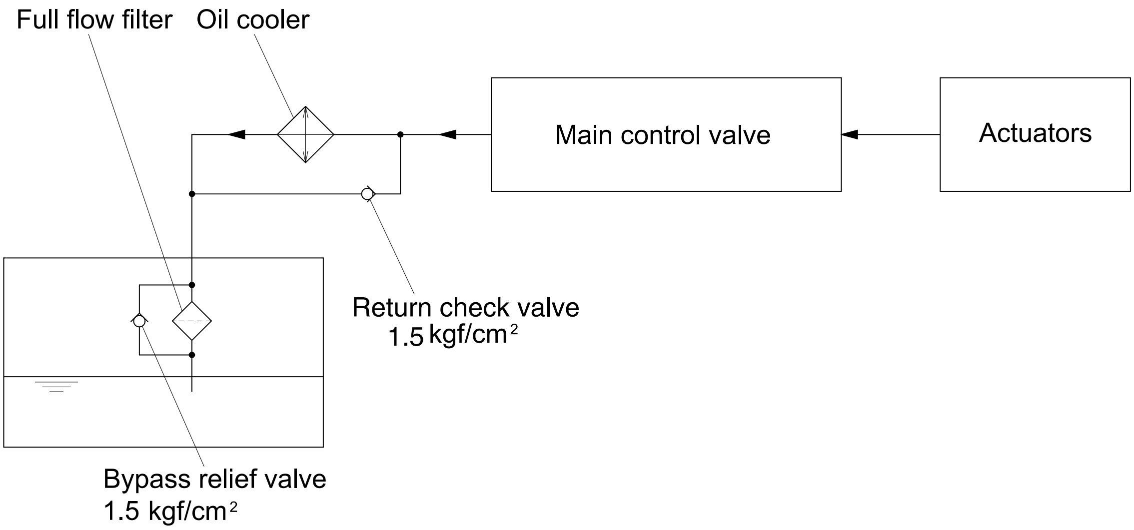


140L3CI01

The pumps receive oil from the hydraulic tank through a suction strainer. The discharged oil from the pump flows into the 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 control main 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.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. RETURN CIRCUIT



35AZ3CI02

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

The return check valve is provided in the return circuit.

The setting pressure of return check valve is 1.5 kgf/cm^2 (21 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 1.5 kgf/cm^2 (21 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 return check valve.

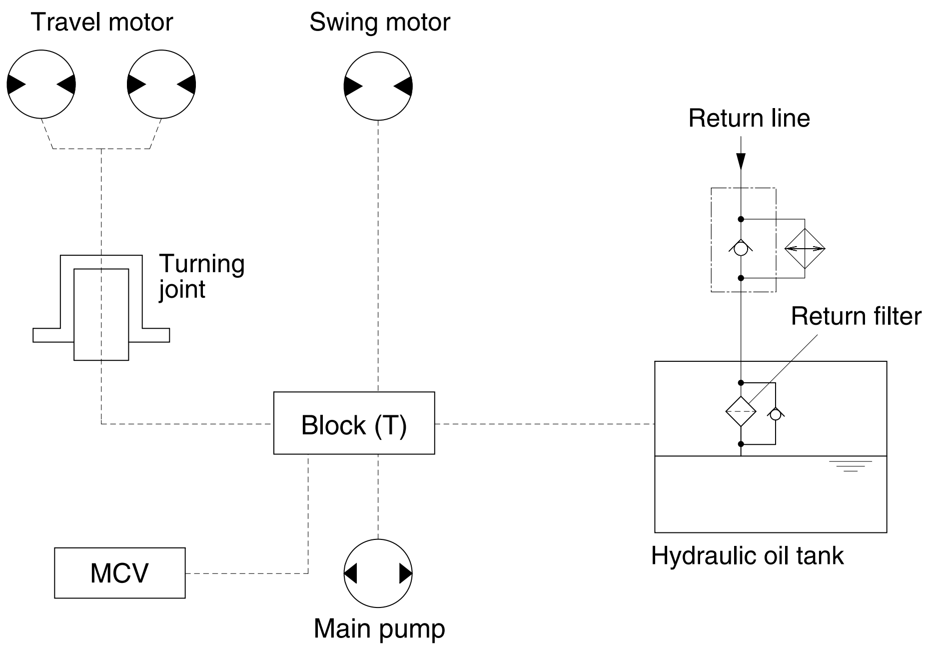
The full-flow filter and bypass relief valve are provided in the hydraulic tank.

The oil returned from the main control valve is 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.

※ The circuit diagram may differ from the equipment, so please check before a repair.

3. DRAIN CIRCUIT



35AZ3CI03

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 tank through the block (T).

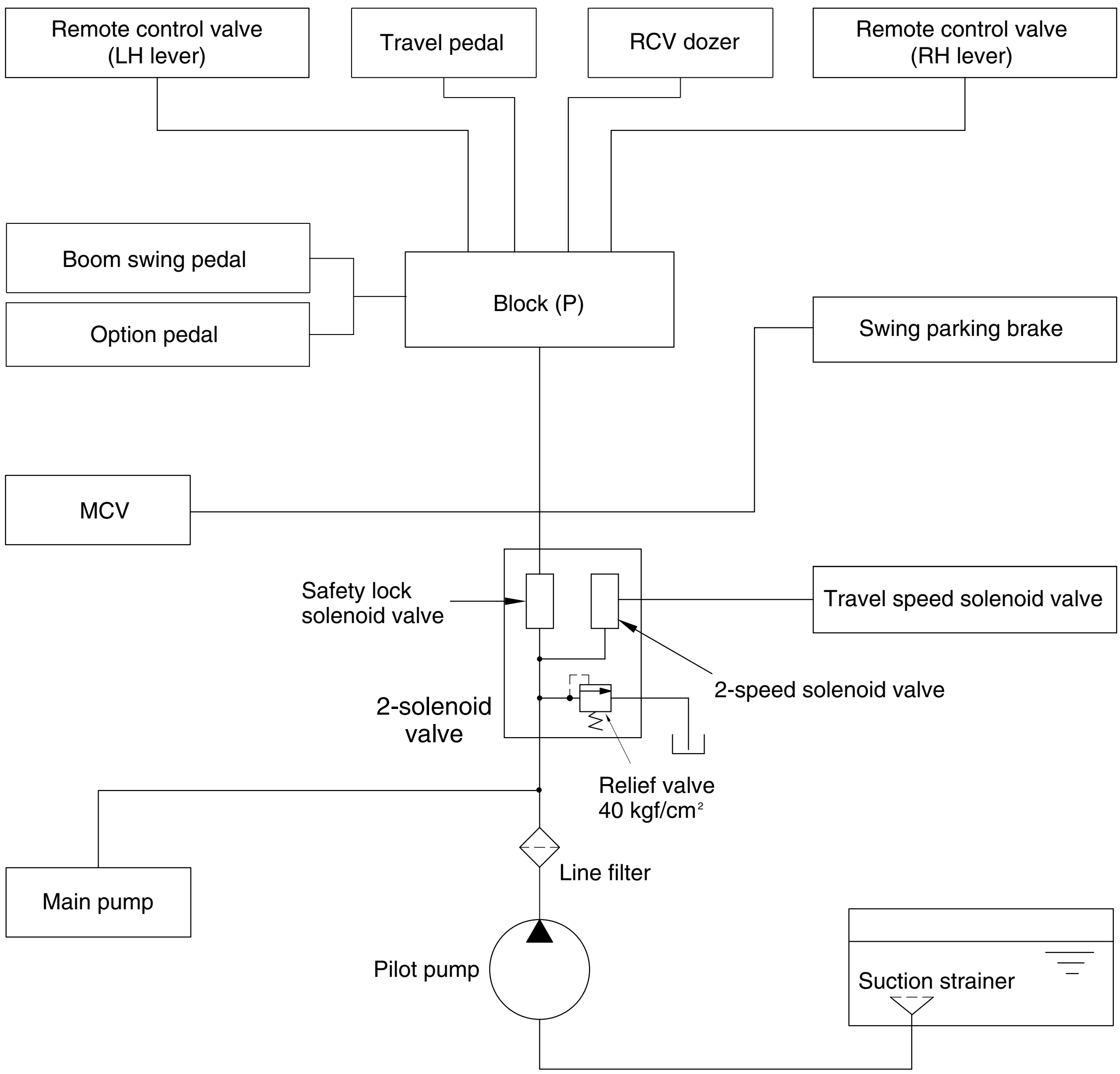
2) SWING MOTOR DRAIN CIRCUIT
   Oil leaked from the swing motor returns to the hydraulic tank passing through the block (T).

3) MAIN CONTROL VALVE
   Oil leaked from the main control valve returns to the hydraulic tank passing through the block (T).

4) MAIN PUMP
   Oil leaked from the main pump returns to the hydraulic tank passing through the block (T).

※ The circuit diagram may differ from the equipment, so please check before a repair.

GROUP 3 PILOT CIRCUIT



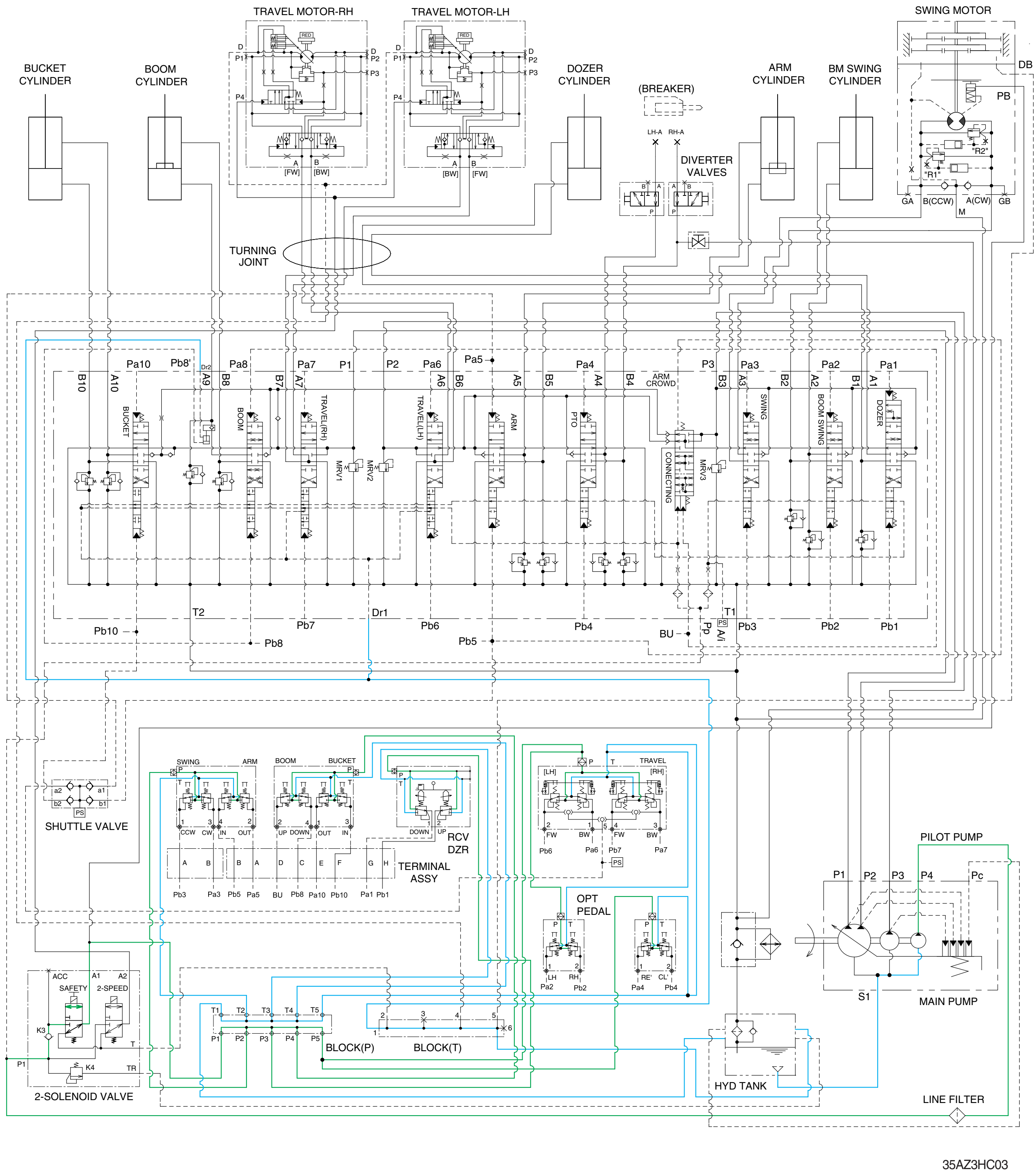
The pilot circuit consists of suction circuit, delivery circuit and return circuit.
The pilot pump receives the oil from the hydraulic tank through the suction strainer.
The discharged oil from the pilot pump flows to the 2-solenoid valve and provides oil to each control valve as below.

- RCV lever (LH & RH), RCV dozer, travel pedal, boom swing pedal and option pedal through the safety lock solenoid valve and block (P).
- Swing parking brake through the safety lock solenoid valve.
- Travel speed solenoid valve through the 2-speed solenoid valve and turning joint.

Also, the oil from the pilot pump flows to the pilot pressure port of the main control valve and functions as auto idle signal pressure.

※ The circuit diagram may differ from the equipment, so please check before a repair.

1. SUCTION, DELIVERY AND RETURN CIRCUIT



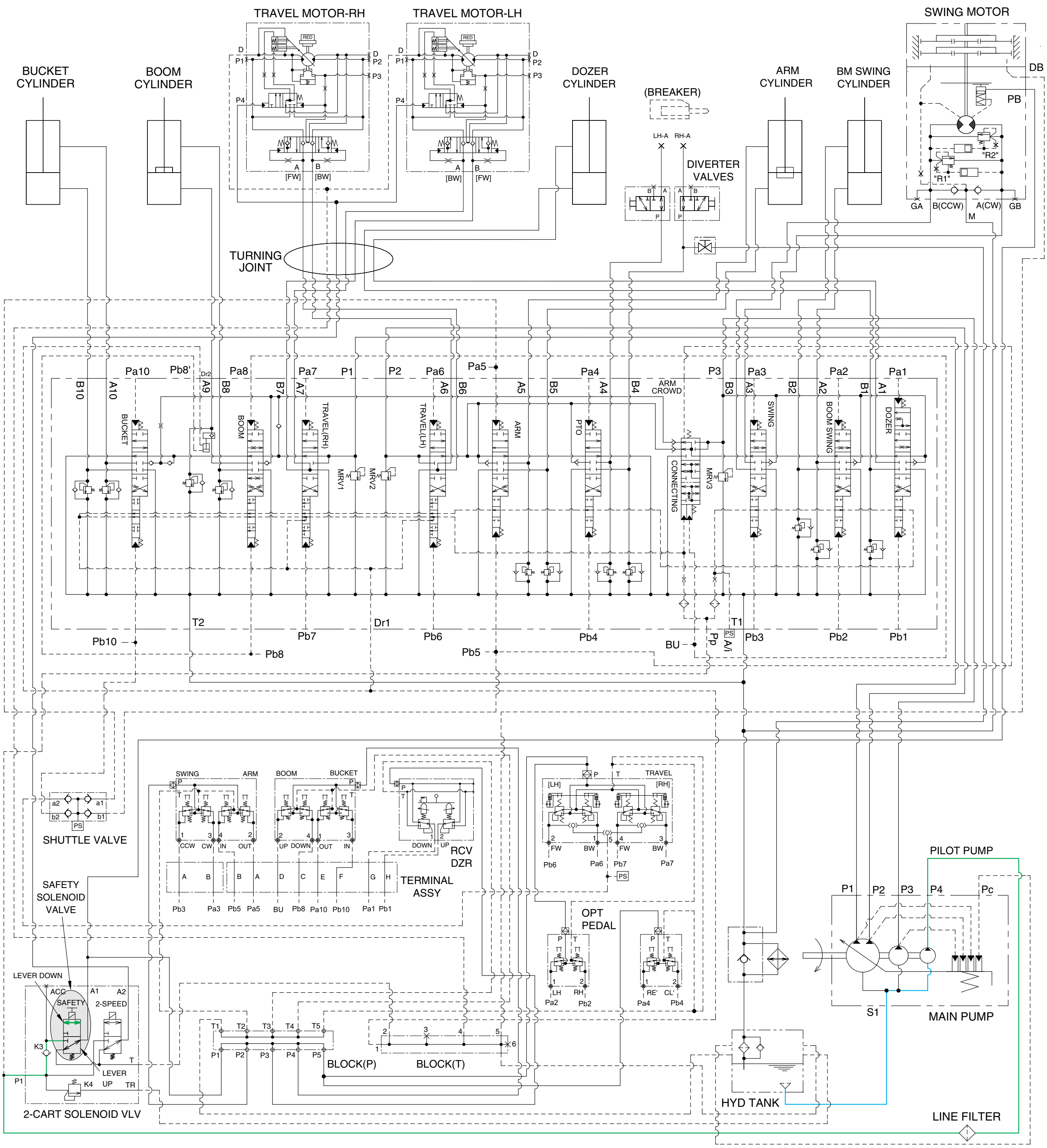
The pilot pump receive oil from the hydraulic tank. The discharged oil from the pilot pump flows to the safety solenoid valve through the line filter. The oil is filtered by the line filter. The pilot relief valve is provided in the 2-solenoid valve for limiting the pilot circuit pressure.

The oil filtered by line filter flows remote control valve, MCV and swing port through safety solenoid valve.

The return oil flow from remote control valve is returned to the hydraulic tank.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. SAFETY VALVE (SAFETY LEVER)



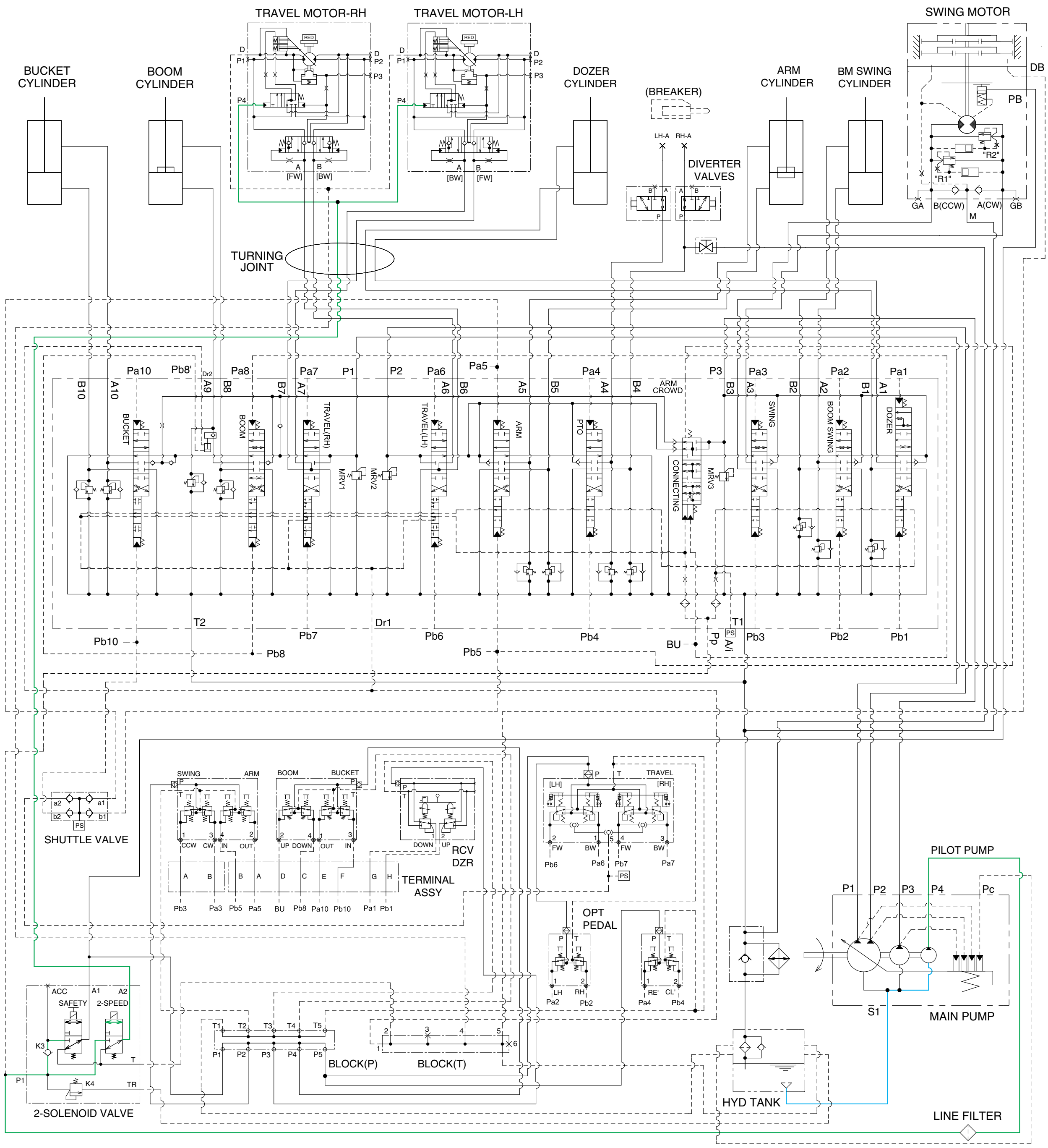
35AZ3HC04

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

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.

※ The circuit diagram may differ from the equipment, so please check before a repair.

3. TRAVEL SPEED CONTROL SYSTEM



35AZ3HC05

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 **P4** port of pilot valve in the travel motors.

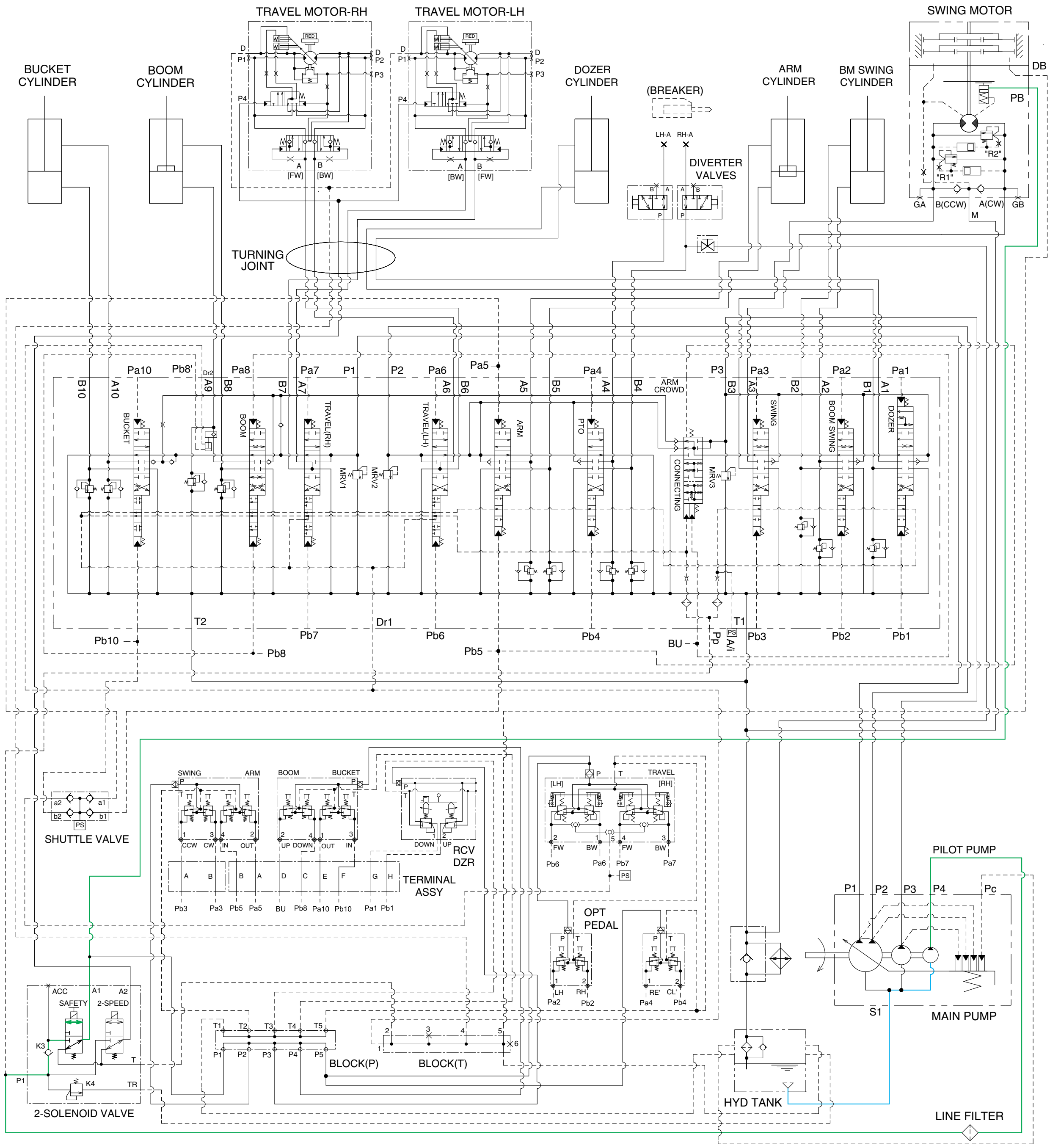
As a result, the control piston is pushed by the main oil flow, thus the displacement is minimized.

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 **P4** port returns to the hydraulic tank.

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

※ The circuit diagram may differ from the equipment, so please check before a repair.

4. SWING PARKING BRAKE RELEASE



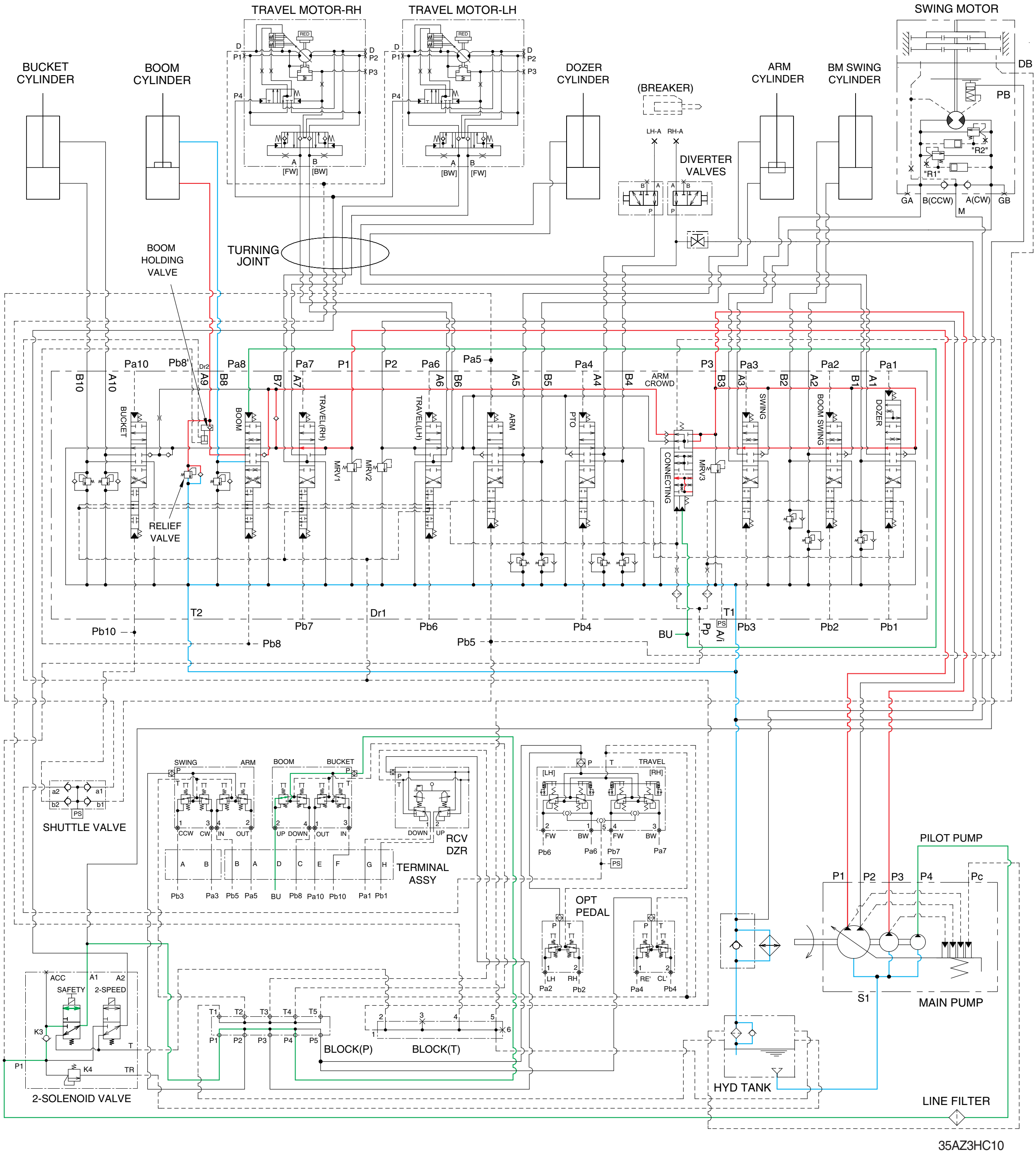
35AZ3HC06

When the safety solenoid lever is moved downward, the pilot oil flow into PB port of the swing motor through solenoid valve. This pressure is applied to swing motor disc, thus the brake is released.

When the safety solenoid lever is moved to upward, oil in the swing motor disc cylinder is drained, thus the brake is applied.

※ The circuit diagram may differ from the equipment, so please check before a repair.

1. BOOM UP OPERATION

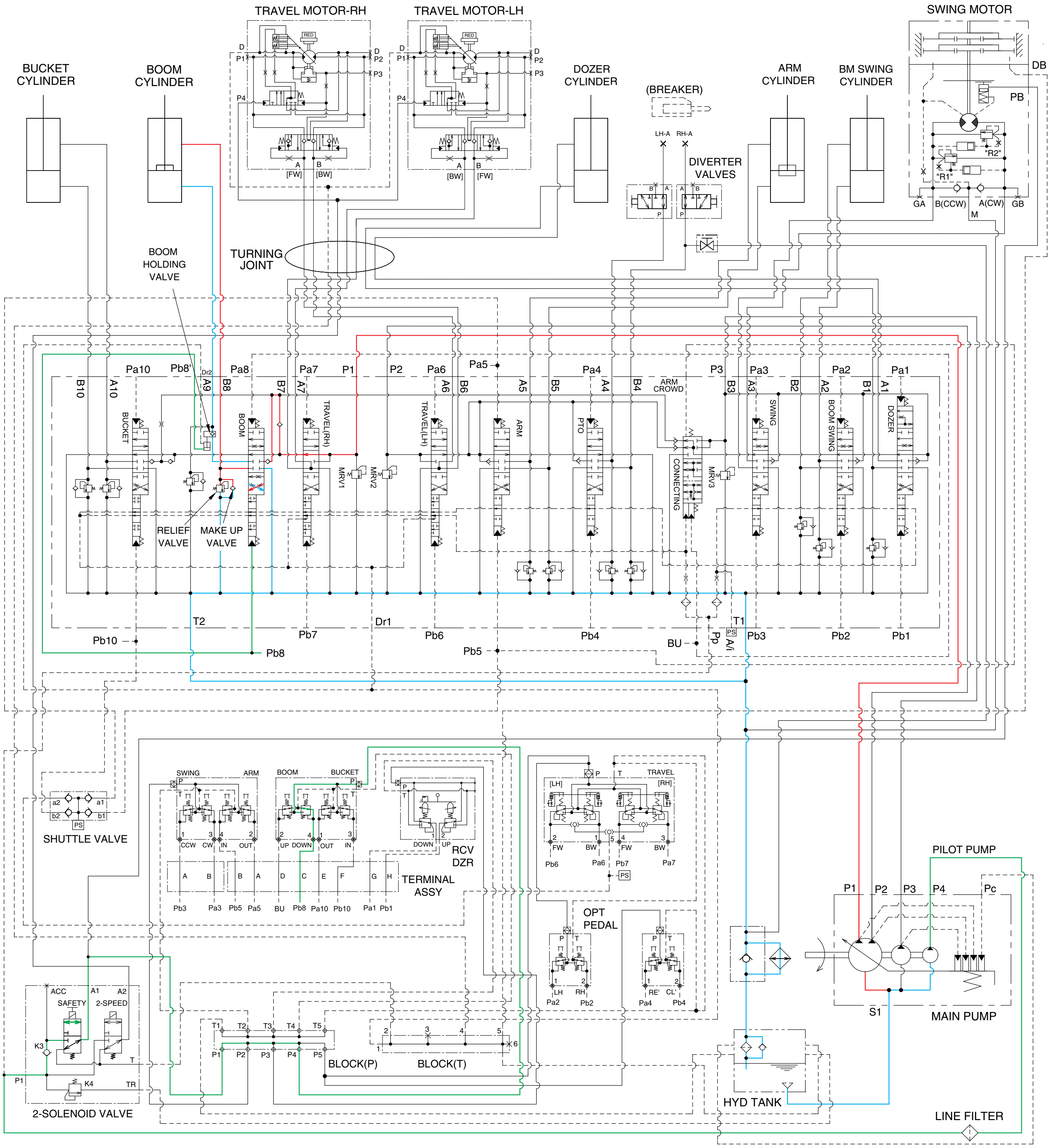


When the right control lever is pulled back, the boom spools in the main control valve are moved to the up position by the pilot oil pressure (PU, Pa8) from the remote control valve.

The oil from the P1 and P3 pump flows into the main control valve and then goes to the large chamber of boom cylinders. At the same time, the oil from the small chamber of boom cylinders 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.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. BOOM DOWN OPERATION



35AZ3HC11

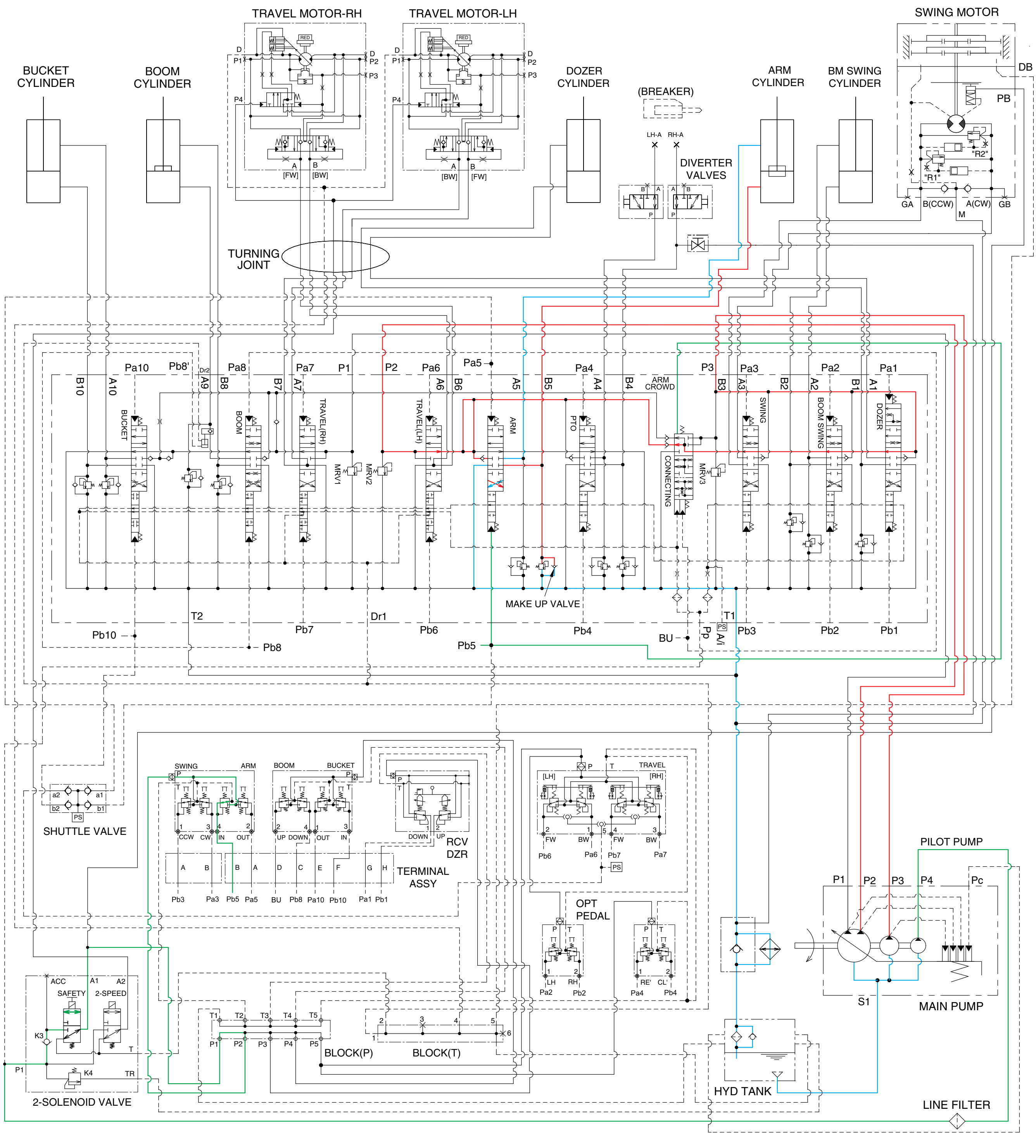
When the right control lever is pushed forward, the boom spools in the main control valve are moved to the down position by the pilot oil pressure (Pb8) from the remote control valve. Since **Pb8** port is connected **Pb8'** port through the piping, boom holding valve is also released.

The oil from the P1 pump flows into the main control valve and then goes to the small chamber of boom cylinders. At the same time, the oil from the large chamber of boom cylinders 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.

※ The circuit diagram may differ from the equipment, so please check before a repair.

3. ARM ROLL IN OPERATION



35AZ3HC12

When the left control lever is pulled back, the arm spools in the main control valve are moved the to roll in position by the pilot oil pressure (Pb5) from the remote control valve.

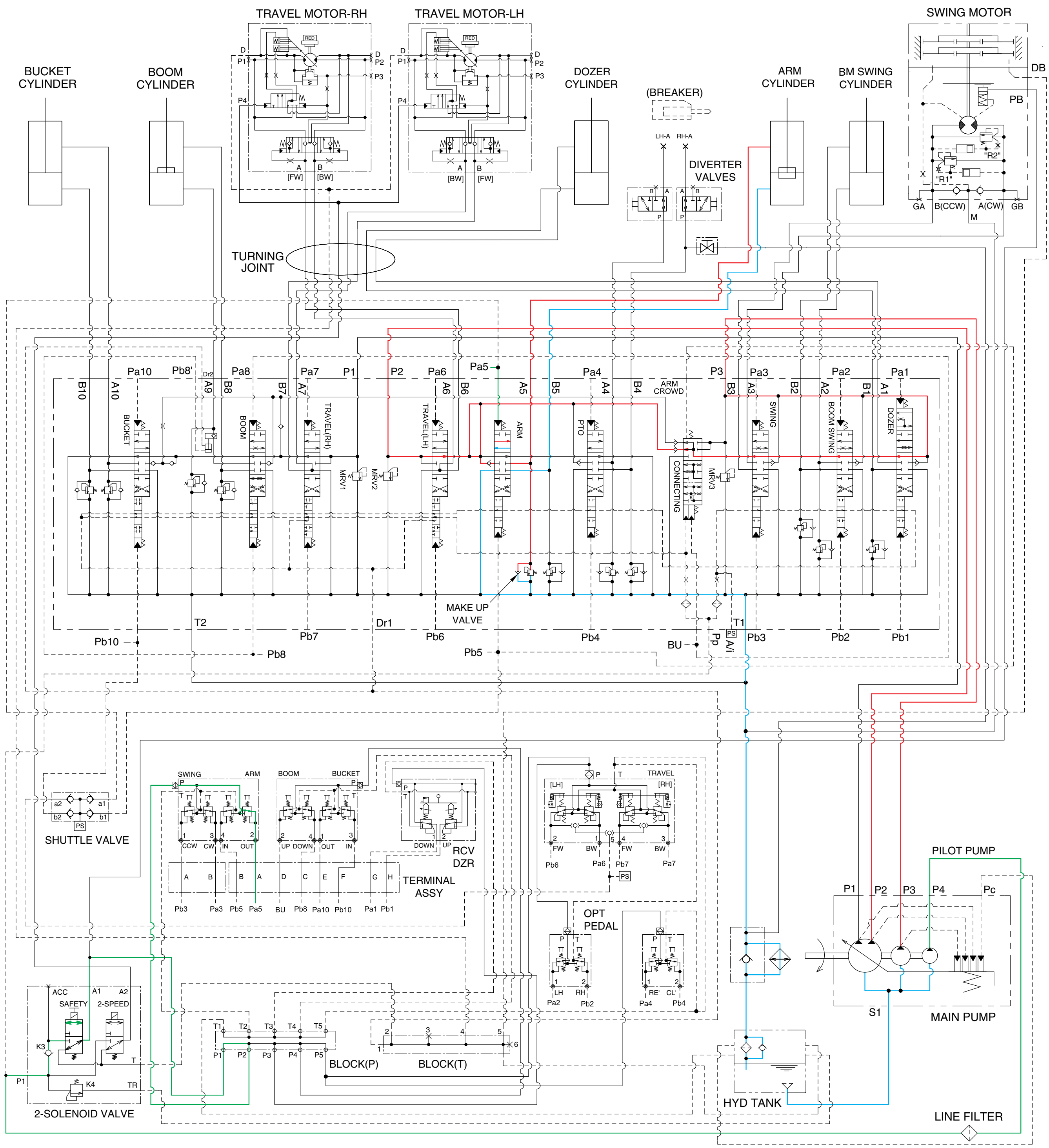
The oil from the P2 and P3 pump flows into the main control valve and then goes to the large chamber of arm cylinder.

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.

※ The circuit diagram may differ from the equipment, so please check before a repair.

4. ARM ROLL OUT OPERATION



35AZ3HC13

When the left control lever is pushed forward, the arm spool in the main control valve are moved to the roll out position by the pilot oil pressure (Pa5) from the remote control valve.

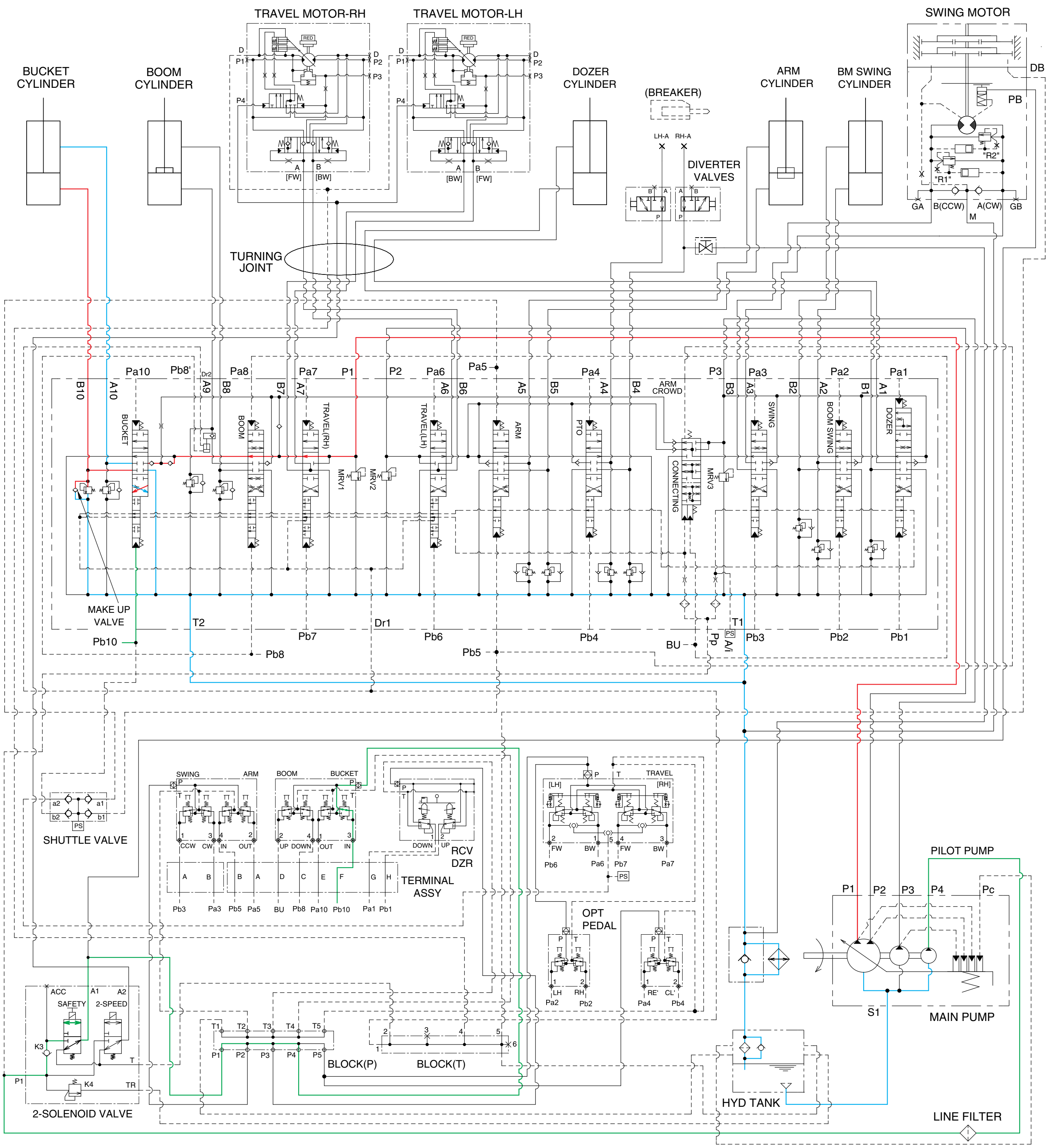
The oil from the P2 and P3 pump flows into the main control valve and then goes to the small chamber of arm cylinder.

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.

※ The circuit diagram may differ from the equipment, so please check before a repair.

5. BUCKET ROLL IN OPERATION



35AZ3HC14

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 (Pb10) from the remote control valve.

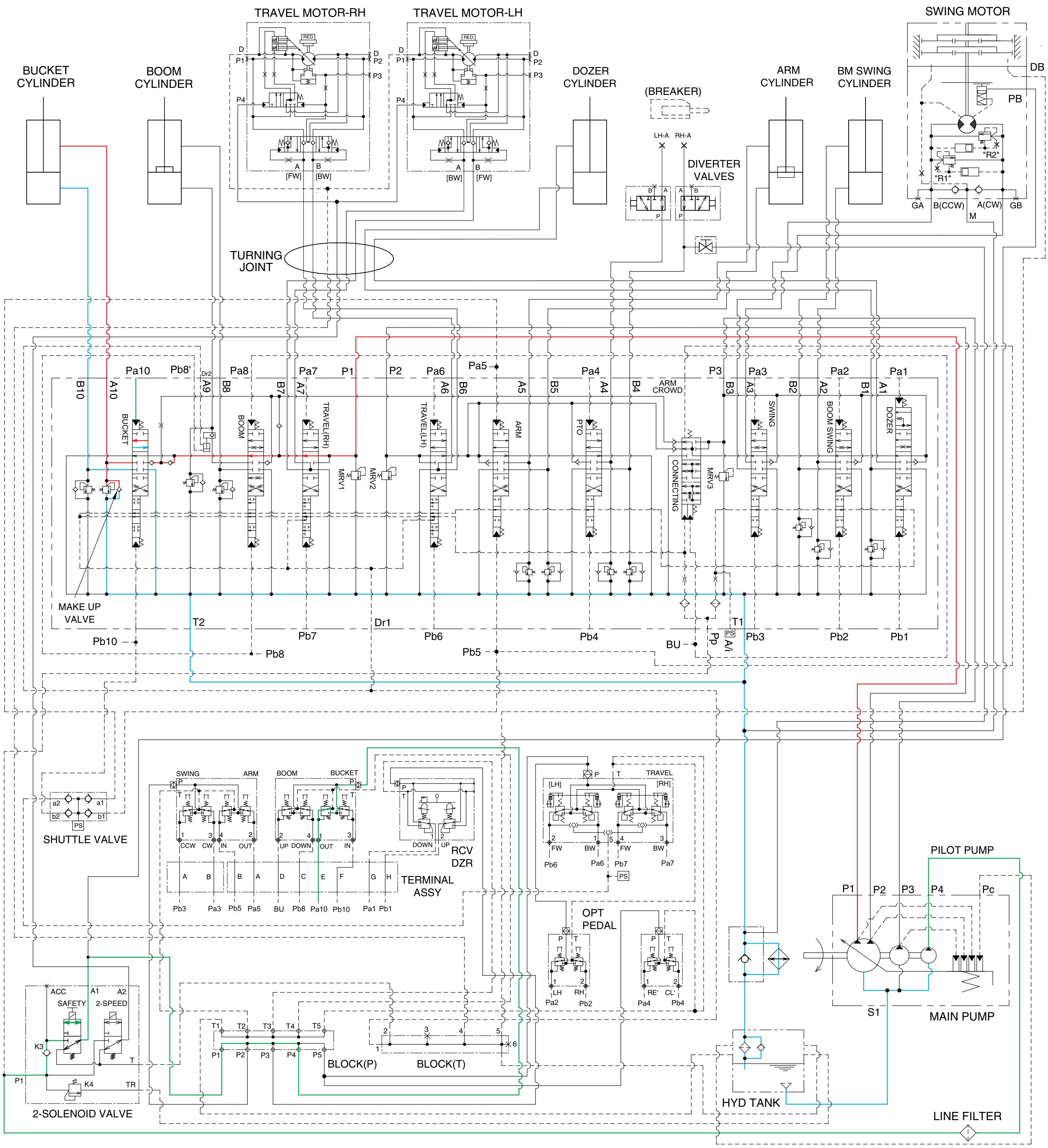
The oil from the P1 pump flows into the main control valve and then goes to the large chamber of bucket cylinder.

At the same time, the oil from the small chamber of bucket cylinder returns to the hydraulic oil tank through the boom 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.

※ The circuit diagram may differ from the equipment, so please check before a repair.

6. BUCKET ROLL OUT OPERATION



35AZ3HC15

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 (Pa10) from the remote control valve.

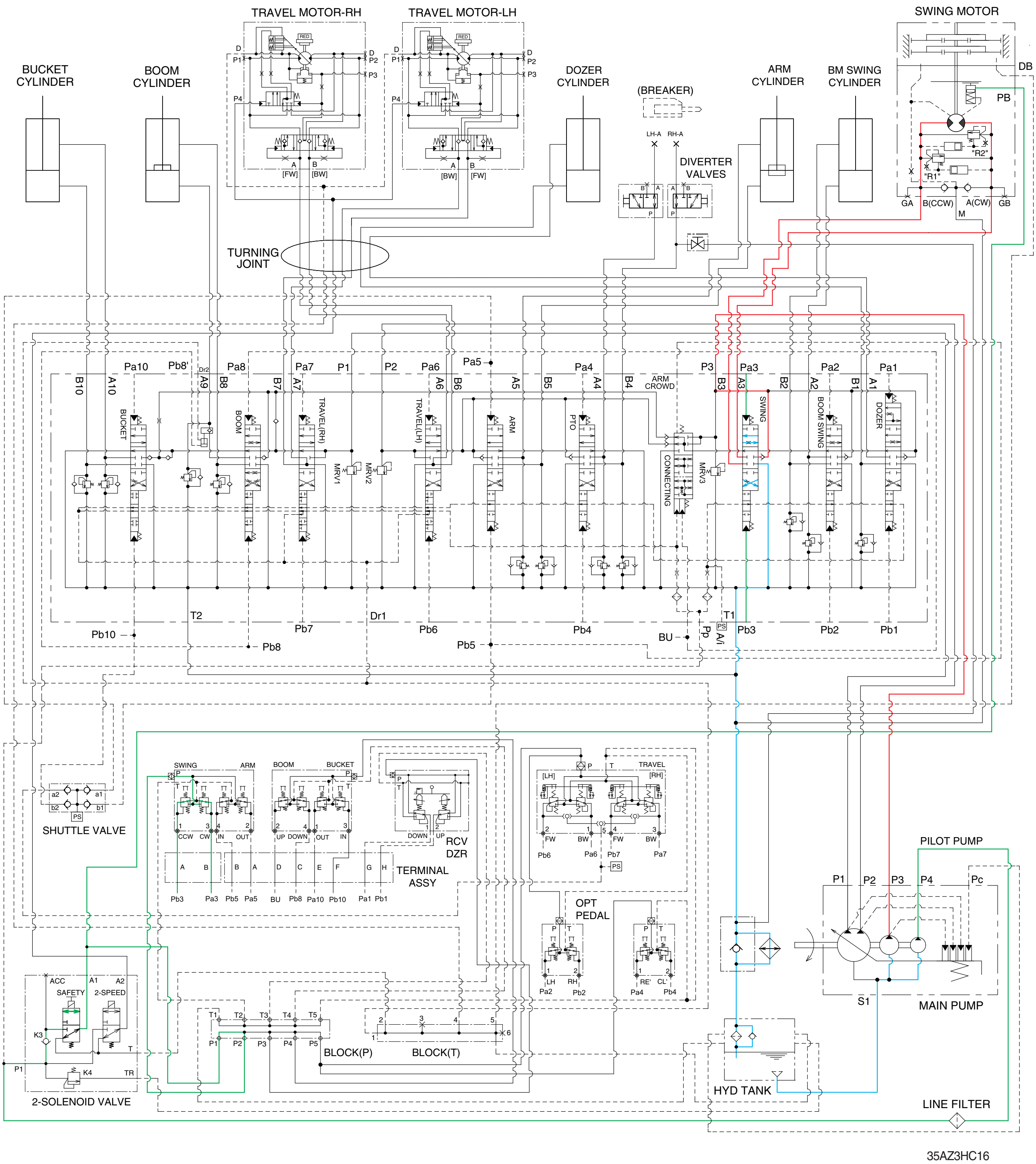
The oil from the P1 pump flows into the main control valve and then goes to the small chamber of bucket cylinder.

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.

※ The circuit diagram may differ from the equipment, so please check before a repair.

7. SWING OPERATION



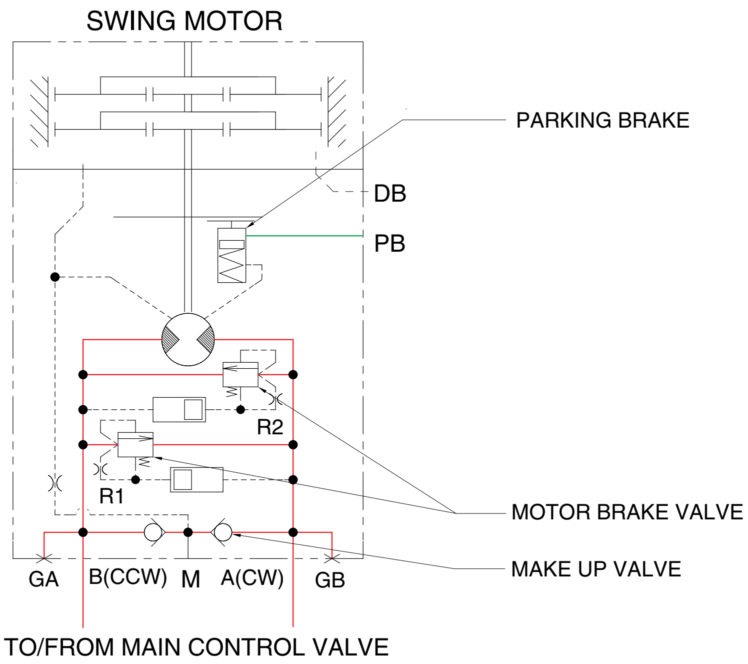
When the left control lever is pushed left or right, the swing spool in the main control valve is moved to the left or right swing position by the pilot oil pressure (Pa3, Pb3) from the remote control valve.

The oil from the P3 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 motor. The cavitation which will happen to the swing motor is also prevented by the make up valve in the swing motor itself.

※ The circuit diagram may differ from the equipment, so please check before a repair.

SWING CIRCUIT OPERATION



35AZ3HC17

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

PARKING BRAKE "ON" OPERATION

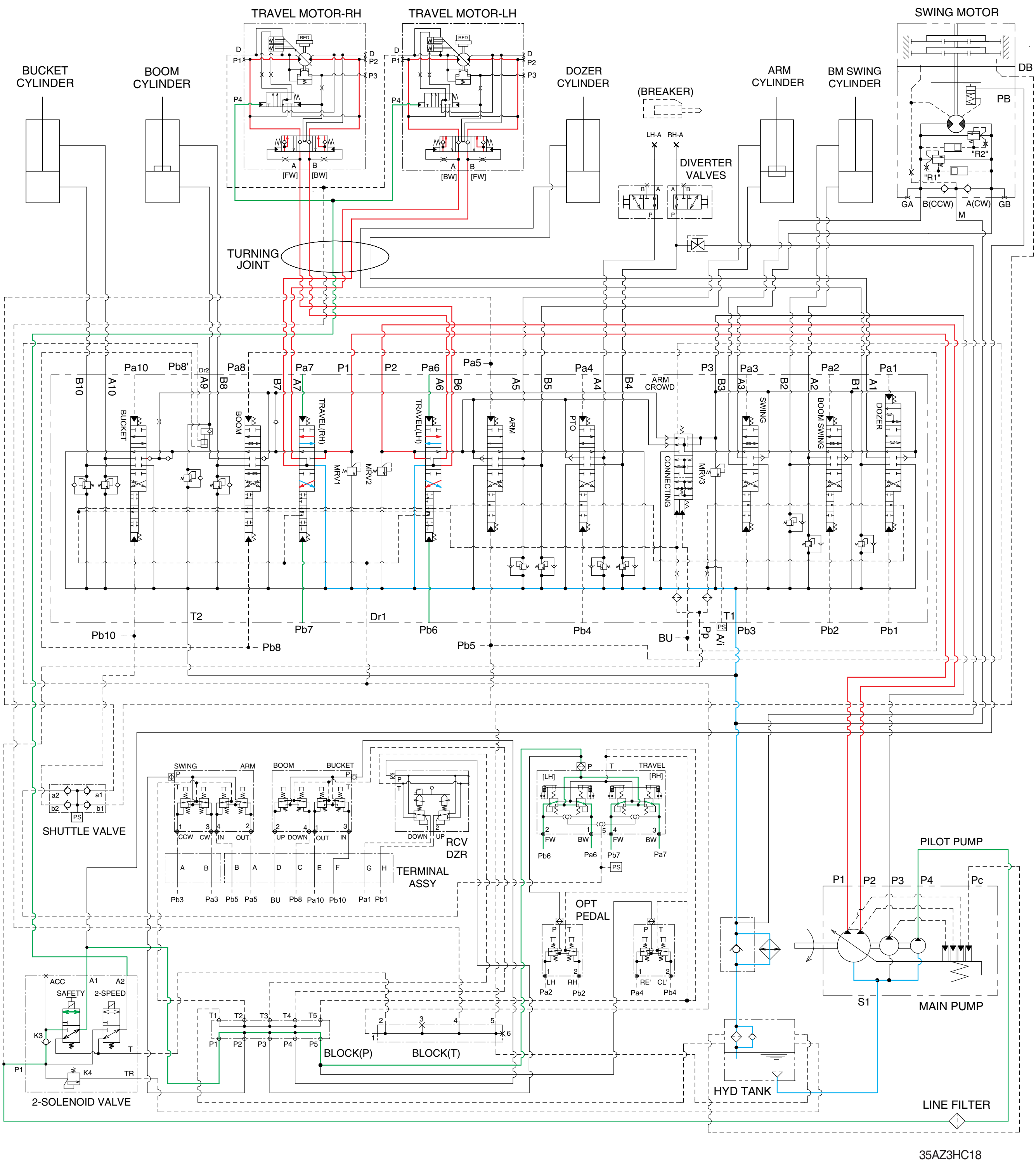
When the safety solenoid lever is moved to upward, the oil in the parking brake is drained to the tank. So, parking brake is applied.

PARKING BRAKE "OFF" OPERATION

The parking brake is released by the pilot pressure oil from pilot pump.
When the safety solenoid lever is moved to downward, the pilot pressure from the P4 pilot pump is flow into parking brake through safety solenoid valve.
Then the pilot pressure lift the brake piston and release the parking brake.

※ The circuit diagram may differ from the equipment, so please check before a repair.

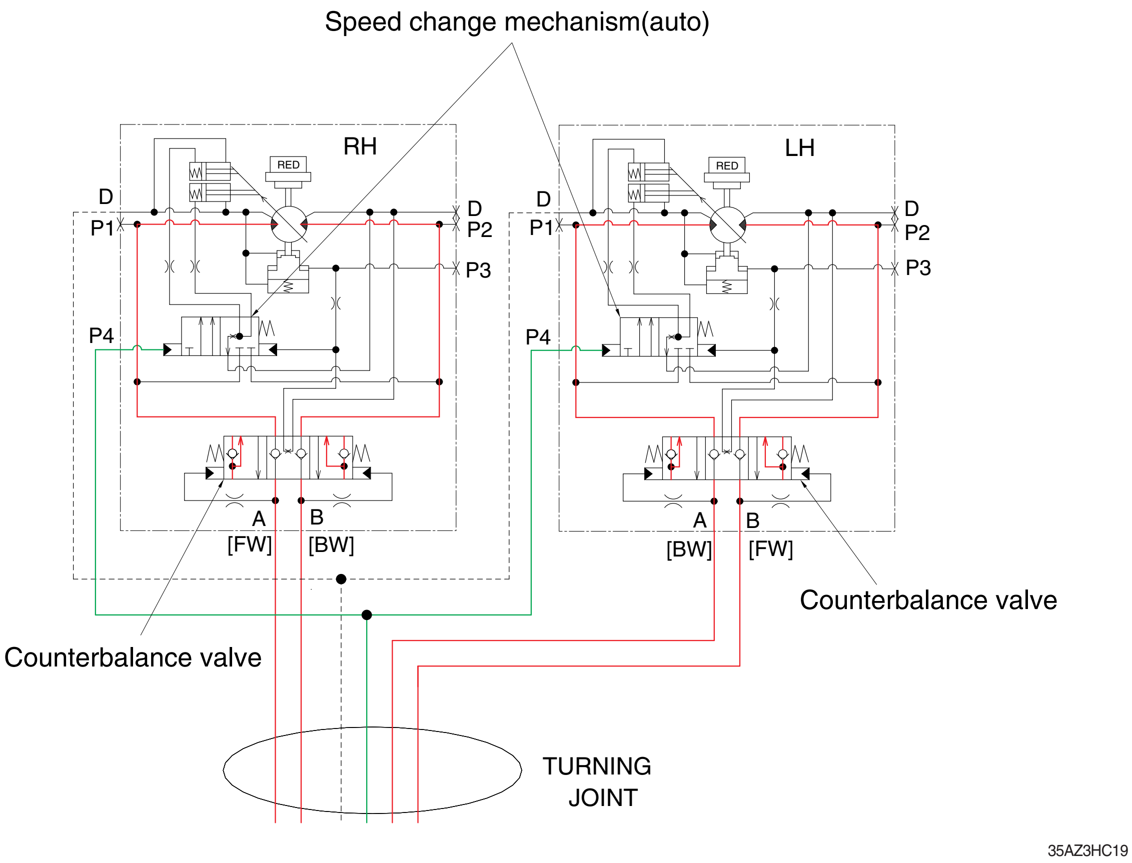
8. TRAVEL FORWARD AND REVERSE OPERATION



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 pilot pressure oil (Pb6, Pb7, Pa6, Pa7) from the travel pedal. The oil from the both pumps 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.

※ The circuit diagram may differ from the equipment, so please check before a repair.

TRAVEL CIRCUIT OPERATION



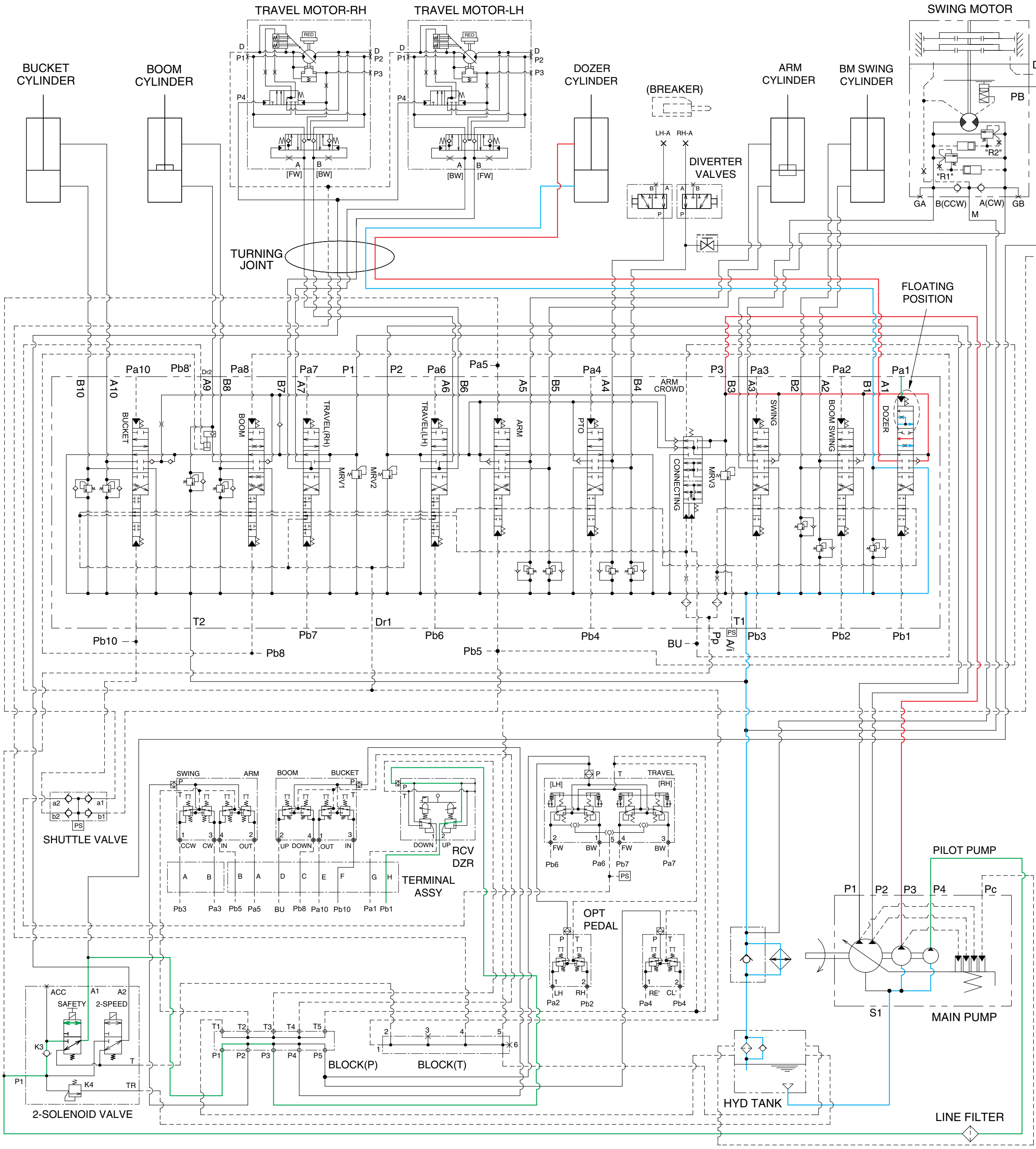
Valves are provided on travel motors to offer the following functions.

1) COUNTERBALANCE VALVE
   When stopping the motor of slope descending, this valve to prevent the motor over run.

2) SPEED CHANGE MECHANISM (auto)
   Auto two speed control mechanism consists of two spools and spring. This valve automatically changes motor displacement in portion to motor pressure

※ The circuit diagram may differ from the equipment, so please check before a repair.

9. DOZER UP OPERATION



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 (Pa1) from the remote control valve.

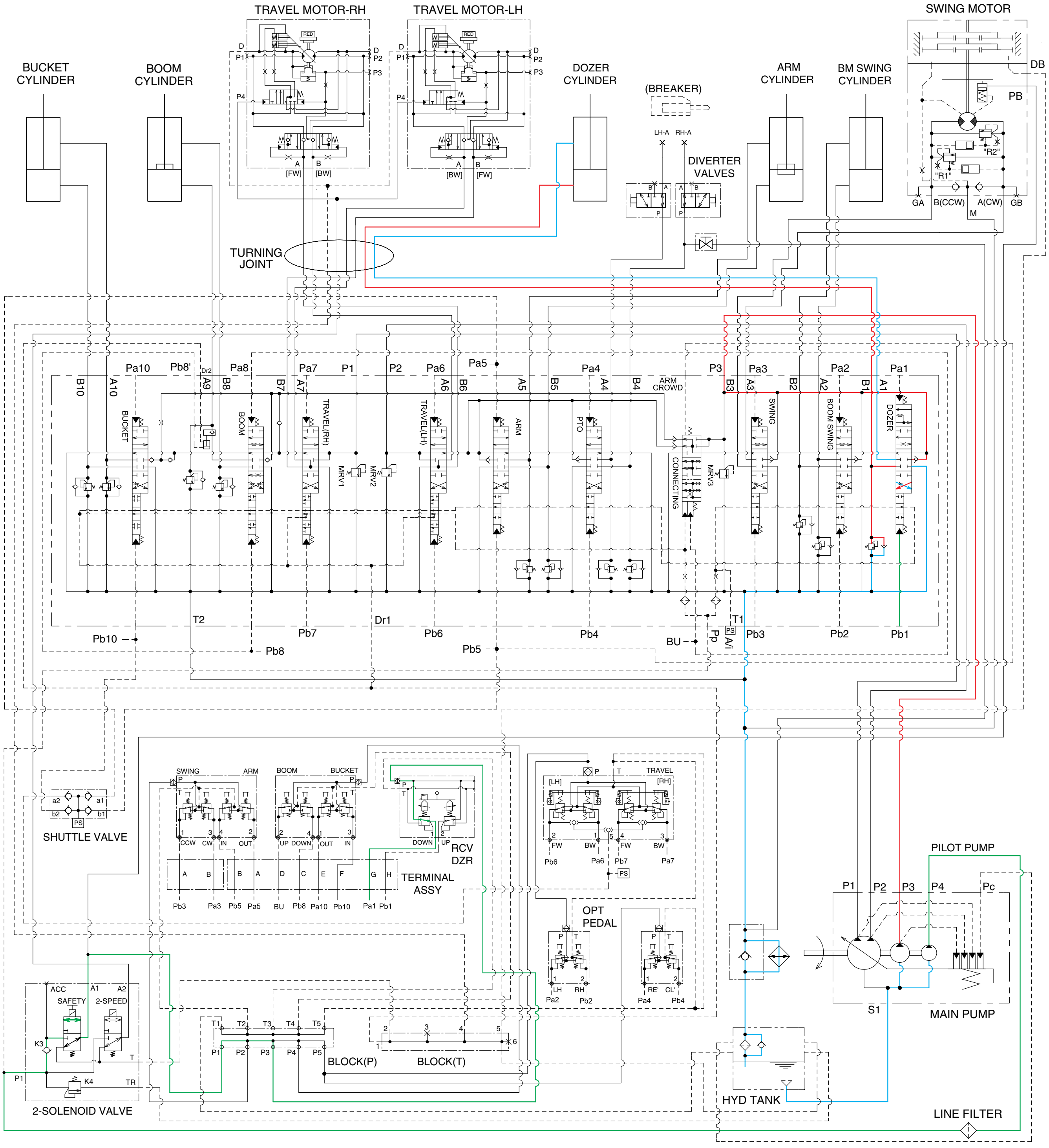
The oil from the P3 pump flows into the main control valve and then goes to the small chamber of dozer cylinder.

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

Press the dozer floating button and push the dozer 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.

※ The circuit diagram may differ from the equipment, so please check before a repair.

10. DOZER DOWN OPERATION



35AZ3HC21

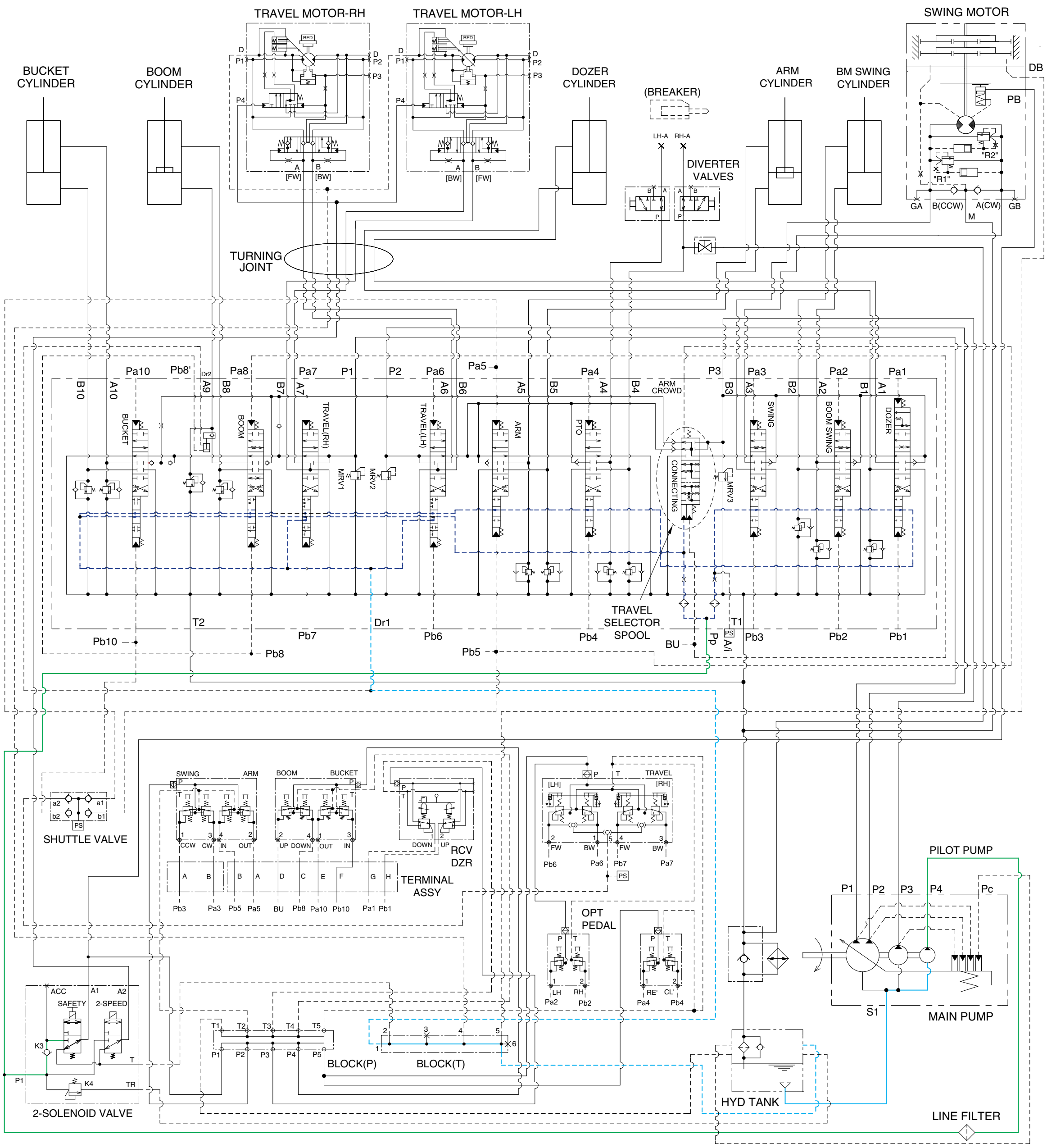
When the dozer control lever is pushed forward, the dozer spool in the main control valve is moved to the dozer down position by the pilot oil pressure (Pb1) from the remote control valve.

The oil from the P3 pump flows into the main control valve and then goes to the large chamber of dozer cylinder.

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

※ The circuit diagram may differ from the equipment, so please check before a repair.

1. OUTLINE



35AZ3HC30

The oil from the P1, P2, P3 pump flows through the neutral oil passage, bypass oil passage and confluence 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.

INDEPENDENT TRAVEL SYSTEM

This independent travel system for straight travel is provided in the main control valve.

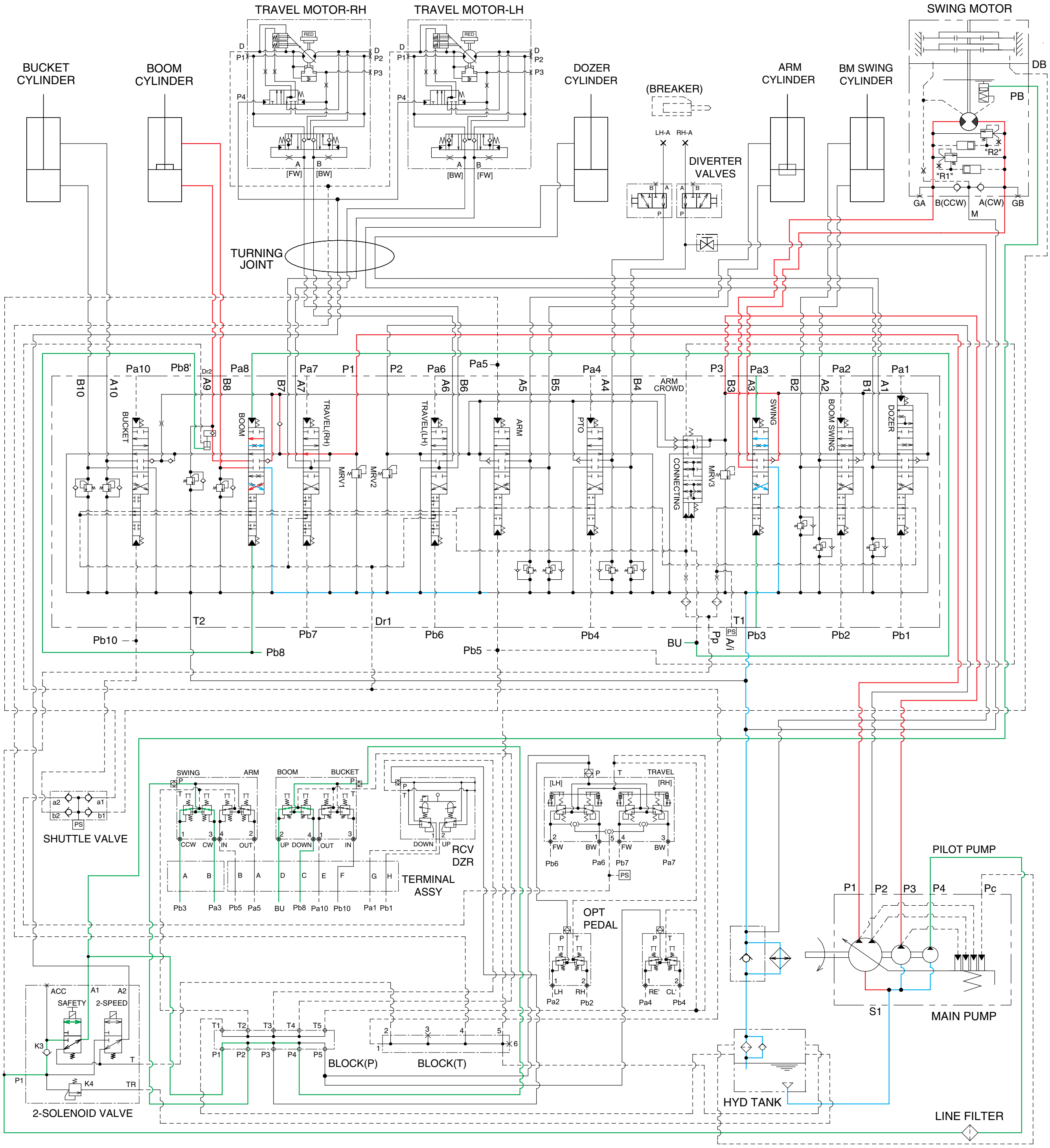
If any actuator(s) on P1 and P2 pump side is operated when traveling, the travel selector spool is moved to the selected side by the pilot oil pressure.

Consequently, the pressure oil from P1 and P2 pump are supplied to the right and left travel motor and oil from P3 pump flows into the other operated actuator.

This keeps the straight travel.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. COMBINED SWING AND BOOM OPERATION



35AZ3HC31

When the swing and boom functions are operated, simultaneously the swing spool and boom spools in the main control valve are moved to the functional position by the pilot oil pressure (Pa3, Pb3, BU, Pb8) from the remote control valve.

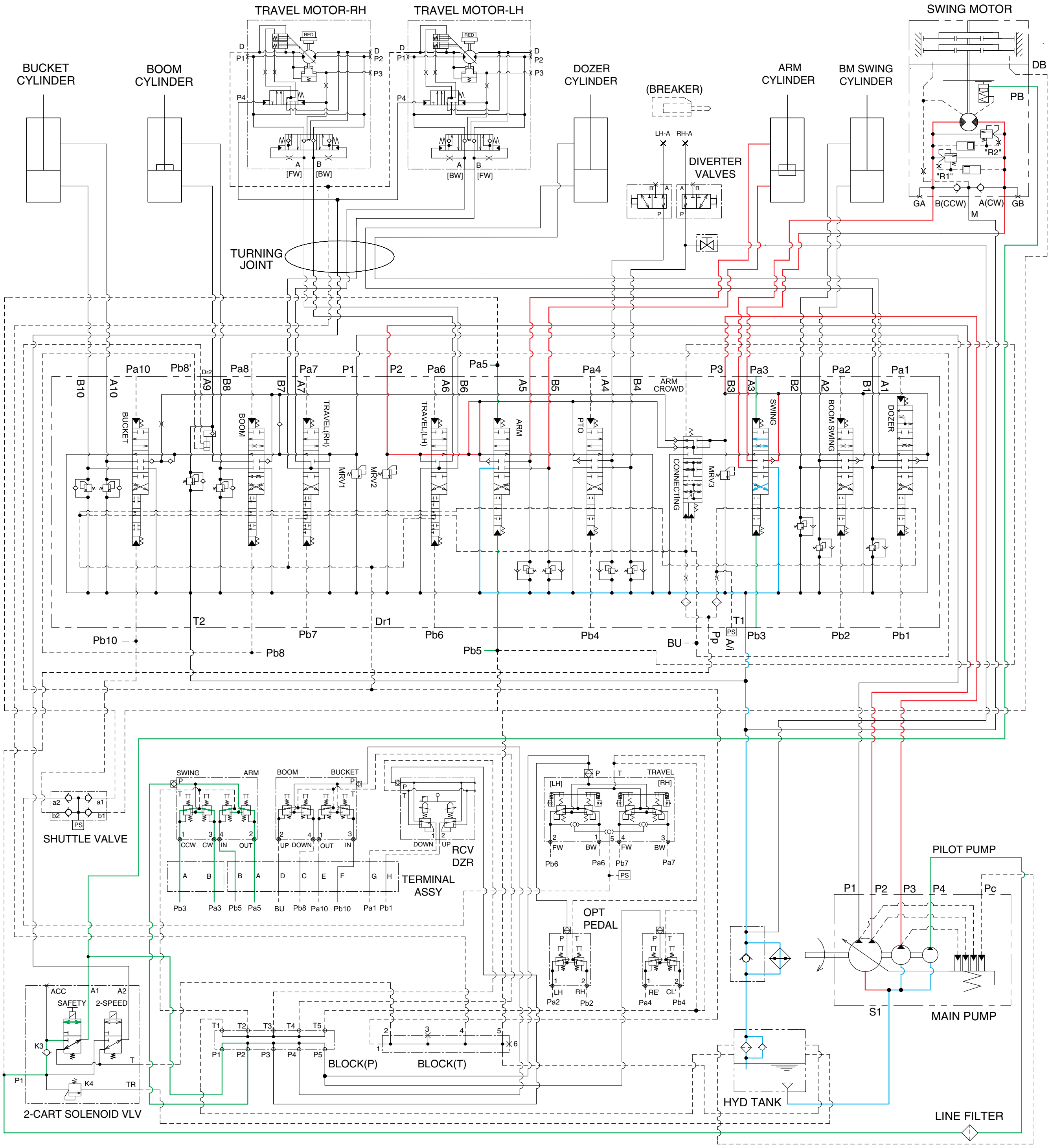
The oil from the P1 pump flows into the boom cylinder through boom.

The oil from the P3 pump flows into the swing motor through the swing spool.

The superstructure swings and the boom is operated.

※ The circuit diagram may differ from the equipment, so please check before a repair.

3. COMBINED SWING AND ARM OPERATION



35AZ3HC32

When the swing and arm functions are operated, simultaneously the swing spool and arm spools in the main control valve are moved to the functional position by the pilot oil pressure (Pa3, Pb3, Pb5, Pa5) from the remote control valve.

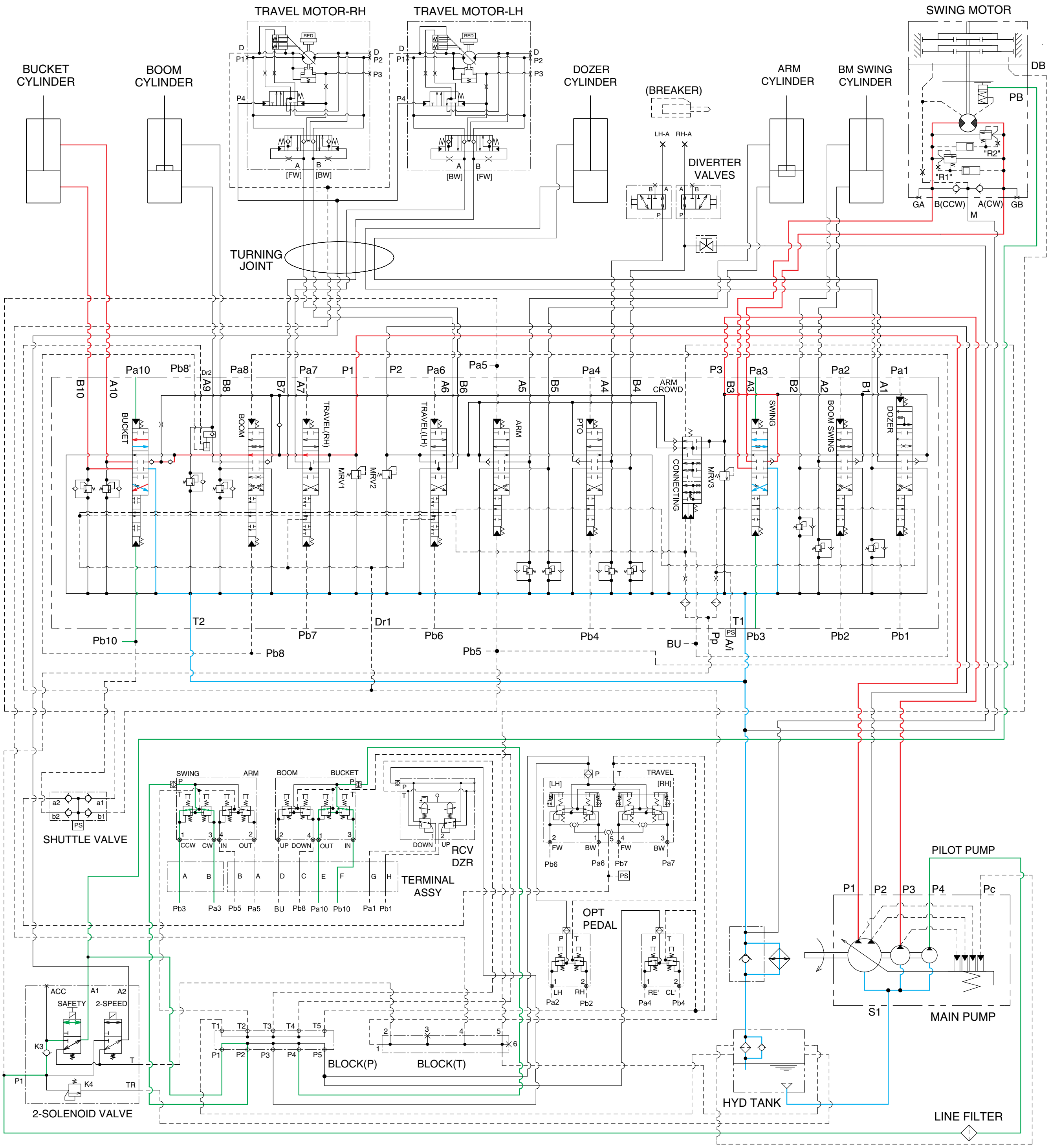
The oil from the P3 pump flows into the swing motor through swing spool.

The oil from the P2 pump flows into the arm cylinder through the arm.

The superstructure swings and the arm is operated.

※ The circuit diagram may differ from the equipment, so please check before a repair.

4. COMBINED SWING AND BUCKET OPERATION



35AZ3HC33

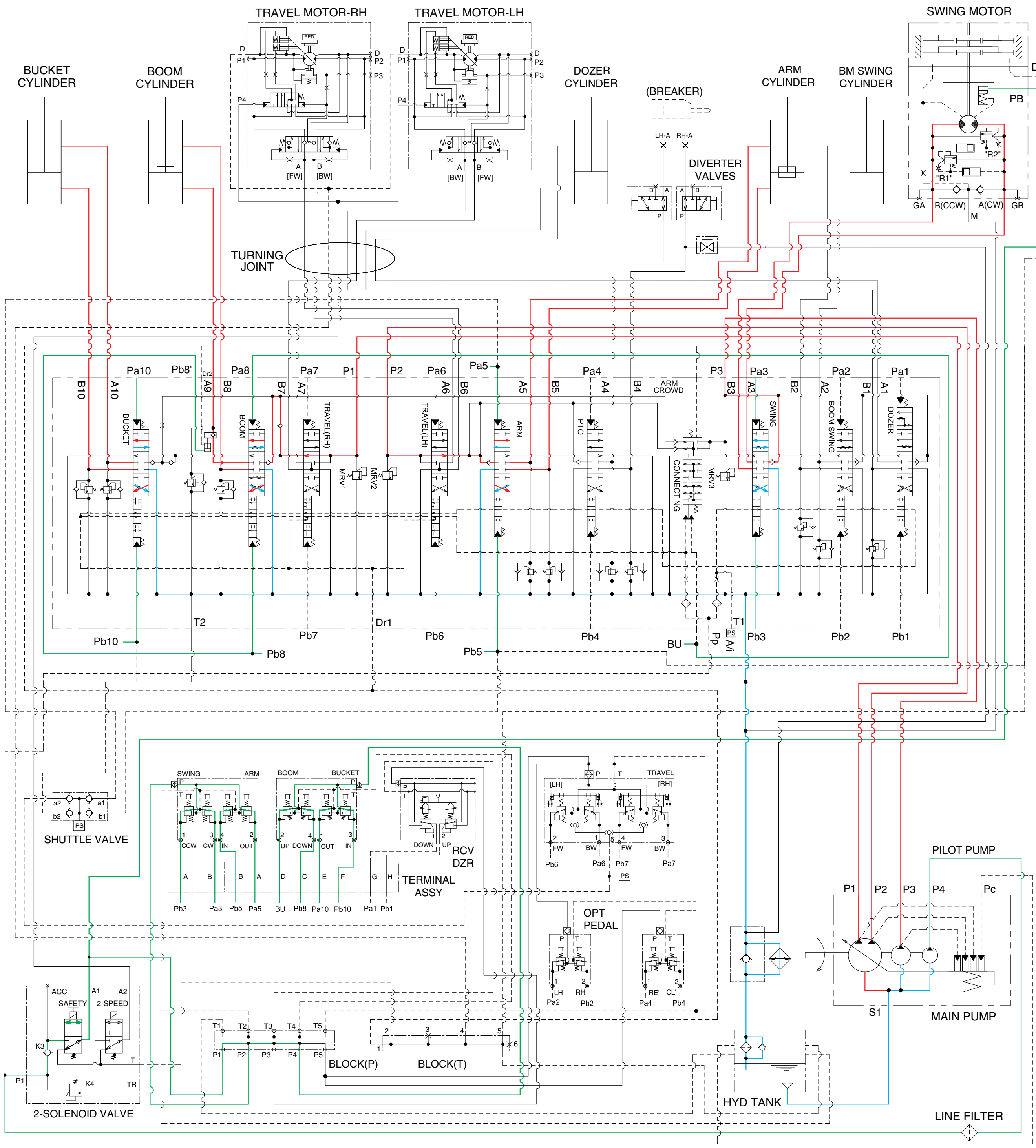
When the swing and bucket functions are operated, simultaneously the swing spool and bucket spool in the main control valve are moved to the functional position by the pilot oil pressure (Pa3, Pb3, Pb10, Pa10) from the remote control valve.

The oil from the P3 pump flows into the swing motor through the swing spool.

The oil from the P1 pump flows into the bucket cylinder through the bucket spool.

※ The circuit diagram may differ from the equipment, so please check before a repair.

5. COMBINED SWING, BOOM, ARM AND BUCKET OPERATION



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 (Pa3, Pb3, BU, Pb8, Pb5, Pa5, Pb10, Pa10) from the remote control valve.

The oil from the P2 pump flows into the arm cylinder through, arm spool.

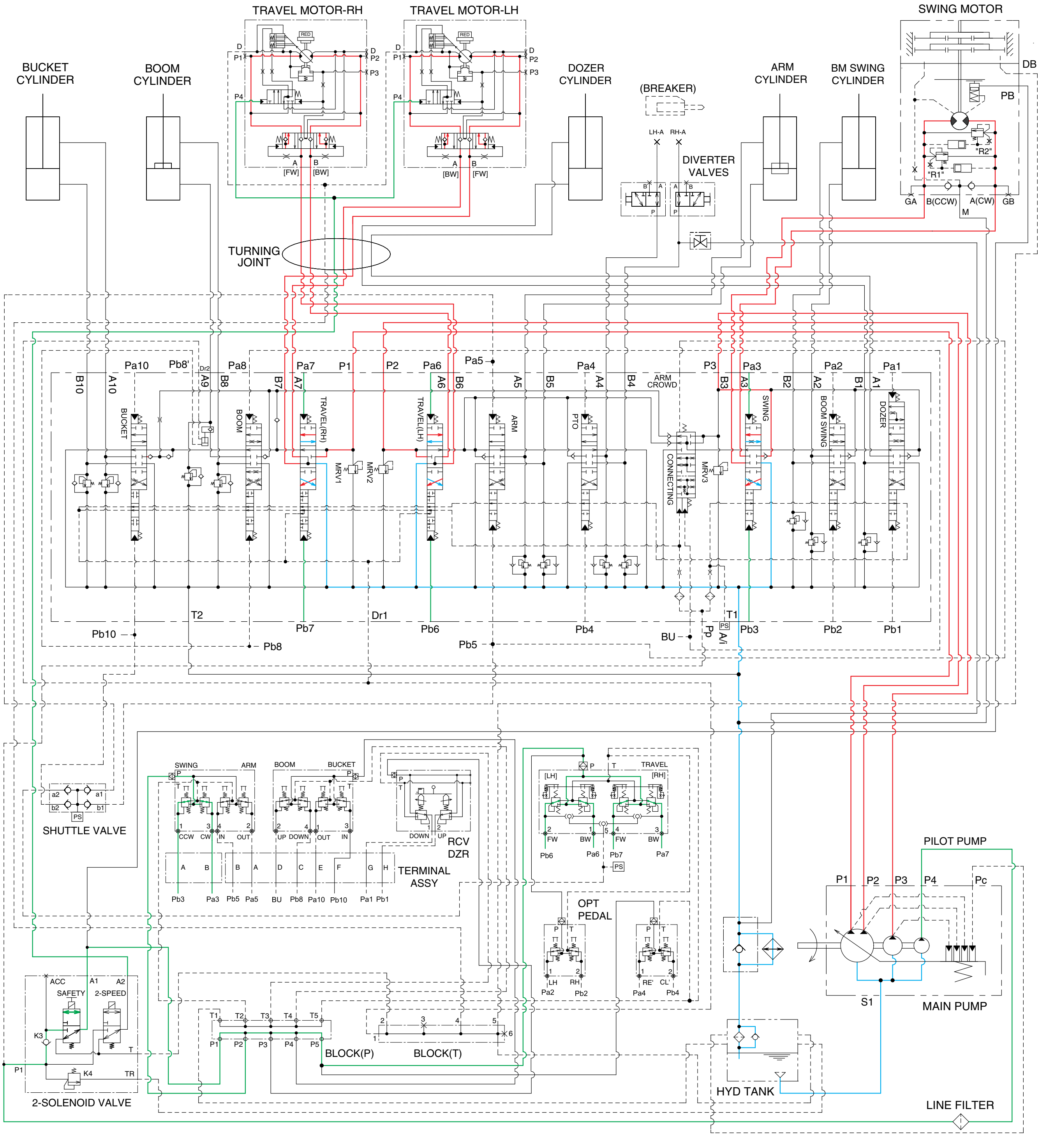
The oil from the P1 pump flows into the boom cylinders and bucket cylinder through the boom spool, bucket spool.

The oil from the P3 pump flows into the swing motor through the swing spool.

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

※ The circuit diagram may differ from the equipment, so please check before a repair.

6. COMBINED SWING AND TRAVEL OPERATION



35AZ3HC35

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 (Pa3, Pb3, Pb6, Pb7, Pa6, Pa7) from the remote control valve and the travel levers.

The oil from the P3 pump flows into the swing motor through the swing spool.

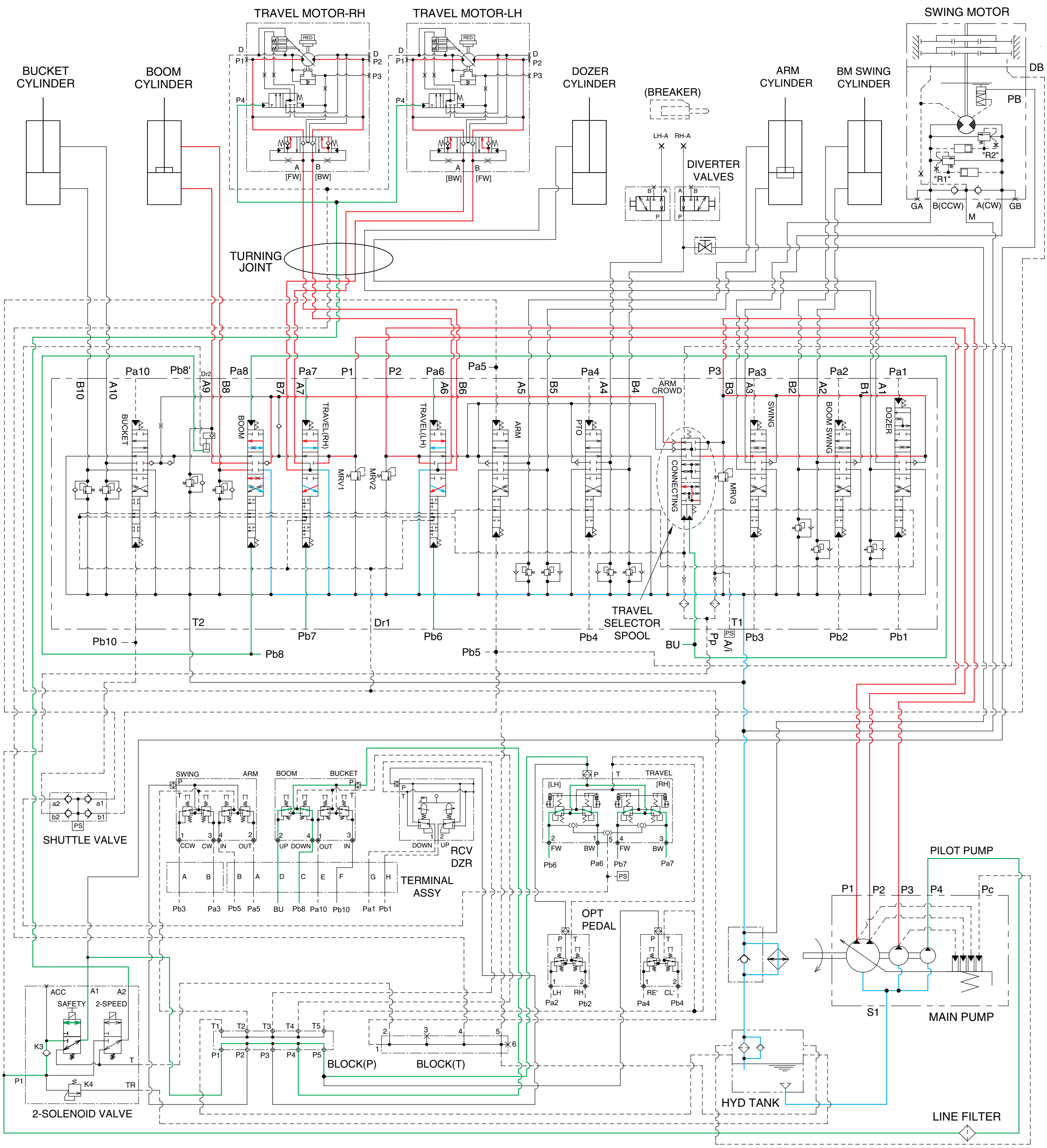
The oil from the P1 pump flows into the travel motor through the RH travel spool.

The oil from the P2 pump flows into the travel motor through the LH travel spool.

The superstructure swings and the machine travels straight.

※ The circuit diagram may differ from the equipment, so please check before a repair.

7. COMBINED BOOM AND TRAVEL OPERATION



35AZ3HC36

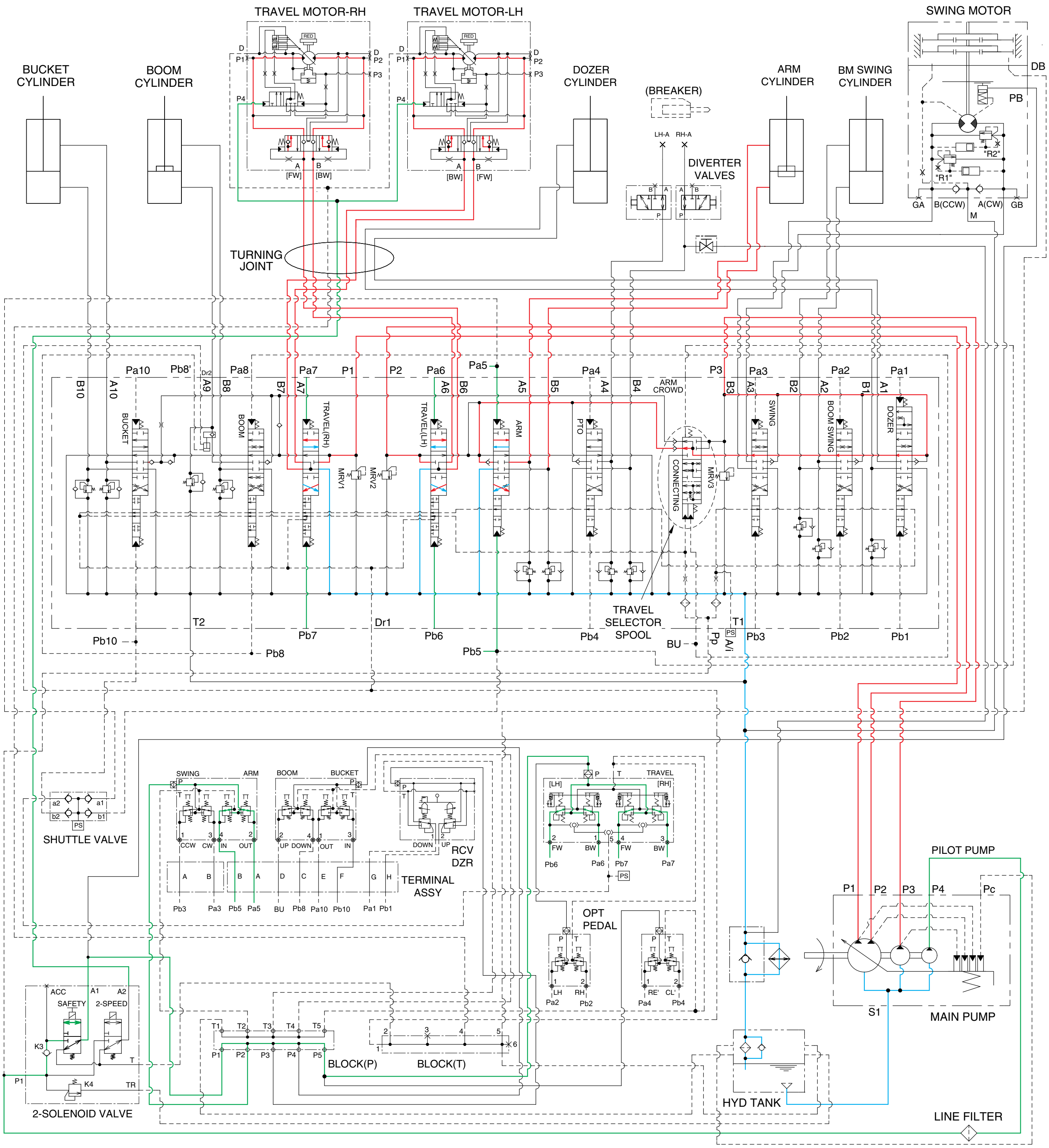
When the boom and travel functions are operated, simultaneously the boom spools and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (PU, Pb8, Pb6, Pb7, Pa6, Pa7) from the remote control valve.

The oil from the P1 and P2 pumps flows into the travel motors through travel RH and travel LH spools.

The oil from the P3 pump flows into the boom cylinders through boom spool via the travel selector spool. The boom is operated and the machine travels straight.

※ The circuit diagram may differ from the equipment, so please check before a repair.

8. COMBINED ARM AND TRAVEL OPERATION



35AZ3HC37

When the arm and travel functions are operated, simultaneously the arm spools and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (Pb5, Pa5, Pb6, Pb7, Pa6, Pa7) from the remote control valve.

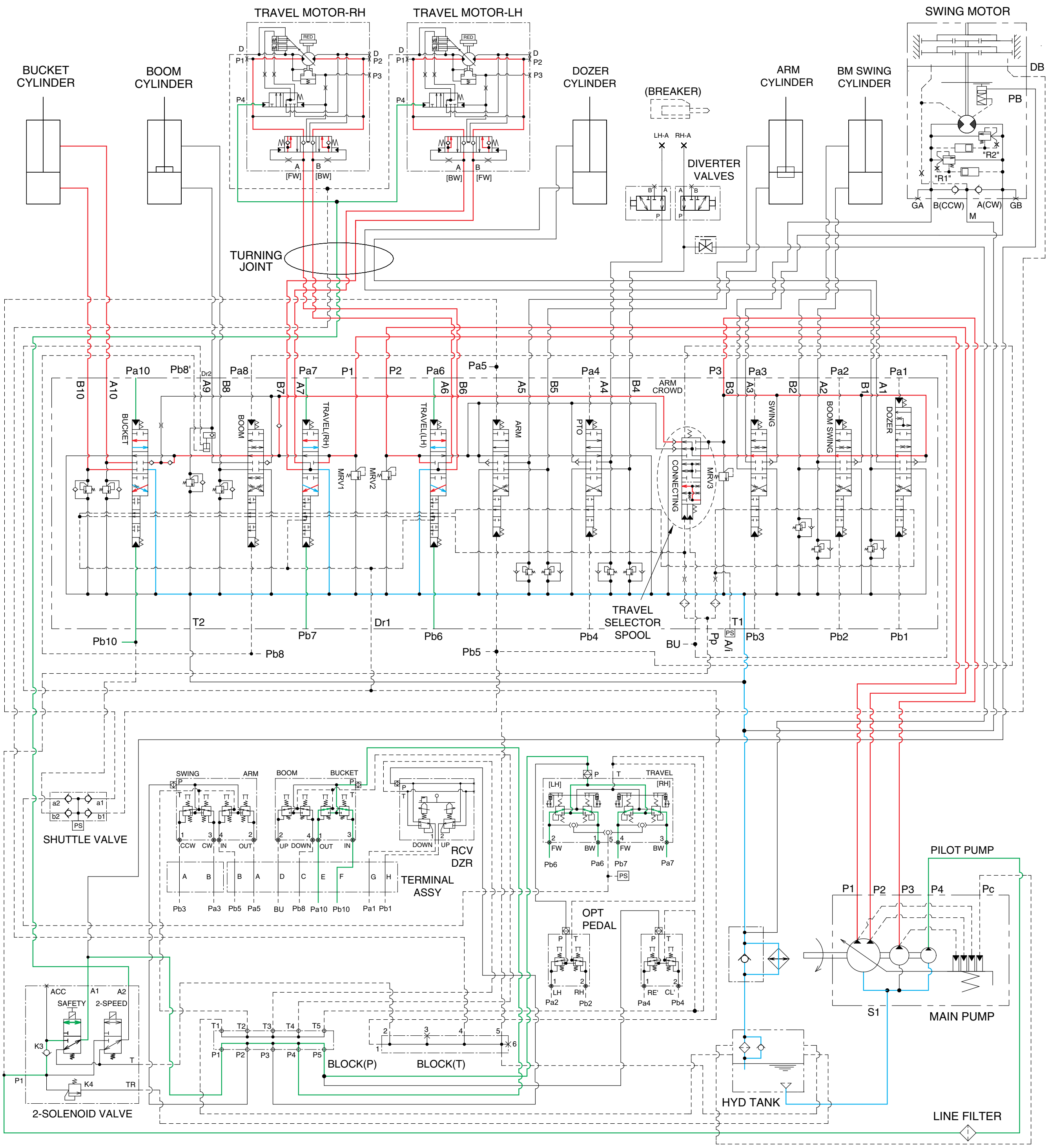
The oil from the P1 and P2 pumps flows into the travel motors through travel spools.

The oil from the P3 pump flows into the arm cylinder through arm spool via the travel selector spool.

The arm is operated and the machine travels straight.

※ The circuit diagram may differ from the equipment, so please check before a repair.

9. COMBINED BUCKET AND TRAVEL OPERATION



35AZ3HC38

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 (Pb10, Pa10, Pb6, Pb7, Pa6, Pa7) from the remote control valve, and the travel selector spool is pushed to the up by the oil pressure from pilot pump. The oil from the P1 and P2 pumps flows into the travel motors.

The oil from the P3 pump flows into the bucket cylinder through bucket spool via the travel selector spool.

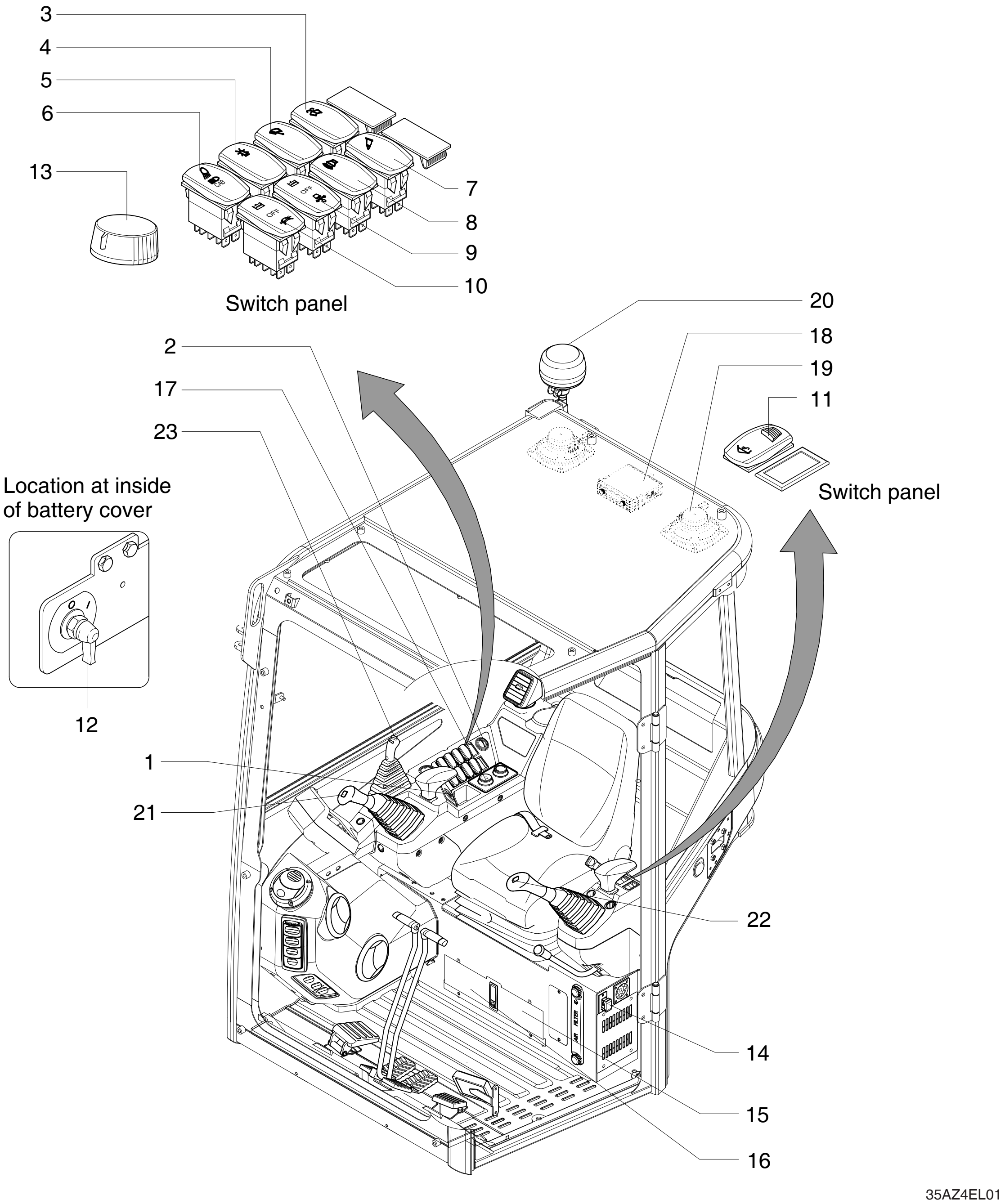
The bucket is operated and the machine travels straight.

※ The circuit diagram may differ from the equipment, so please check before a repair.

SECTION 4 ELECTRICAL SYSTEM

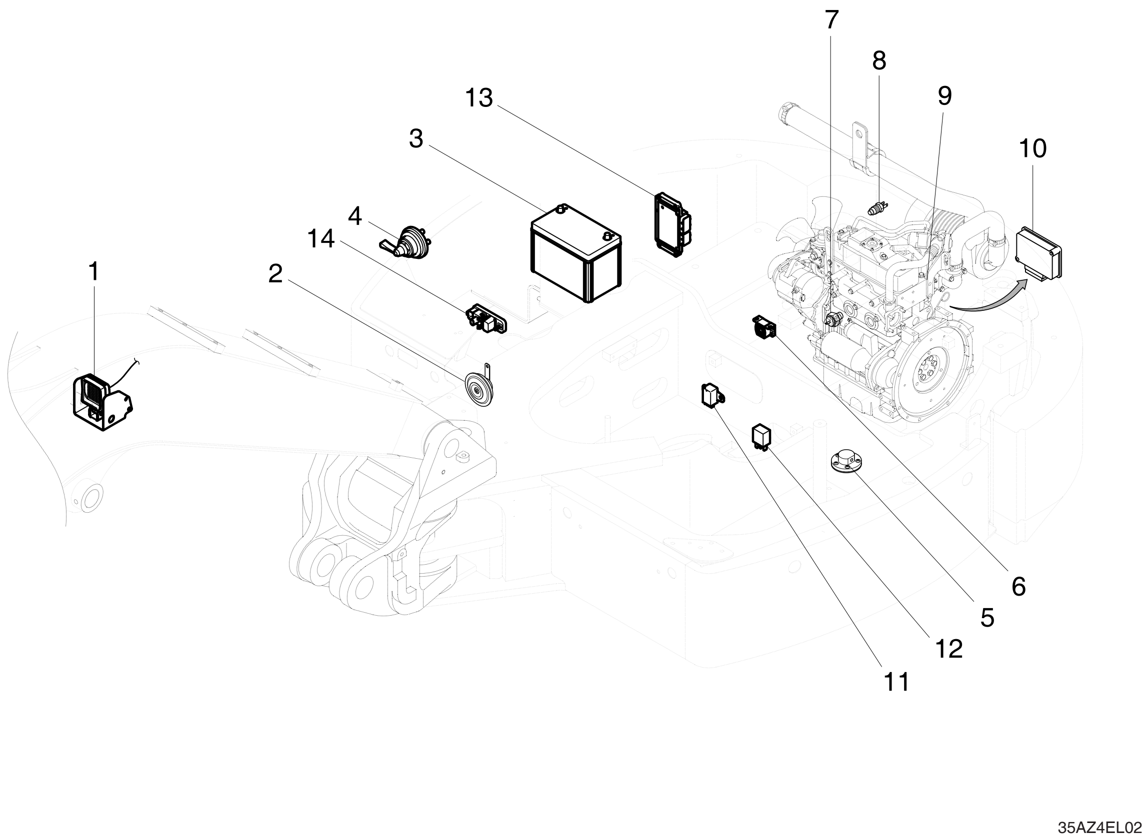
GROUP 1 COMPONENT LOCATION

1. LOCATION 1



1	Start switch	10	Aux 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 1 switch	18	New cassette radio		

2. LOCATION 2



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

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 chapter 6, Maintenance.**

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

Warning lamps (see page 4-6)

Gagues (see page 4-4)

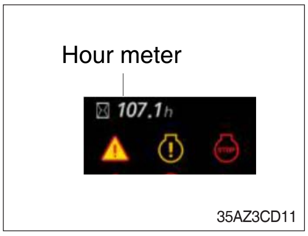
Pilot lamps (see page 4-9)

Switches (see page 4-13)

35AZ4CD05

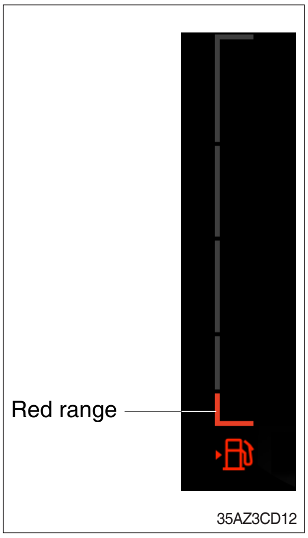
2) GAUGES AND DISPLAYS

(1) Hour meter



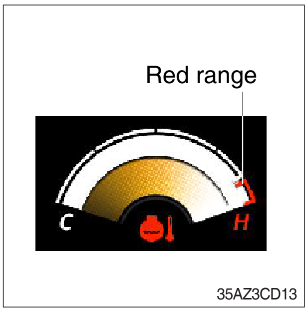
① This meter shows the total operation hours of the machine.
② Always ensure the operating condition of the meter during the machine operation.
Inspect and service the machine based on hours as indicated in chapter 6, maintenance.

(2) Fuel gauge



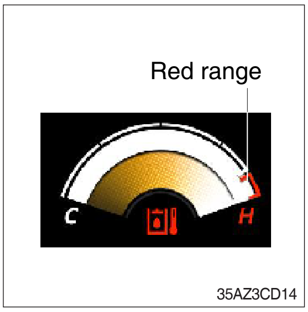
① This gauge indicates the amount of fuel in the fuel tank.
② Fill the fuel when in the red range or warning lamp ON.
※ If the gauge illuminates the red range or warning lamp ON even though the machine is in the normal condition range, check the electric device as this can be caused by poor connection of sensor.

(3) Engine coolant temperature gauge



① This indicates the temperature of coolant.
· Red range : Above 115°C (239°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.

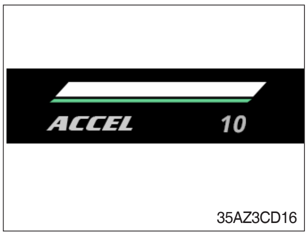
※ If the gauge indicates the red range or warning lamp ON in red even though the machine is in the normal condition range, check the electric device as this can be caused by poor connection of sensor.

(5) Engine rpm gauge and clinometer

① This displays the engine speed.

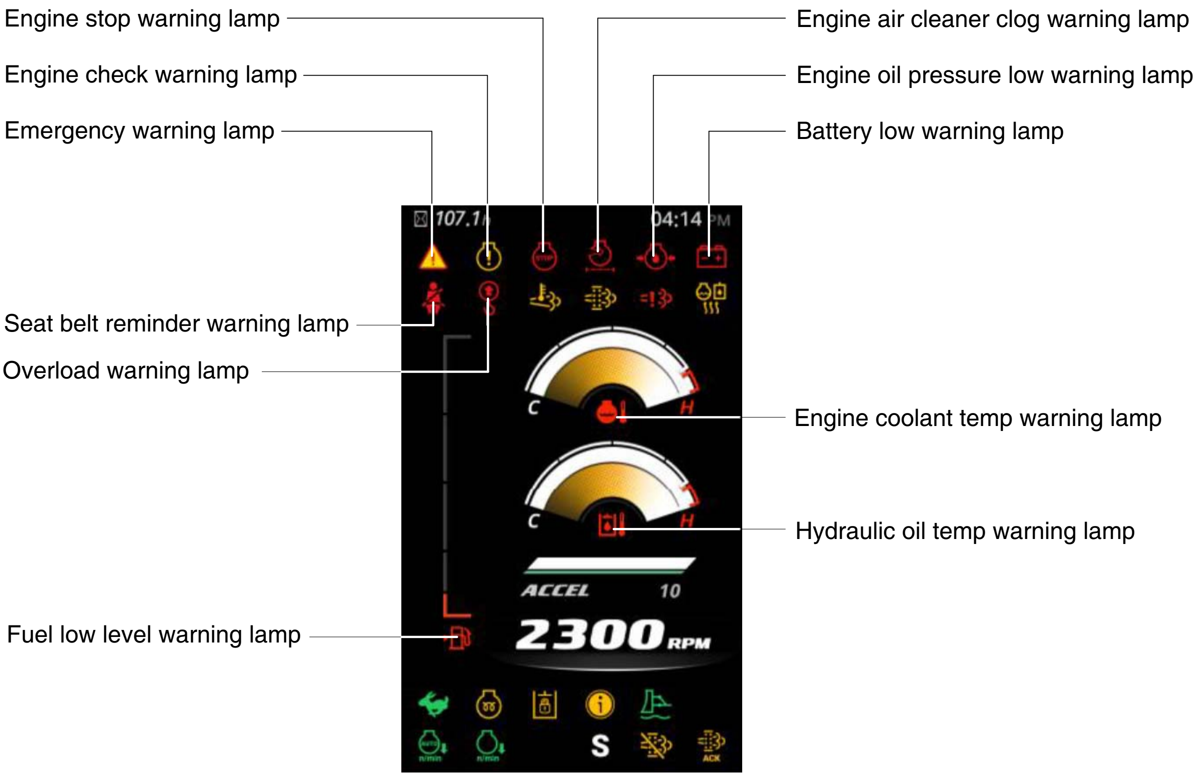
② This displays the tilt of machine.

(6) Accel dial gauge



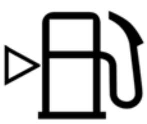
① This gauge indicates the level of accel dial from 0 to 10 step.

3) WARNING LAMPS



35AZ3CD20

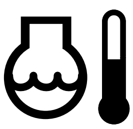
(1) Fuel low level warning lamp



35AZ3CD21

① This lamp lights up and buzzer sounds when the level of fuel is below 12.5 ℓ (3.3 U.S. gal).
② Fill the fuel immediately when the lamp ON.

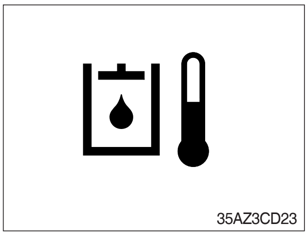
(2) Engine coolant temperature warning lamp



35AZ3CD22

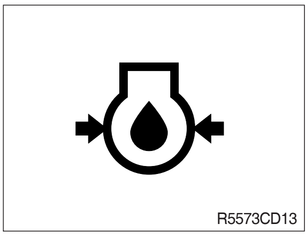
① This lamp lights up and buzzer sounds when the temperature of coolant is over the normal temperature 115°C (239°F).
② Check the cooling system when the lamp ON.

(3) Hydraulic temperature warning lamp



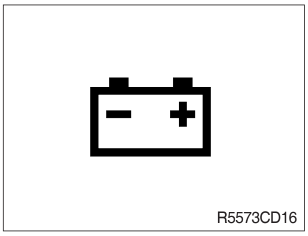
① This lamp lights up and buzzer sounds when the temperature of coolant is over the normal temperature 105°C (221°F).
② Check the cooling system when the lamp ON.

(4) Engine oil pressure low warning lamp



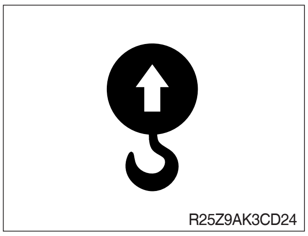
① This lamp lights up and buzzer sounds after starting the engine because of the low oil pressure.
② If the lamp ON during engine operation, shut OFF engine immediately. Check oil level.

(5) Battery low warning lamp



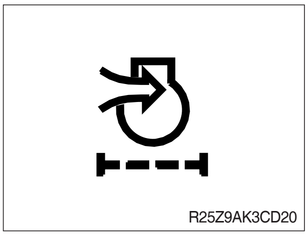
① This lamp lights up and buzzer sounds when the starting switch is ON, it is turned OFF after starting the engine.
② Check the battery charging circuit when this lamp blinks during engine operation.

(6) Overload warning lamp



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

(7) Air cleaner clog warning lamp



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

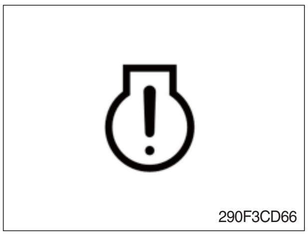
290F3CD64

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

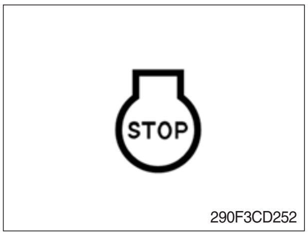


290F3CD66

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 HD Hyundai Construction Equipment service center or local dealer.**

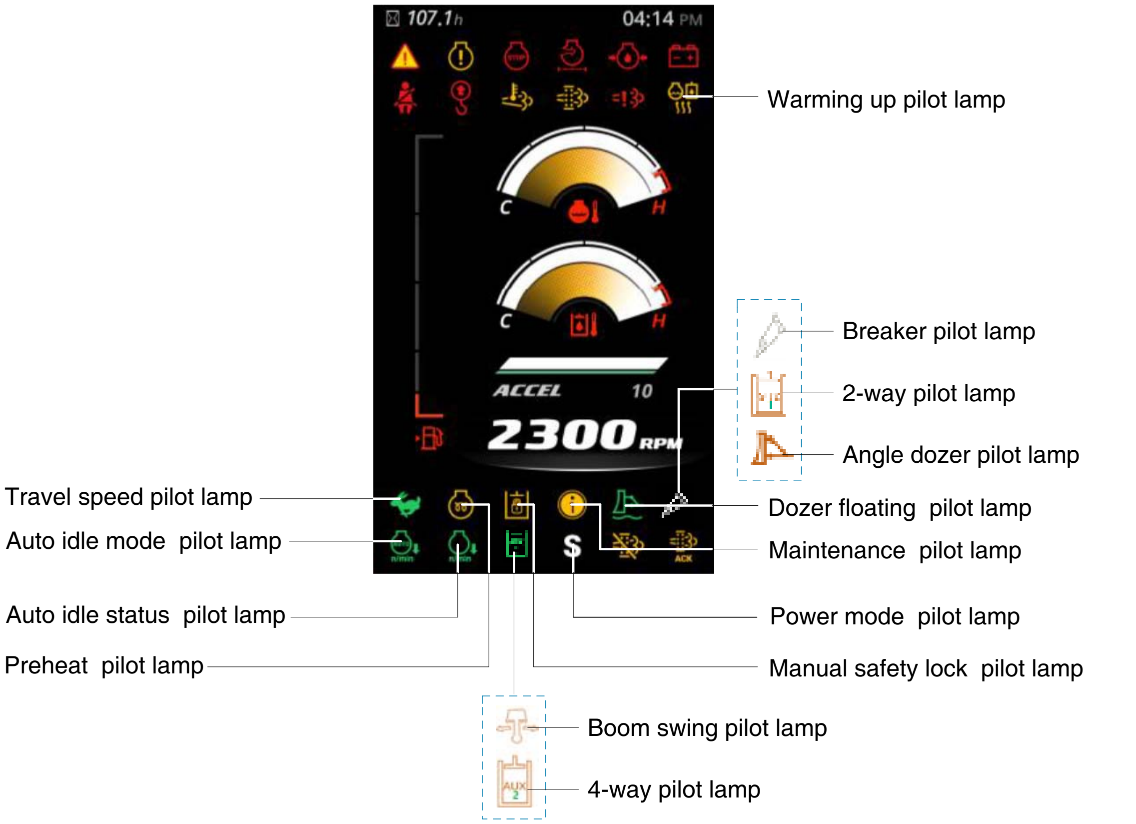
(11) Seat belt reminder warning lamp

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.

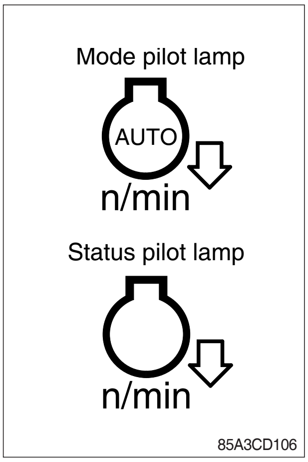
4) PILOT LAMP



(1) Power mode pilot lamp

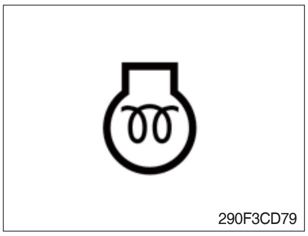
No	Mode	Pilot lamp	Selected mode
1	Power mode	S	Standard power mode
2	Travel mode		Low speed traveling High speed traveling

(2) Auto idle status/ mode pilot lamp



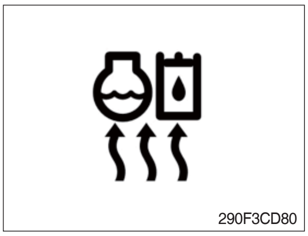
① The auto idle mode pilot lamp will light up when the idle mode is selected.
② The auto idle status pilot lamp will light up when all levers and pedals are at neutral position and the auto idle mode is selected.
③ One of the lever or pedal is operated, the status lamp will go off and the engine speed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

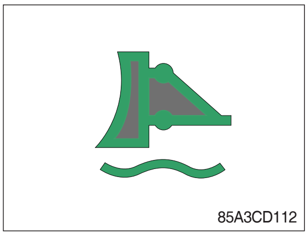
(5) Maintenance pilot lamp

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

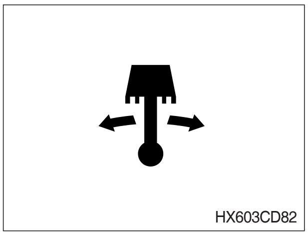
① This lamp lights up when the safety lever is set to the LOCK position.
※ Refer to the operator's manual page 3-35 for the safety lever.

(7) Dozer floating pilot lamp



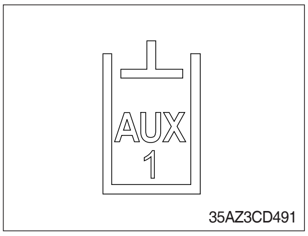
① This lamp will be light up when the dozer floating lever is pressed.
※ Refer to the operator's manual page 3-33.

(8) Boom swing pilot lamp



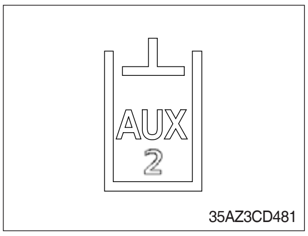
① This lamp lights up when the boom offset switch is pressed.
※ Refer to the operator's manual page 3-32.

(9) 2-way pilot lamp



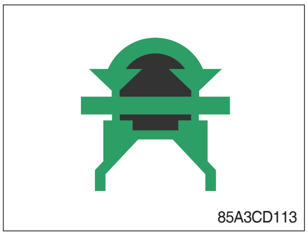
① This lamp lights up when the option flow control function is activated in the cluster.
※ Refer to the page 4-25.

(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 4-25.

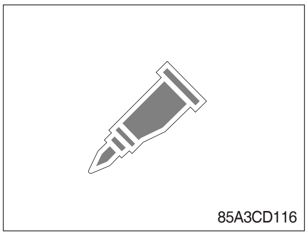
(11) Angle dozer pilot lamp



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

※ Refer to the operator's manual page 3-33

(12) Breaker pilot lamp



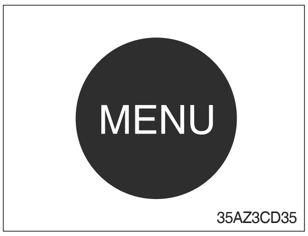
① This lamp will be light up when the breaker select switch is pressed.

※ Refer to the operator's manual page 3-32.

5) SWITCHES

Sound short beep when each button is pressed.

(1) Menu button



① Go into the menu screen.

※ **Please refer to page 4-14.**

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

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

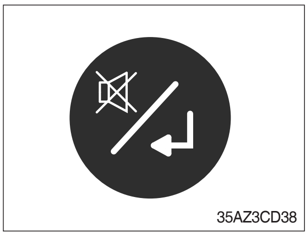
(3) Right/down/(-) button

① Move right in sub menu.

② Move down in menu list

③ Decrease input value in menu

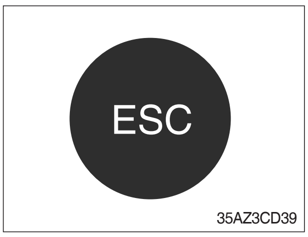
(4) Enter and buzzer stop button



① Select menu (enter).

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

(5) ESC/ rear camera button

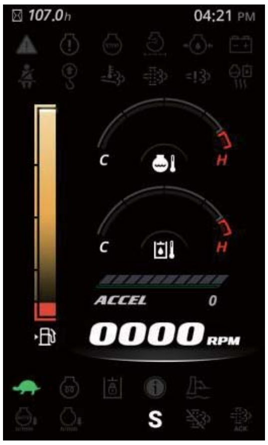


① Escape in the menu.

② Rear camera ON or OFF in the operation screen

6) MAIN MENU

Operation screen



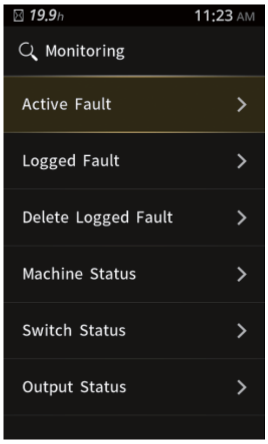
35AZ3CD100

press MENU button

Main menu screen

35AZ3CD106

Sub menu screen

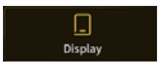


35AZ3CD107A

※ Please refer to the switches, page 4-13 for selection and change of menus and input values.

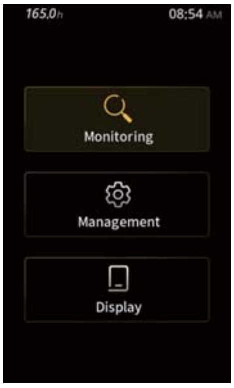
※ In the operation screen, press the menu button to access the sub-menu screen.

(1) Structure

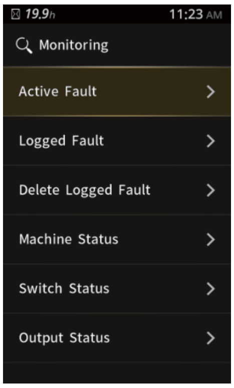
No	Main menu	Sub menu	Description
1	 Monitoring 35AZ3CD103A	Active fault Logged fault Del logged fault Analog Switch Output	Machine, Engine Machine, Engine Machine, Engine Hyd oil temp, Coolant temp, Battery volt Engine speed, Accel dial volt Safety lever, Dozer floating, Seat belt, Travel speed Travel speed sol, Dozer floating sol, Start limit relay, Buzzer
2	 Management 35AZ3CD104A	Operating hours Maintenance Start limit mode Warning setting on/off Change password Machine information A/S phone number Auxilary flow	Operating hours Elapsed time, Change interval, Replacement etc. Disabled, Enable (Always), Enable (Interval) Overload on/off Change password Machine, Engine, CMCU A/S phone number, A/S phone number change Auxilary flow
3	 Display 35AZ3CD105A	Clock Brightness Unit Language	12 Hour, 24 Hour Manual, Auto Temperature, Pressure Korean, English, Turkish

(2) Monitoring

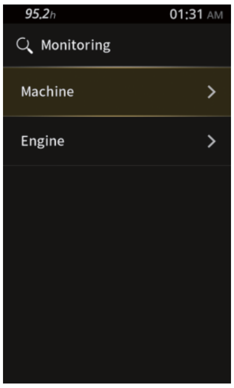
① Active fault



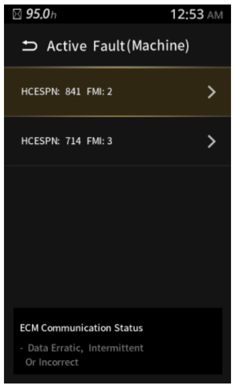
35AZ3CD106



35AZ3CD107A

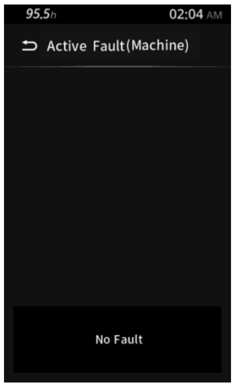


35AZ3CD108

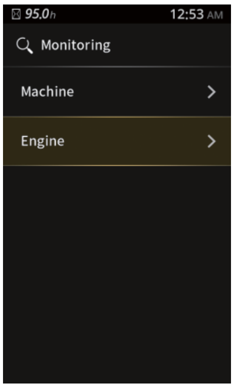


35AZ3CD110A

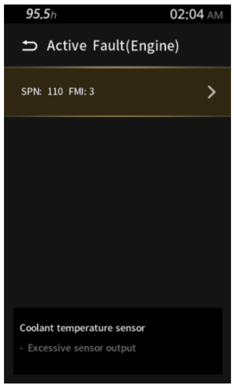
- The active fault of the machine and engine can be checked by this menu.



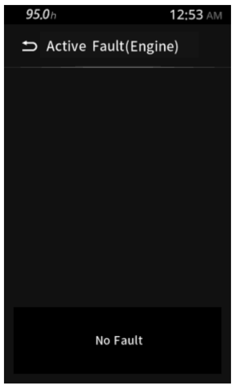
35AZ3CD135A



35AZ3CD109

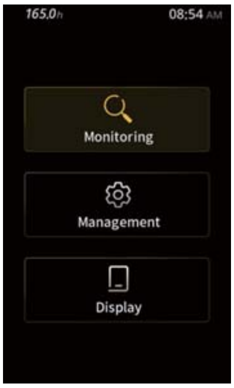


35AZ3CD111A

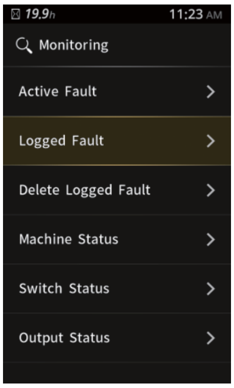


35AZ3CD136A

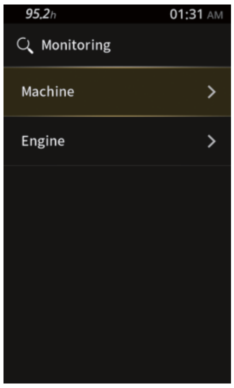
② Logged fault



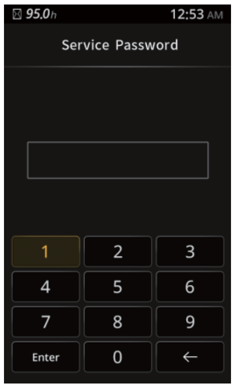
35AZ3CD106



35AZ3CD112A

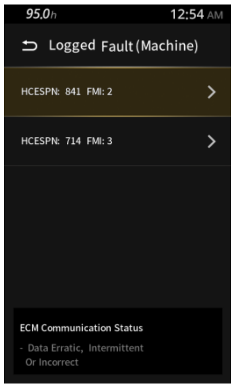


35AZ3CD108

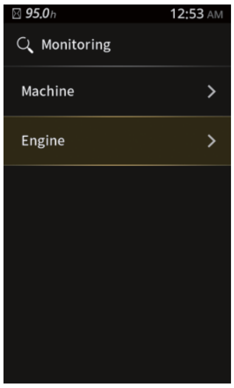


35AZ3CD113

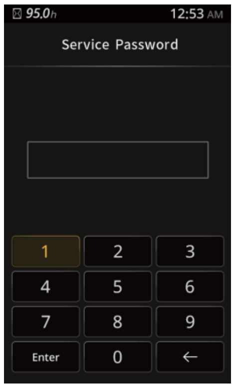
- The logged fault of the machine and engine can be checked by this menu.
- · This menu can be used only HD HCE service man.



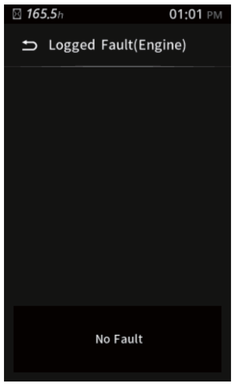
35AZ3CD114A



35AZ3CD109



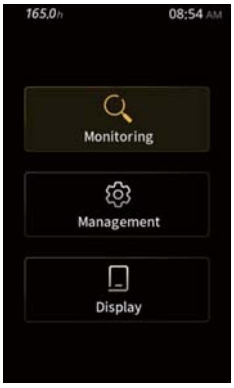
35AZ3CD113



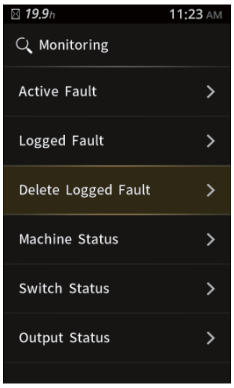
35AZ3CD137A

③ Delete logged fault

"All logged faults deleted" or "Failure"



35AZ3CD106

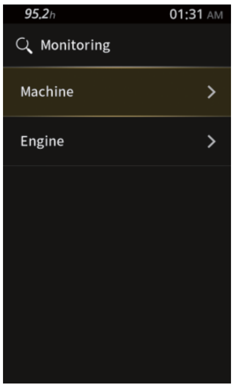


35AZ3CD116A

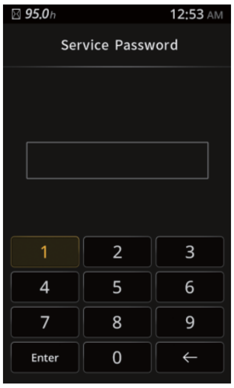
35AZ3CD119A

35AZ3CD118A

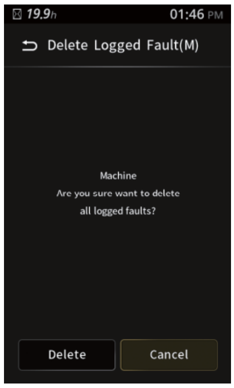
- The logged fault of the machine and engine can be deleted by this menu.
  (It is possible under the engine stop conditions)



35AZ3CD108

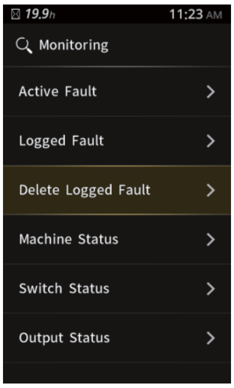


35AZ3CD113



35AZ3CD117A

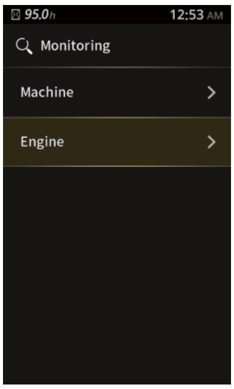
"All logged faults deleted" or "Failure"



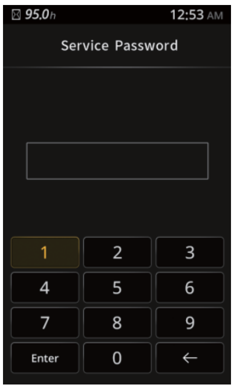
35AZ3CD116A

35AZ3CD122A

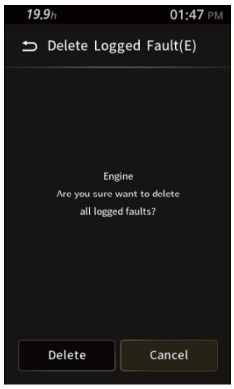
35AZ3CD123A



35AZ3CD109

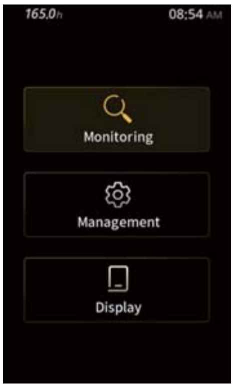


35AZ3CD113

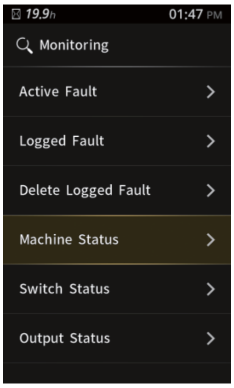


35AZ3CD124A

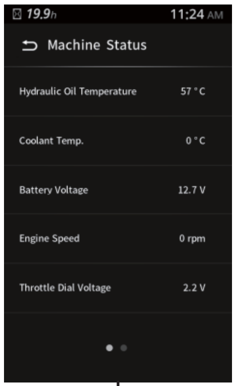
④ Machine status



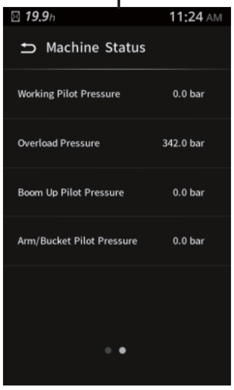
35AZ3CD106



35AZ3CD125A



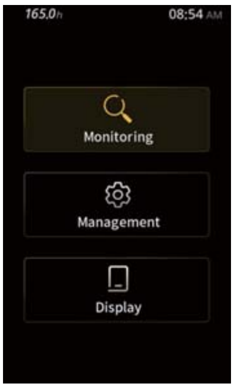
35AZ3CD126A



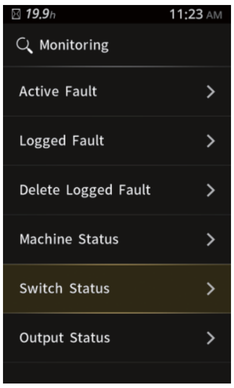
35AZ3CD127A

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

⑤ Switch status

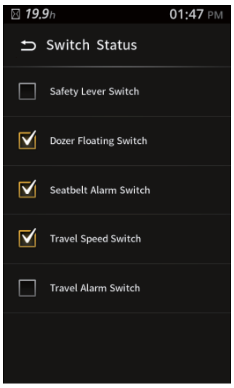


35AZ3CD106



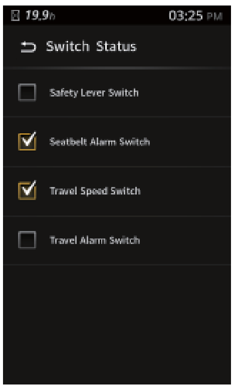
35AZ3CD128A

With DPC option



35AZ3CD129A

Without DPC option

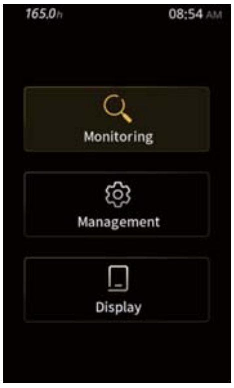


35AZ3CD229A

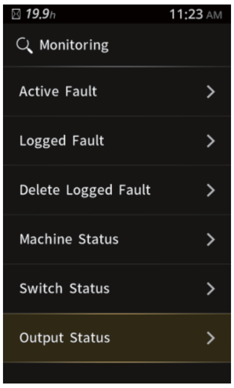
- You can select to display the lamps of the switches on the cluster by this menu.

⑥ Output statue

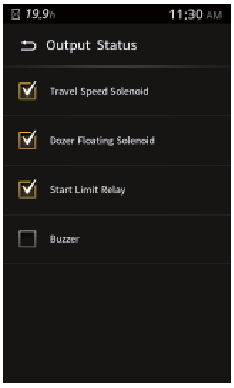
With DPC option



35AZ3CD106



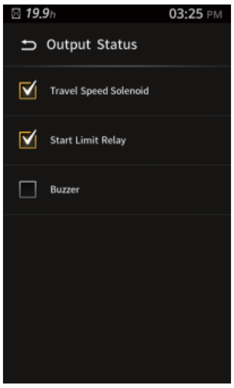
35AZ3CD130A



35AZ3CD131A

- The output status can be confirmed by this menu.

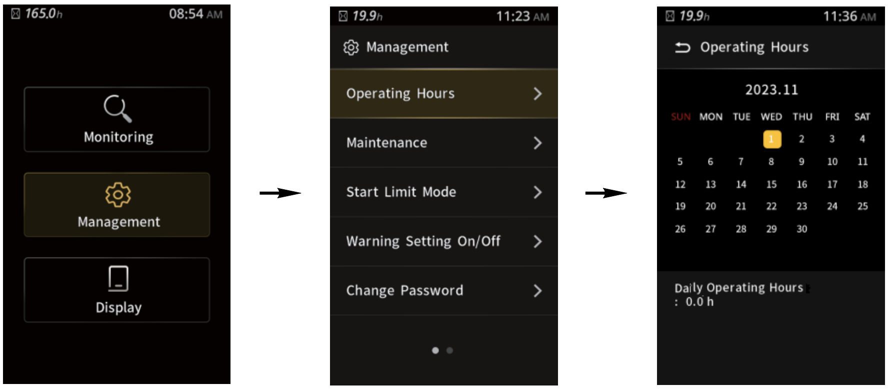
Without DPC option



35AZ3CD231A

(3) Management

① Operating hours

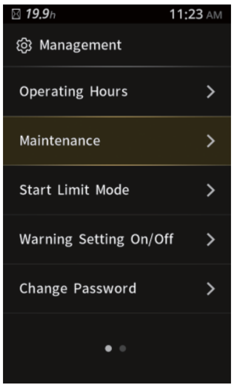


35AZ3CD140A 35AZ3CD141A 35AZ3CD142A

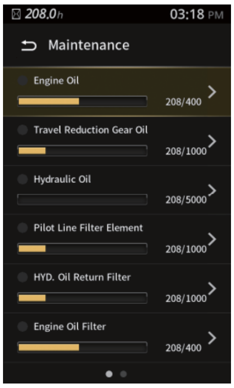
- You can check the operating hours by this menu.

② Maintenance

35AZ3CD140A



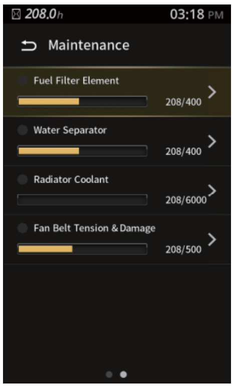
35AZ3CD143A



35AZ3CD144

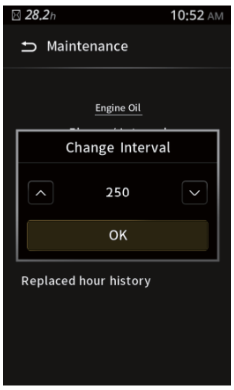
- Elapse : Maintenance elapsed time.
- Interval : The change intervals can be changed in hour increments of 50.
- History-Hourmeter : Display elapsed time.
- Replacement : The elapsed time will be reset to zero (0).

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



35AZ3CD145A

35AZ3CD146A

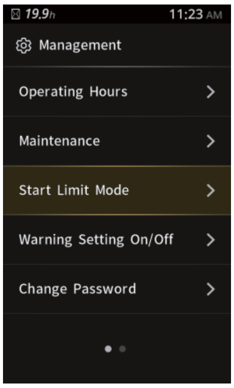


35AZ3CD147A

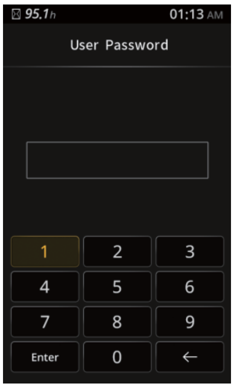
35AZ3CD148A

③ Start limit mode

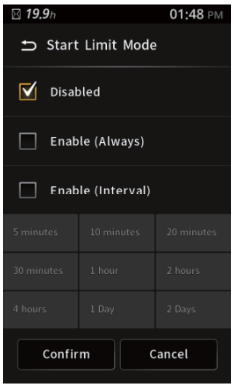
35AZ3CD140A



35AZ3CD150A

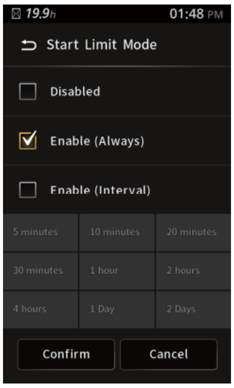


35AZ3CD151

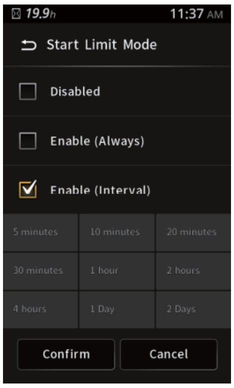


35AZ3CD152A

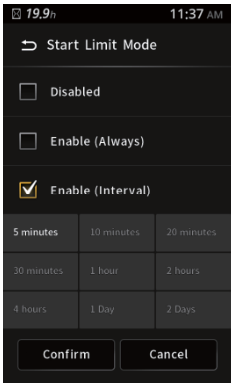
Start limit mode setting
- Start limit mode is designed to be a theft deterrent or will prevent the unauthorized operation of the machine.
- When you Enable the start limit mode, the password will be required when the starting switch is turned to the on position.
- Machine security
  · Disable : Start limit 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.



35AZ3CD153A



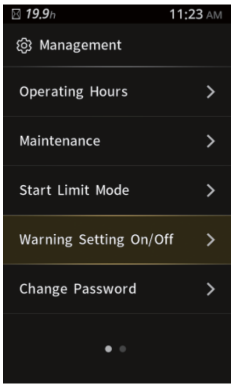
35AZ3CD154A



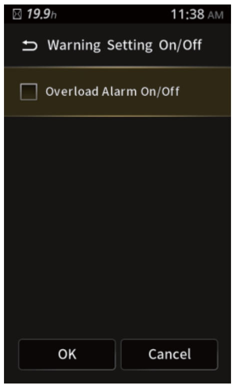
35AZ3CD155A

④ Warning setting on/off

35AZ3CD140A



35AZ3CD156A

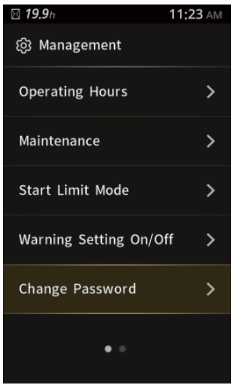


35AZ3CD157A

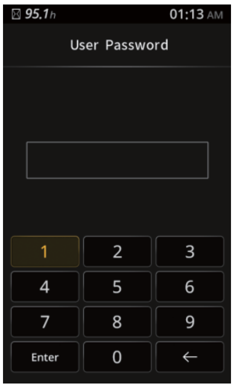
- You can set the warning items by this menu.

⑤ Change password

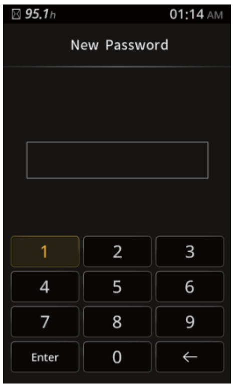
35AZ3CD140A



35AZ3CD158A



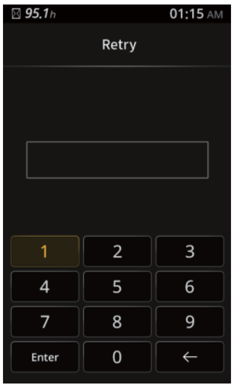
35AZ3CD151



35AZ3CD159

- The password is 5~10 digits.

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

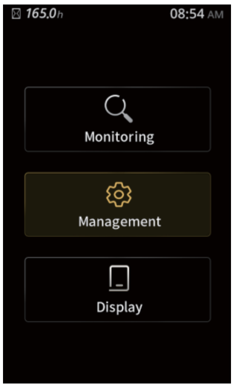


35AZ3CD160

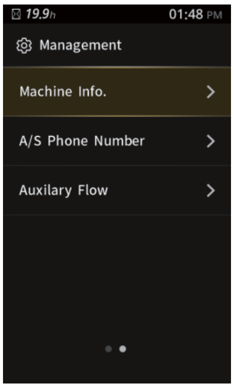
35AZ3CD162A

35AZ3CD161A

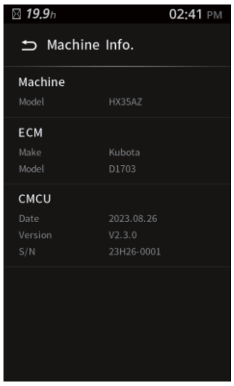
⑥ Machine information



35AZ3CD140A



35AZ3CD163A

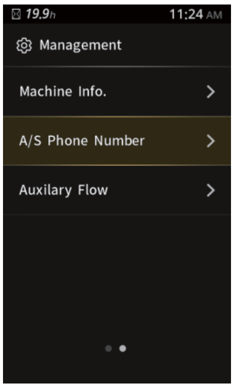


35AZ3CD164A

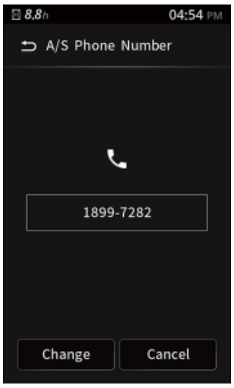
- This can confirm the identification of the machine, engine and cluster.

⑦ Contact

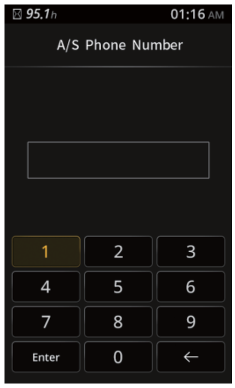
35AZ3CD140A



35AZ3CD165A



35AZ3CD166A



35AZ3CD167

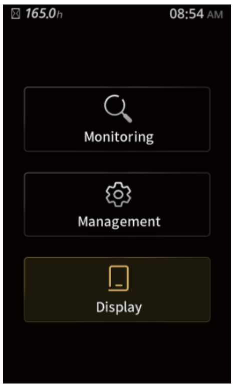
- The A/S phone number can be checked and changed.

⑧ Aux. Flow

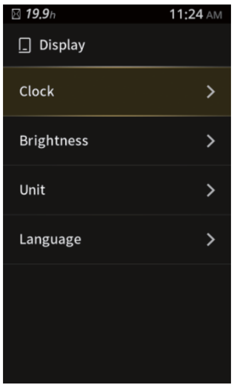
- 3 kinds of option attachment can be selected by this menu.
  a. Rotary grapple (4-way)
  b. Grapple (2-way)
  c. Auger (2-way)
- There are two user modes (type A or B) in each option attachment.

(4) Display set

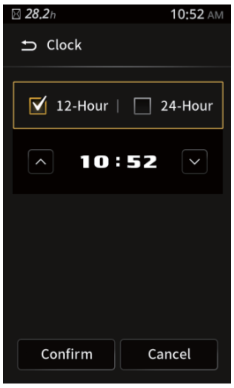
① Clock



35AZ3CD185A



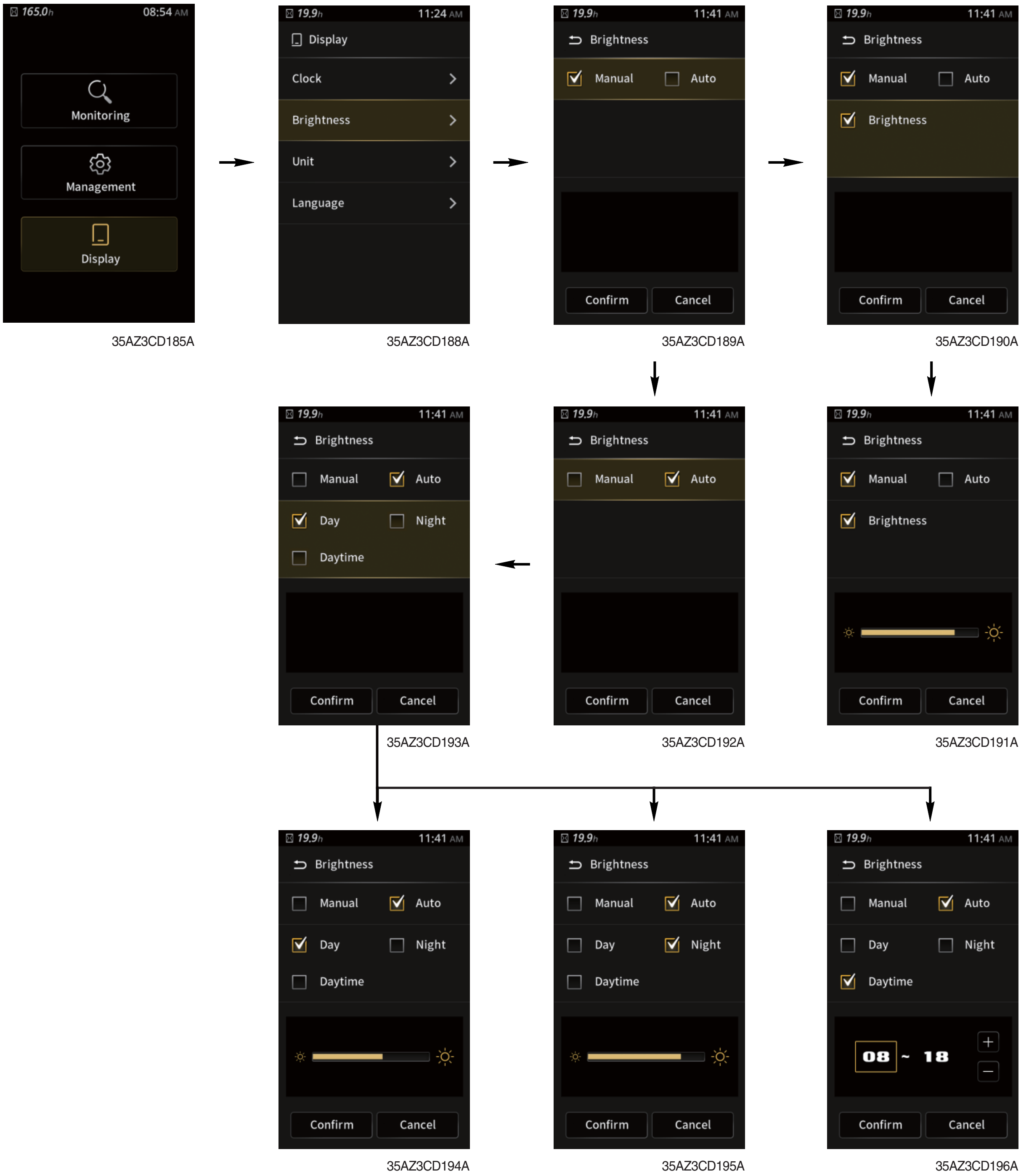
35AZ3CD186A



35AZ3CD187A

- Set the time (12 hours or 24 hours)

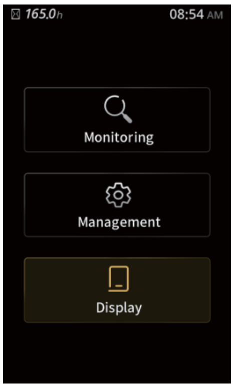
② Brightness



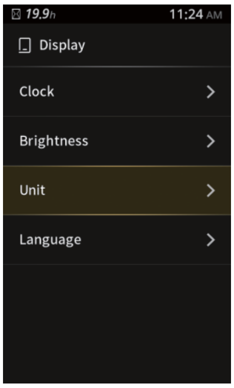
- Manual : Manual setting for LCD brightness.
- Automatic : Automatic control of LCD brightness as set level of Day/Night.
- Setting day time : Set the time for daylight.

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

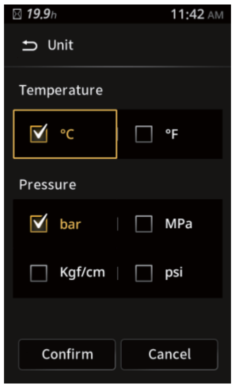
③ Unit



35AZ3CD185A



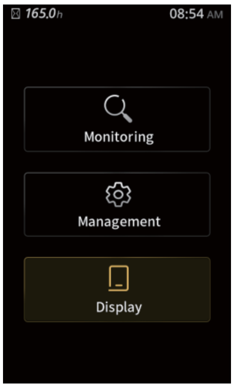
35AZ3CD197A



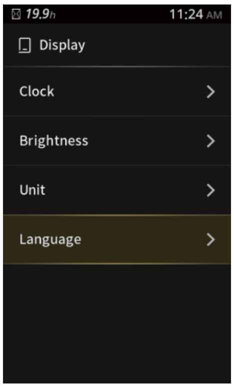
35AZ3CD198A

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

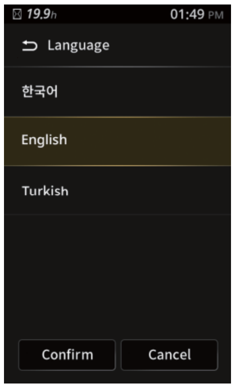
④ Language



35AZ3CD185A



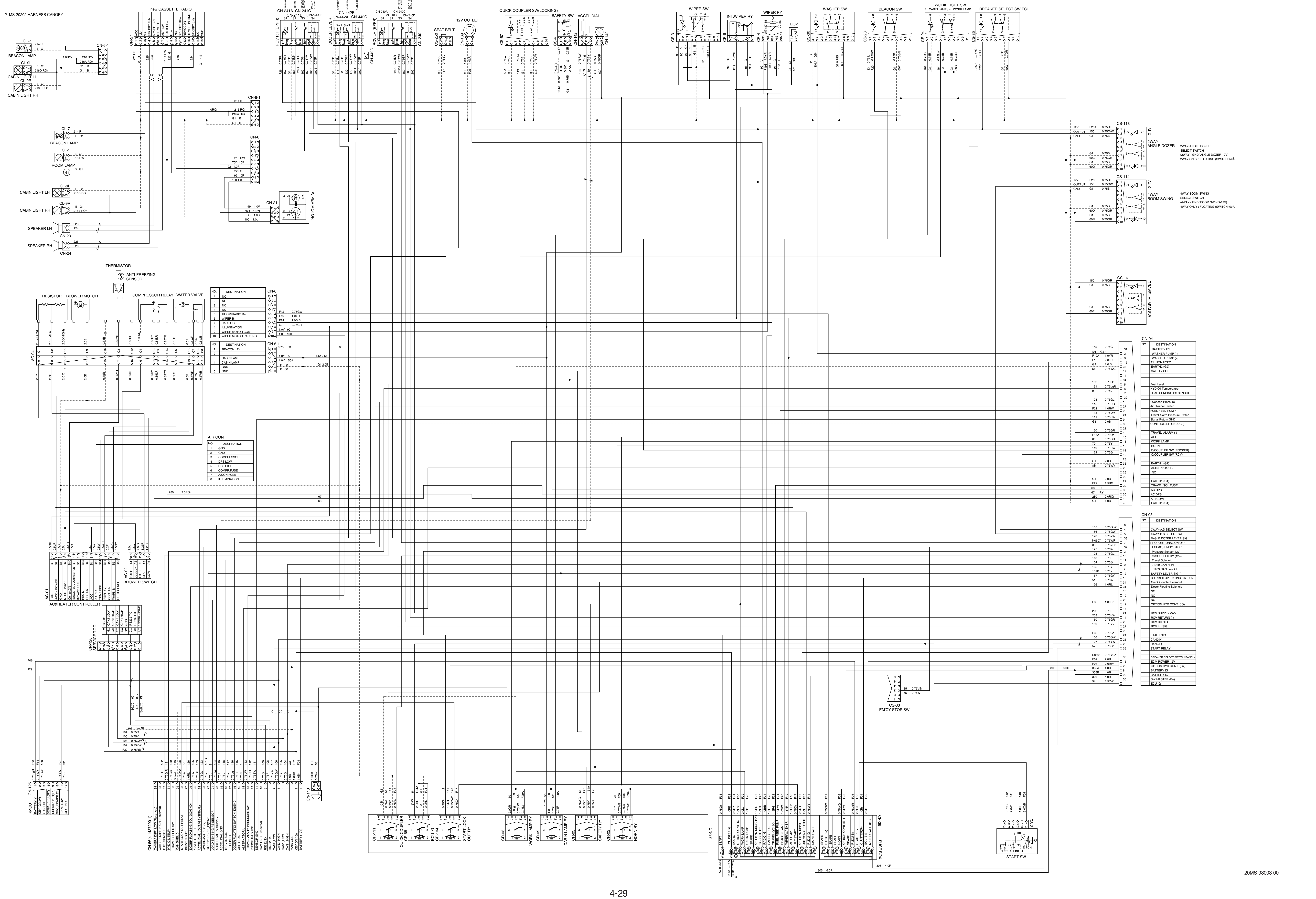
35AZ3CD199A



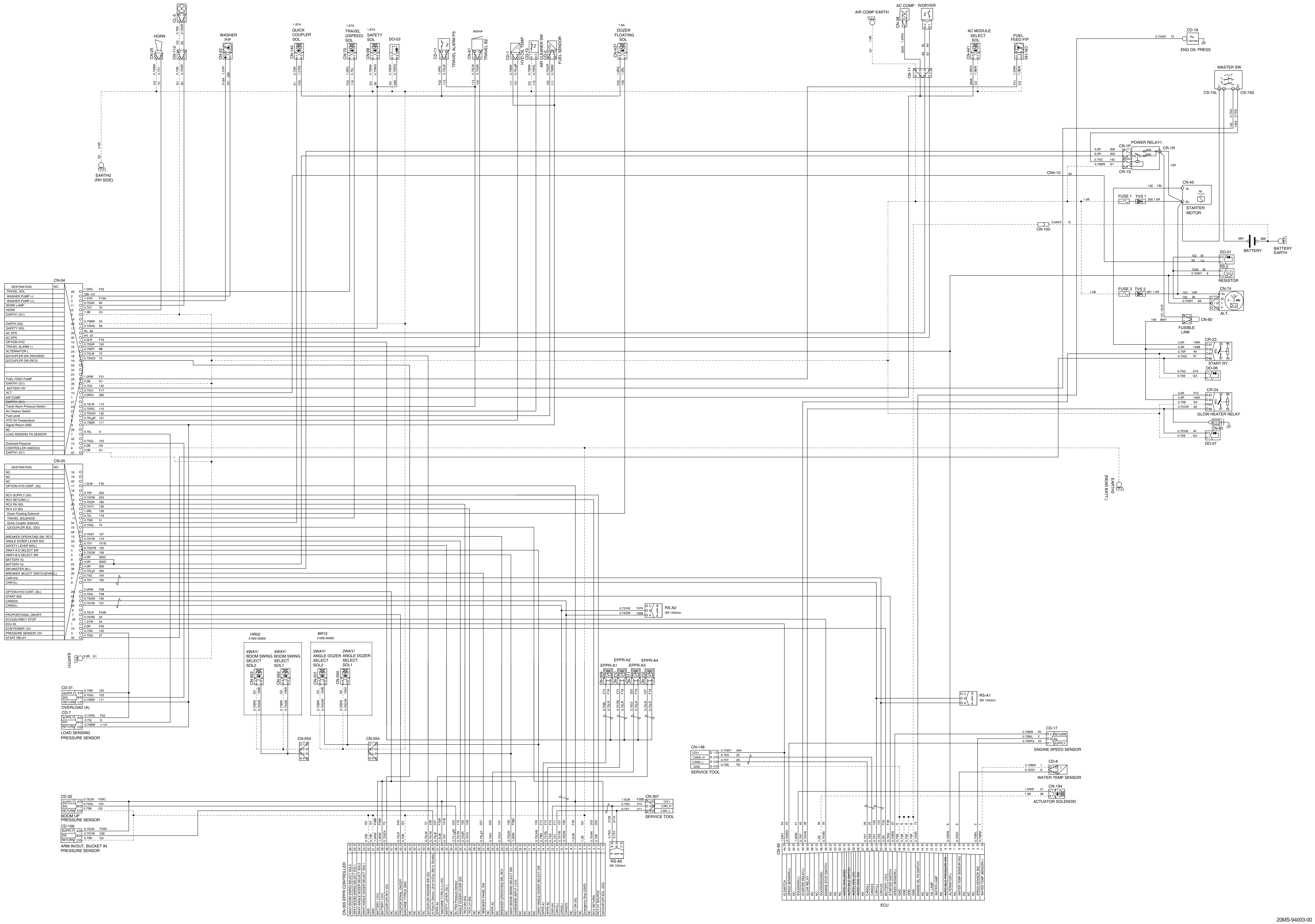
35AZ3CD184A

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

· ELECTRICAL CIRCUIT (1/2)



· 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] → Fusible link [CN-60] → Start relay [CR-23 (30)]

→ Glow heater relay [CR-24 (30)]

→ Power relay 1 [CR-1P (1)] → I/conn [CN-05 (36)]

→ Fuse box [No.2] → I/conn [CN-05 (15)] → ECU [CN-93 (22)]

→ Fuse box [No.4] → Cluster [CN-56 (1)]

→ Fuse box [No.5] → Start switch [CS-2 (1)]

→ Fuse box [No.6] → RMCU [CN-125 (1)]

→ Fuse box [No.8] → I/conn [CN-05 (29)] → EPPR controller [CN-305 (20, 49, 50)]

→ Fuse box [No.9] → Horn relay [CR-02 (1, 3)]

→ Fuse box [No.12] → I/conn [CN-6 (5)] → New cassette radio [CN-27 (8)]

→ Room lamp [CL-1 (2)]

※ I/conn : Intermediate connector

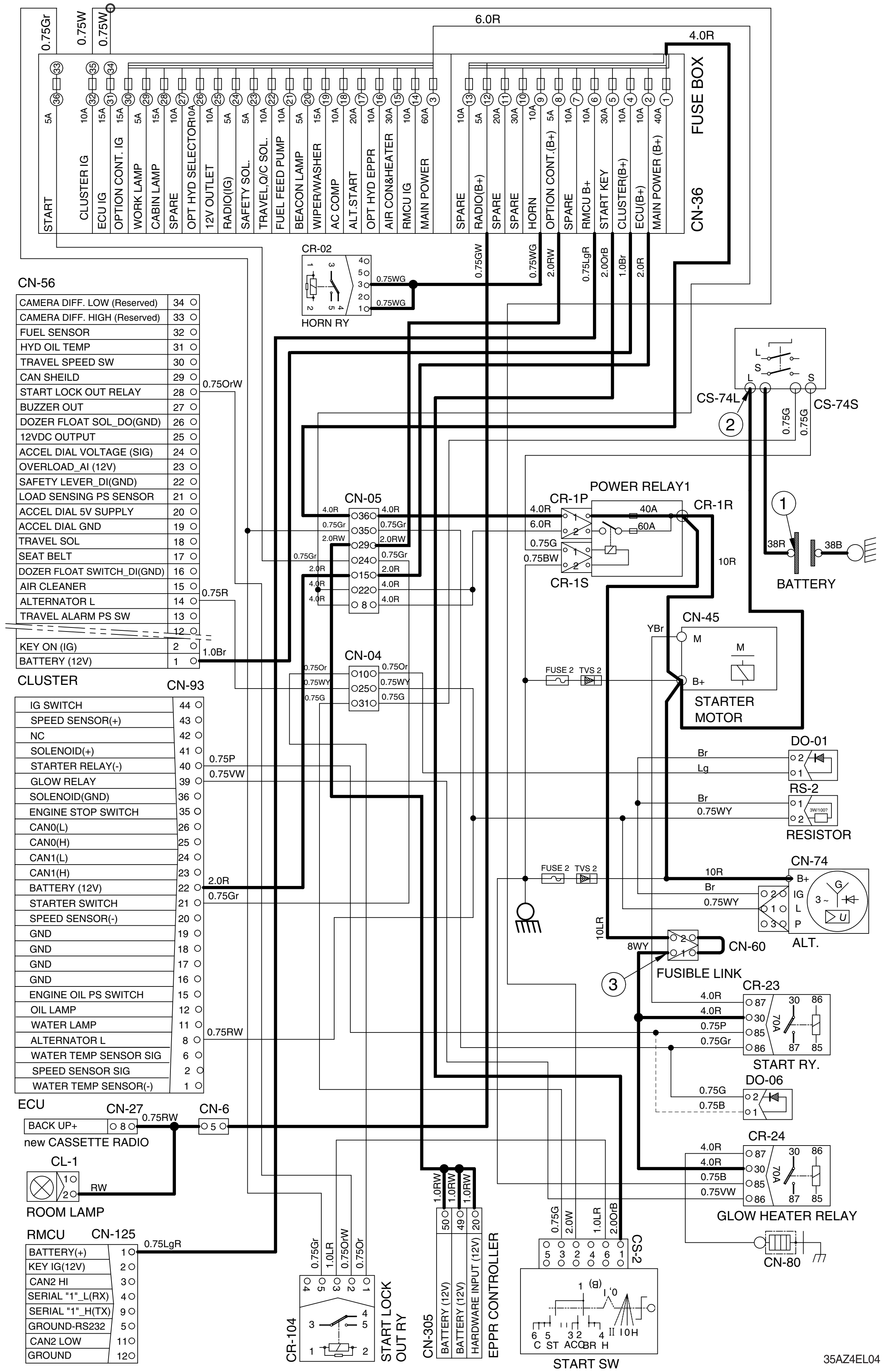
2) CHECK POINT

Engine	Start switch	Check point	Voltage
OFF	OFF	① - GND (Battery) ② - GND (Master switch) ③ - GND (Fusible link)	10~12.5 V

※ GND : Ground

※ The circuit diagram may differ from the equipment, so please check before a repair.

POWER CIRCUIT



※ The circuit diagram may differ from the equipment, so please check before a repair.

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 (36)] → Fuse box No.5 → Start switch [CS-2 (1)]

(1) Start switch : ON

Start switch ON [CS-2 (2)] → Fuse box [No. 34 → 31] → ECU IG relay [CR-68 (1, 3 → (5)] → I/conn [CN-05 (1)] → ECU [CN-93 (44)]
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 (8, 22)] → Fuse box [No.23] → Safety relay [CR-05 (1, 3)]

(2) Start switch : START

Start switch START [CS-2 (6)] → Start lock out relay [CR-104 (3) → (5)]
→ Fuse box [No. 33 → 36] → I/conn [CN-05 (24)] → ECU [CN-93 (21)]
→ I/conn [CN-05 (35)] → Start relay [CR-23 (86) → (87)] → Start motor [CN-45 (M)] → Starter operating

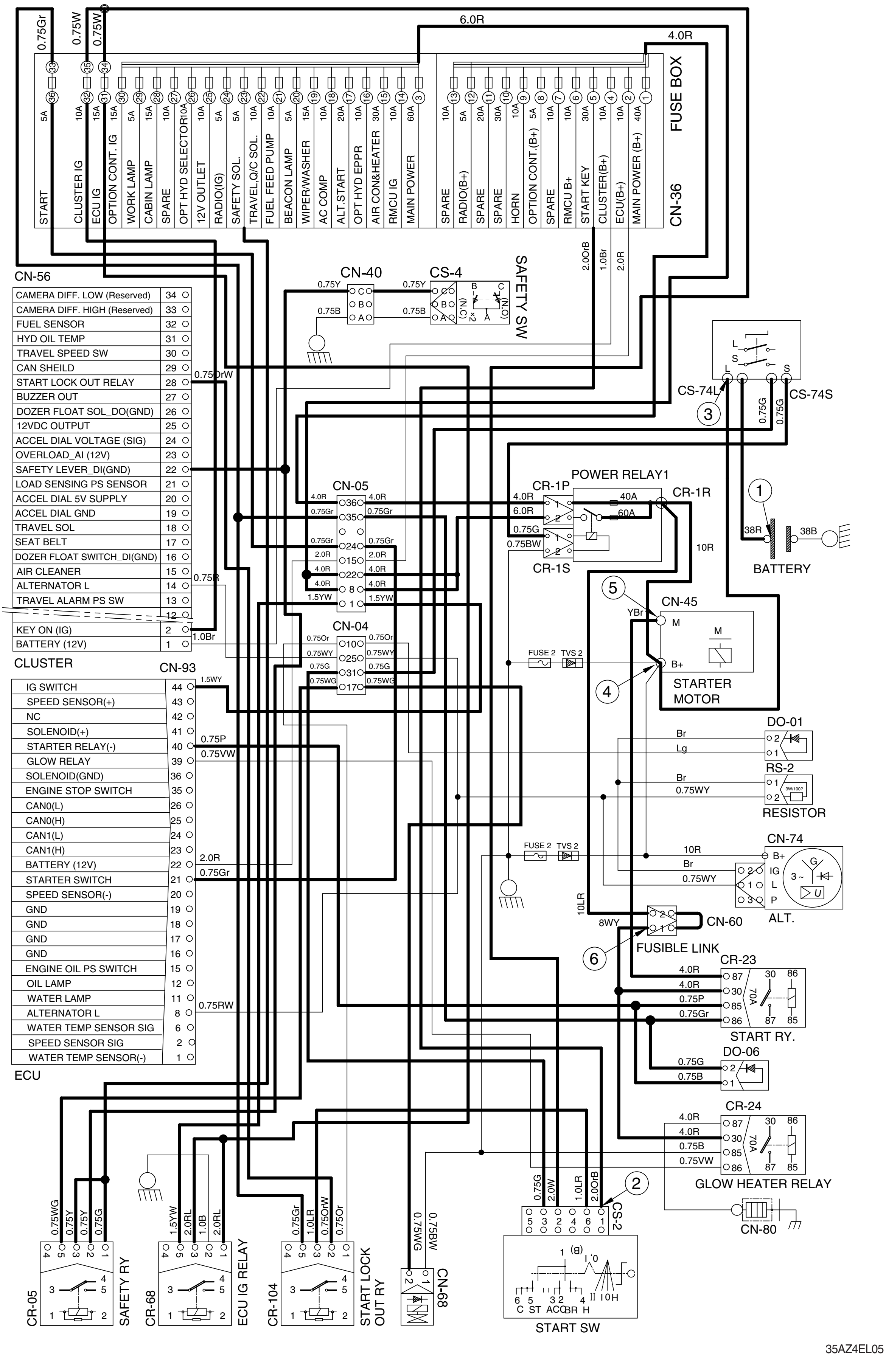
2) CHECK POINT

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 (Fusible link)	10~12.5 V

※ GND : Ground

※ The circuit diagram may differ from the equipment, so please check before a repair.

STARTING CIRCUIT



※ The circuit diagram may differ from the equipment, so please check before a repair.

3. CHARGING CIRCUIT

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

Charging current generated by operating the alternator flows into the battery through the master switch (CS-73).

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 (L)] → I/conn [CN-04 → (25)] → Cluster [CN-56 (14)] → Cluster warning lamp
→ ECU [CN-93 (87)]

(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 (38)] → Fuse box [No.1~13]
→ Power relay 1 [CR-1P (2)] → I/conn [CN-05 (8, 22)] → Fuse box [No.3~30]

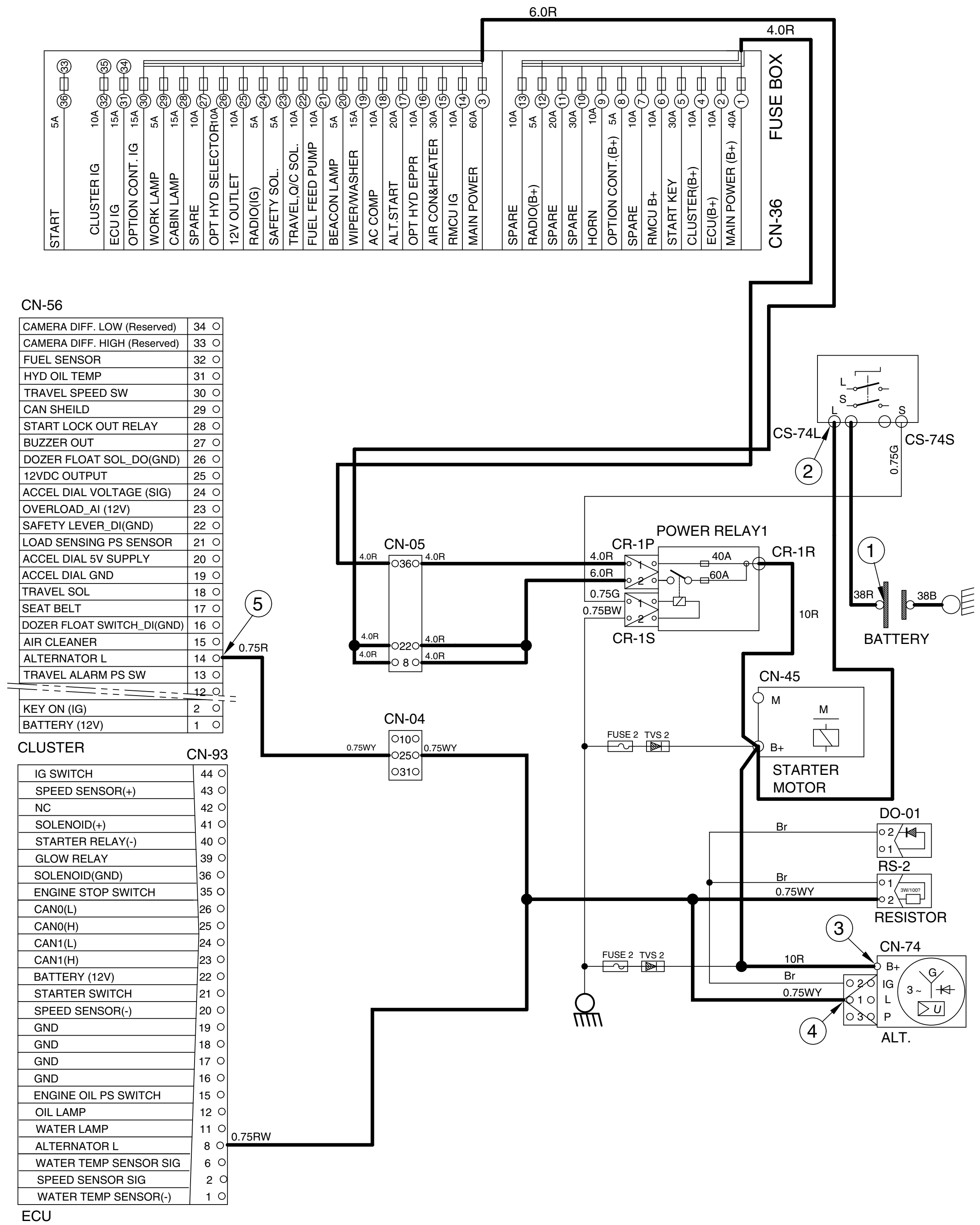
2) CHECK POINT

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

※ The circuit diagram may differ from the equipment, so please check before a repair.

CHARGING CIRCUIT



35AZ4EL06

※ The circuit diagram may differ from the equipment, so please check before a repair.

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-11 (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 switch illumination lamp ON [CS-113 (8)]
- → Aux switch illumination lamp ON [CS-114 (8)]
- → Beacon lamp switch illumination lamp ON [CS-23 (8)]
- → Accel dial illumination lamp [CN-142L (2)]

(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)]

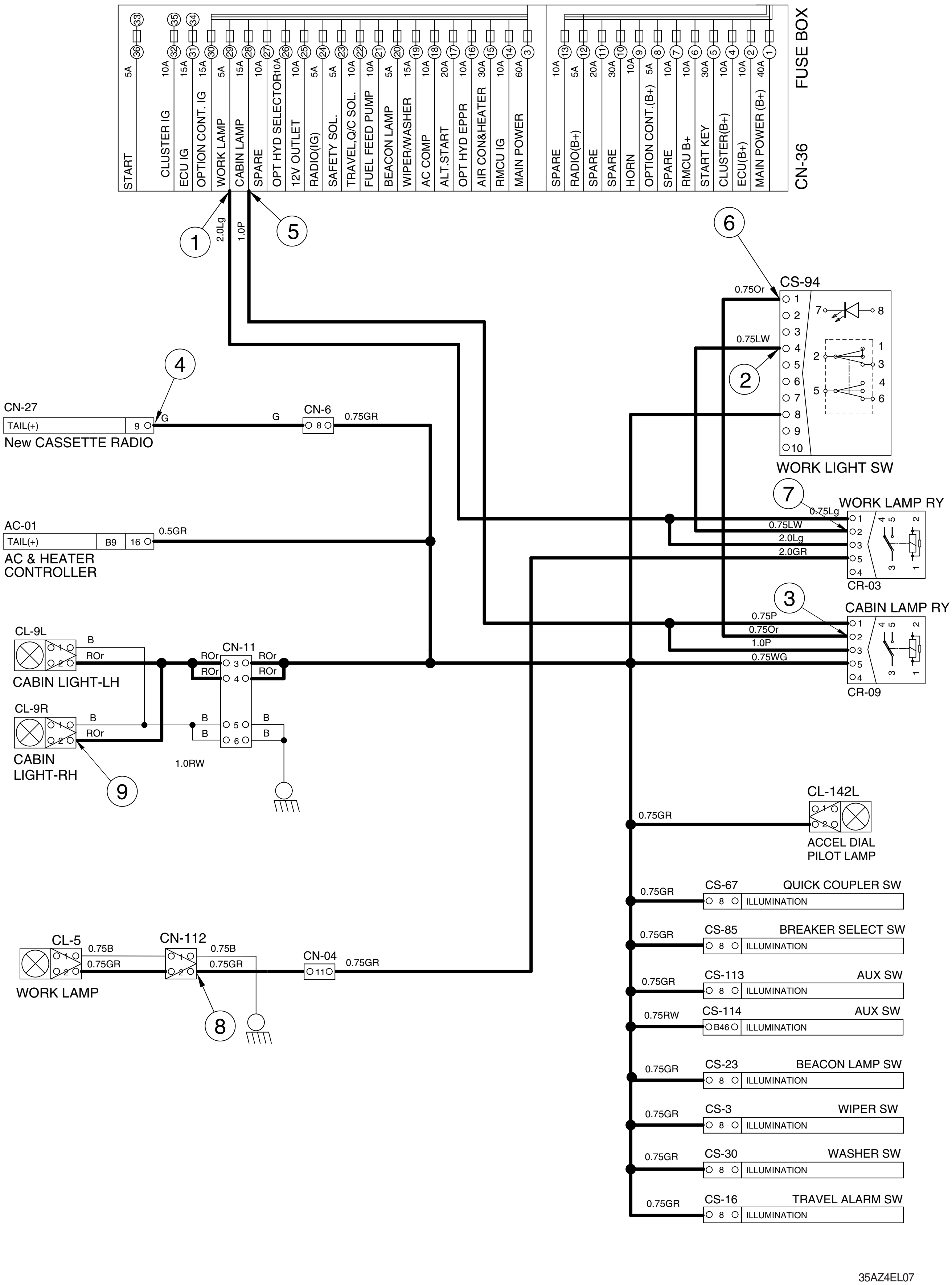
2) CHECK POINT

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

※ The circuit diagram may differ from the equipment, so please check before a repair.

CABIN AND WORK LAMP CIRCUIT



※ The circuit diagram may differ from the equipment, so please check before a repair.

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-6-1 (1)] → Beacon lamp ON [CL-7 (2)]

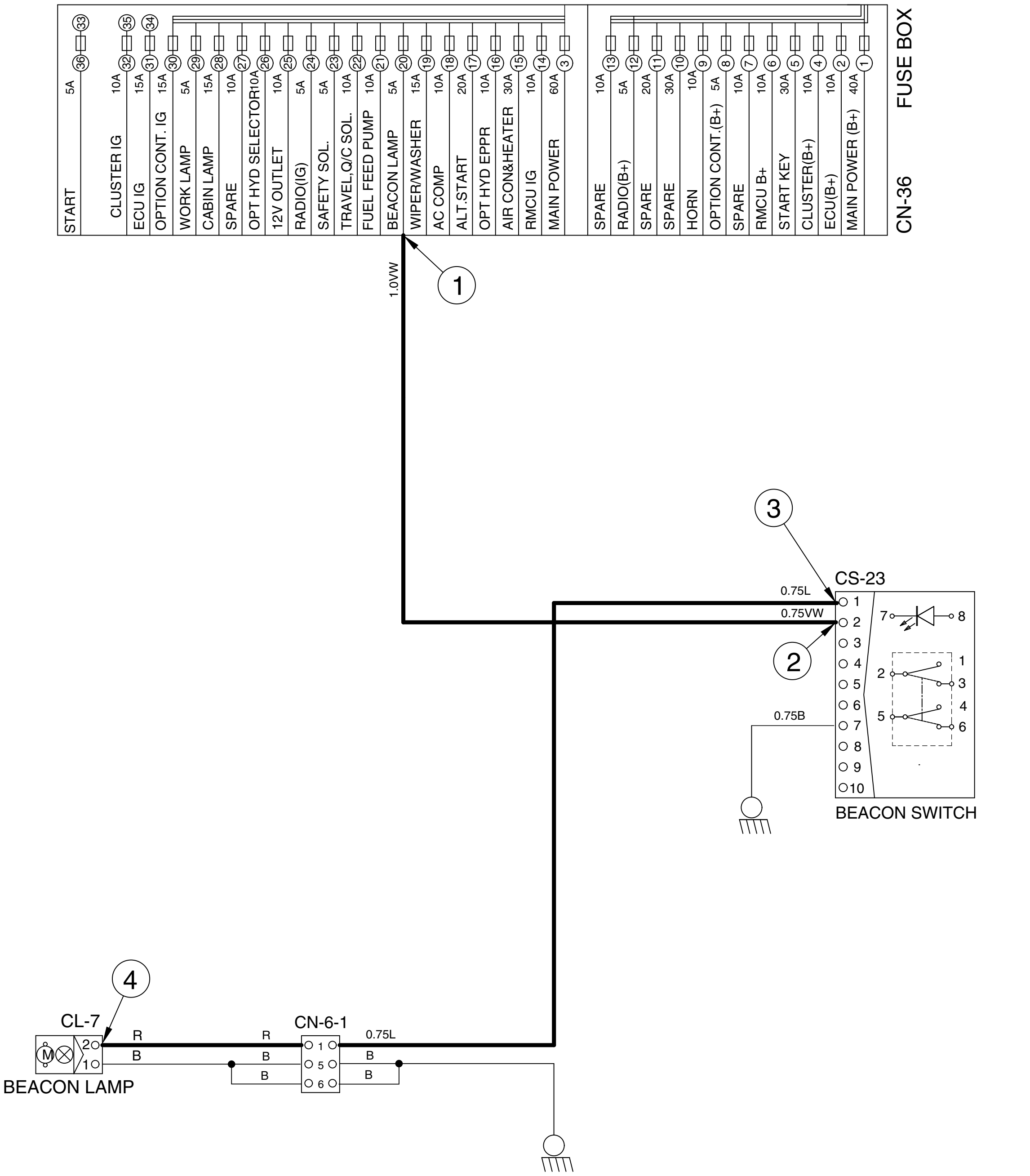
2) CHECK POINT

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

※ The circuit diagram may differ from the equipment, so please check before a repair.

BEACON LAMP CIRCUIT



35AZ4EL08

※ The circuit diagram may differ from the equipment, so please check before a repair.

6. WIPER AND WASHER CIRCUIT

1) OPERATING FLOW

(1) Start switch ON

Fuse box (No.19) → Wiper relay [CR-4 (86, 87)]
→ 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 (85) → (30)] → 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 (85) → (87a)]
→ Wiper motor operating [CN-21 (4)]

Washer switch ON [CS-30 (2)] → I/conn [CN-04 (2)] → Washer pump operating [CN-22 (1)]

(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 (85) → (30)] → I/conn [CN-6 (9)] → Wiper motor [CN-21 (4)]
→ Wiper motor parking position by wiper motor controller

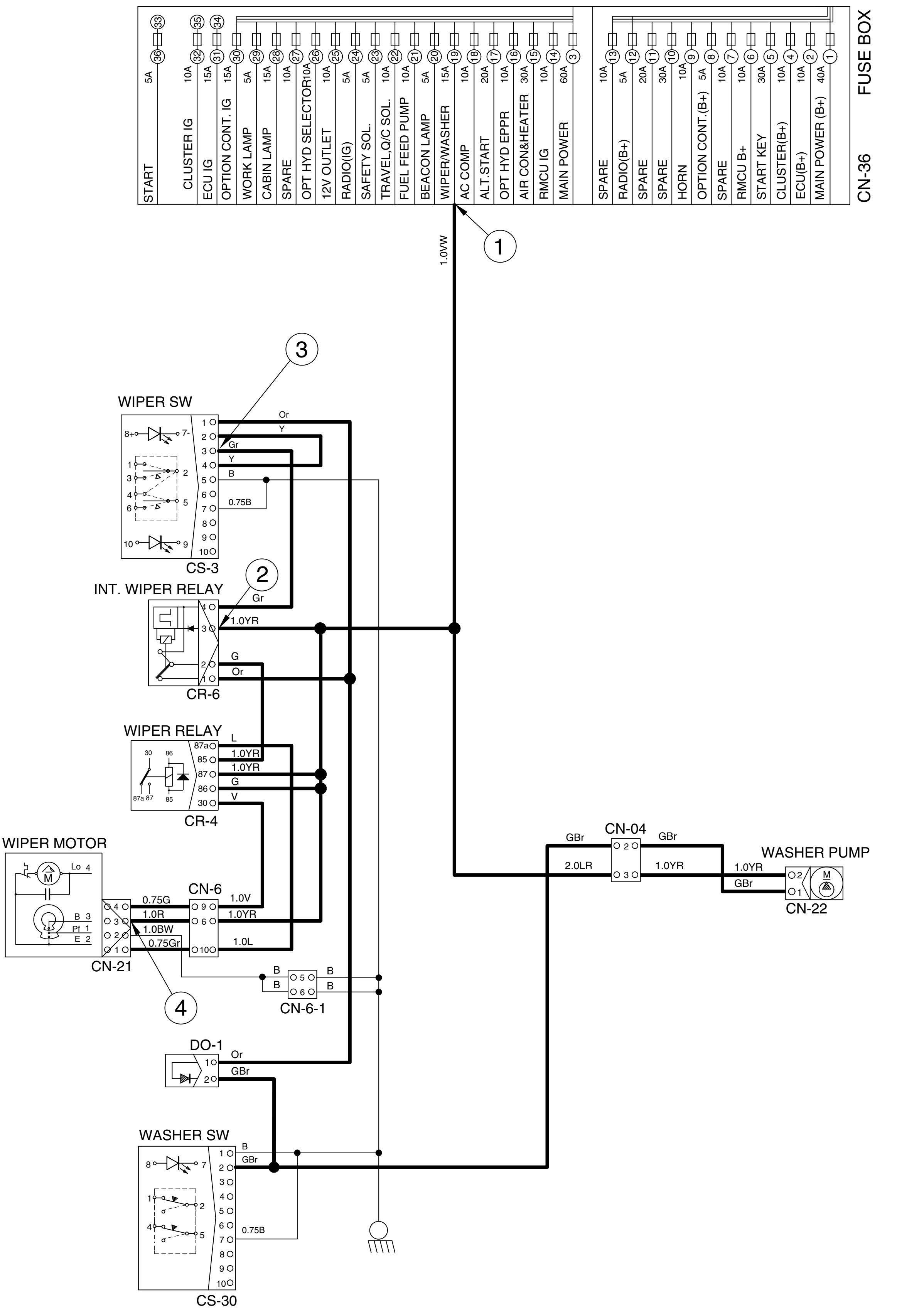
2) CHECK POINT

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

※ GND : Ground

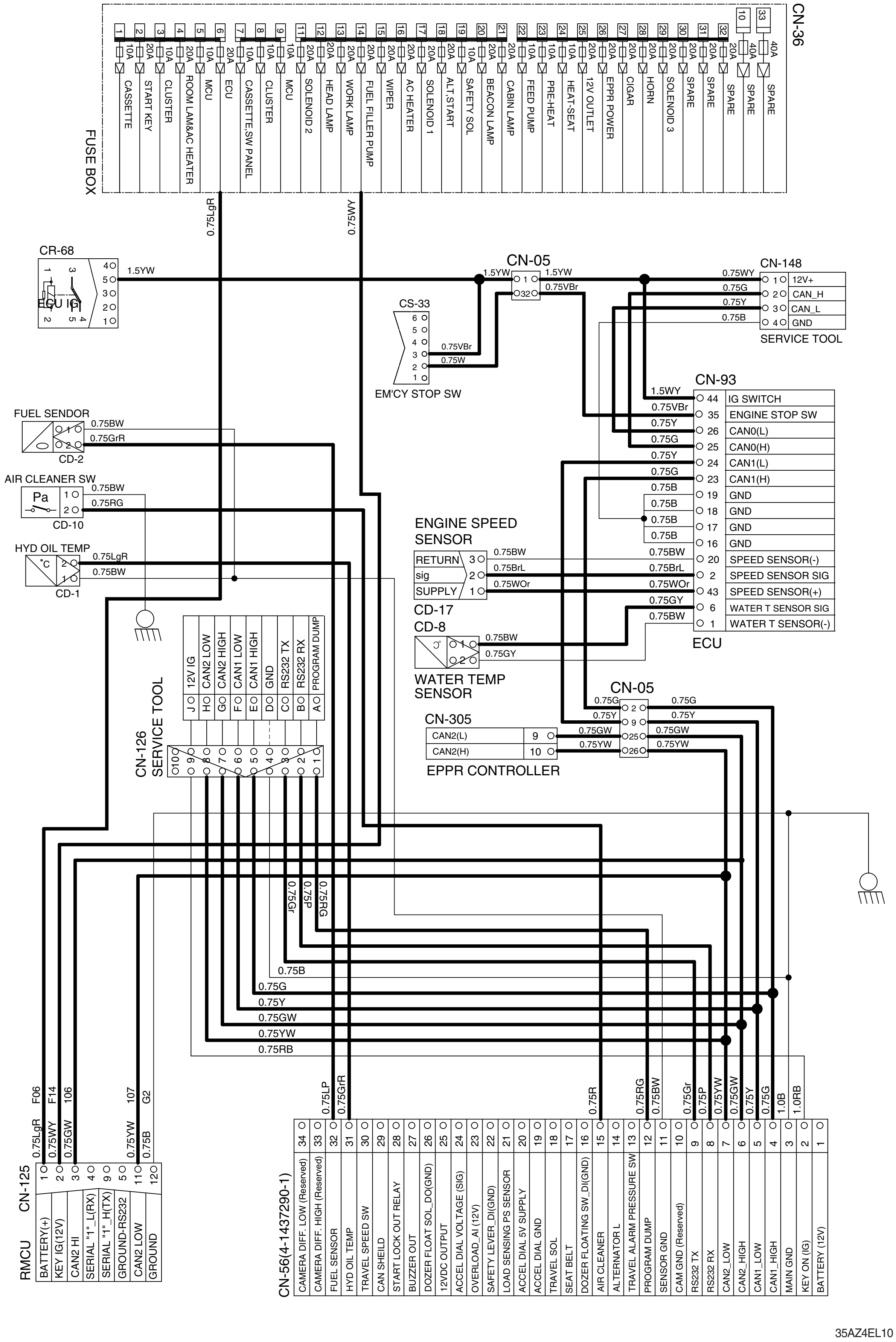
※ The circuit diagram may differ from the equipment, so please check before a repair.

6. WIPER AND WASHER CIRCUIT



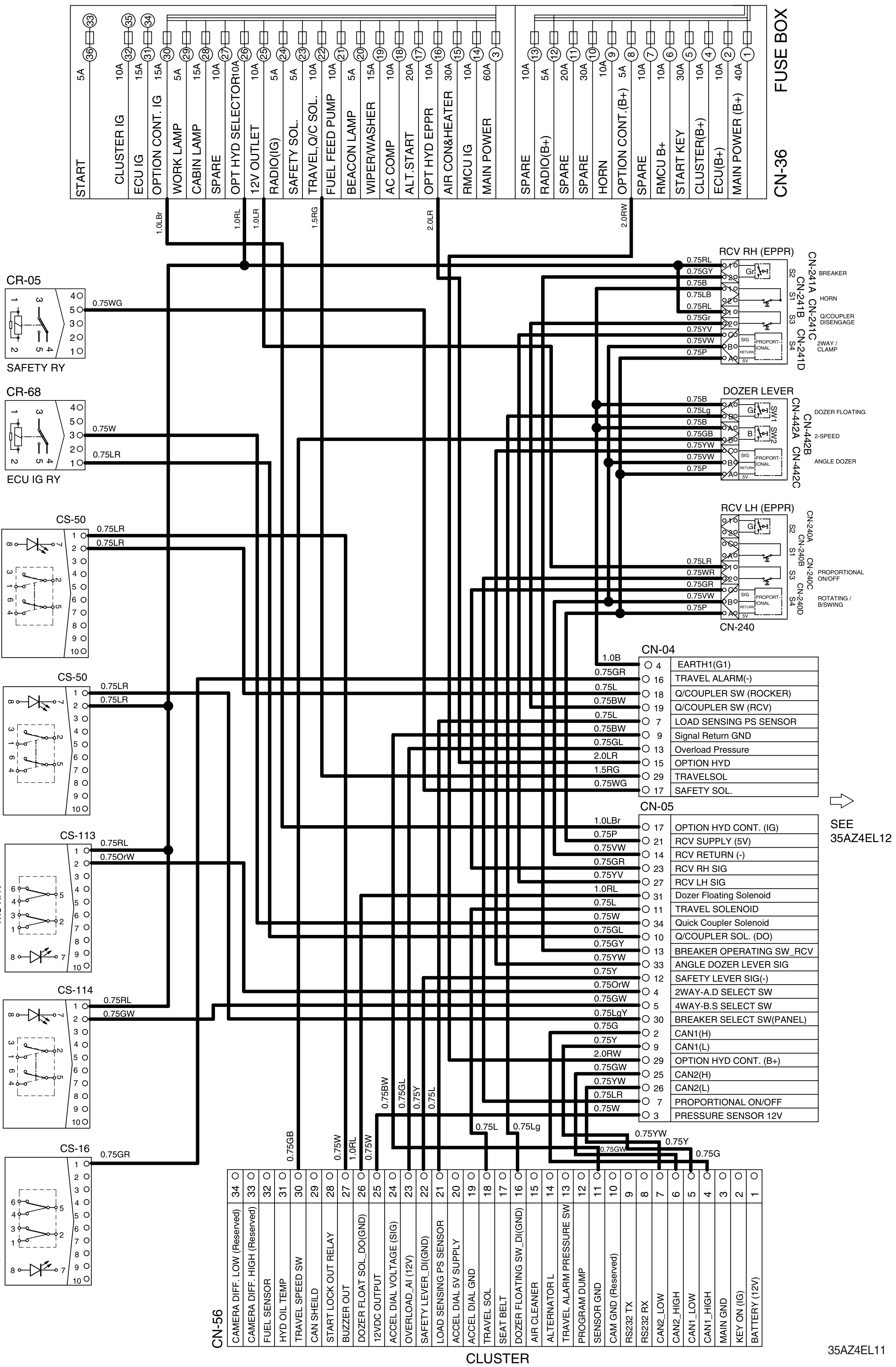
※ The circuit diagram may differ from the equipment, so please check before a repair.

7. MONITORING CIRCUIT



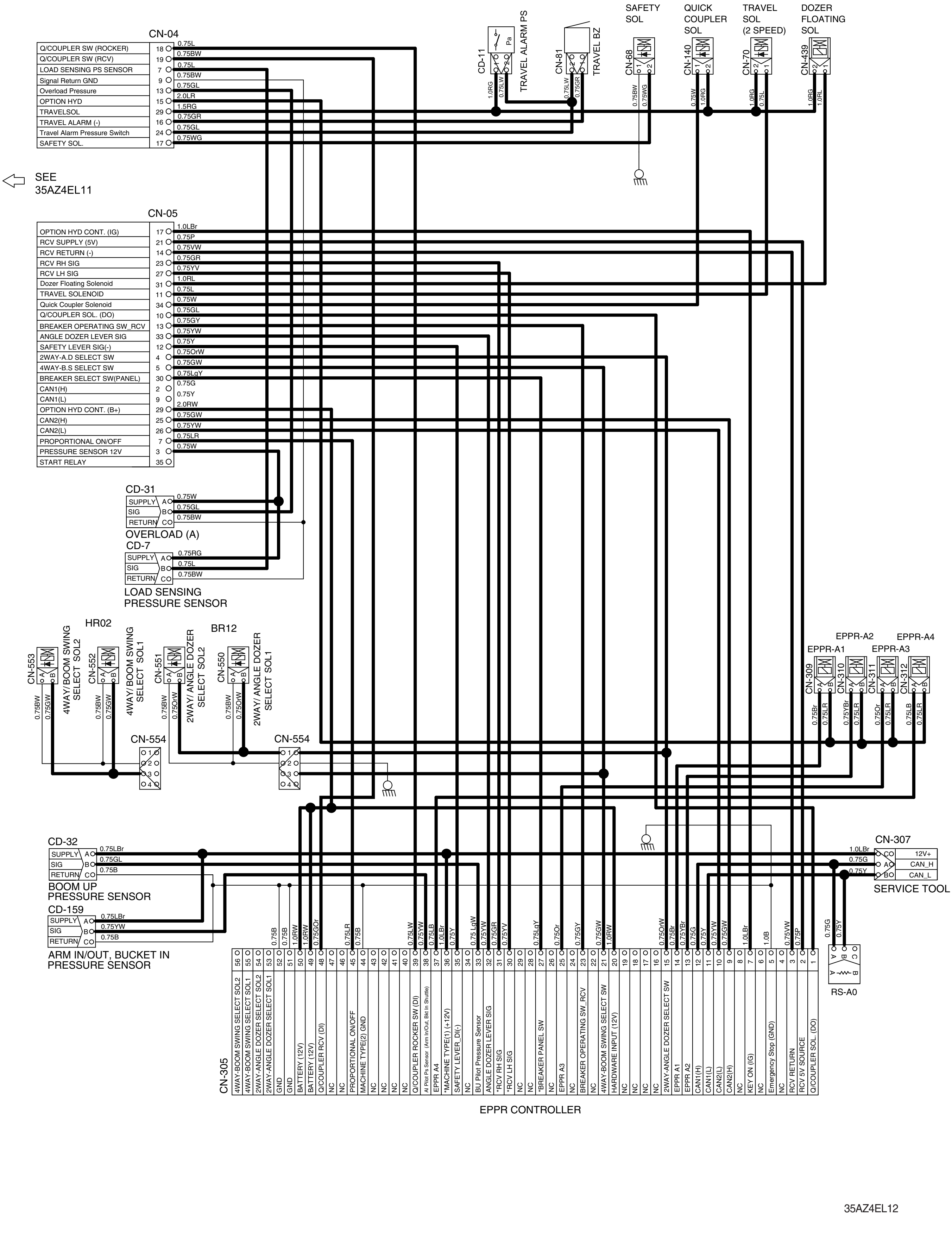
※ The circuit diagram may differ from the equipment, so please check before a repair.

8. ELECTRIC CIRCUIT FOR HYDRAULIC (1/2)



※ The circuit diagram may differ from the equipment, so please check before a repair.

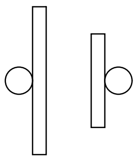
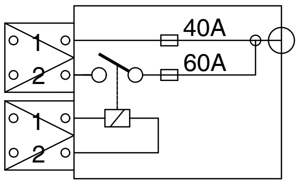
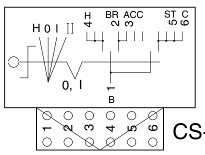
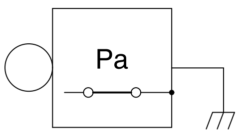
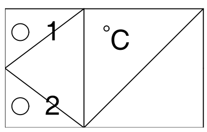
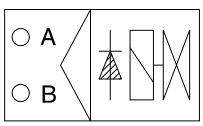
ELECTRIC CIRCUIT FOR HYDRAULIC (2/2)

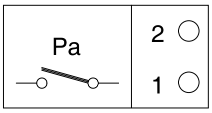
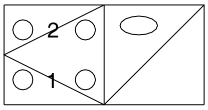
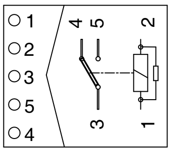
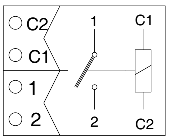
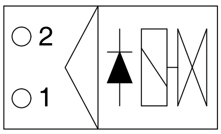
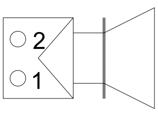


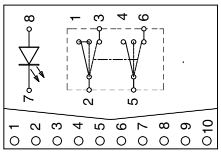
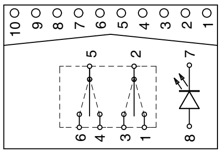
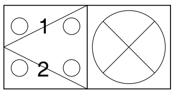
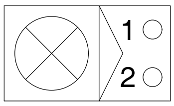
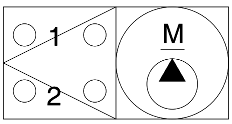
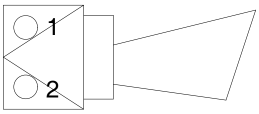
35AZ4EL12

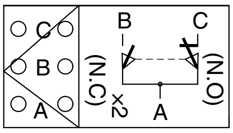
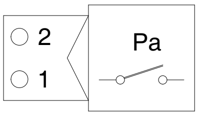
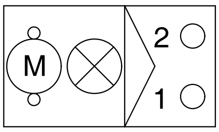
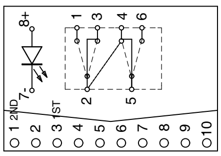
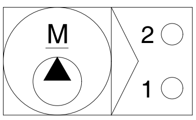
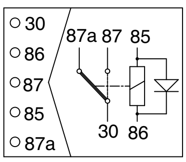
※ The circuit diagram may differ from the equipment, so please check before a repair.

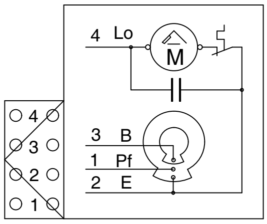
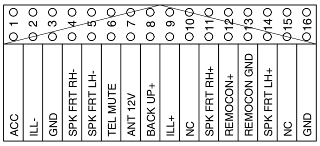
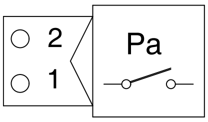
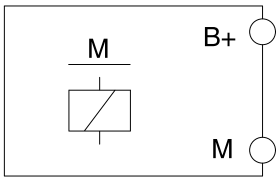
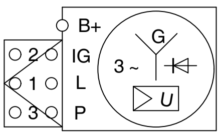
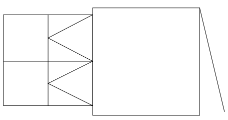
GROUP 4 ELECTRICAL COMPONENT SPECIFICATION

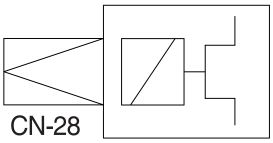
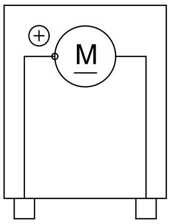
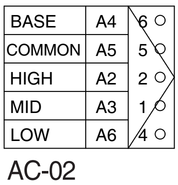
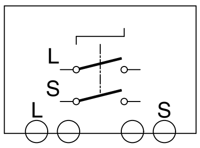
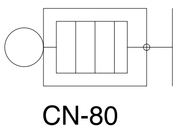
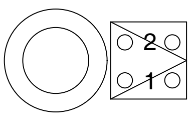
Part name	Symbol	Specification	Check
Battery		12V × 72Ah	※ Check specific gravity 1.280 over : over charged 1.280 ~ 1.250 : normal 1.250 below : recharging
Power relay 1	 CR-1	Rated load : 12V 100A (continuity) 1000A (30 second)	※ Check coil resistance Normal : about 12Ω ※ Check contact Normal : ∞Ω
Start 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 CD-8	0.5 kgf/cm^2 (N.C TYPE)	※ Check resistance 50˚C : 804Ω 80˚C : 310Ω 100˚C : 180Ω
Solenoid valve	 CN-550 CN-551 CN-552 CN-553	12V 1A	※ Check resistance Normal : 15~25Ω(for terminal 1-2)

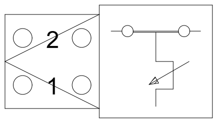
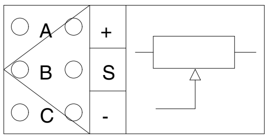
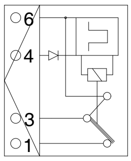
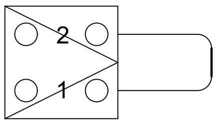
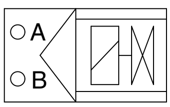
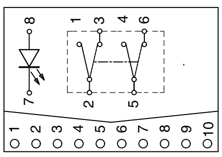
Part name	Symbol	Specification	Check
Air cleaner pressure switch	 CD-10	Pressure: 635mmH$_2$O (N.O TYPE)	※ Check contact Normal : ∞Ω (for terminal 1-2)
Fuel sender	 CD-2	-	※ Check resistance Full : 100Ω Low : 500Ω Empty warning :700Ω
Relay	 CR-02 CR-03 CR-05 CR-09 CR-68 CR-104 CR-111	12V 20A	※ Check 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-121 CN-140 CN-194 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

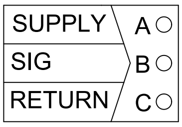
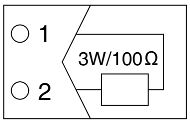
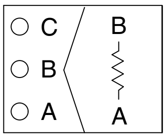
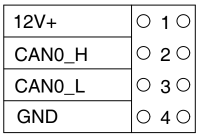
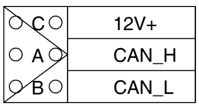
Part name	Symbol	Specification	Check
Work lamp switch	 CS-94	12V 16A	※ Check contact Normal OFF - ∞Ω (for terminal 2-1, 5-4) - 0Ω (for terminal 2-3, 5-6)
Quick clamp switch	 CS-67	12V 16A	※ Check contact Normal OFF - ∞Ω (for terminal 2-3, 5-6)
Lamp	 CL-4 CL-9L CL-9R	12V LED	※ Check disconnection Normal : 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 fewΩ
Wiper switch	 CL-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)
Relay	 CR-4	12V 20A	※Check coil resistance Normal : about 200Ω (for terminal 85-86)

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 1.2kW	※ Check contact Normal : 0.1Ω
Alternator		12V 30A	※ 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)
Blower switch		12V	-
Master switch		12V 1000A	-
Preheater		12V 42A 500W	-
12V socket		12V 120W	-

Part name	Symbol	Specification	Check
Duct sensor		1˚C OFF 4˚C ON	※ Check resistance Normal : 0Ω (for terminal 1-2) the atmosphere temp : over 4˚C
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	 CR-6	12V 12A	-
Fusible link	 CN-60	12V	-
EPPR valve	 CN-309 CN-310 CN-311 CN-312	-	-
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-17 CD-31 CD-32 CD-159	12V	-
Resistor	 RS-1	3W 100Ω	-
Resistor	 RS-A0 RS-A1 RS-A2	3W 120Ω	-
Service tool	 CN-148	-	-
Service tool		-	-

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	174657-2	-
CN-6A	AMP	6	Seat base harness	174264-2	-
CN-6-1	AMP	6	Seat base harness - Cab harness	174264-2	-
CN-11	-	4	Air-con	174257-2	174259-2
CN-16B	AMP	6	Emergency rpm dial connector	174262-2	21NB-10710
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-29	KET	2	Receiver dryer	MG640795	-
CN-36	-	-	Fuse box	21MN-55010	-
CN-37	-	-	Relay box	21HN-55110	-
CN-40	DEUTSCH	3	Safety switch	DT06-3S-EP06	-
CN-45	RING TERM	-	Start motor B+	S820-408000	-
CN-45M	YAZAKI	1	Start motor M	7323-2115	-
CN-56	AMP	34	Cluster	4-1437290-0	-
CN-60	KET	2	Fusible link	MG610557	-
CN-68	DEUTSCH	2	Safety solenoid	DT06-2S-EP06	-
CN-70	DEUTSCH	2	Travel solenoid	DT06-2S-EP06	-
CN-74	SUMTOMO	3	Alternator	6189-0443	-
CN-74	RING TERM	-	Alternator B+	S820-306000	-
CN-80	RING TERM	-	Glow plug	S820-304000	-
CN-81	KET	2	Buzzer	MG610320	-
CN-93	TYCO	44	ECU	1376886-1	-
CN-100	KET	1	ECU earth	MG640944-5	-
CN-112	DEUTSCH	2	Main harness-Boom harness	DT6-2S-EP06	DT04-2P
CN-113	KET	6	Buzzer	MG614354	-
CN-125	DEUTSCH	12	RMCU	DT06-12S	-
CN-126	DEUTSCH	9	Service tool	-	HD10-9-96P
CN-126	AMP	10	Service tool	-	S816-110002

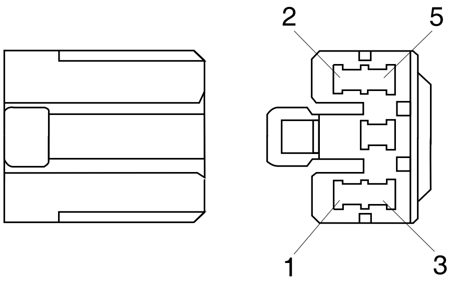
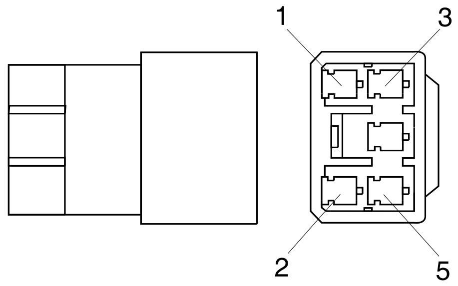
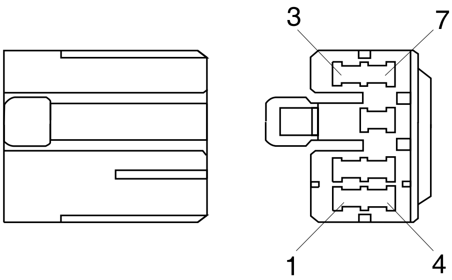
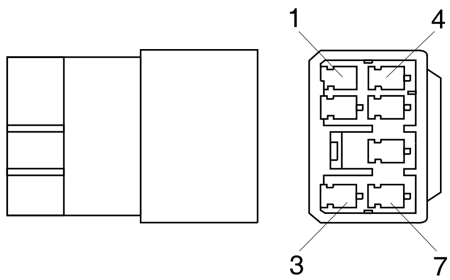
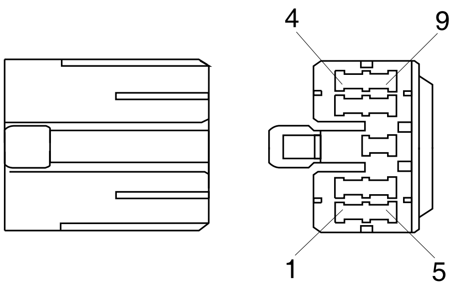
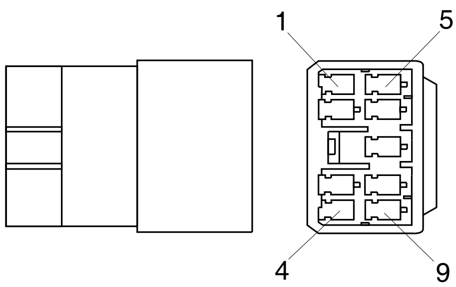
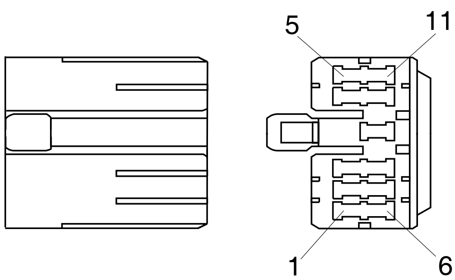
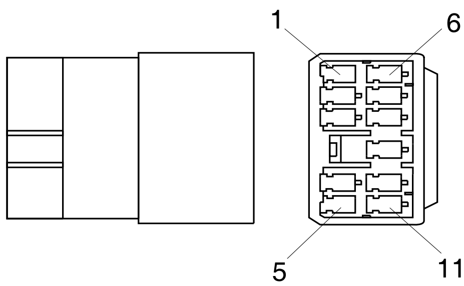
Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-126	AMP	10	Service tool	174655-2	-
CN-139	AMP	2	Power socket	172434-2	-
CN-140	DEUTSCH	2	Quick coupler solenoid	DT06-2S-EP06	DT04-2P-E005
CN-142	DEUTSCH	3	Accel dial	DT06-3S-EP06	-
CN-142L	AMP	2	Accel dial pilot lamp	174352-2	-
CN-145	YAZAKI	2	Fuel feed pump	7123-6423-30	-
CN-148	TYCO	4	Sevice tool	174257-2	174259-2
CN-194	SUMITOMO	2	Engine actuator solenoid	6189-0249	-
CN-554	DEUTSCH	4	Main harness-opt harness	DT06-4S-EP06	DT04-4P-E005
CN-240C	-	-	Proportional ON/OFF	-	CA104
CN-240D	DEUTSCH	3	LH RCV EPPR	DT06-3S-EP06	-
CN-241A	DEUTSCH	2	Breaker sw	DT06-2S-E005	-
CN-241B	DEUTSCH	2	Horn sw	-	DT04-2P-E005
CN-241C	DEUTSCH	3	EPPR sw	DT06-3S-EP06	-
CN-305	REXROTH	56	EPPR controller	1-928-405-217	-
CN-307	DEUTSCH	3	EPPR service tool	DT06-3S-E005	DT04-3P-E005
CN-309	DEUTSCH	2	EPPR-A1	DT06-2S-EP06	DT04-2P-E005
CN-310	DEUTSCH	2	EPPR-A2	DT06-2S-EP06	DT04-2P-E005
CN-311	DEUTSCH	2	EPPR-A3	DT06-2S-EP06	DT04-2P-E005
CN-312	DEUTSCH	2	EPPR-A4	DT06-2S-EP06	DT04-2P-E005
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-E005	-
CN-442B	DEUTSCH	2	2-speed sw	-	DT04-2P-E005
CN-442C	DEUTSCH	3	Dozer floating	DT06-3S-EP06	DT04-3P
CN-442D	-	1	GND	CB104	-
CN-550	DEUTSCH	2	Option solenoid 1	DT06-2S-EP06	-
CN-551	DEUTSCH	2	Option solenoid 2	DT06-2S-EP06	-
CN-552	DEUTSCH	2	Option solenoid 1	DT06-2S-EP06	-
CN-553	DEUTSCH	2	Option solenoid 2	DT06-2S-EP06	-
CN-554	DEUTSCH	2	AVCU-Main harness	-	DT04-4P-E005
CN-554	DEUTSCH	4	Main harness-opt harness	DT06-4S-EP06	DT04-4P-E005
AC-01	KET	16	HAVC controller	MG655666	-
AC-02	KET	6	Brower switch	MG610049	-
AC-04	KET	18	HAVC unit	936204-1	-

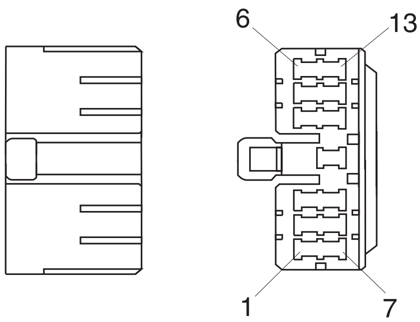
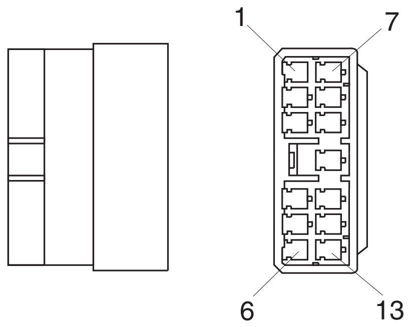
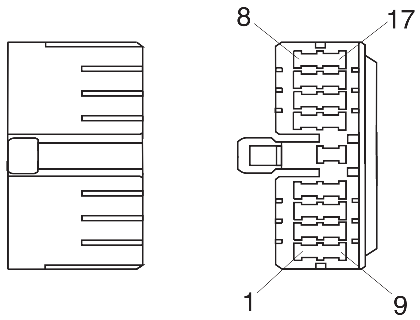
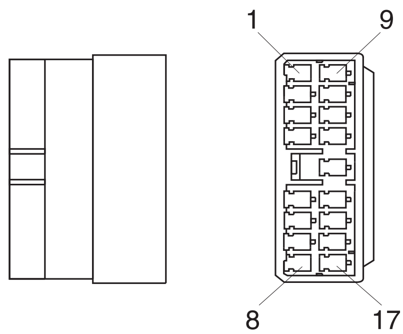
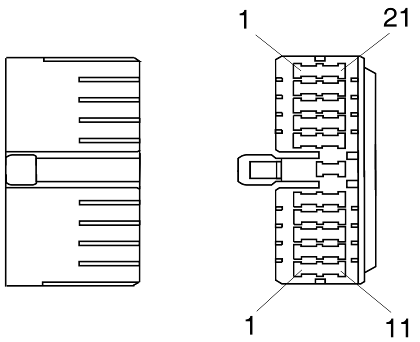
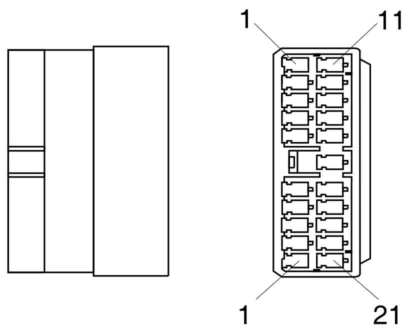
Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
· LAMP					
CL-1	KET	2	Room lamp	MG610392	-
CL-5	-	2	Work lamp	DT06-2S	-
CL-7	DEUTSCH	2	Beacon lamp	-	DT04-2P-E005
CL-9L	DEUTSCH	2	Work lamp - LH	DT06-2S-EP06	DT04-2P-E005
CL-9R	DEUTSCH	2	Work lamp - RH	DT06-2S-EP06	DT04-2P-E005
· RELAY					
CR-1R	RING TERM	2	Power relay 1	S820-106000	-
CR-1P	-	2	Power relay 1	32004A2	-
CR-1S	-	2	Power relay 1	282080-1	-
CR-04	-	5	Wiper motor relay	VCFM-1002	-
CR-06	KET	6	Wiper int relay	MG610049	-
CR-23	KET	4	Start relay	MG612017-5	-
CR-24	KET	4	Air heater relay	MG612017-5	-
· SENSOR					
CD-1	AMP	2	Hydraulic temp sender	85202-1	-
CD-2	DEUTSCH	2	Fuel sender	DT06-2S-E006	-
CD-7	DEUTSCH	3	Pressure sensor	DT06-3S-E006	-
CD-8	SUMITOMO	2	Water temperature sensor	6189-0552	-
CD-10	AMP	2	Air cleaner switch	85202-1	-
CD-11	KET	2	Travel pressure switch	MG640795	-
CD-17	YAZAKI	3	Engine speed sensor	7283-8732-40	-
CD-18	RING TERM	-	Engine oil pressure switch	S820-106000	-
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/out, bucket in ps sensor	DT06-3S-E006	DT04-3P-E005
DO-01	-	2	Diode	21EA-50550	-
DO-02	-	2	Diode	174352-2	-
DO-03	-	2	Diode	174352-2	-
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	-	3	Safety switch	-	-
CS-16	CARLING	10	Travel alarm switch	21NH-56300	-

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
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	S820-106000	-
CS-74S	RING TERM	-	Master switch S	S820-608000	-
CS-85	CARLING	10	Breaker select switch	21HN-56300	-
CS-94	CARLING	10	Work lamp 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	-

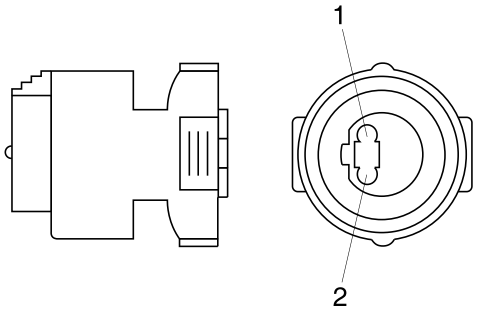
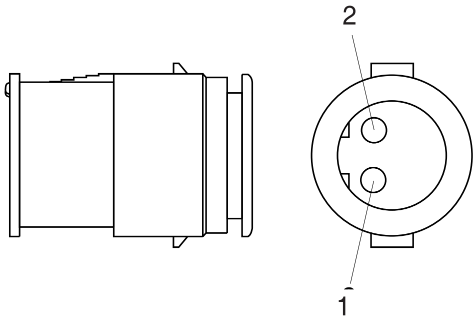
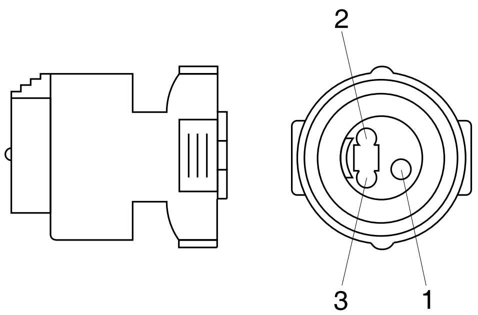
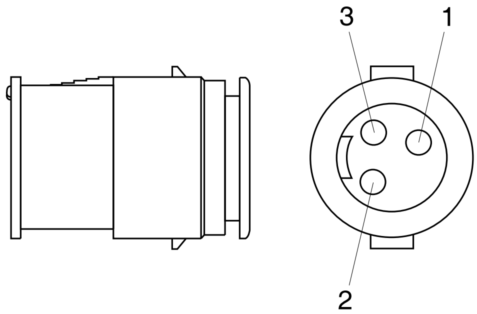
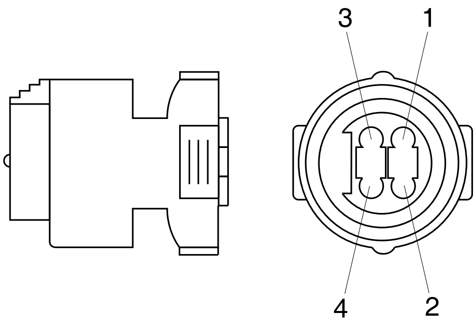
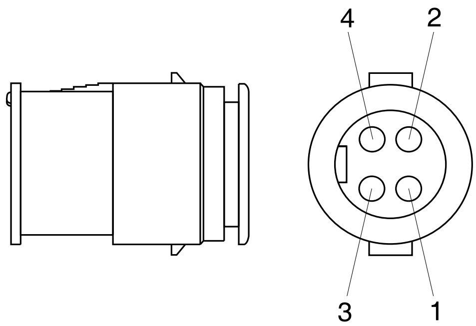
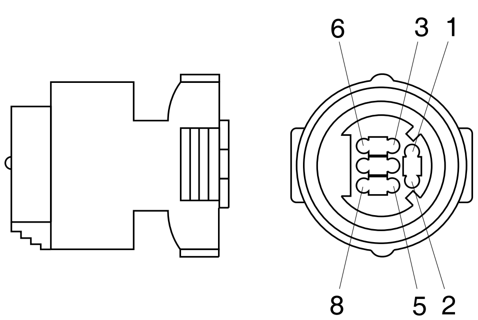
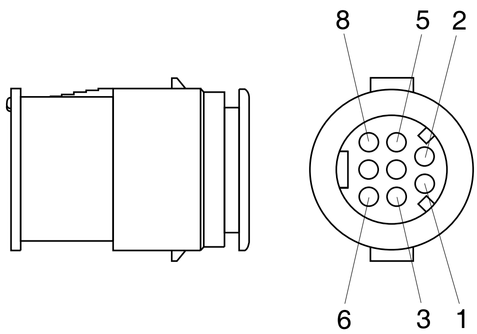
2. CONNECTION TABLE FOR CONNECTORS

1) PA TYPE CONNECTOR

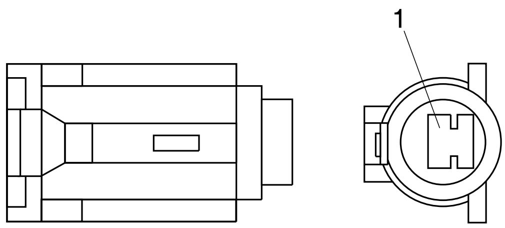
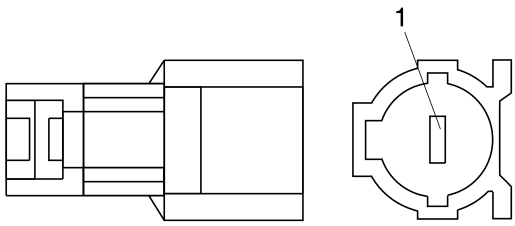
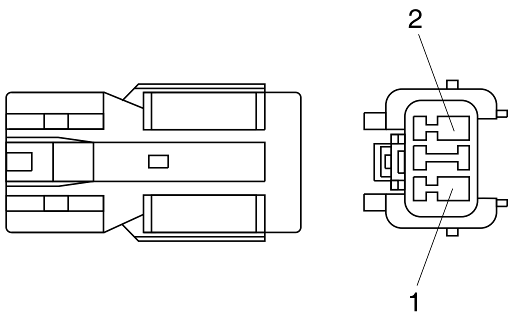
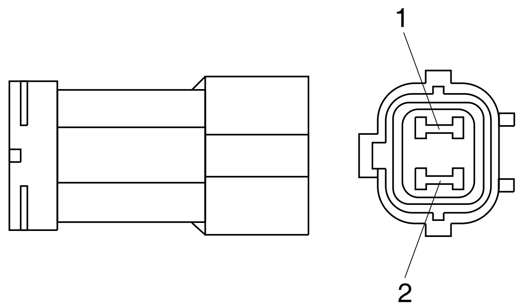
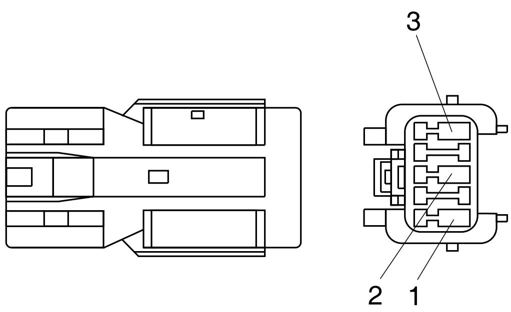
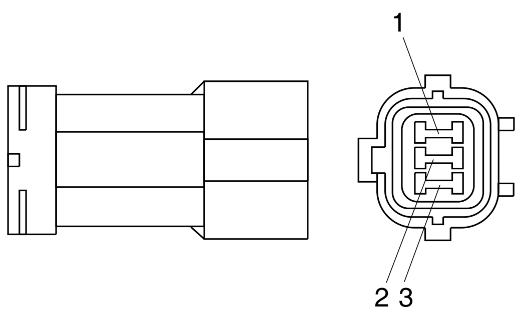
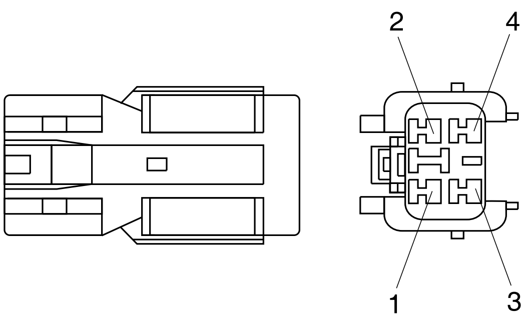
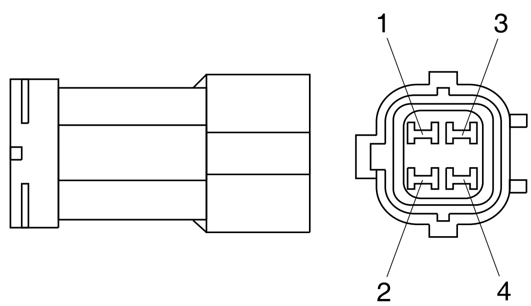
No. of pin	Receptacle connector (female)	Plug connector (male)
5	 S811-005002	 S811-105002
7	 S811-007002	 S811-107002
9	 S811-009002	 3S811-109002
11	 S811-011002	 S811-111002

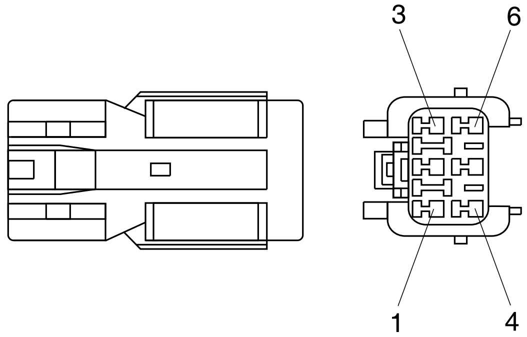
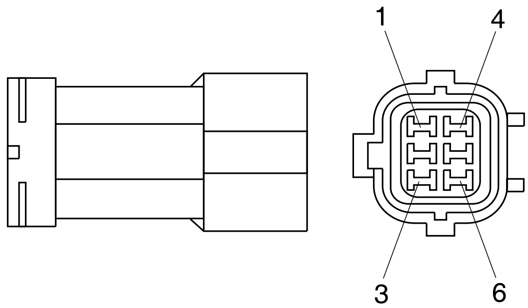
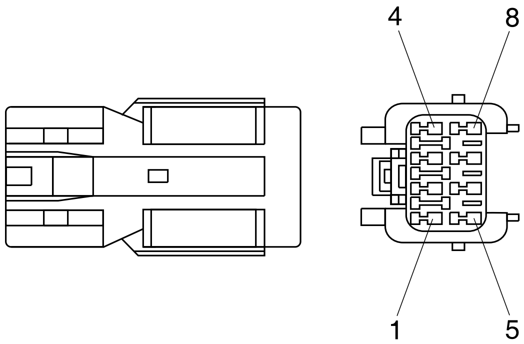
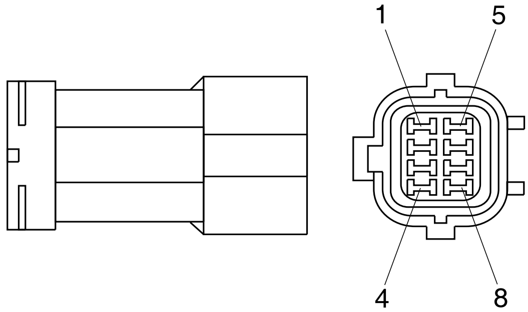
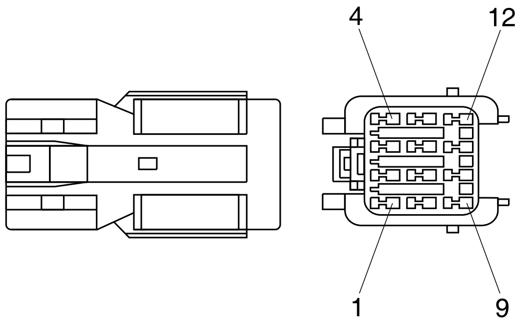
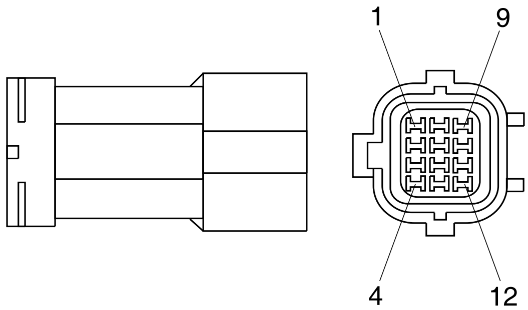
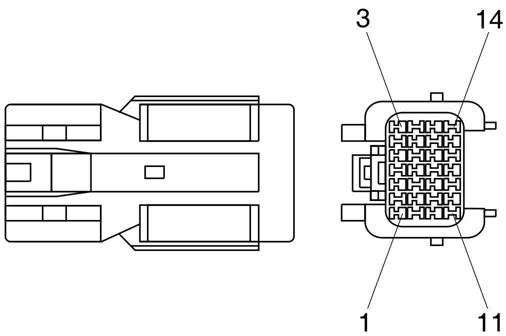
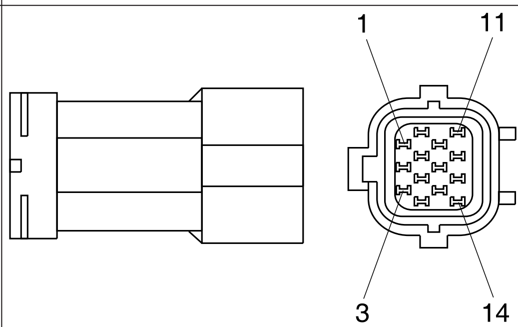
No. of pin	Receptacle connector (female)	Plug connector (male)
13	 S811-013002	 S811-113002
17	 S811-017002	 S811-117002
21	 S811-021002	 S811-121002

2) J TYPE CONNECTOR

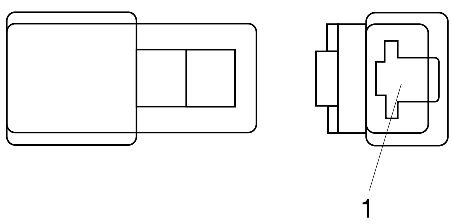
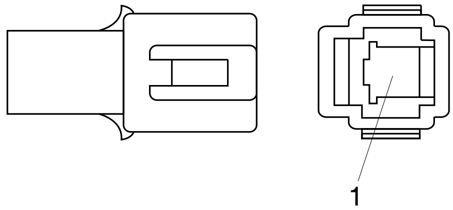
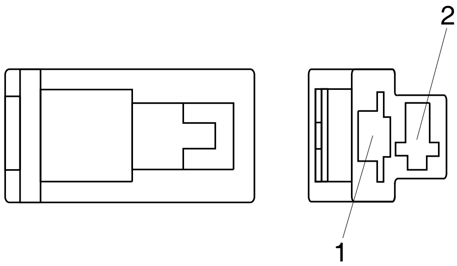
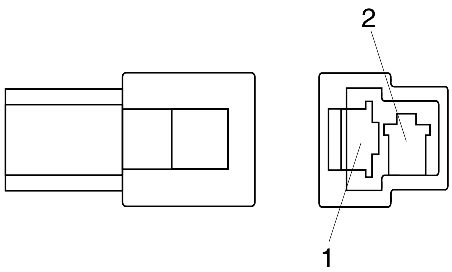
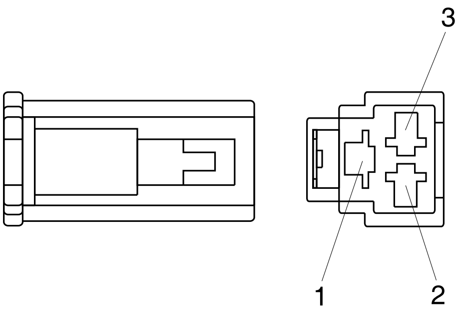
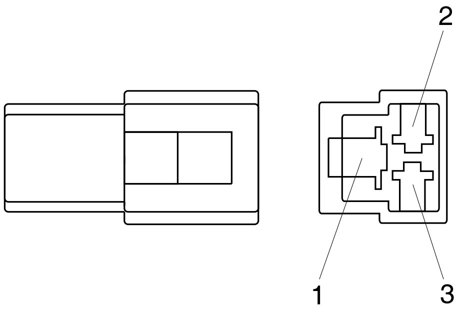
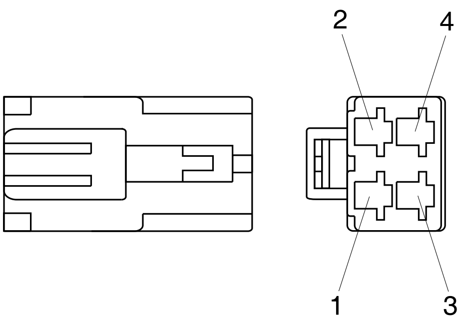
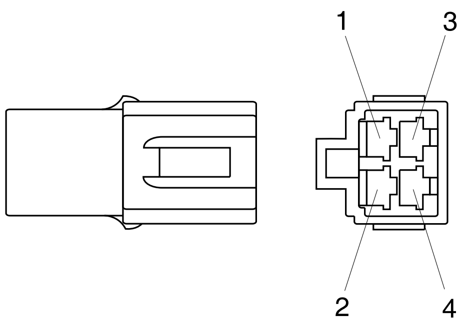
No. of pin	Receptacle connector (female)	Plug connector (male)
2	 S816-002001	 S816-102001
3	 S816-003001	 S816-103001
4	 S816-004001	 S816-104001
8	 S816-008001	 S816-108001

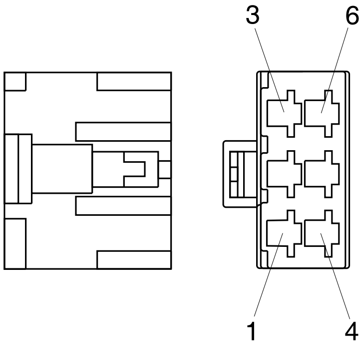
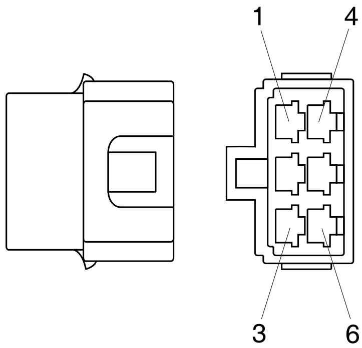
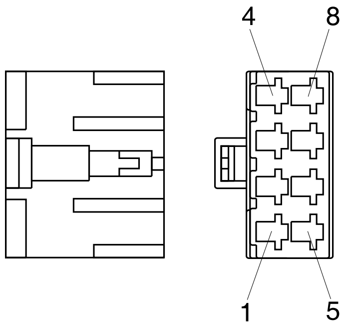
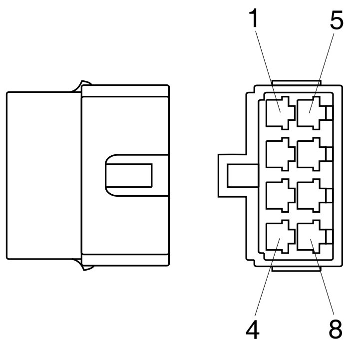
3) SWP TYPE CONNECTOR

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

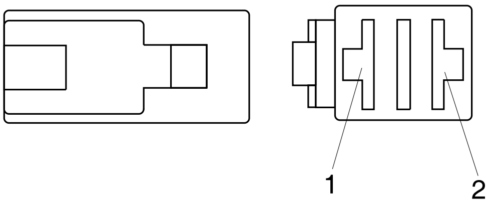
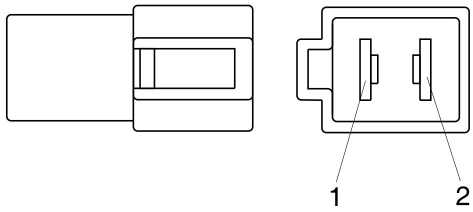
No. of pin	Receptacle connector (female)	Plug connector (male)
6	 S814-006000	 S814-106000
8	 S814-008000	 S814-108000
12	 S814-012000	 S814-112000
14	 S814-014000	 S814-114000

4) CN TYPE CONNECTOR

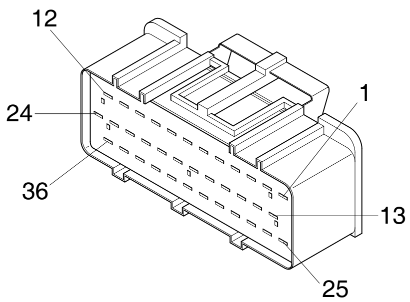
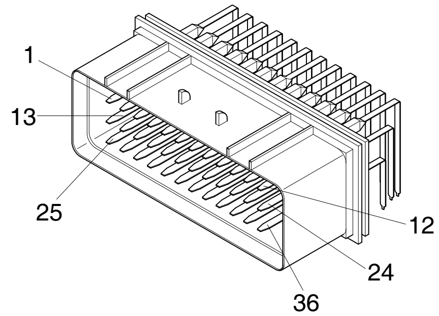
No. of pin	Receptacle connector (female)	Plug connector (male)
1	 S810-001202	 S810-101202
2	 S810-002202	 S810-102202
3	 S810-003202	 S810-103202
4	 S810-004202	 S810-104202

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 S810-006202	 S810-106202
8	 S810-008202	 S810-108202

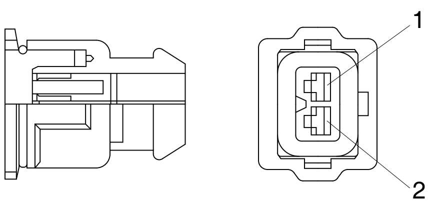
5) 375 FASTEN TYPE CONNECTOR

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

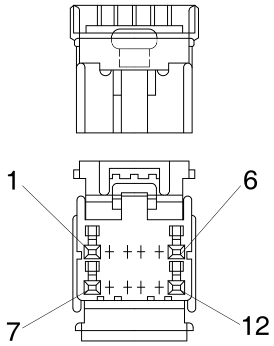
6) AMP ECONOSEAL CONNECTOR

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

<table>
<tr><th>No. of pin</th><th>Receptacle connector (female)</th><th>Plug connector (male)</th></tr>
<tr><td>12</td><td>174045-2</td><td></td></tr>
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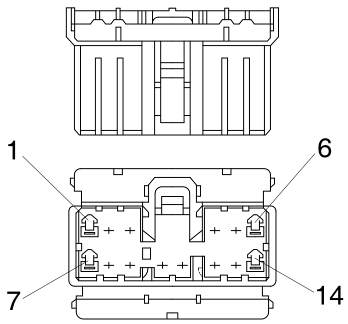
9) AMP 070 MULTILOCK CONNECTOR

<table>
<tr><th>No. of pin</th><th>Receptacle connector (female)</th><th>Plug connector (male)</th></tr>
<tr><td>14</td><td>173852</td><td></td></tr>
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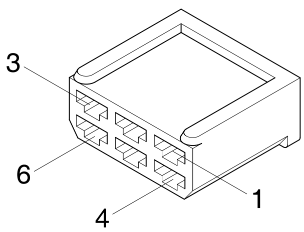
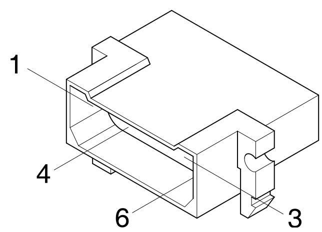
10) AMP FASTIN - FASTON CONNECTOR

<table>
<tr><th>No. of pin</th><th>Receptacle connector (female)</th><th>Plug connector (male)</th></tr>
<tr><td>6</td><td>925276-0</td><td>480003-9</td></tr>
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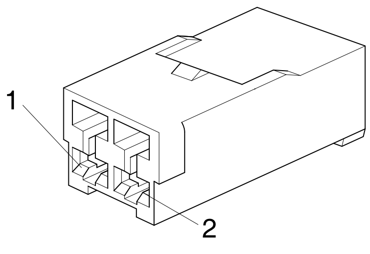
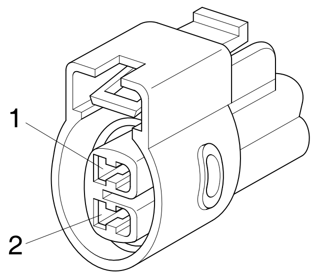
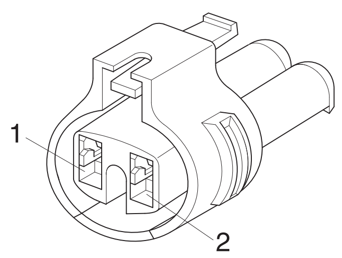
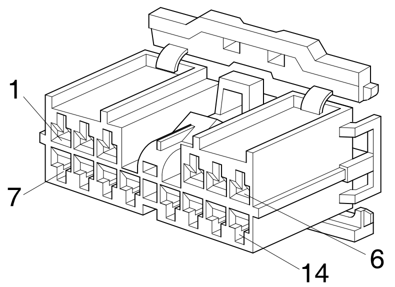
11) KET 090 CONNECTOR

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	

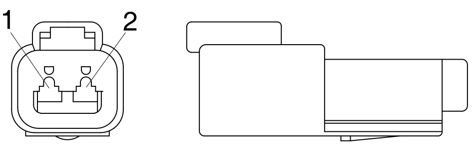
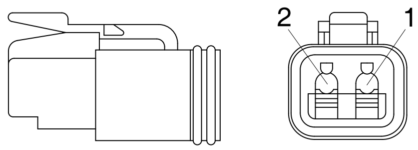
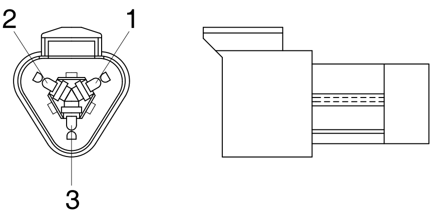
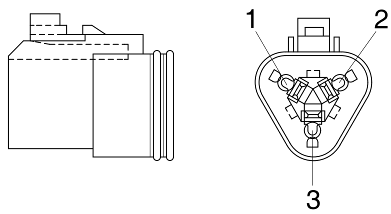
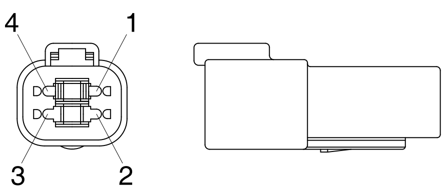
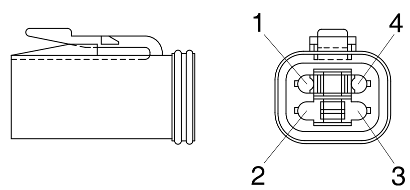
14) DEUTSCH DT CONNECTORS

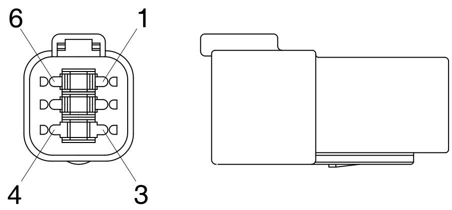
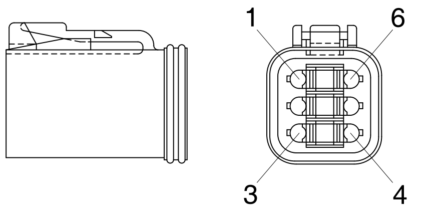
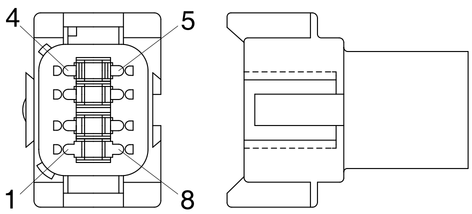
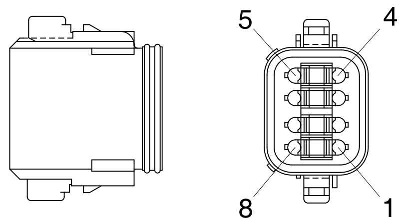
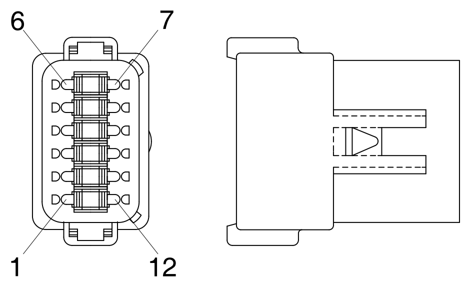
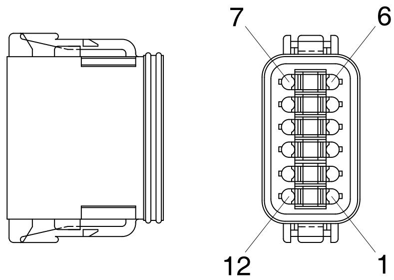
DT 06 - 3S - ★★★★

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

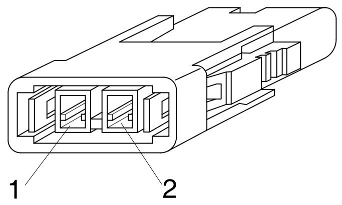
※ Modification

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

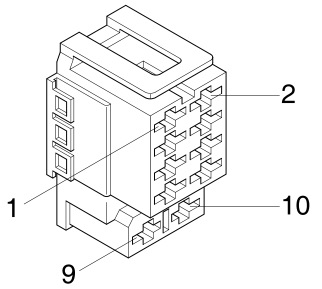
No. of pin	Receptacle connector (female)	Plug connector (male)
2	 DT06-2S	 DT04-2P
3	 DT06-3S	 DT04-3P
4	 DT06-4S	 DT04-4P

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 DT06-6S	 DT04-6P
8	 DT06-8S	 DT04-8P
12	 DT06-12S	 DT04-12P

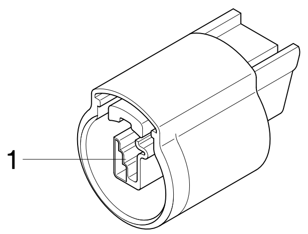
15) MOLEX 2CKTS CONNECTOR

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

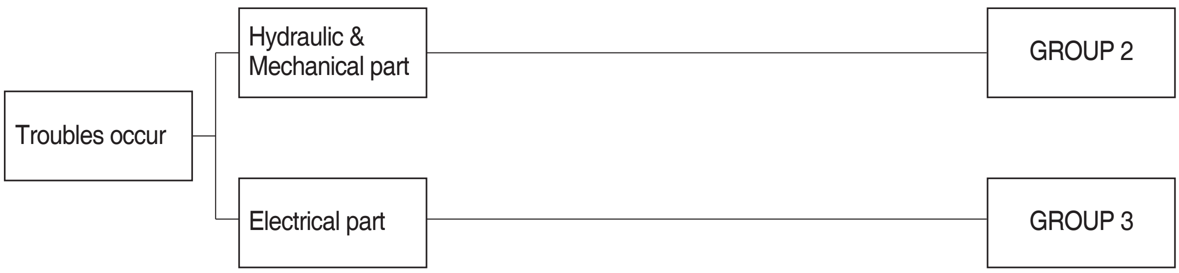
GROUP 1 BEFORE TROUBLESHOOTING

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.

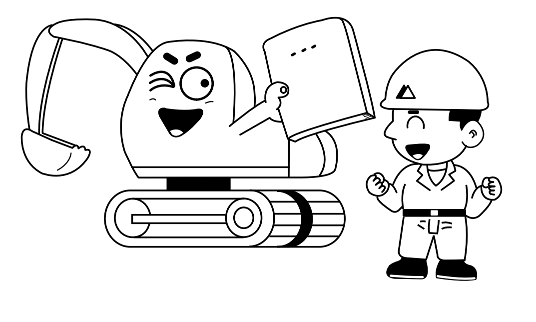


2. DIAGNOSING PROCEDURE

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.

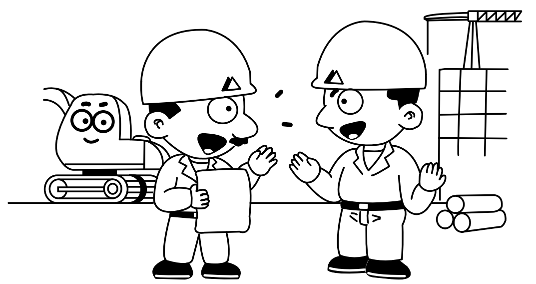


13031SH02

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.

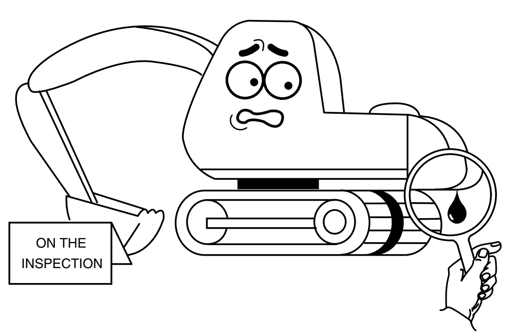


13031SH03

STEP 3. Inspect the machine

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

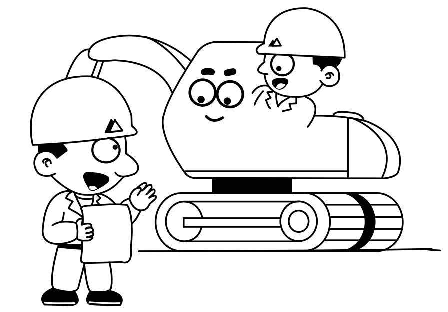
And also check the electrical system including batteries, as the troubles in the electrical system such as low battery voltage, loose connections and blown out fuses will result in malfunction of the controllers causing total operational failures of the machine.



6-2(3) 140-7

STEP 4. Inspect the trouble actually on the machine

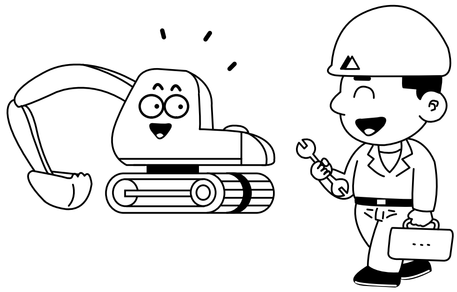
In case that some trouble cannot be confirmed, obtain the details of the malfunction from the operator.
Also, check if there are any in complete connections of the wire harnesses are or not.



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.

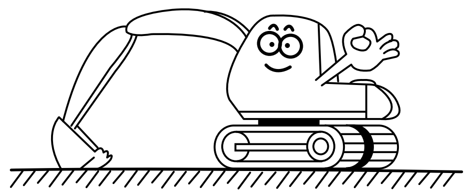


13031SH05

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.

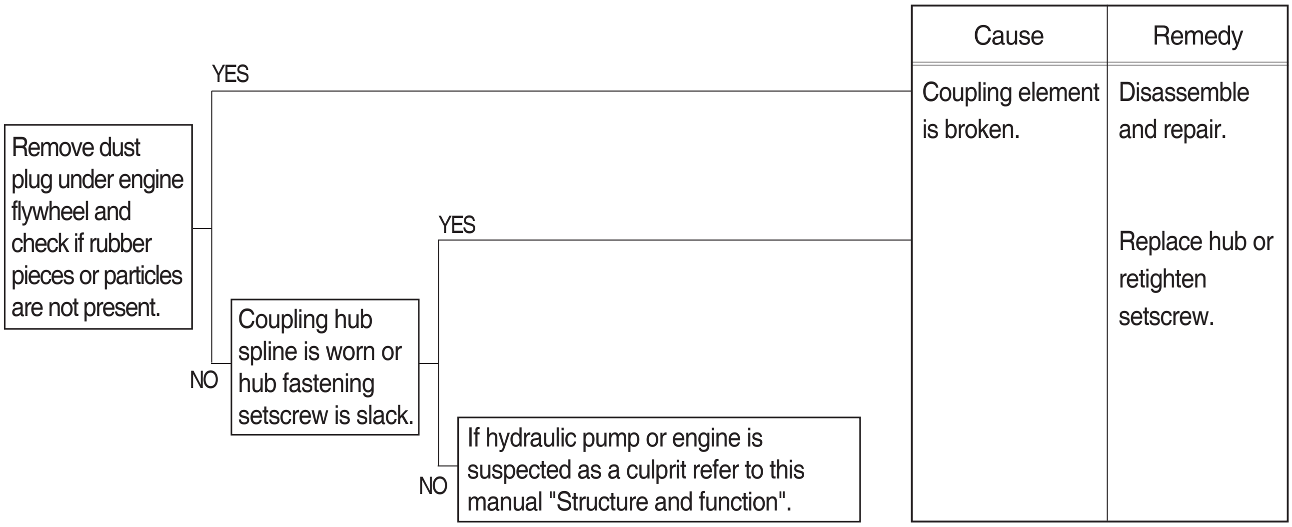
(3) When carrying out troubleshooting, do not hurry to disassemble the components.
It will become impossible to find the cause of the problem.

(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?

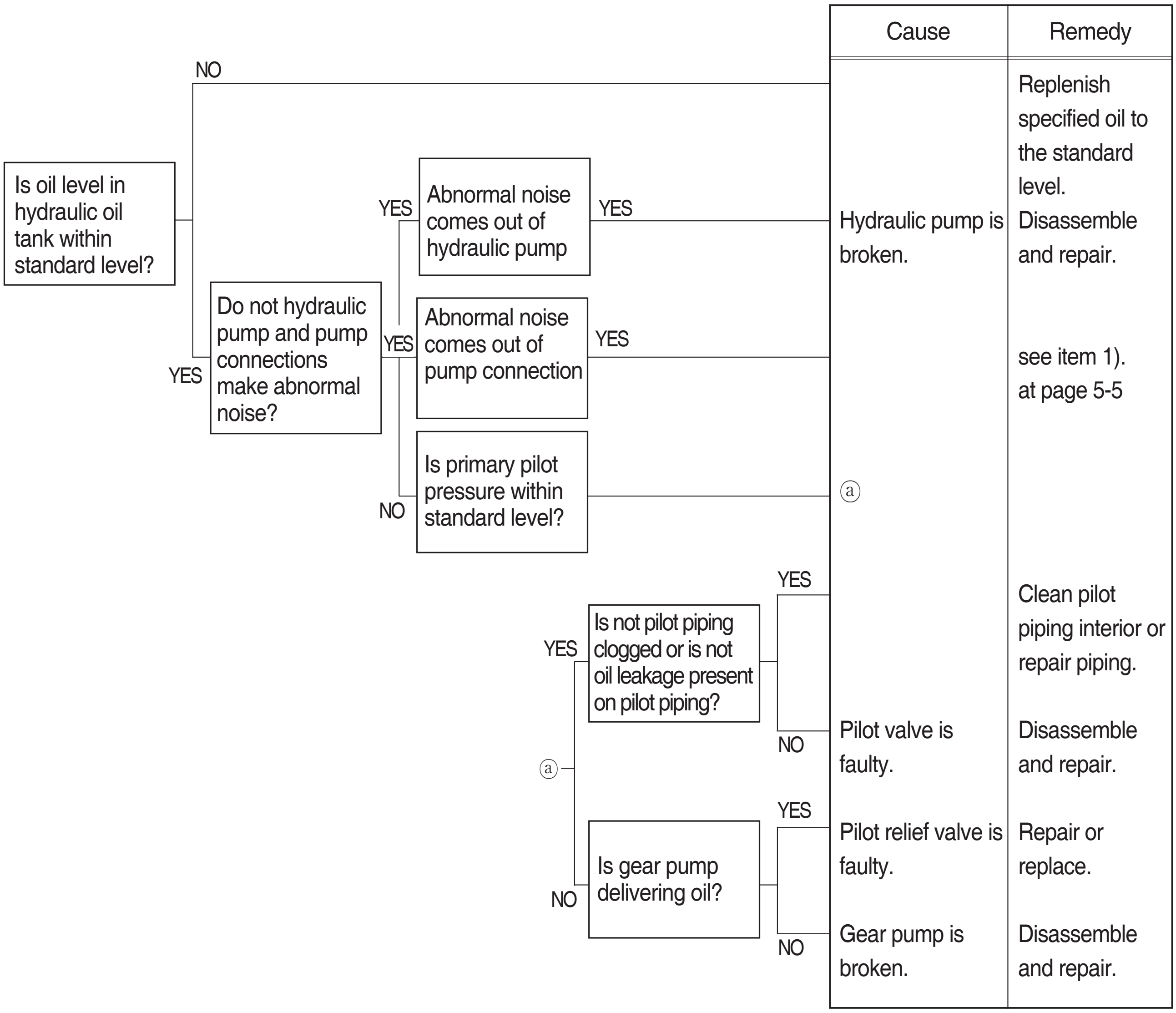
(5) Check before troubleshooting.
① Check oil and fuel level.
② Check for any external leakage of oil from components.
③ Check for loose or damage of wiring and connections.

2. DRIVE SYSTEM

1) UNUSUAL NOISE COMES OUT OF PUMP CONNECTION



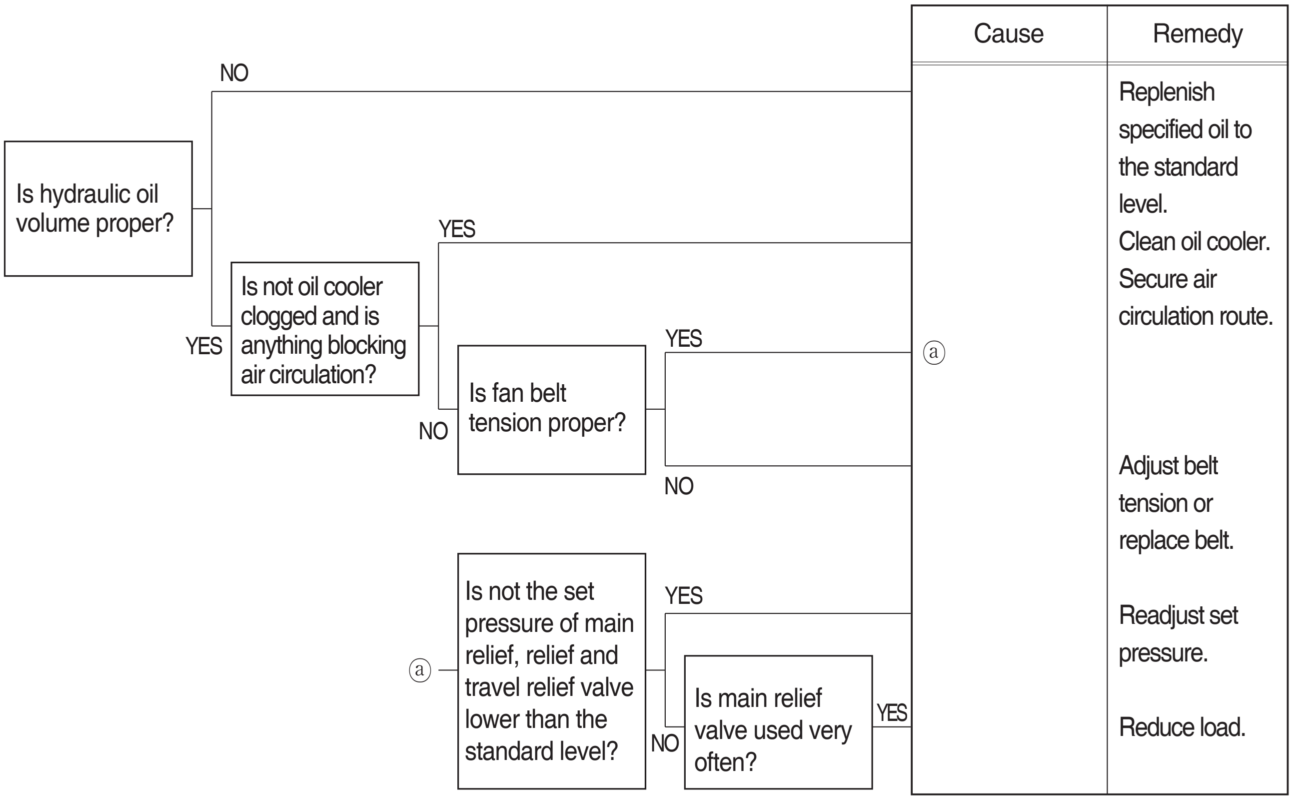
2) ENGINE STARTS BUT MACHINE DOES NOT OPERATE AT ALL



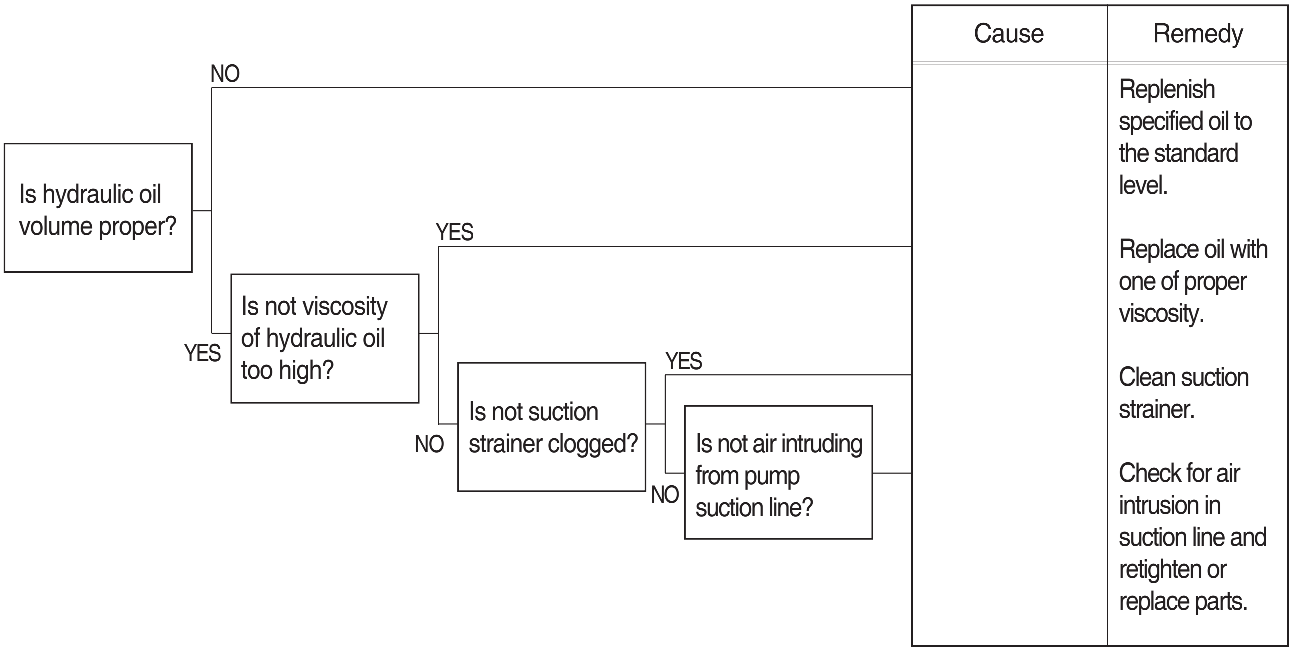
3. HYDRAULIC SYSTEM

1) HYDRAULIC OIL IS CLOUDY

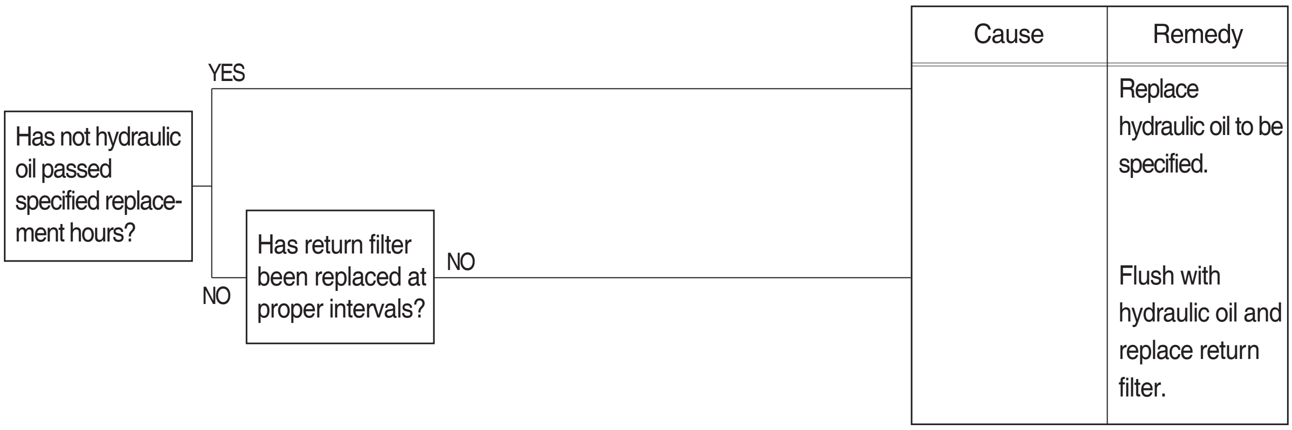
2) HYDRAULIC OIL TEMPERATURE HAS RISEN ABNORMALLY



3) CAVITATION OCCURS WITH PUMP

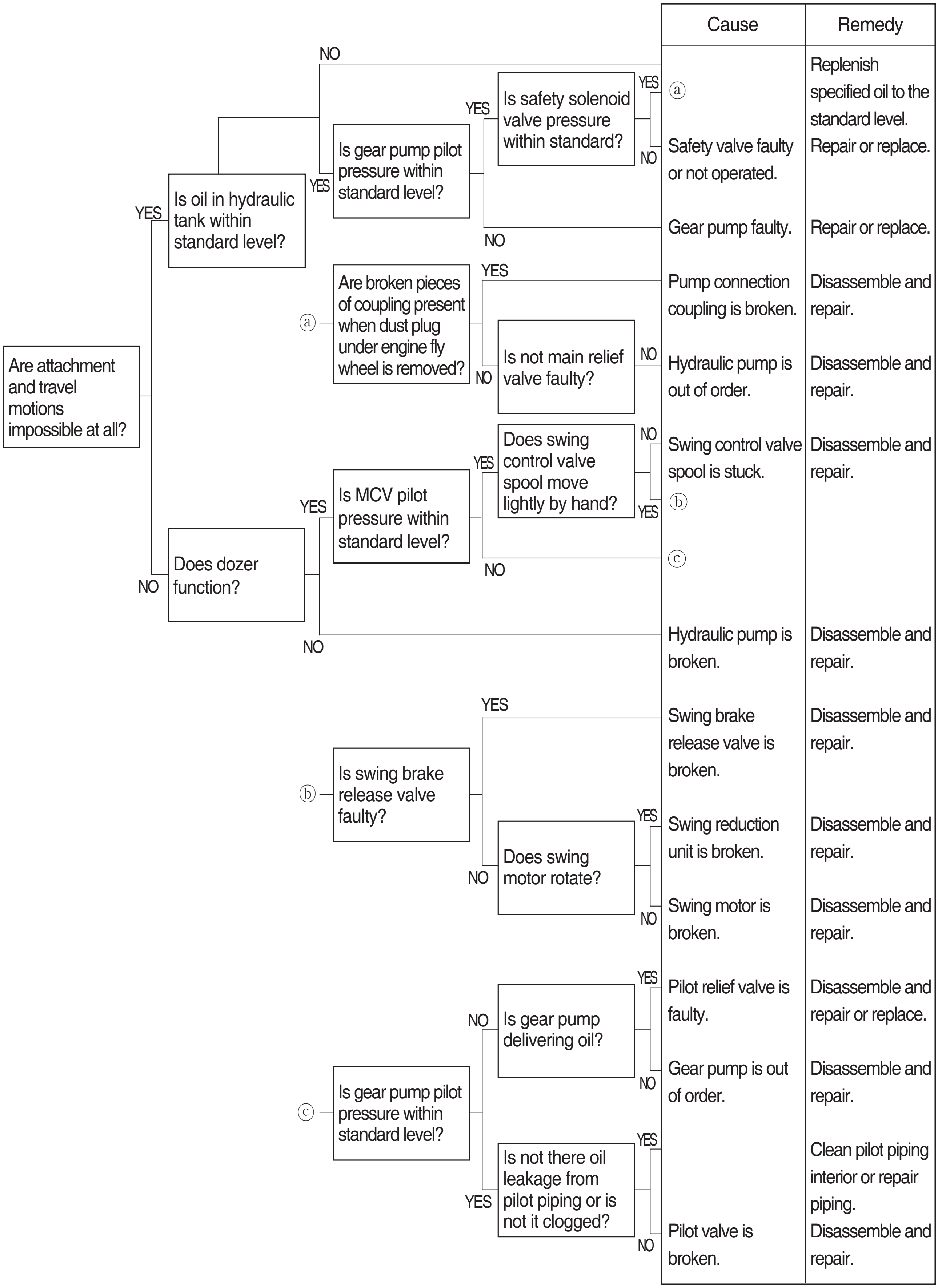


4) HYDRAULIC OIL IS CONTAMINATED

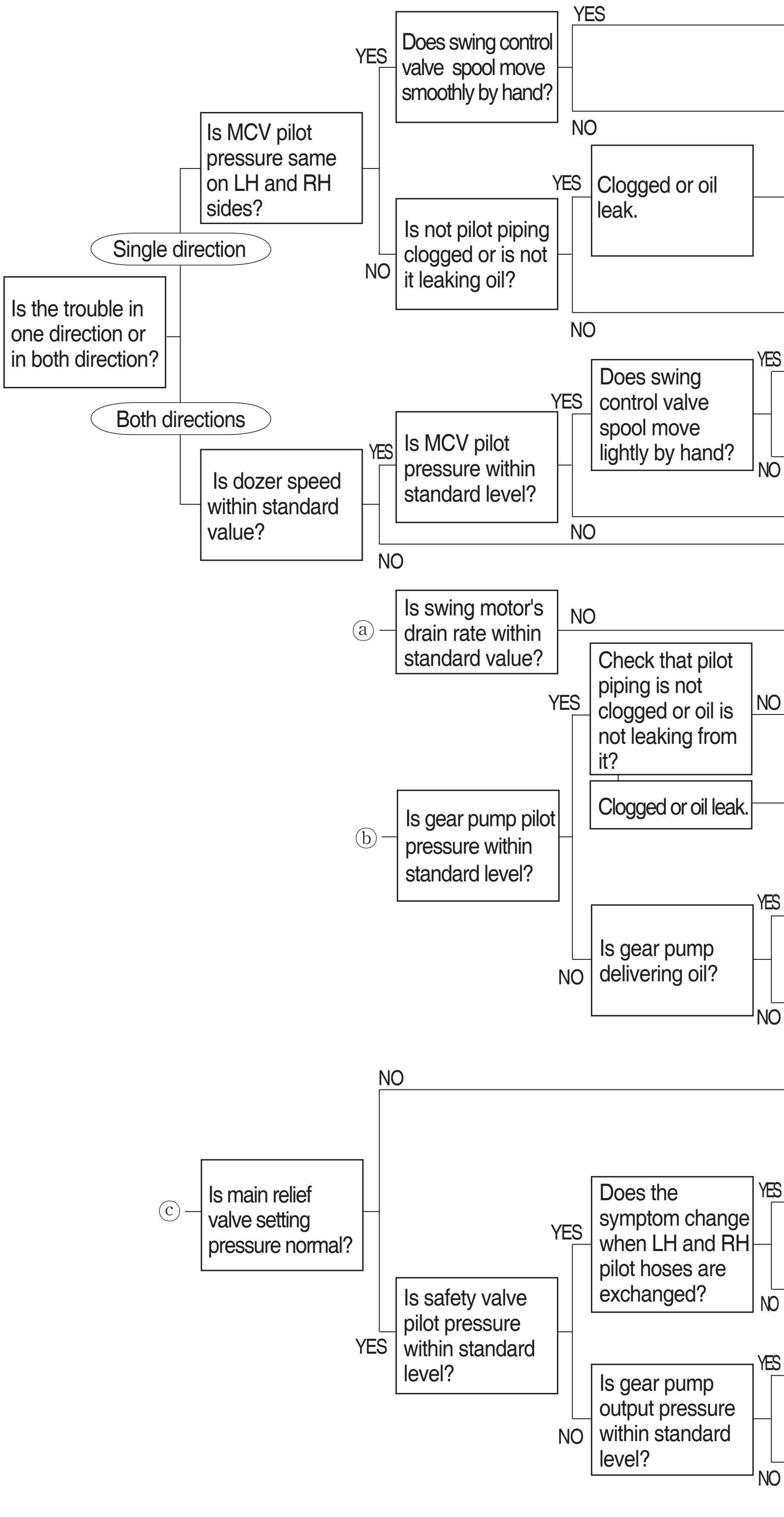


4. SWING SYSTEM

1) BOTH LH AND RH SWING ACTIONS ARE IMPOSSIBLE

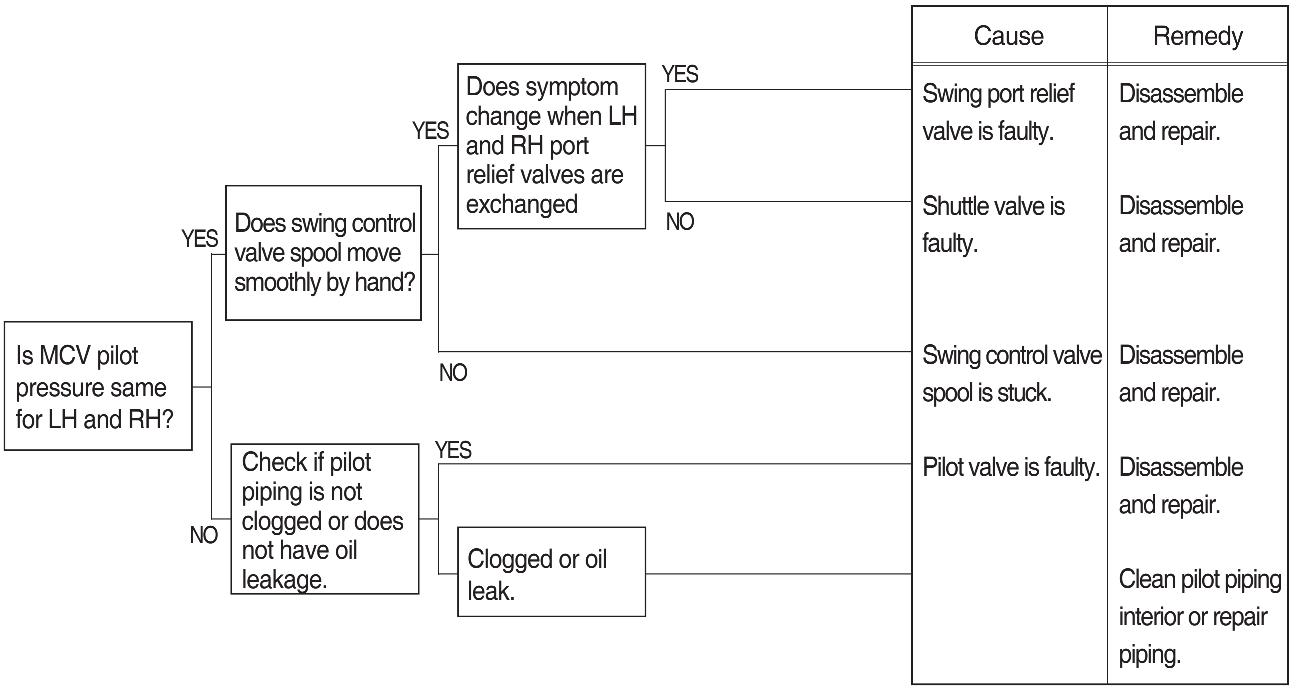


2) SWING SPEED IS LOW

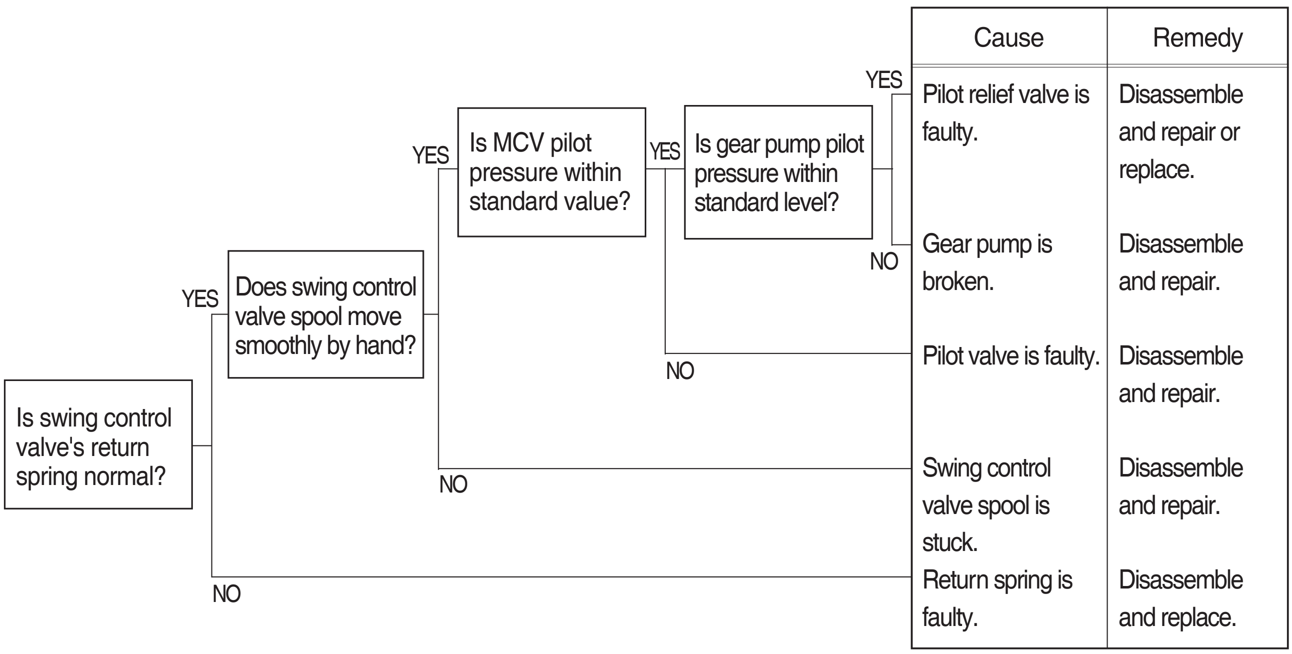


Cause	Remedy
Swing port relief valve is faulty.	Disassemble and repair or replace.
Swing control valve spool is stuck.	Disassemble and repair.
	Clean pilot piping interior or repair piping.
Pilot valve or shuttle valve is faulty. ⓐ	Disassemble and repair.
Swing control valve spool is stuck. ⓑ ⓒ	Disassemble and repair.
Swing motor is broken.	Disassemble and repair.
Pilot valve or shuttle valve is faulty.	Disassemble and repair.
	Clean pilot piping interior or repair piping.
Pilot relief valve is defective.	Disassemble and repair or replace.
Gear pump is broken.	Disassemble and repair.
Main relief valve faulty.	Main relief valve pressure resetting or repair.
Hydraulic pump is broken.	Disassemble and repair.
Shuttle valve is faulty.	Repair or replace.
Pilot relief valve is faulty.	Repair or replace.
Gear pump is faulty.	Repair or replace.

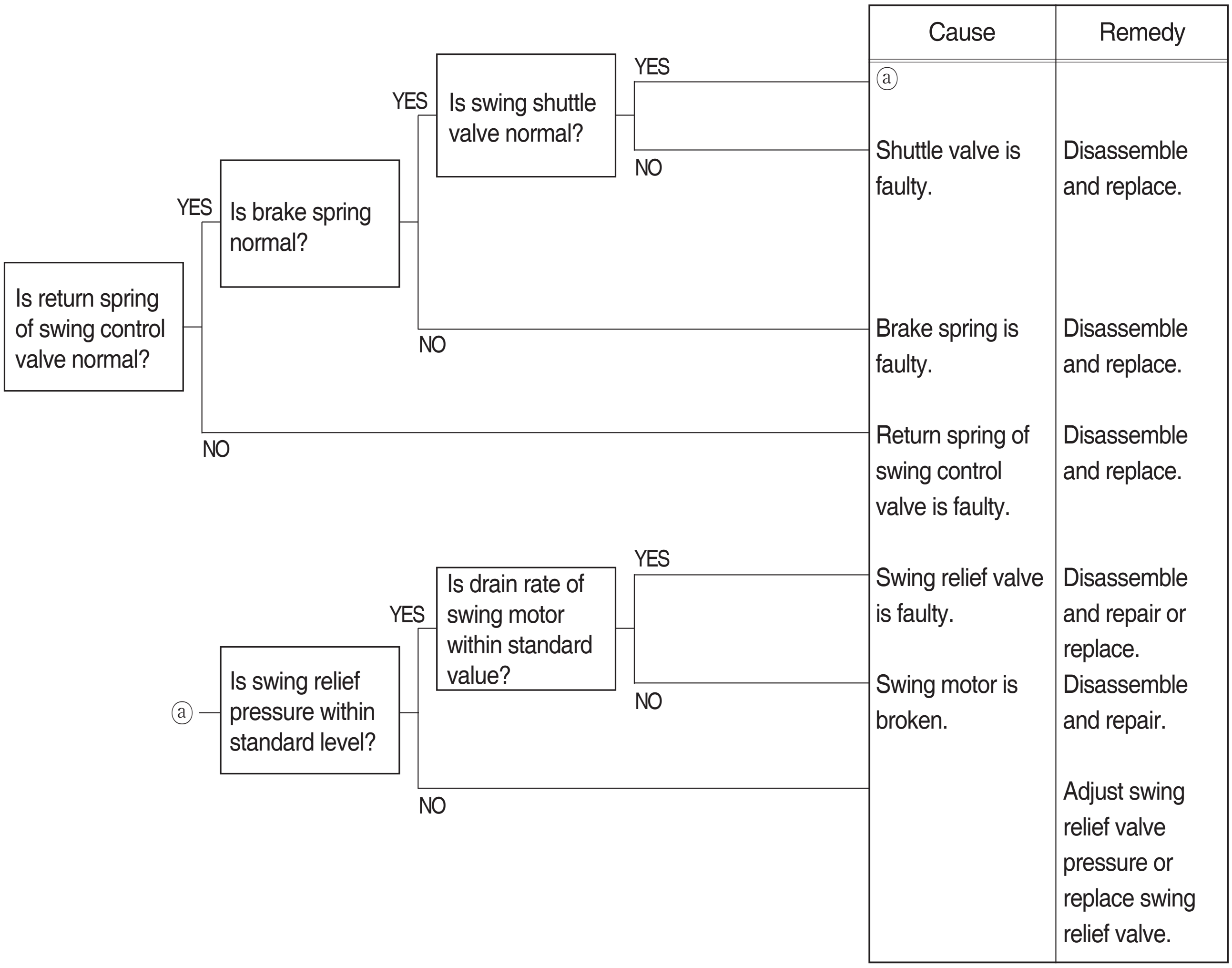
3) SWING MOTION IS IMPOSSIBLE IN ONE DIRECTION



4) MACHINE SWINGS BUT DOES NOT STOP

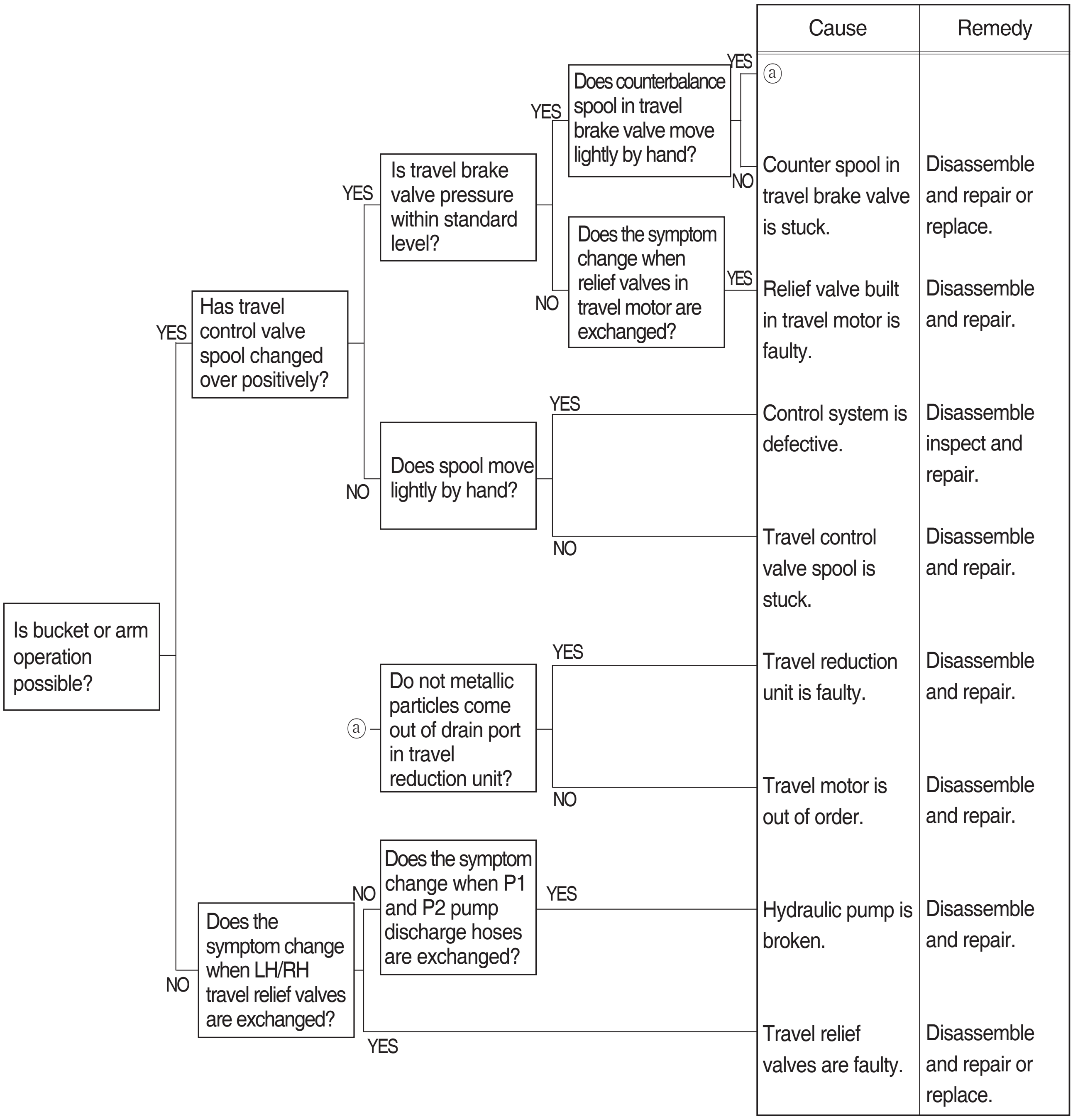


5) THE SWING UNIT DRIFTS WHEN THE MACHINE IS AT REST ON A SLOPE

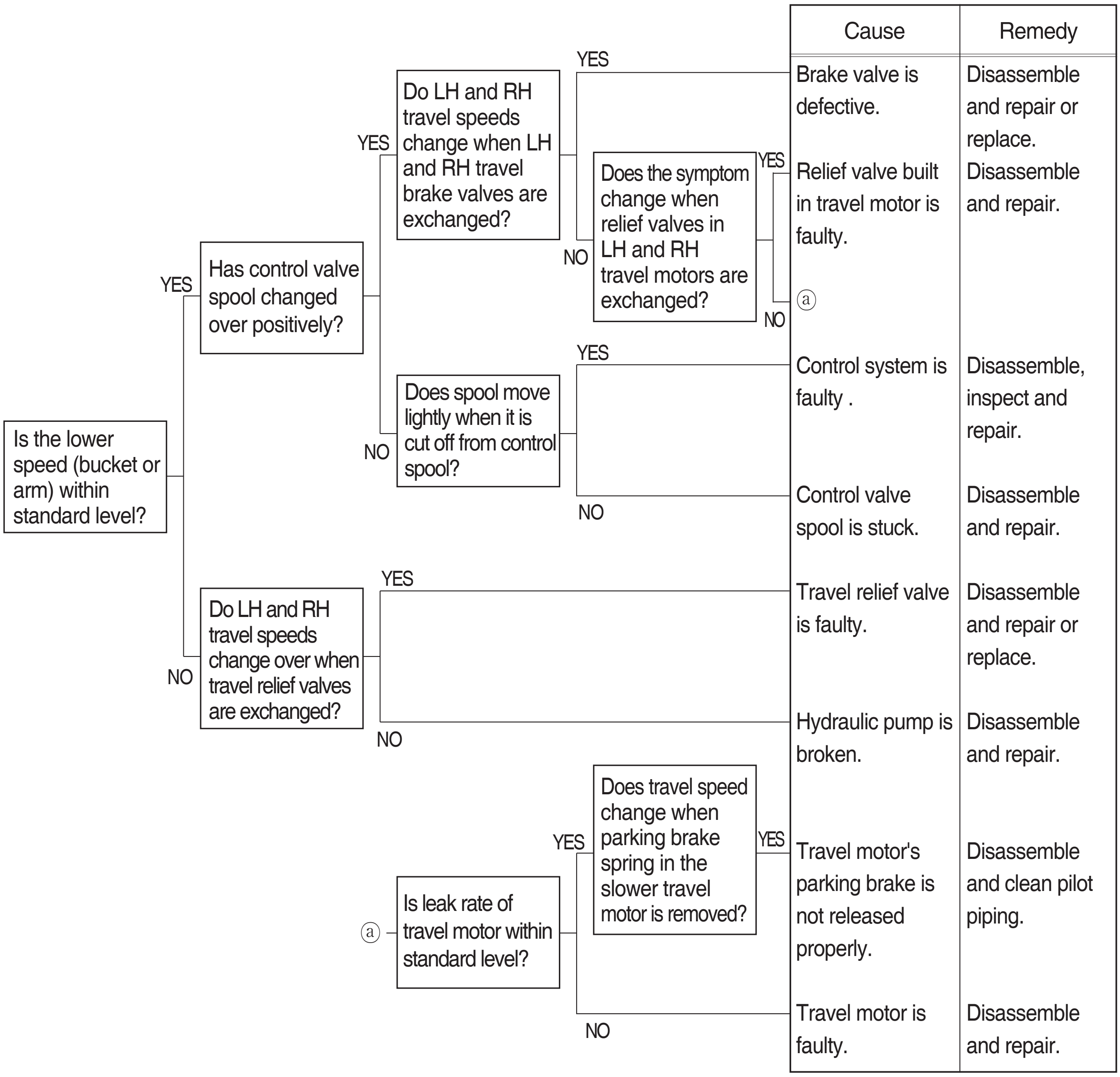


5. TRAVEL SYSTEM

1) TRAVEL DOES NOT FUNCTION AT ALL ON ONE SIDE

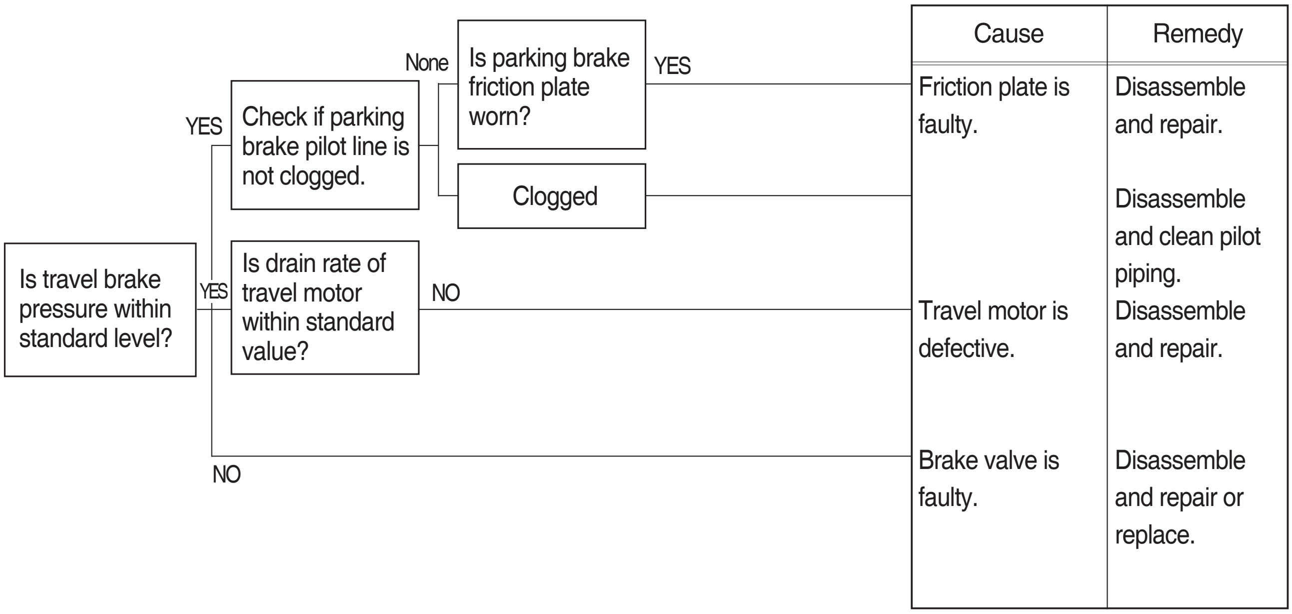


2) SPEED ON ONE SIDE FALLS AND THE MACHINE CURVES

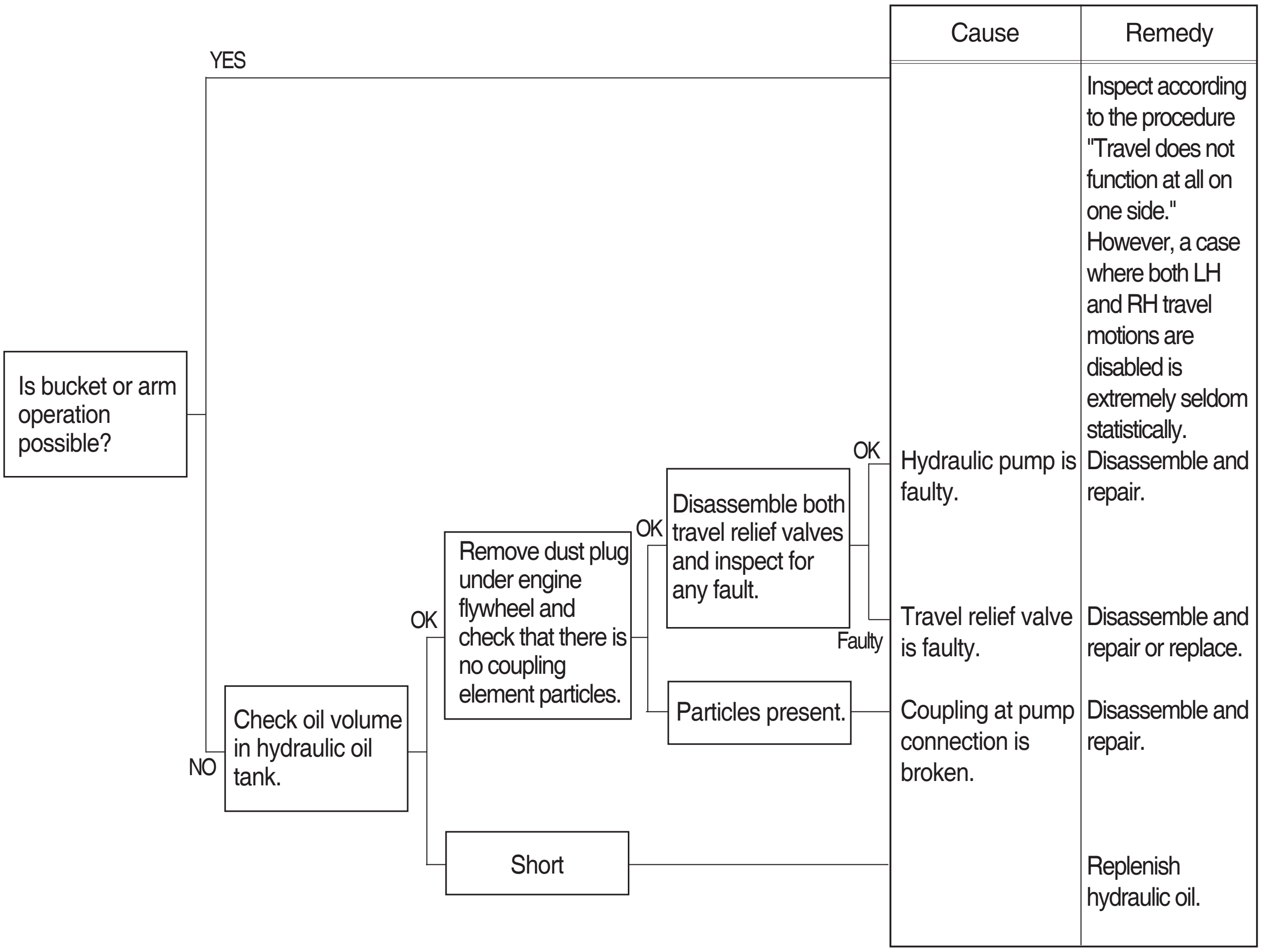


3) MACHINE DOES NOT STOP ON A SLOPE

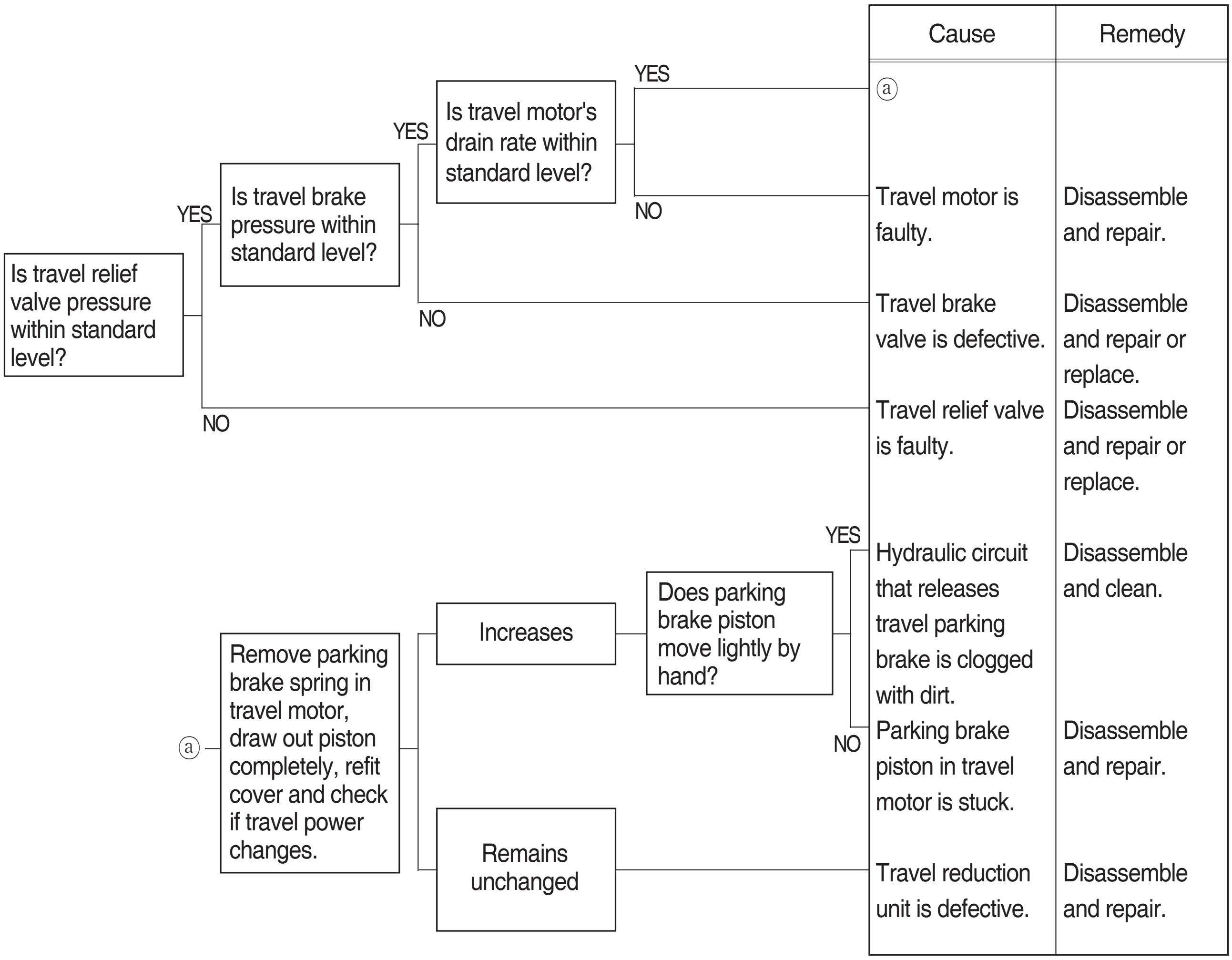
Machine is pulled forward as sprocket rotates during digging operation.



4) LH AND RH TRAVEL MOTIONS ARE IMPOSSIBLE

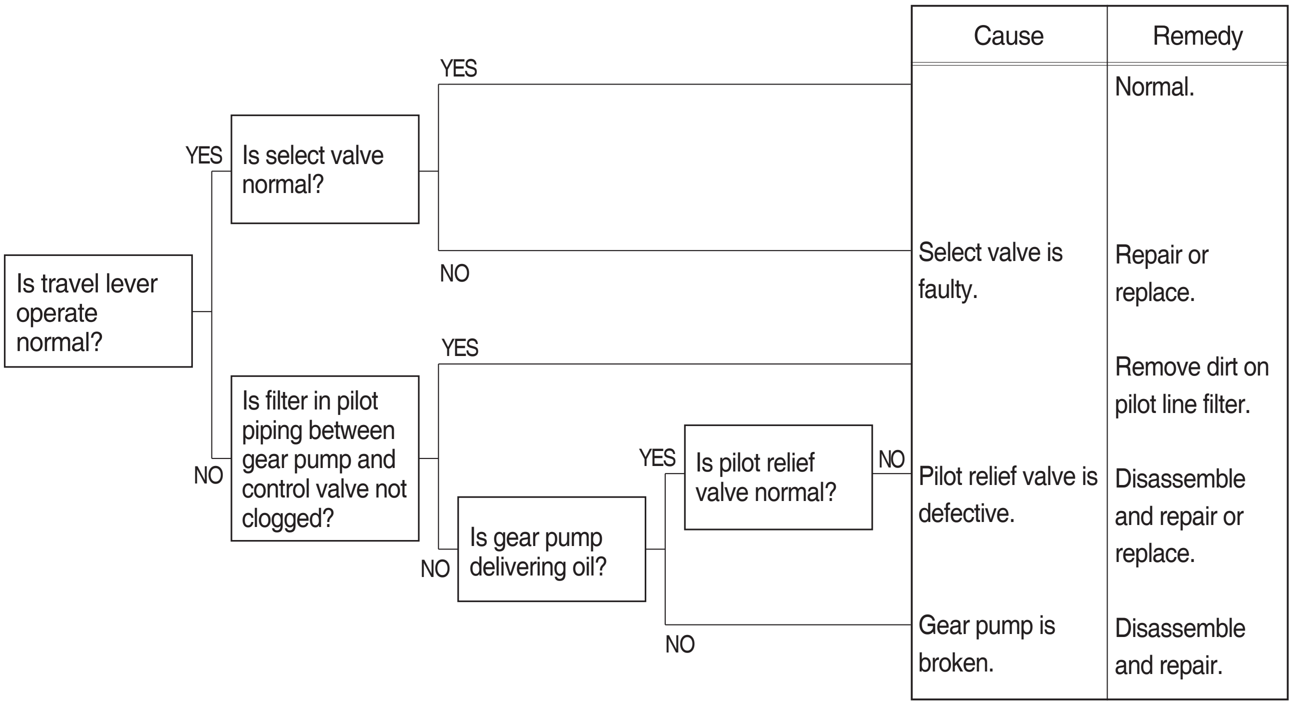


5) TRAVEL ACTION IS POWERLESS (travel only)



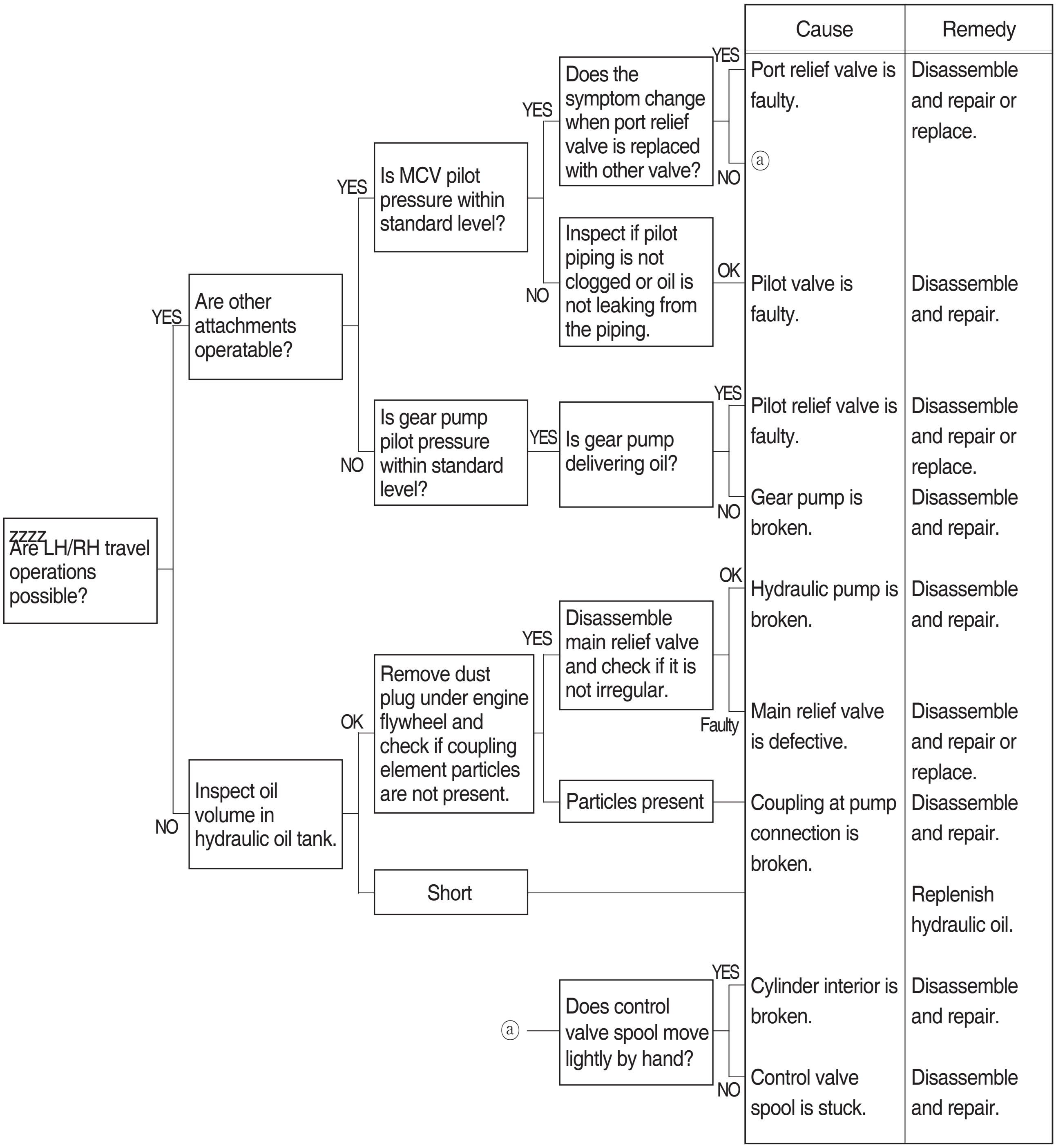
6) MACHINE RUNS RECKLESSLY ON A SLOPE

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

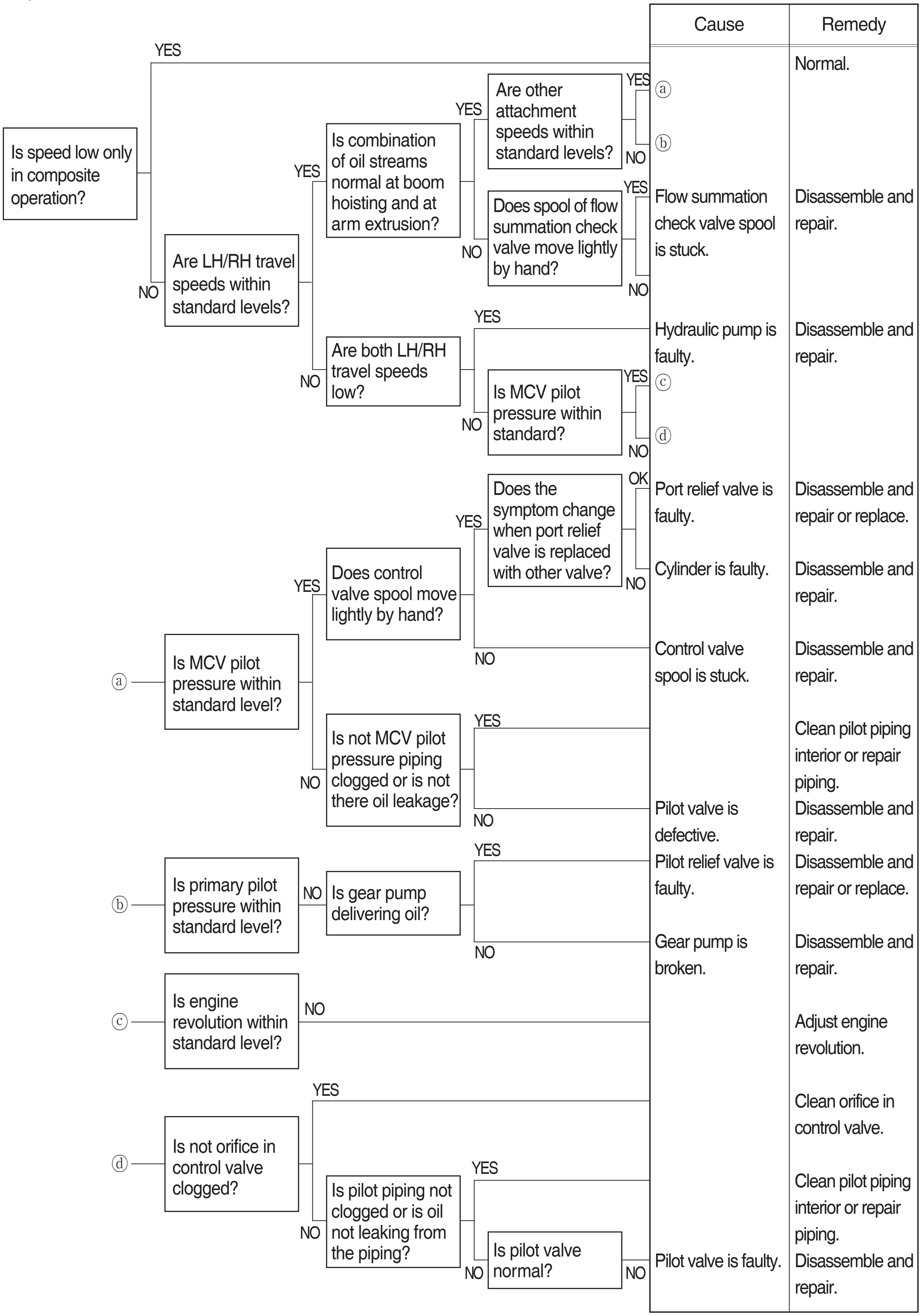


6. ATTACHMENT SYSTEM

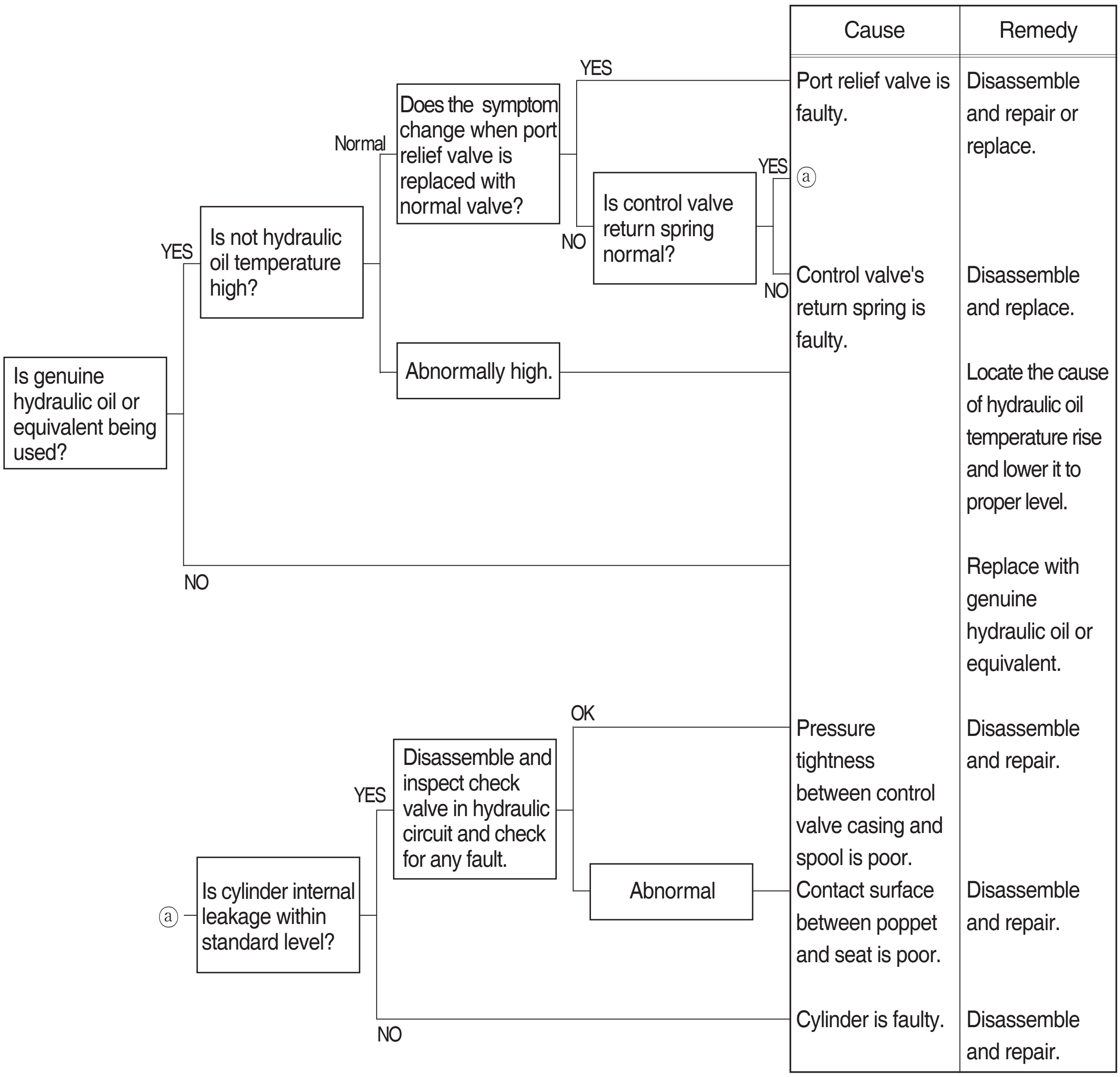
1) BOOM OR ARM ACTION IS IMPOSSIBLE AT ALL



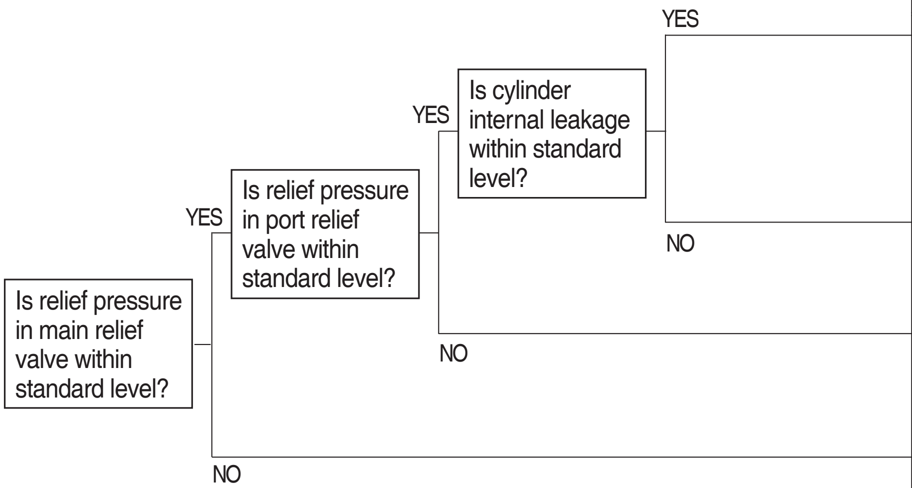
2) BOOM, ARM OR BUCKET SPEED IS LOW



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

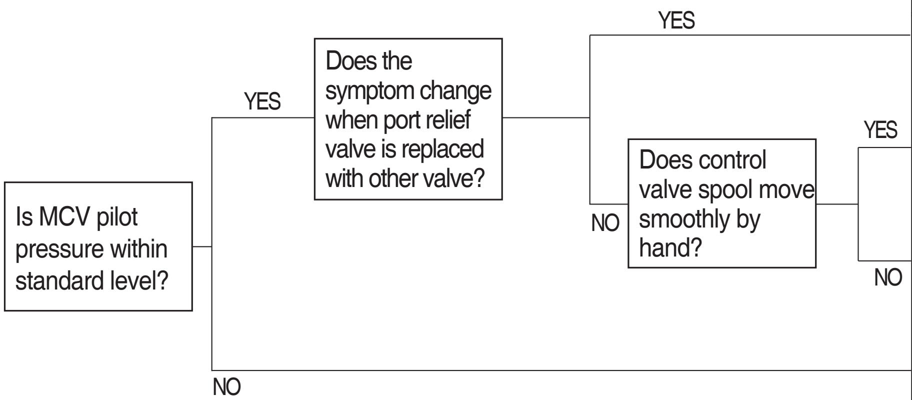


4) BOOM, ARM OR BUCKET POWER IS WEAK



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.

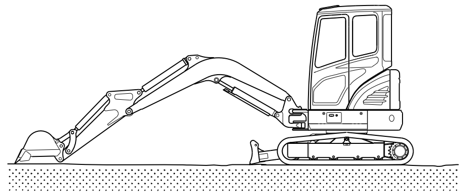
6) BOOM MAKES A SQUEAKING NOISE WHEN BOOM IS OPERATED

Is boom foot pin greased sufficiently?

Answer	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.



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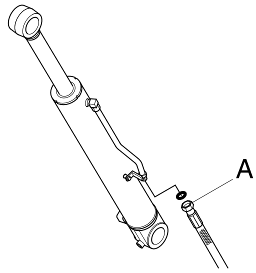
2. Disconnect hose (A) from rod side of boom cylinder and drain oil from cylinders and hose. (put cups on piping and hose ends)



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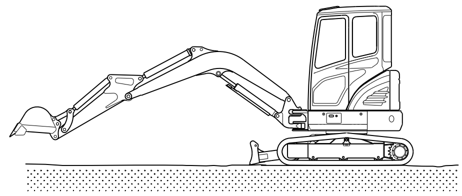
3. Raise bucket OFF the ground by retracting the arm cylinder rod.

   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.



R35Z75TS02

GROUP 3 ELECTRICAL SYSTEM

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

YES → Cause: Defective cluster — Remedy: Replace

NO → Cause: Disconnection in wiring harness or poor contact between CN-56 (1) and fuse No.4. — Remedy: Repair or replace (after clean)

	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)

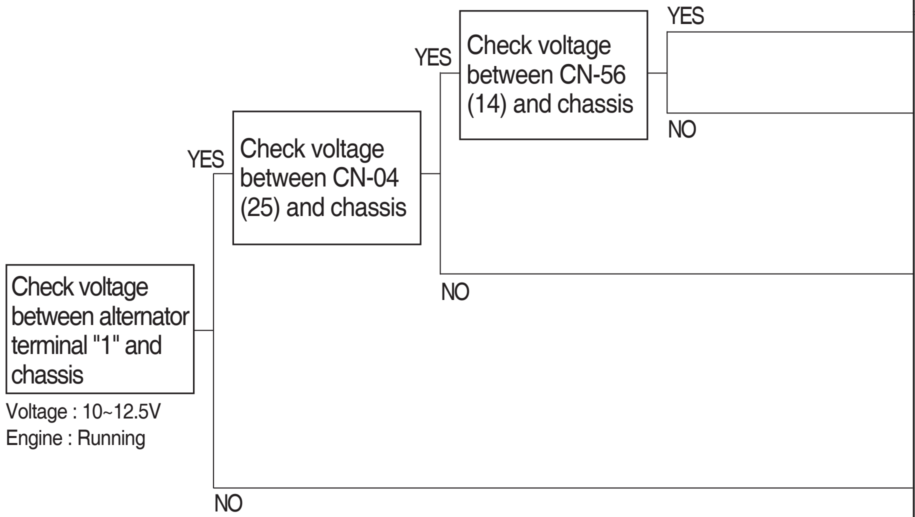
Check voltage

YES	10 ~ 12.5V
NO	0V

35AZ5TS10

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

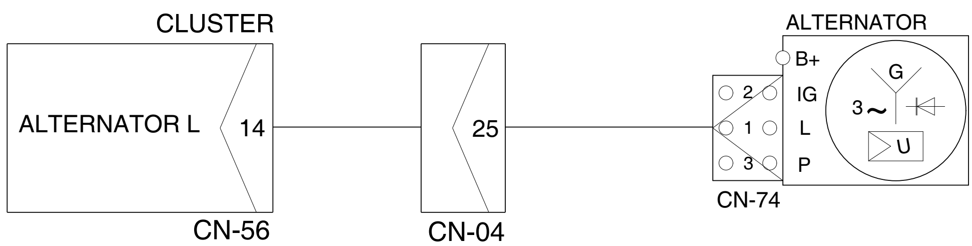
· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.



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

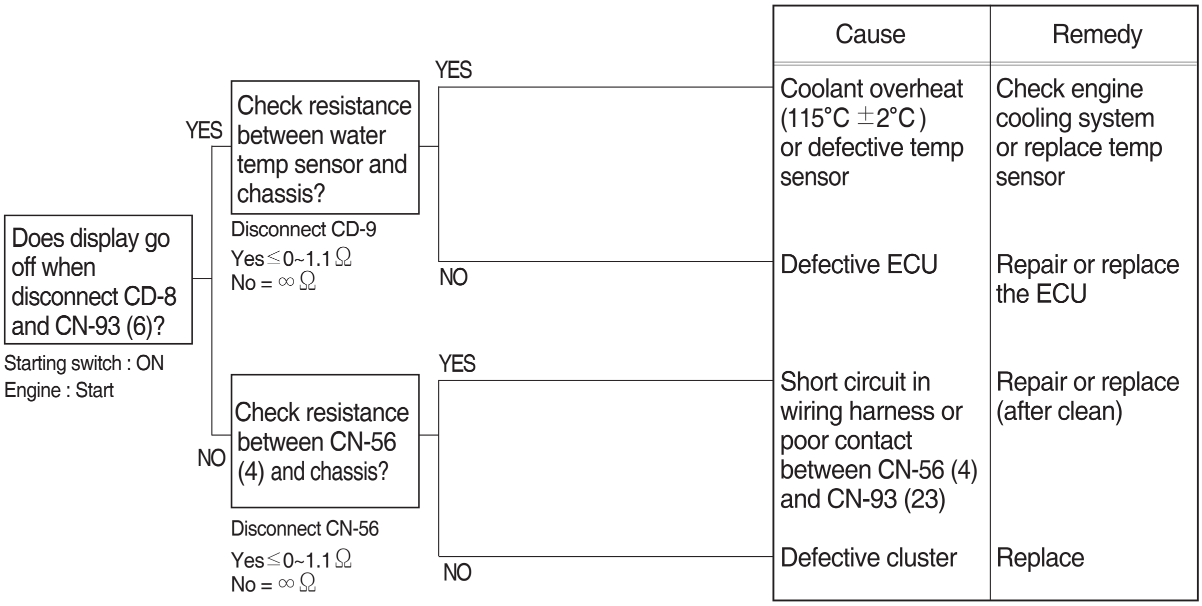
YES	10 ~ 12.5V
NO	0V

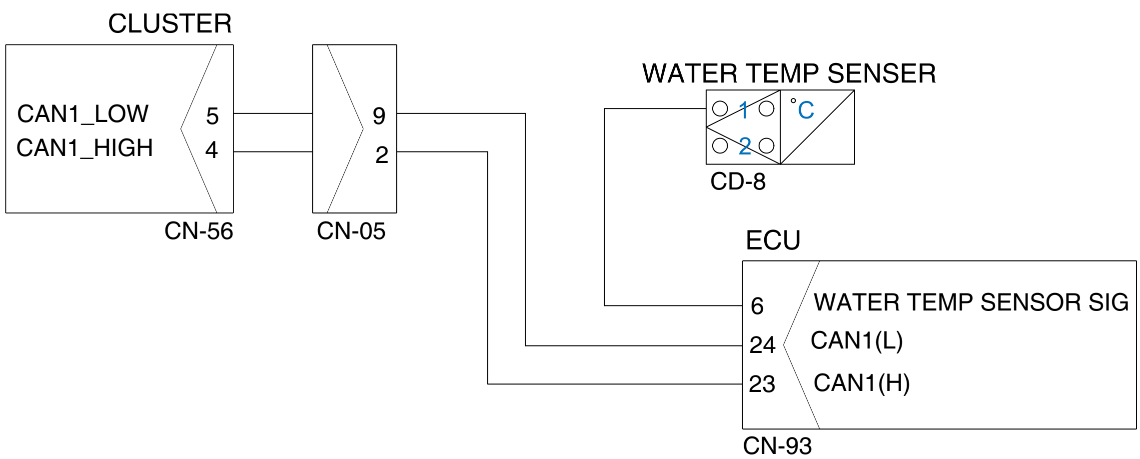


35AZ5TS11

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.

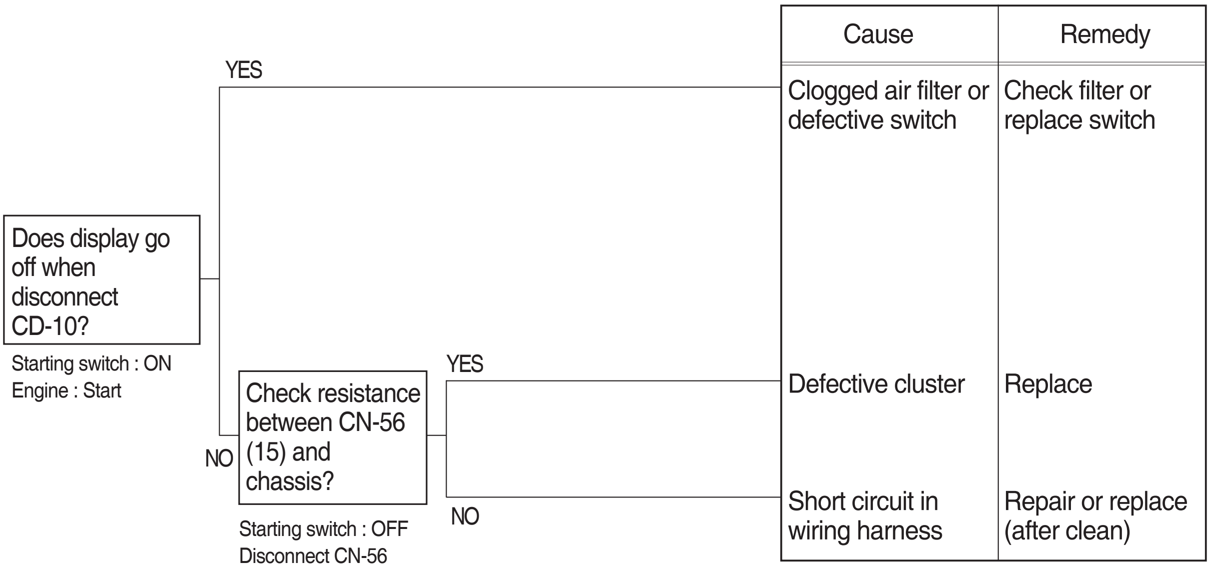




35AZ5TS12

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.



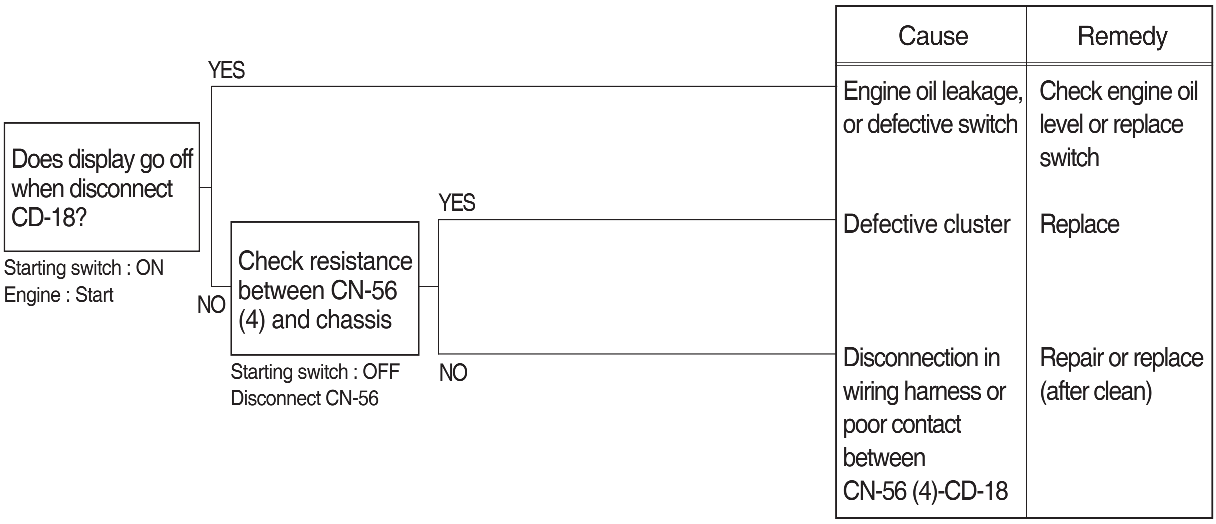
Check resistance

YES	MAX 1Ω
NO	MIN 1MΩ

35AZ5TS13

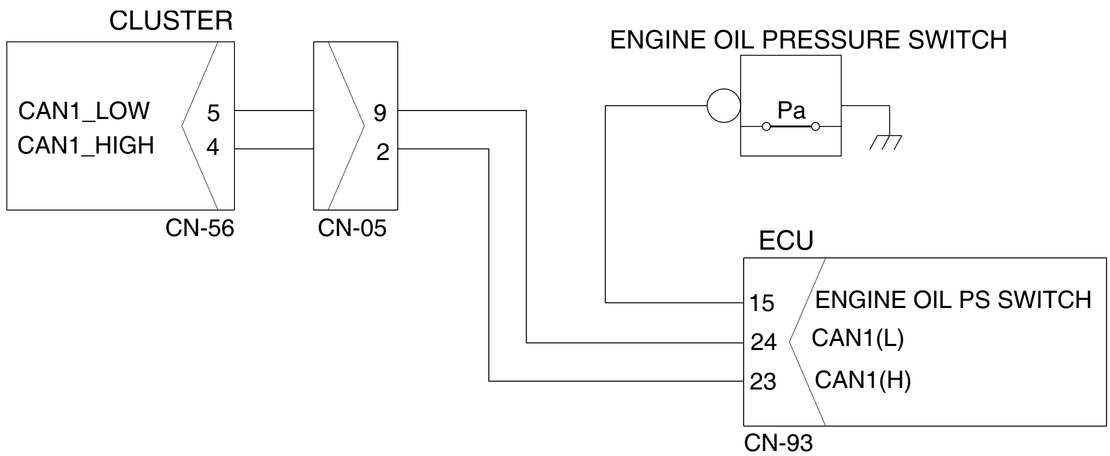
5. WHEN ENGINE OIL PRESSURE WARNING LAMP LIGHTS UP (engine is started)

· 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

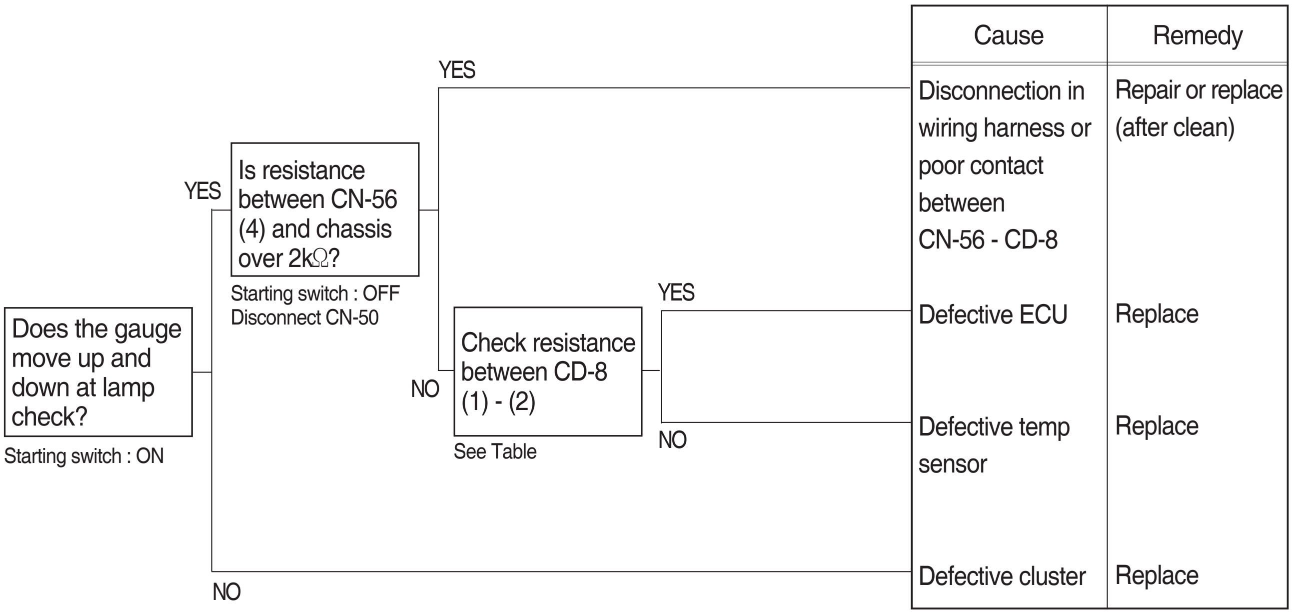
YES	MAX 1Ω
NO	MIN 1MΩ

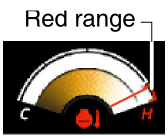


35AZ5TS14

6. WHEN COOLANT TEMPERATURE GAUGE DOES NOT OPERATE

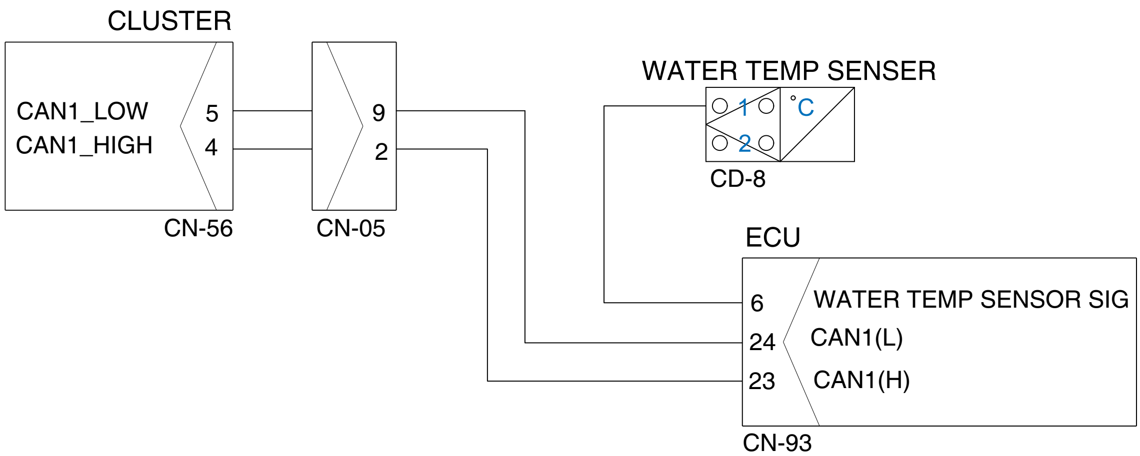
· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.





Check Table

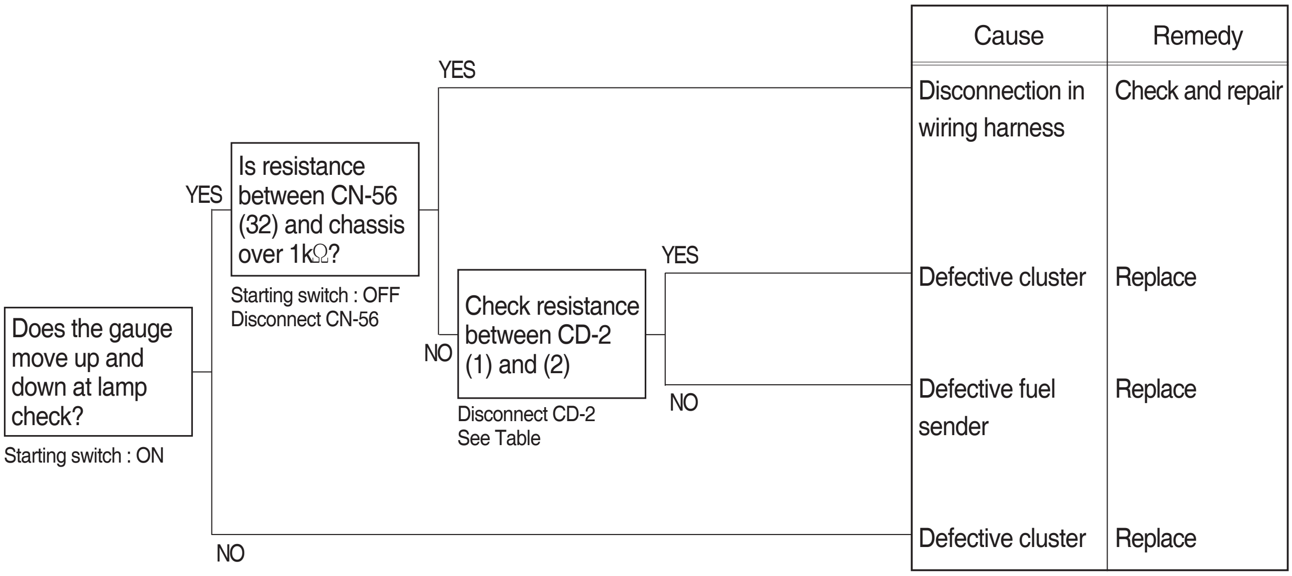
Temperature / Item	50°C	80°C	100°C	115°C (red range)
Unit Resistance (Ω)	350	118	63.5	36.2



35AZ5TS15

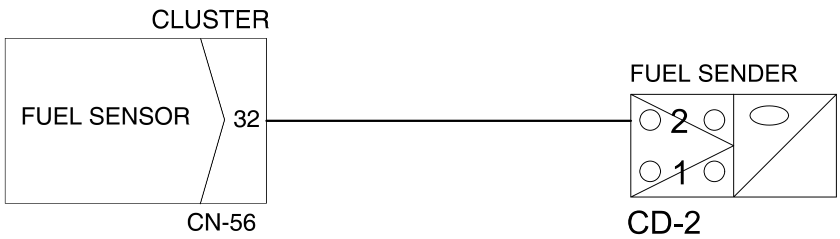
7. WHEN FUEL GAUGE DOES NOT OPERATE (check warning lamp ON/OFF)

· 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

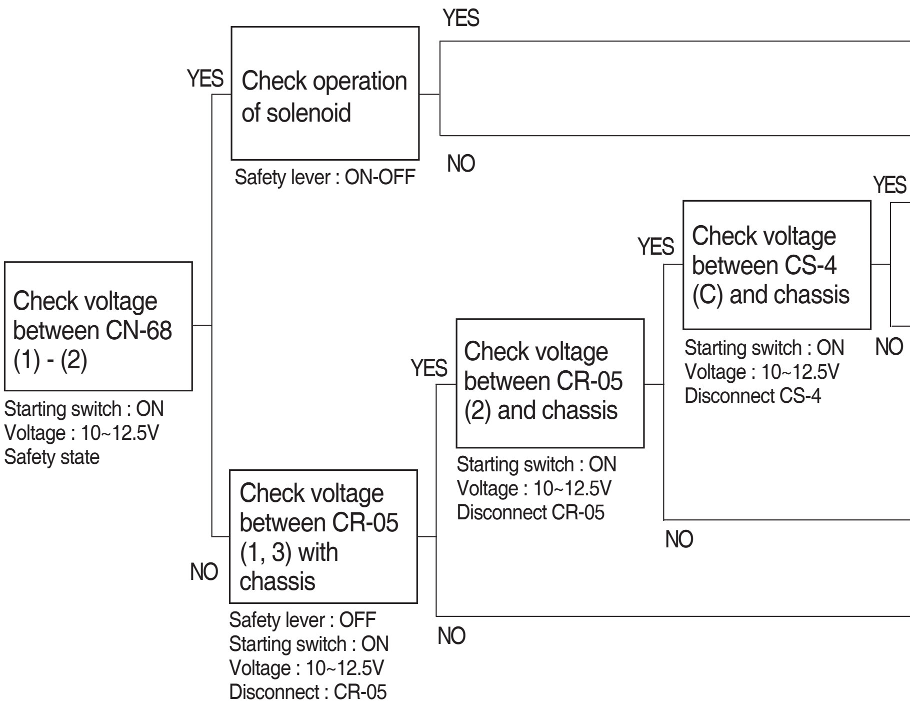
Temperature / Item	Empty	1/2	Full
Unit resistance (Ω)	90	38	10



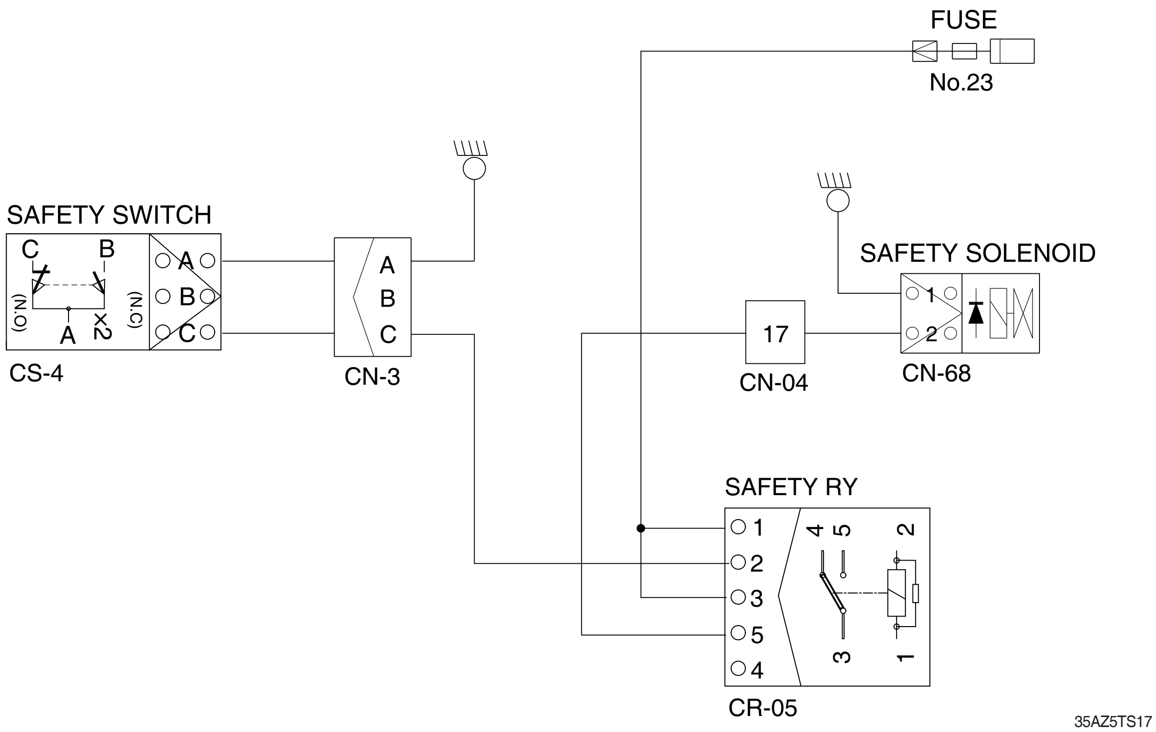
35AZ5TS16

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.

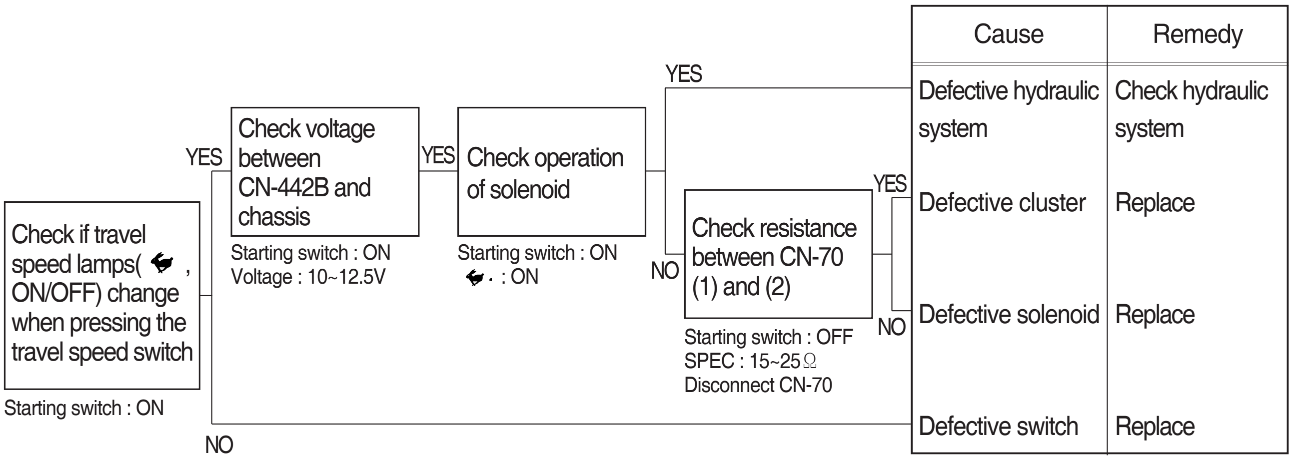


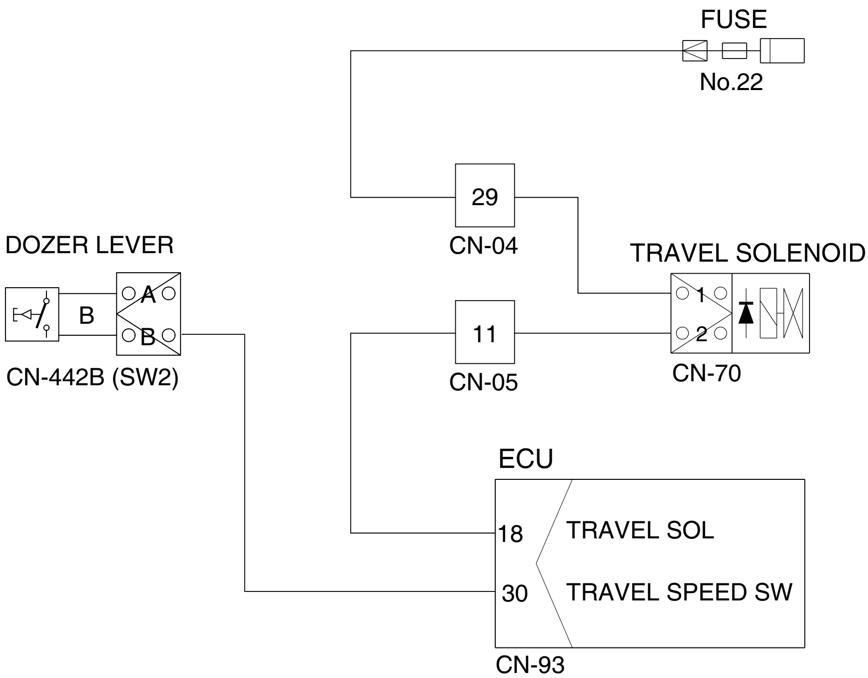
Cause	Remedy
Hydraulic malfunction	Check hydraulic system
Defective solenoid	Replace
Defective switch (CS-4)	Repair or replace
Disconnect in wiring harness or poor contact between CR-05 (2) -CS-4 (C)	Repair or replace (after clean)
Ddfective safety relay	Repair or replace (after clean)
Disconnection in wiring harness between CR-05 (1, 3)-fuse	Repair or replace



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.





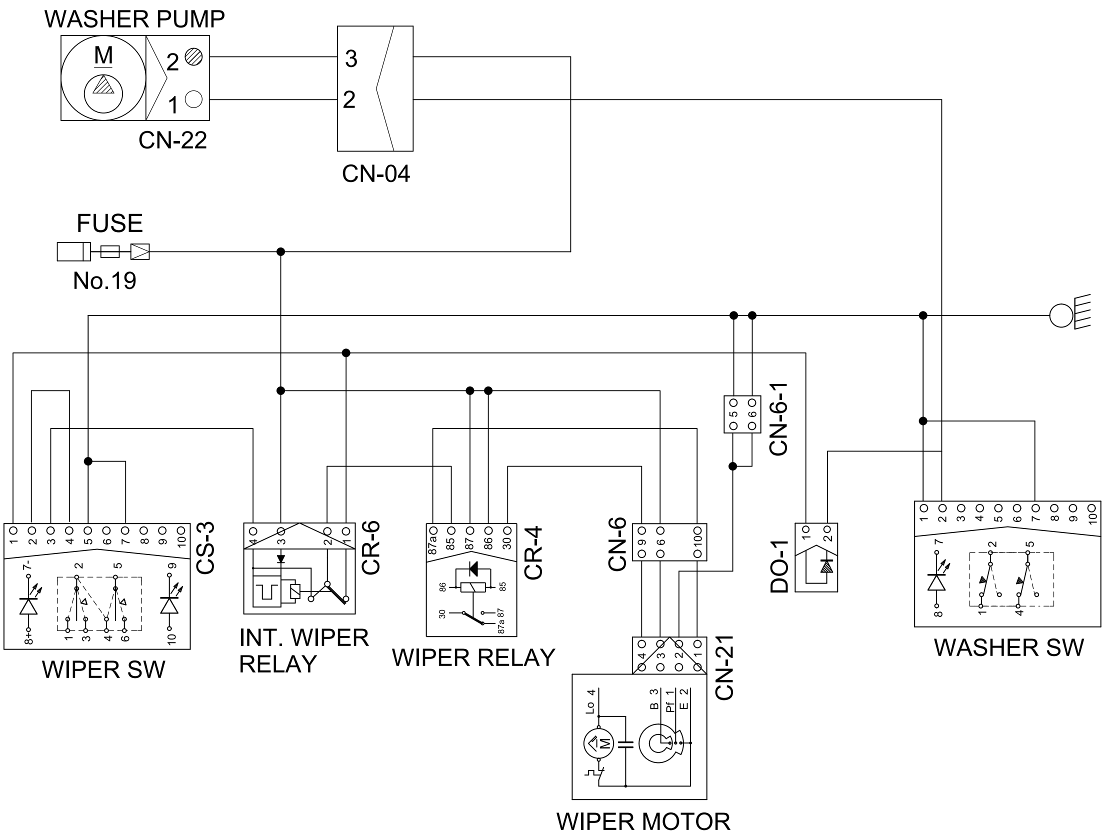
35AZ5TS18

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.

Check voltage between CS-3 (1) and chassis
Voltage : 10~12.5V
- NO → Recheck fuse / Replace
- YES → Check voltage between CS-3 (3) and chassis
  Wiper switch : ON
  Voltage : 10~12.5V
  - NO → Defective wiper switch / Replace
  - YES → Check voltage between CN-21 (3) and chassis
    Starting switch : ON
    Voltage : 10~12.5V
    - YES → Defective wiper motor / Replace
    - NO → Recheck fuse / Replace

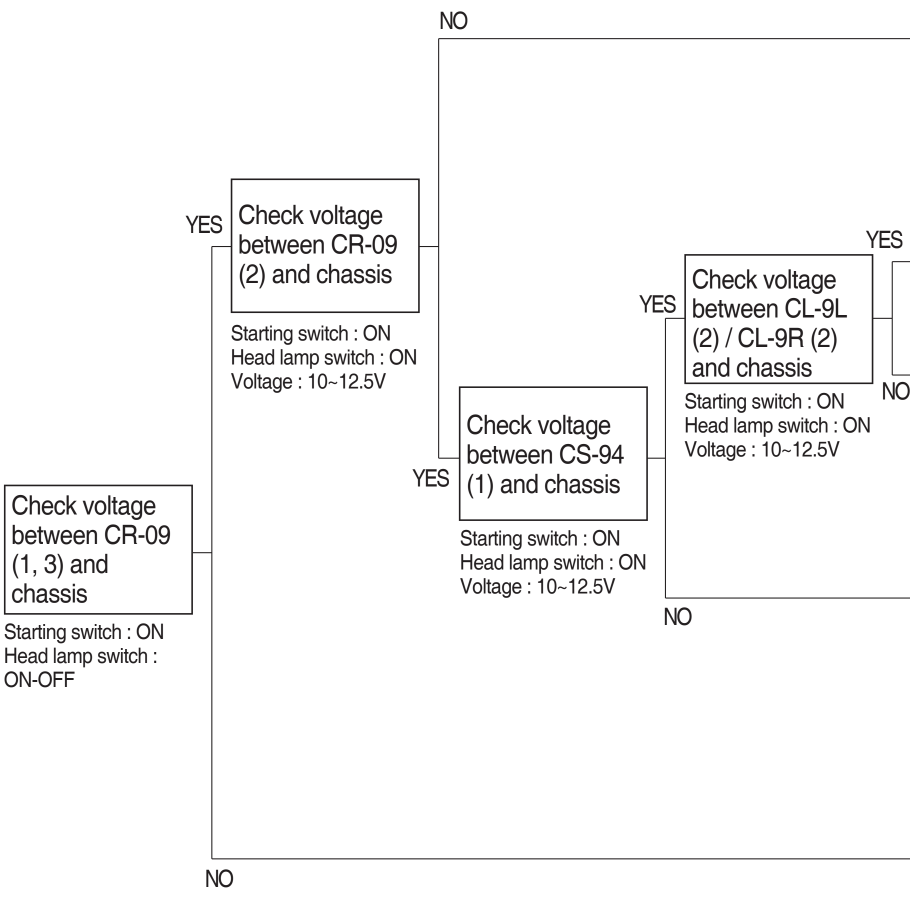
Cause	Remedy
Recheck fuse	Replace
Defective wiper switch	Replace
Defective wiper motor	Replace
Recheck fuse	Replace



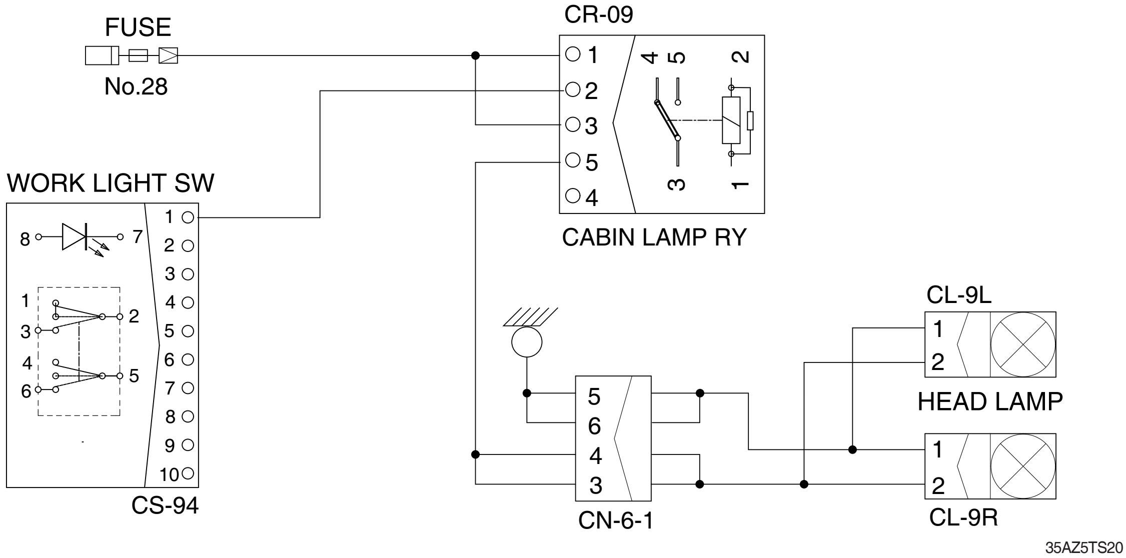
35AZ5TS19

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.

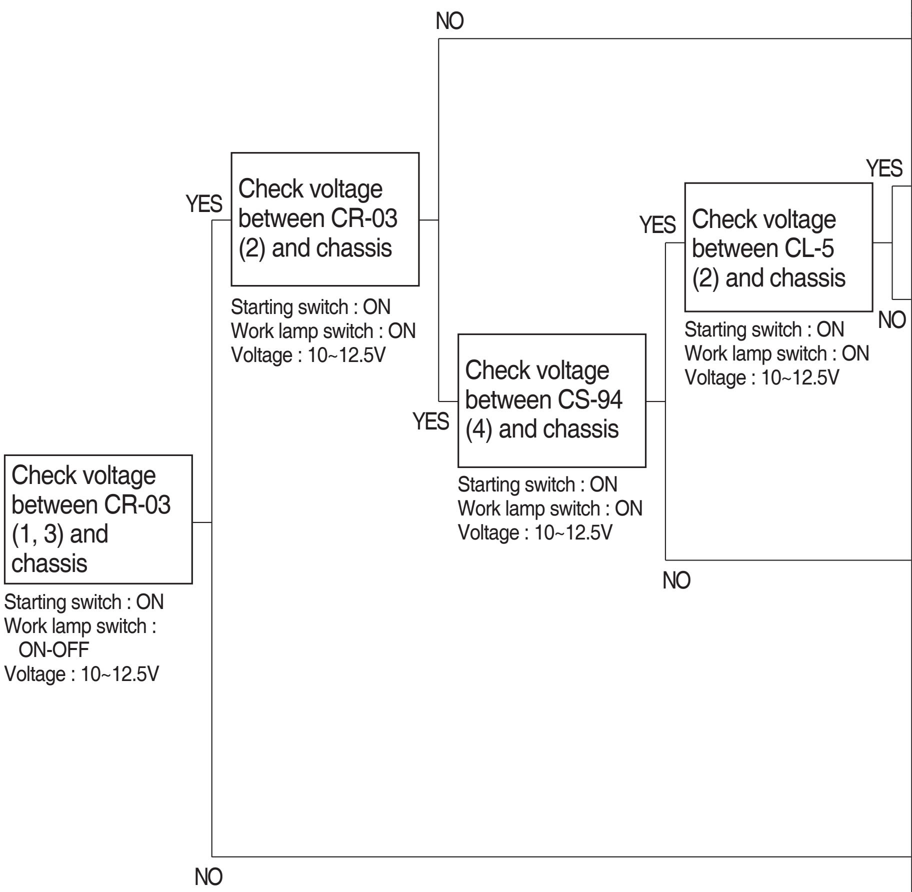


Cause	Remedy
Defective lamp switch	Replace switch
Defective bulb	Replace
Disconnection in wiring harness or poor contact between CR-09 (5) -CL-9L (2)/CL-9R (2)	Repair or replace (after clean)
Disconnection in wiring harness or poor contact between CS-94 (1)-CR-09 (2)	Repair or replace (after clean)
Disconnection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

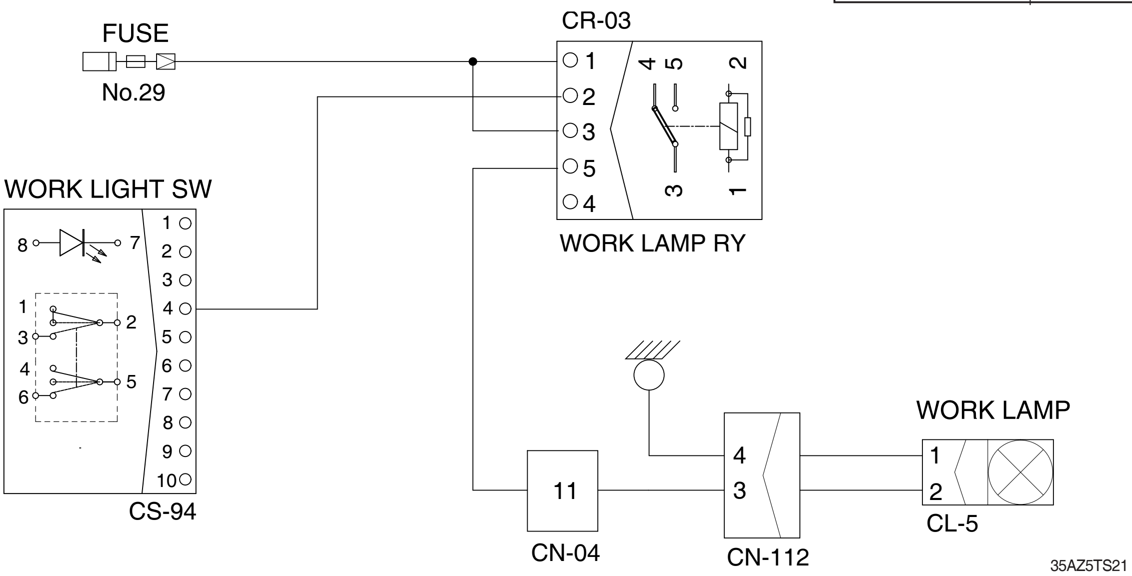


12. WHEN STARTING SWITCH IS TURNED ON, WORK LAMP DOES NOT LIGHTS UP

· 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.

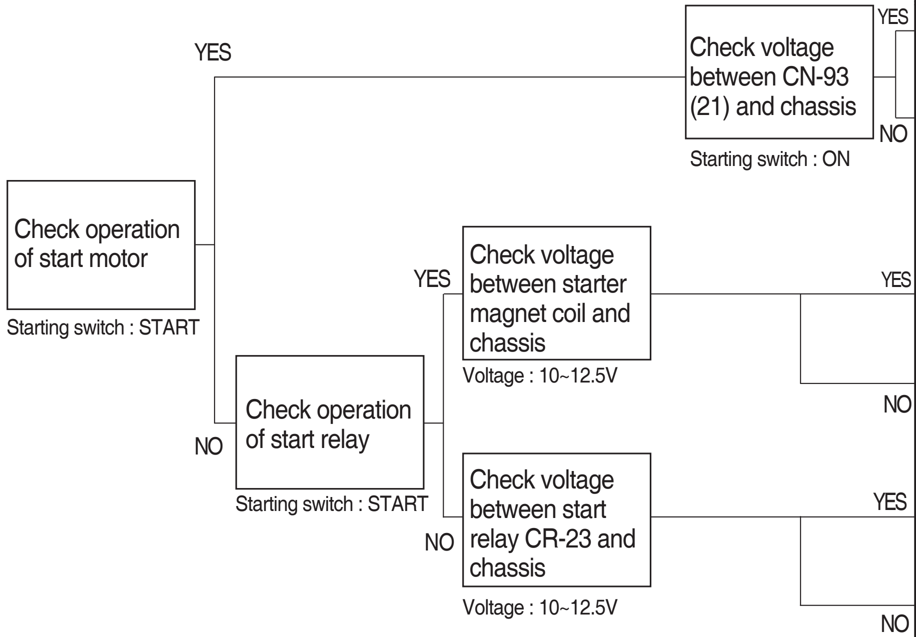


Cause	Remedy
Defective light switch	Replace switch
Defective bulb	Replace
Disconnection in wiring harness or poor contact between CR-03 (5) and CL-5 (2)	Repair or replace (after clean)
Disconnection in wiring harness or poor contact between CS-94 (4)-CR-03 (2)	Repair or replace (after clean)
Disconnection in wiring harness or poor contact between CR-03 (1, 3) and fuse No.29	Repair or replace (after clean)

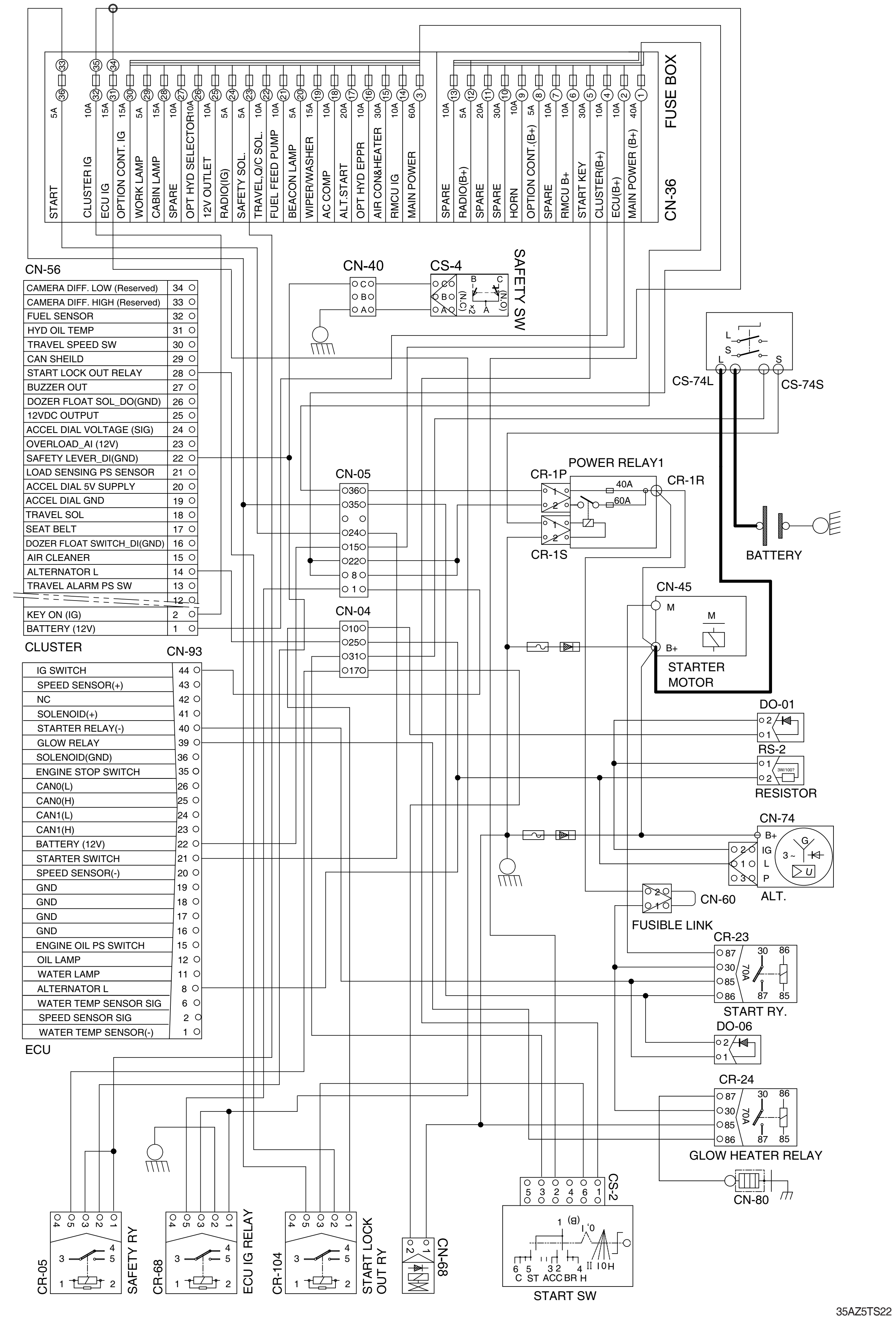


13. WHEN ENGINE DOES NOT START

- · 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-93 (21) 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

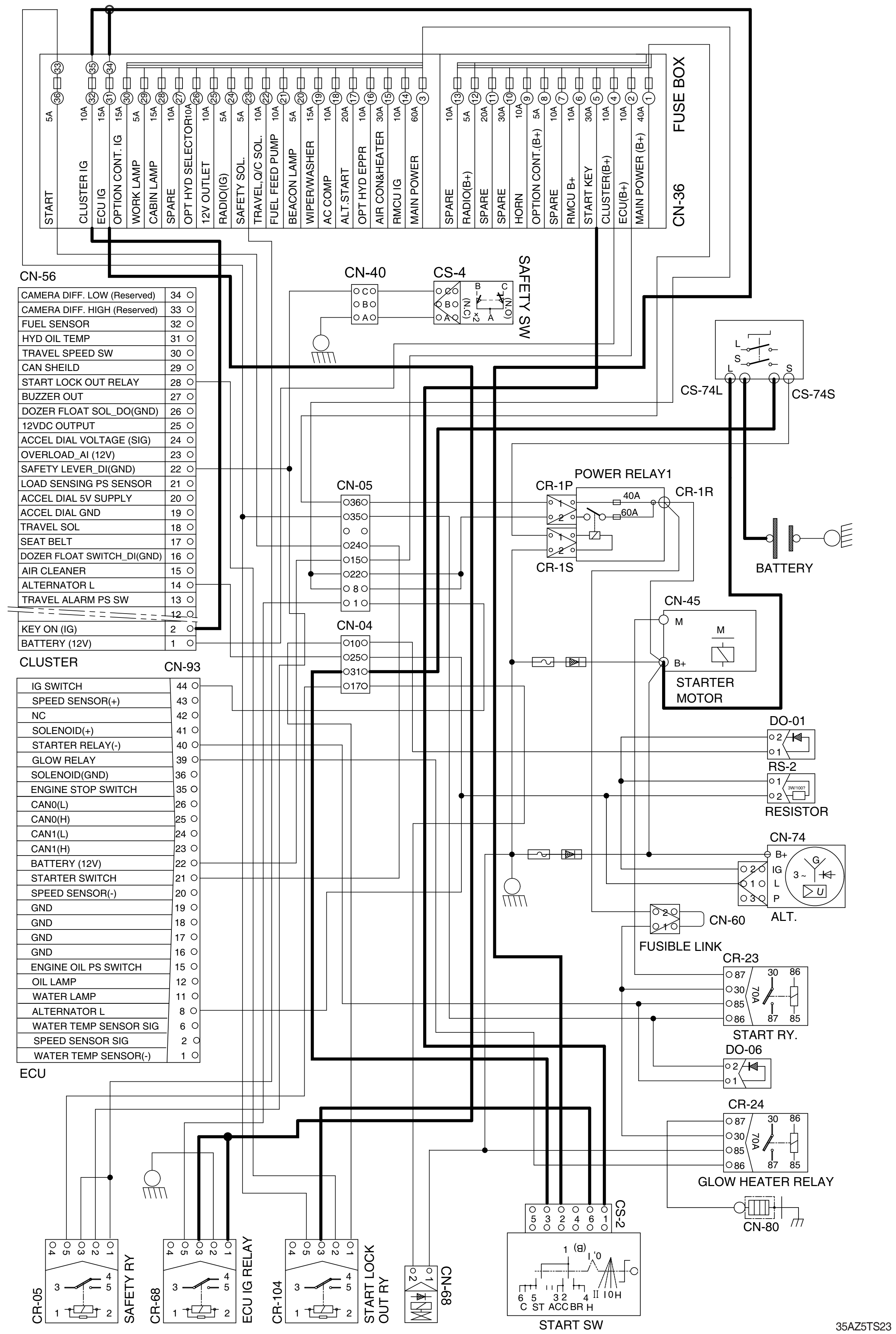
- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted and master switch ON.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.

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

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 HD Hyundai Construction Equipment spec.

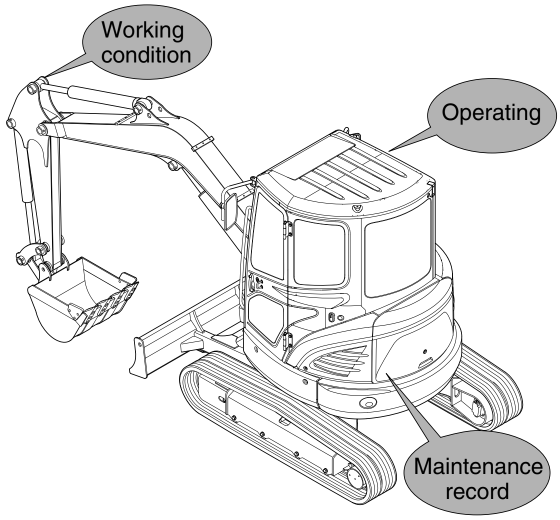
2) OPERATIONAL PERFORMANCE OF A WORKING MACHINE

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.

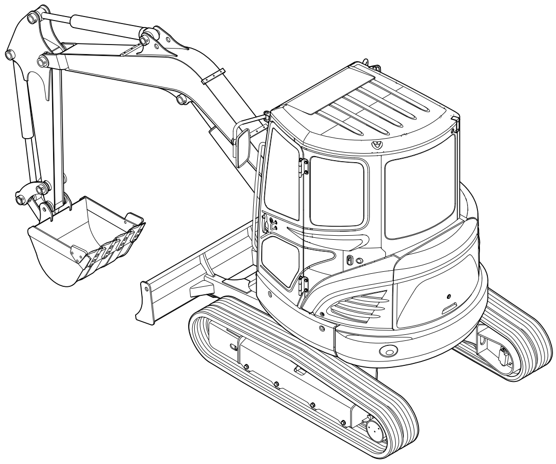


R35Z76MC01

2. TERMINOLOGY

1) STANDARD

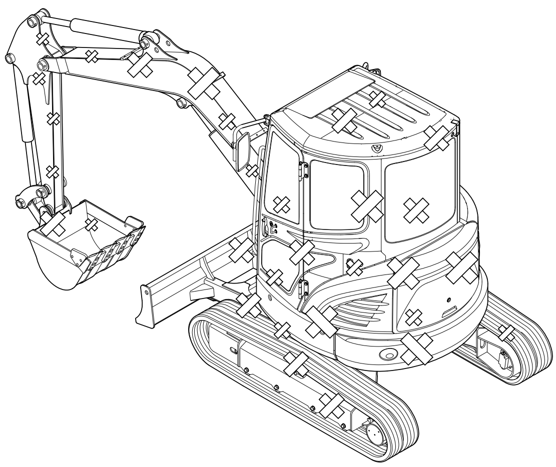
Specifications applied to the brand-new machine, components and parts.



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

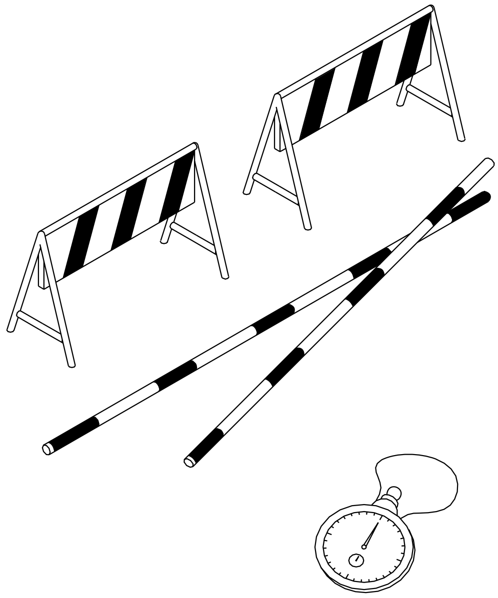
1) Observe the following rules in order to carry out performance tests accurately and safely.

(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.



7-3 (140-7)

(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.

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
		Common	Europe	
HX35A Z	Low idle	1300±50	1300±50	
	High idle	2300±50	2000±50	

3) TRAVEL SPEED

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

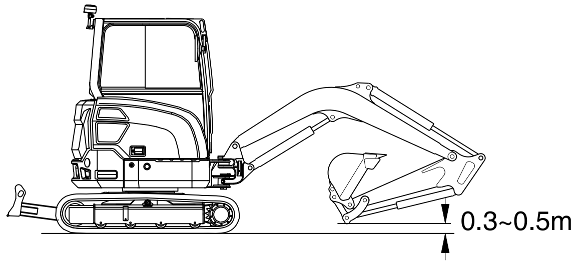
(2) Preparation

① Adjust the tension of both tracks to be equal.

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

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

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



35AZ6MC04

(3) Measurement

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

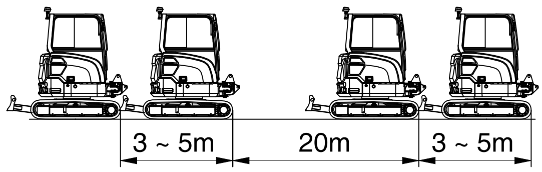
② Before starting either the low or high speed tests, adjust the travel mode switch to the speed to be tested.

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.



35AZ6MC05

(4) Evaluation

The average measured time should meet the following specifications.

Unit : Seconds / 20 ㎙

Model	Travel speed	Standard		Remarks
		Common	Europe	
HX35A Z	1 Speed	29.2	30.6	
	2 Speed	16.3	17.1	

4) TRACK REVOLUTION SPEED

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

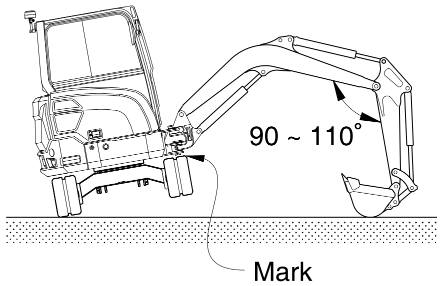
(2) Preparation

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.



35AZ6MC06

(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.

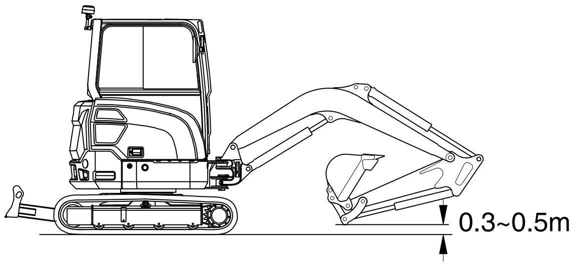
Unit : Seconds / 3 revolutions

Model	Travel speed	Standard		Remarks
		Common	Europe	
HX35A Z	1 Speed	19.6±1.5	20.5±1.5	
	2 Speed	10.9±1.5	11.4±1.5	

5) TRAVEL DEVIATION

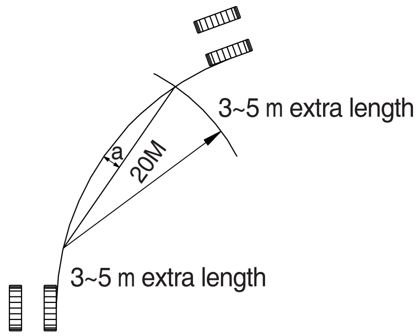
(1) Measure the deviation by the tracks from a 20㎧ straight line.

(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.



35AZ6MC04

(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
HX35A Z	200 below	240	

6) SWING SPEED

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

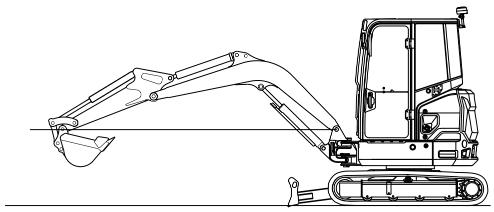
(2) Preparation

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.



35AZ6MC07

(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

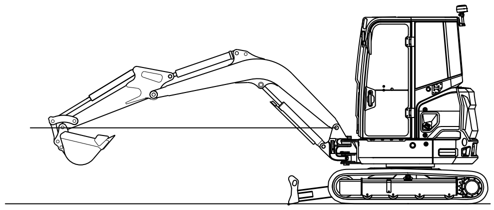
The time required for 2 swings should meet the following specifications.

Unit : Seconds / 2 revolutions

Model	Standard		Remarks
	Common	Europe	
HX35A Z	12.8±0.4	14.6±0.4	

7) SWING FUNCTION DRIFT CHECK

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



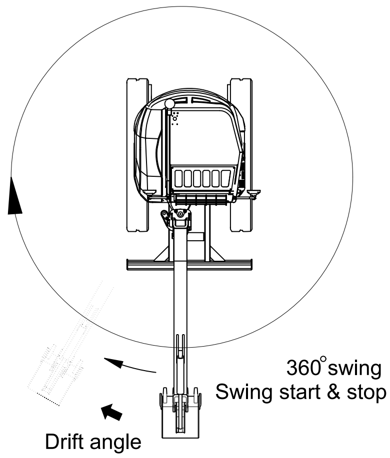
35AZ6MC07

(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.

(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.



35AZ6MC08

(4) Evaluation

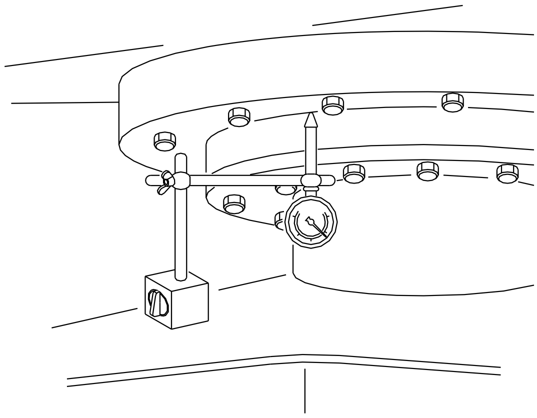
The measured drift angle should be within the following specifications.

Unit : Degree

Model	Standard	Maximum allowable	Remarks
HX35A Z	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

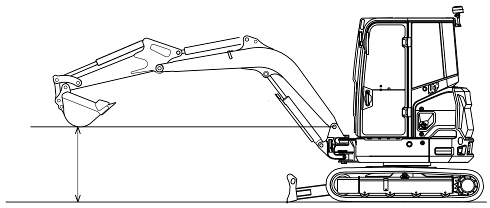
(2) Preparation

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

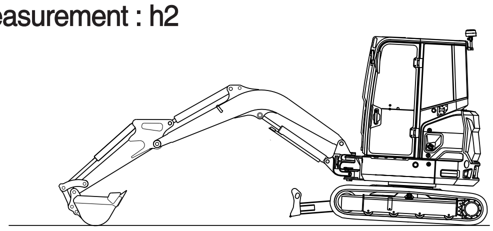
① With the arm rolled out and bucket rolled in, hold the bottom face of the bucket to the same height of the boom foot pin.
Record the dial gauge reading (h1).
② Lower the bucket to the ground and use it to raise the front idler 50 cm.
Record the dial gauge reading (h2).
③ Calculate bearing play (H) from this data (h1 and h2) as follows.
H=h2-h1

Measurement : h1



35AZ6MC09

Measurement : h2



35AZ6MC10

(4) Evaluation

The measured drift should be within the following specifications.

Unit : mm

Model	Standard	Maximum allowable	Remarks
HX35A Z	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.

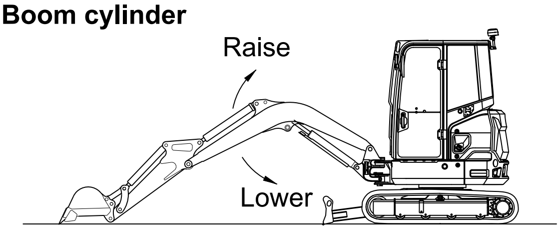
(3) Measurement

① To measure cylinder cycle times.

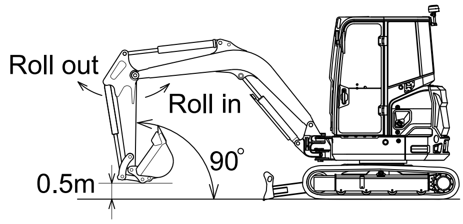
- Boom cylinders
Measure the time it takes to raise the boom, and the time it takes to lower the boom. To do so, position the boom at one stroke end then move the control lever to the other stroke end as quickly as possible.

- 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.

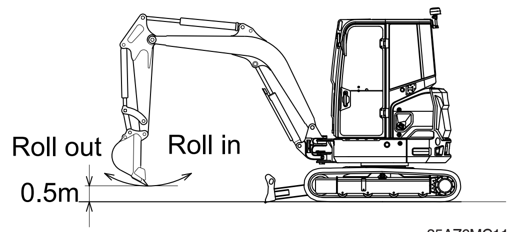
Boom cylinder



Arm cylinder



Bucket cylinder



35AZ6MC11

- 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.

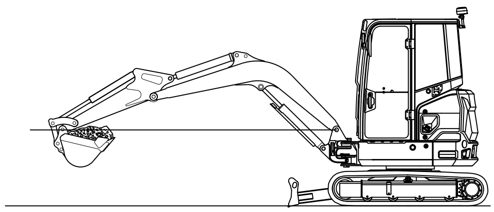
(4) Evaluation
The average measured time should meet the following specifications.

Unit : Seconds

Model	Function	Standard		Remarks
		Common	Europe	
HX35A Z	Boom raise	2.3±0.4	2.4±0.4	
	Boom lower	2.0±0.4	2.0±0.4	
	Arm in	2.7±0.4	2.8±0.4	
	Arm out	2.1±0.3	2.2±0.3	
	Bucket load	3.1±0.4	3.4±0.4	
	Bucket dump	2.0±0.3	2.3±0.3	
	Boom swing (LH)	5.8±0.3	6.6±0.4	
	Boom swing (RH)	5.2±0.3	5.8±0.4	
	Dozer up (raise)	2.2±0.3	2.4±0.3	
	Dozer down (lower)	2.9±0.3	3.4±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.



35AZ6MC12

(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 mm extended from the fully retracted position.

③ Position the bucket cylinder with the rod 20 to 30 mm 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.

(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
HX35A Z	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
HX35A Z	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.

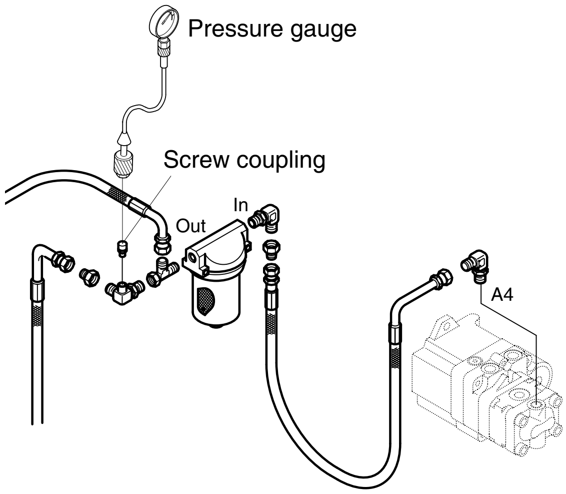
Unit : mm

Model	Kind of lever	Standard	Maximum allowable	Remarks
HX35A Z	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.



35AZ6MC14

(2) Measurement

① Measure the primary pilot pressure in the H mode.

(3) Evaluation

The average measured pressure should meet the following specifications:

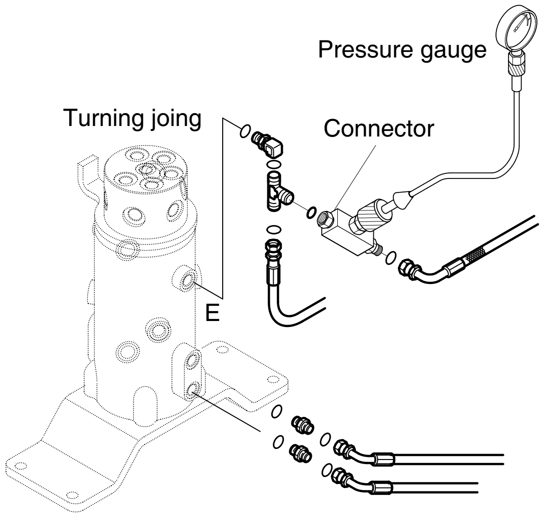
Unit : kgf / cm^2

Model	Standard	Remarks
HX35A Z	40±5	

14) FOR 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.



(2) Measurement

① Select the following switch positions.
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.

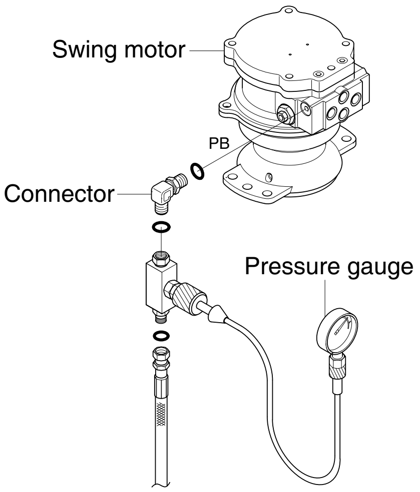
Unit : kgf / cm^2

Model	Travel speed mode	Standard	Maximum allowable	Remarks
HX35A Z	1 Speed	0	-	
	2 Speed	40±5	-	

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 PP 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.



R35Z76MC16

(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
HX35A Z	Brake disengaged	40±5	
	Brake applied	0	

16) MAIN PUMP DELIVERY PRESSURE

(1) Preparation

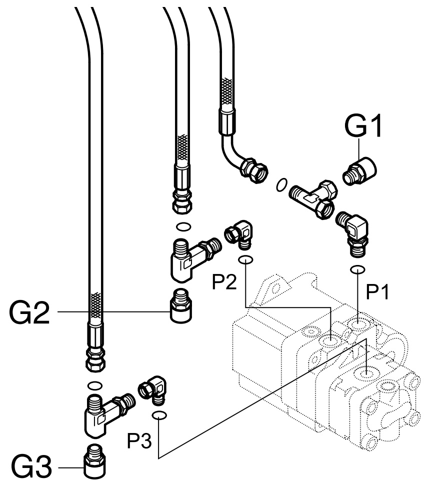
① Stop the engine.

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, G2, G3) as shown.

④ Start the engine and check for oil leakage from the port.

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



35AZ6MC37

(2) Measurement

① Measure the main pump delivery pressure at high idle.

(3) Evaluation

The average measured pressure should meet the following specifications.

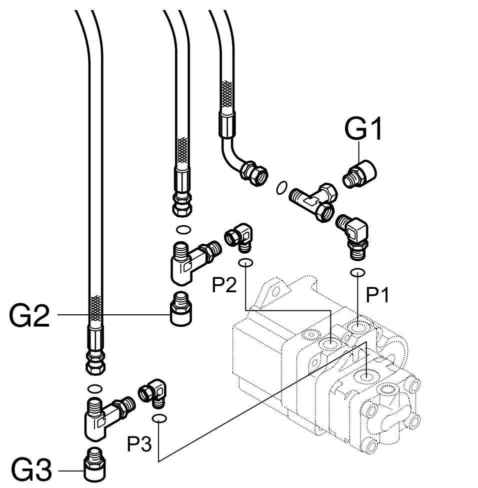
Unit : kgf / cm2

Model	Engine speed	Standard	Allowable limits	Remarks
HX35A Z	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, G2, G3) as shown.
④ Start the engine and check for oil leakage from the port.
⑤ Keep the hydraulic oil temperature at 50±5°C.



35AZ6MC37

(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
HX35A Z	Boom, Arm, Bucket	230±10
	Travel	230±10
	Swing	210±10

GROUP 2 MAJOR COMPONENT

1. MAIN PUMP

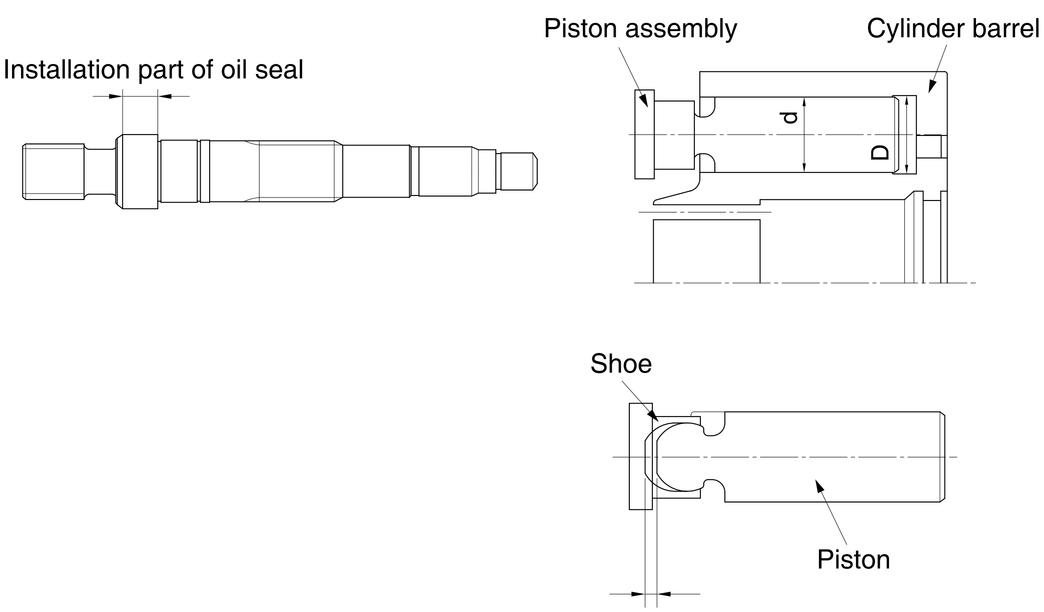
Before inspection, wash the parts well and dry them completely.

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 MOTOR

Wash all parts disassembly in treated oil and dry in the compressed air.

Perform maintenance including replacement or corrections in accordance with the following criterion.

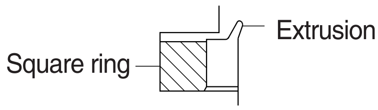
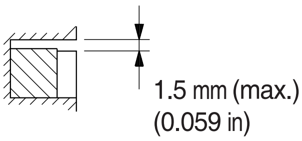
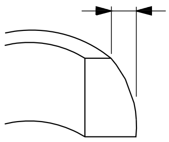
No.	Part name	Check Points	Criterion (recommended standards for replacement)	Measures
1	Floating seal (1-2)	Sliding surface	No remarkable flaws, wear, or seizure are noted.	Replacement
2	Angular bearing (1-3)	Rolling surface	No remarkable flaws, wear, or flaking are noted on balls and race.	Replacement
3	Housing (1-6)	Gear tooth surface	No remarkable flaws, wear, or flaking are noted on gear tooth surface. (note 1)	Replacement
4	Planetary gear A (1-18), B (1-9)	Gear tooth surface and rolling surface of inner side	No remarkable flaws, wear, or flaking are noted as same as No.3	Replacement
5	Needle bearing (1-10), (1-19)	Rolling surface of needle bearing	No remarkable flaws, wear, or flaking are noted.	Replacement
6	Inner race (1-11), (1-20)	Rolling surface of inner race	No remarkable flaws, wear, or flaking are noted.	Replacement
7	Thrust washer (1-12)	Sliding surface	No remarkable flaws, wear, or seizure are noted.	Replacement
8	Thrust plate (1-13), (1-23)	Sliding surface	No remarkable flaws, wear, or seizure are noted.	Replacement
9	Sun gear (1-15)	Gear tooth surface	Same as No. 3	Replacement
10	Holder (1-17)	Sliding surface of planetary gear A	No remarkable flaws, wear, or seizure are noted.	Replace planetary A and holder.
11	Drive gear (1-22)	Gear tooth surface	Same as No. 3	Replacement
13	O-ring (1-25), (1-29), (28), (29), (39), (31-5), (44), (50-5), (50-6), (50-7), (65), (66), (74)	Surface and hardness	No flaws and deflection are noted. Not hardened.	Recommend that seals be replaced with new ones at time of reassembly, since rubber materials normally deteriorate with age.
14	Shaft (2)	Sliding surface of oil seal	No remarkable flaws, wear.	Replacement
15	Ball bearing (3), (27)	Same as No. 2.	Same as No. 2.	Replacement
16	Oil seal (4)	Surface and hardness of seal lip	No flaw, wear or deflection are noted. Not hardened.	Replacement

Note 1 : Pitching in this instance refers to a case where pitching occurs in more than 10% of engagement area per tooth surface.

No.	Part name	Check Points	Criterion (recommended standards for replacement)	Measures
17	Swash plate (5)	Sliding surface and roughness between piston sub assembly and swash plate	No remarkable flaws (over 0.02 [mm] in thickness), wear, or seizure are noted. 0.4a (0.8a)	Correct lapping (#1000) if sliding surface is rough. Replace if proper correction cannot be made.
18	Cylinder block (7)	Clearance between piston sub assembly and cylinder block.	0.02 [mm] (0.04 [mm])	Replace both cylinder block and piston sub assembly concurrently. Correct lapping (#1000) if sliding surface is rough. Replace both cylinder block and piston sub assembly with new, if sliding surfaces cannot be properly corrected.
		Sliding surface and roughness between valve plate and cylinder block.	No remarkable flaws (over 0.02[mm] in thickness), wear, or seizure are noted. 0.4a (0.8a)	
19	Spring (9), (20), (37) (42), (31-3), (50-3), (62), (63)	Breakage or deflection is big.	-	Replacement
20	Piston sub assembly (15)	Clearance between piston sub assembly and cylinder block.	Same as No. 18.	Same as No. 18.
		Sliding surface and roughness between piston sub assembly and swash plate.	Same as No. 17. 0.2a (0.8a)	Same as No. 17.
		Loosen between piston and shoe is big.	0.15 [mm] (0.4 [mm])	Replacement
21	Piston (19)	Clearance between piston sub assembly and flange holder.	Same as No. 18.	Same as No. 18.
		Sliding surface and roughness between piston sub assembly and swash plate.	Same as No. 17.	Same as No. 17.
22	Valve plate (25)	Sliding surface and roughness between valve plate cylinder block.	Same as No. 18.	Same as. No. 18.
		Thickness; 5 [mm]	4.8 [mm]	Replacement
23	Base plate (30)	Sliding surface between plunger and base plate.	No remarkable flaws, wear, or seizure are noted.	Replace both base plate and plunger.
		Sliding surface between spool and base plate.	No remarkable flaws, wear, or seizure are noted.	Replace both base plate and spool.

No.	Part name	Check Points	Criterion (recommended standards for replacement)	Measures
24	Plunger (31-1)	Sliding surface between plunger and base plate.	No remarkable flaws, wear, or seizure are noted.	Replace both base plate and plunger.
		Sliding surface between plunger and check valve.	No remarkable flaws, wear, or seizure are noted.	Replace both check valve and plunger.
25	Check valve (31-2)	Sliding surface between plunger and check valve.	No remarkable flaws, wear, or seizure are noted.	Replace plunger assy.
		Seat surface between plunger and check valve.	No remarkable flaws, wear, or seizure are noted. Entire surface of seats are rubbing.	Replace both check valve and plunger.
26	Spool (41)	Sliding surface between plunger and check valve.	Same as No. 23	Same as No. 23
27	Valve body (50-1)	Sliding surface between spool and valve body.	No remarkable flaws, wear, or seizure are noted.	Replace valve assy.
28	Without parking brake check valve (50-2)	Sliding surface between plunger and check valve.	No remarkable flaws, wear, or seizure are noted.	Replace valve assy.
	With parking brake spool (50-2)	Sliding surface between spool and valve body.	No remarkable flaws, wear, or seizure are noted.	Replace valve assy.

5. TURNING JOINT

<table>
<tr><th colspan="2">Parts Name</th><th>Check Points</th><th>Measures</th></tr>
<tr><td rowspan="6">Body,
Stem</td><td>Sliding surface with sealing sections.</td><td>Plating worn or peeled due to seizure or contamination.</td><td>Replace</td></tr>
<tr><td rowspan="2">Sliding surface between body and stem other than sealing section.</td><td>· Worn abnormality or damaged more than 0.1 mm (0.0039 in) in depth due to seizure contamination.</td><td>Replace</td></tr>
<tr><td>· Damaged more than 0.1 mm (0.0039 in) in depth.</td><td>Smooth with oilstone.</td></tr>
<tr><td rowspan="3">Sliding surface with thrust plate.</td><td>· Worn more than 0.5 mm (0.02 in) or abnormality.</td><td>Replace</td></tr>
<tr><td>· Worn less than 0.5 mm (0.02 in).</td><td>Smooth</td></tr>
<tr><td>· Damage due to seizure or contamination remediable within wear limit (0.5 mm) (0.02 in).</td><td>Smooth</td></tr>
<tr><td rowspan="3">Cover</td><td rowspan="3">Sliding surface with thrust plate.</td><td>· Worn more than 0.5 mm (0.02 in) or abnormality.</td><td>Replace</td></tr>
<tr><td>· Worn less than 0.5 mm (0.02 in).</td><td>Smooth</td></tr>
<tr><td>· Damage due to seizure or contamination remediable within wear limit (0.5 mm) (0.02 in).</td><td>Replace</td></tr>
<tr><td rowspan="3">Seal set</td><td>-</td><td>· Extruded excessively from seal groove square ring.

</td><td>Replace</td></tr>
<tr><td>-</td><td>· Slipper ring 1.5 mm (0.059 in) narrower than seal groove, or narrower than back ring.

</td><td>Replace</td></tr>
<tr><td>-</td><td>· Worn more than 0.5 mm (0.02 in) ~ 1.5 mm (MAX.) (0.059 in)
</td><td>Replace</td></tr>
</table>

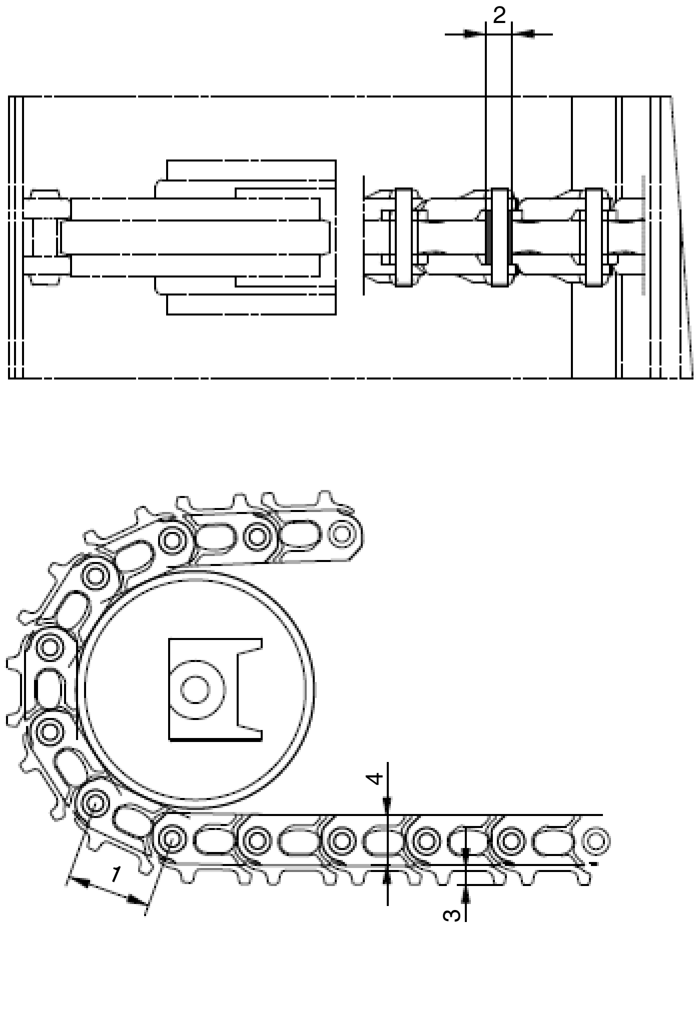
6. CYLINDER

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

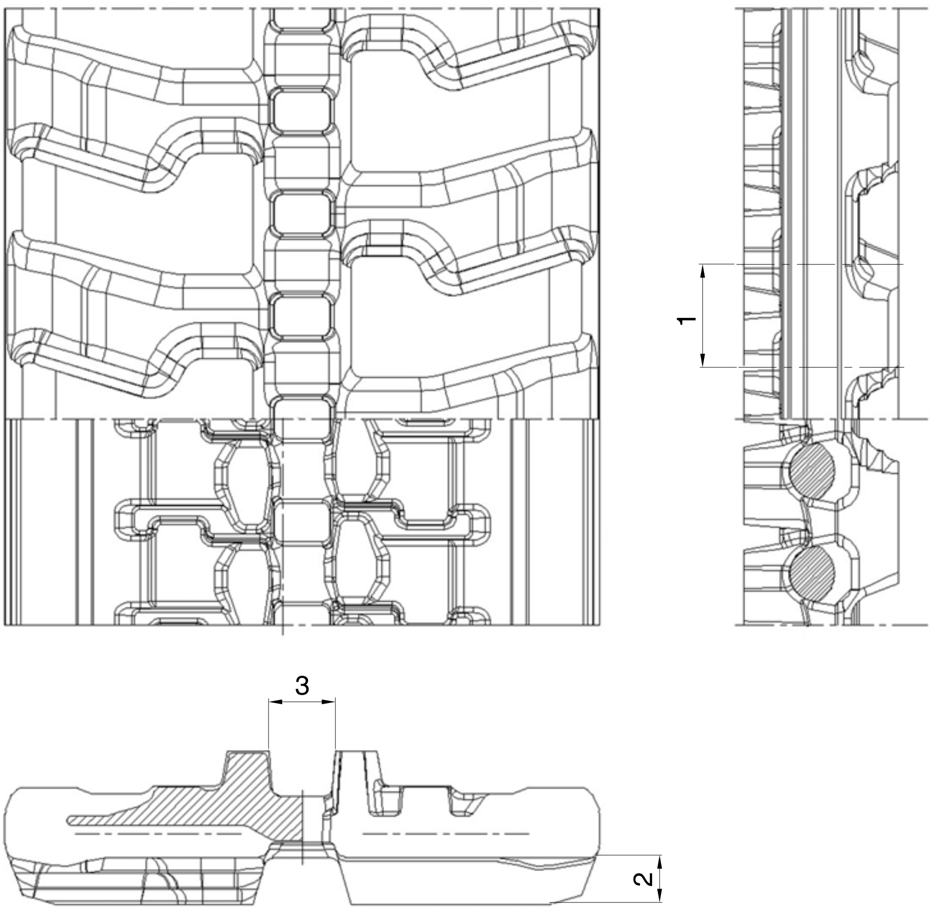


35AZ6MC18

Unit : mm

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Link pitch	101.6	105.0	Replace bushing and pin and link assembly
2	Outside diameter of bushing	32.17	28.77	
3	Height of grouser	16.5	12.5	Lug welding, rebuild or replace
4	Height of link	65	60	

2) RUBBER SHOE

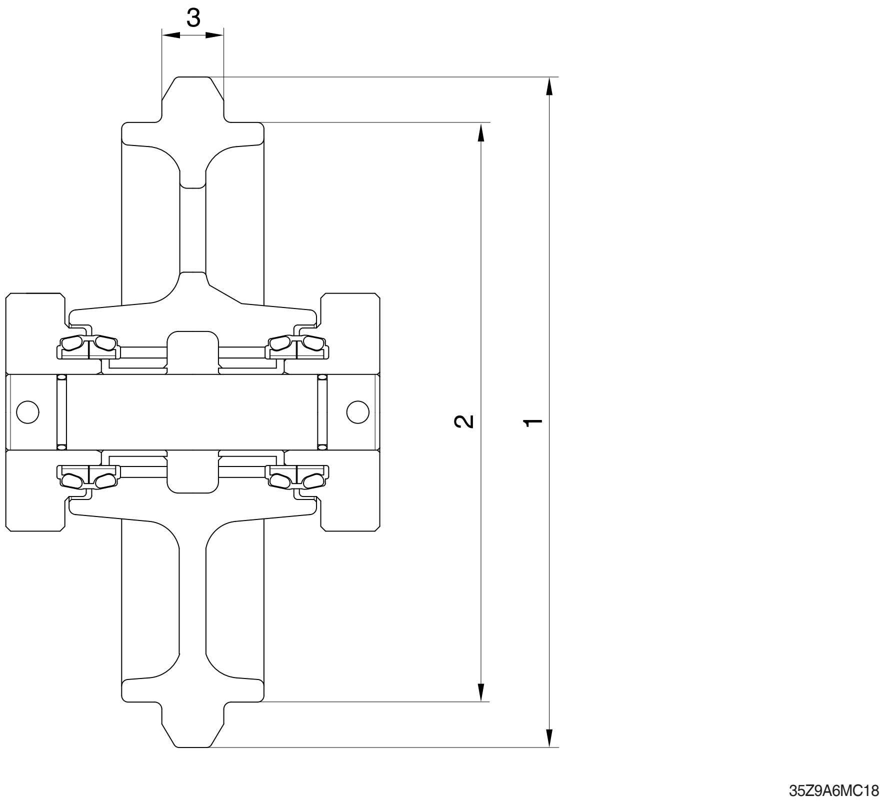


35Z9A6MC17

Unit : mm

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Link pitch	52.5	54.5	Replace
2	Height of grouser	25	5	
3	Width of link	33	46	

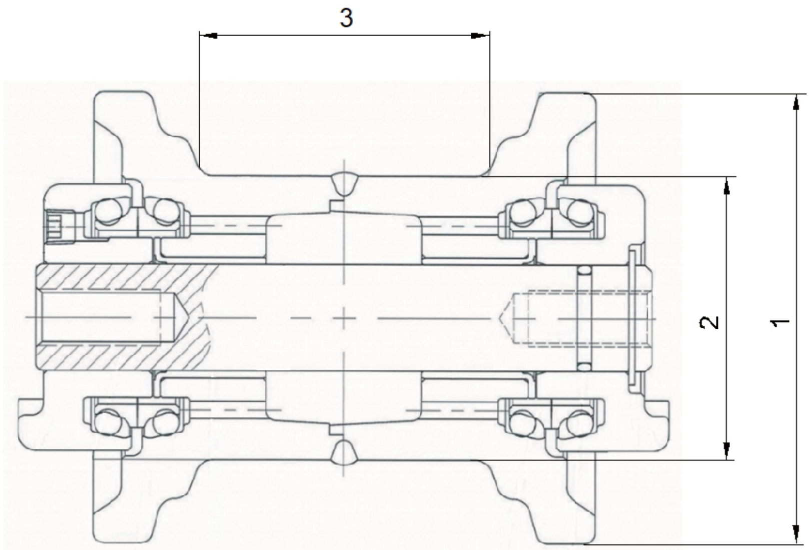
2. IDLER



Unit : mm

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Outside diameter of flange	331	-	Rebuild or replace
2	Outside diameter of thread	289	279	
3	Width of flange	26.2	20.2	

3. TRACK ROLLER

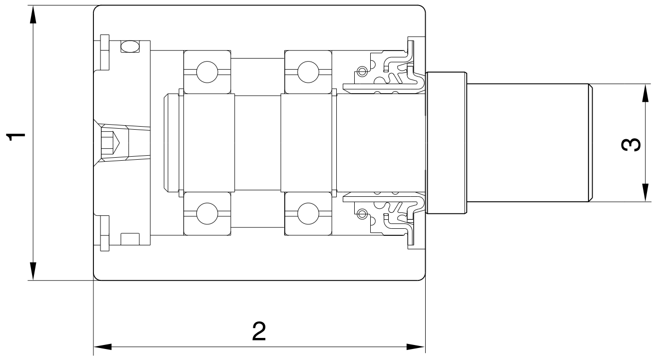


35AZ6MC19

Unit : mm

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Outside diameter of flange	Ø127	129	Rebuild or replace
2	Outside diameter of thread	Ø80	89	
3	Width of flange	81	85	

4. CARRIER ROLLER

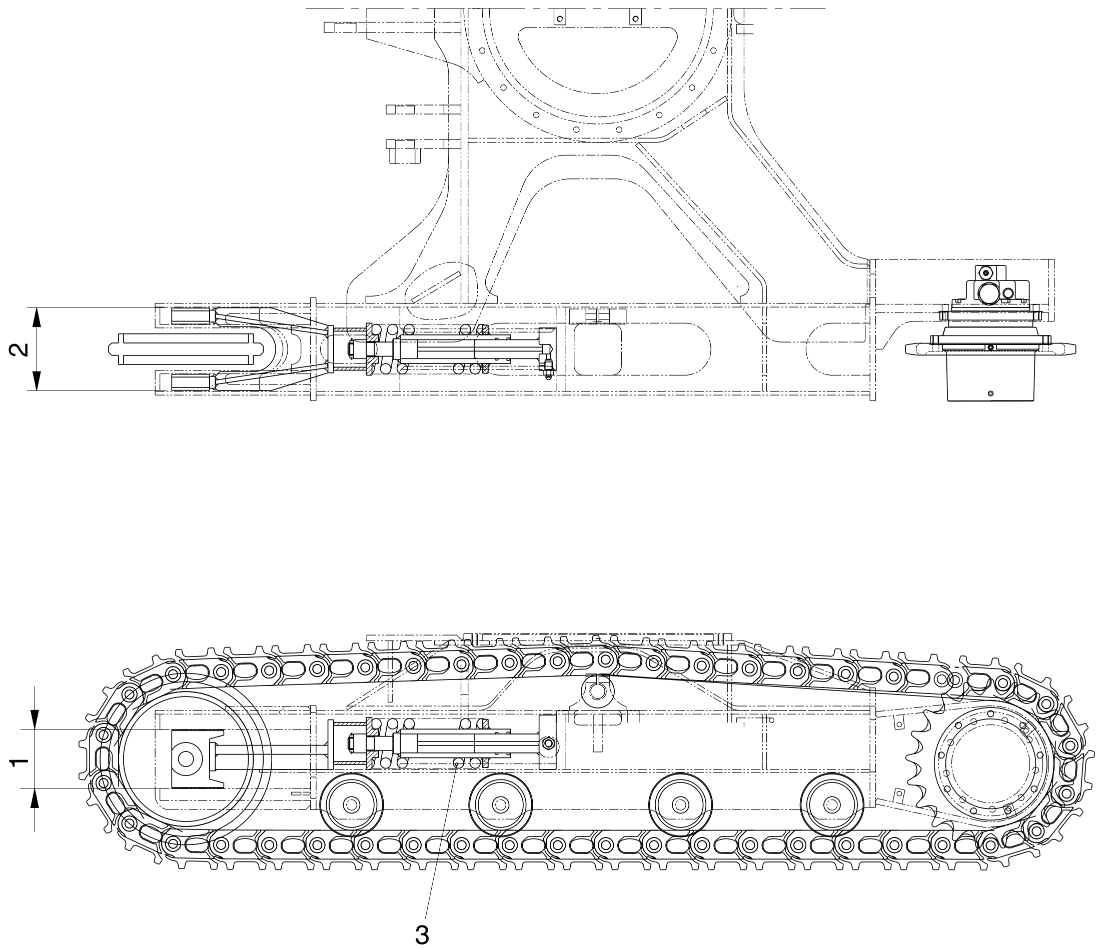


35AZ6MC20

Unit : ㎜

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Outside diameter of flange	Ø70	Ø66	Replace
2	Width of tread	86	-	
3	Diameter of shaft	Ø30	-	

5. TENSION CYLINDER (steel and rubber track)



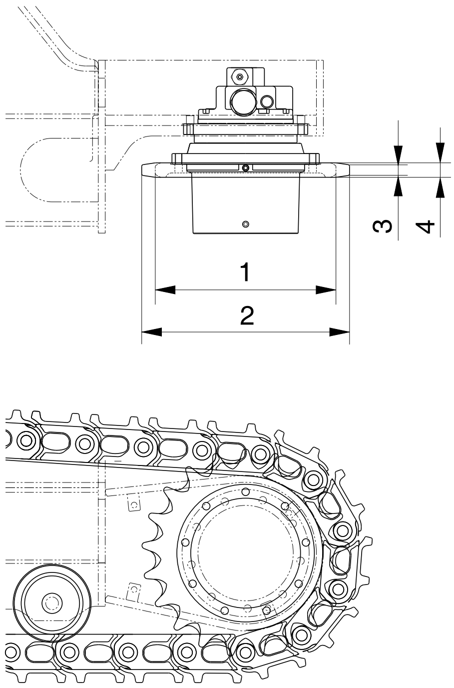
R35Z76MC21

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">125</td><td colspan="2">129</td><td>Rebuild</td></tr>
<tr><td>Idler support</td><td colspan="2">124</td><td colspan="2">128</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">178</td><td colspan="2">182</td><td>Rebuild</td></tr>
<tr><td>Idler guide</td><td colspan="2">174</td><td colspan="2">178</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>286.5</td><td>A : 233.5
B : 220</td><td>2,698 kg</td><td>-</td><td>2,158 kg</td></tr>
</table>

A : steel track B : rubber track

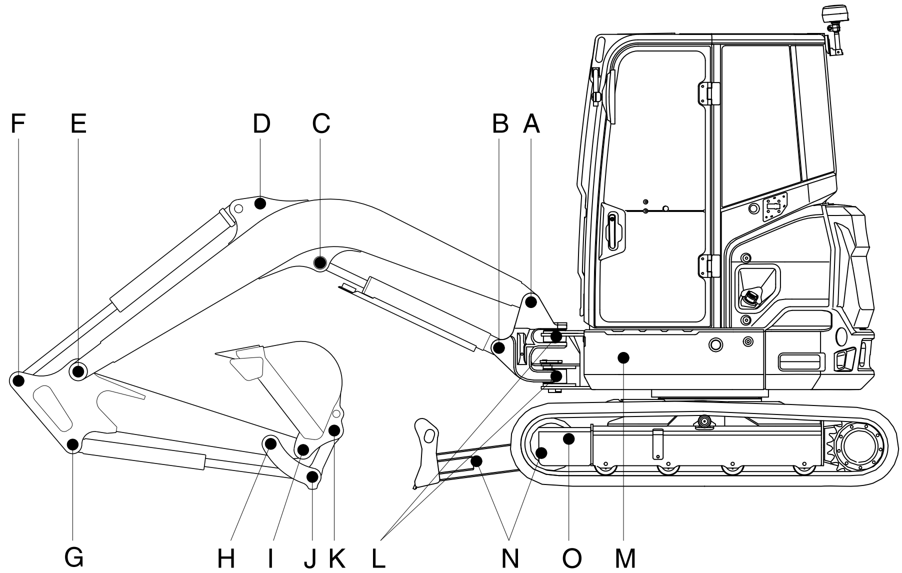
6. SPROCKET (steel and rubber track)



R35Z76MC22

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Wear out of sprocket tooth lower side diameter	313.72	304.72	Repair or Replace
2	Wear out of sprocket tooth upper side diameter	359.75	-	
3	Wear out of sprocket tooth upper side width	18	-	
4	Wear out of sprocket tooth lower side width	25	17	

7. WORK EQUIPMENT



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	45	44	43.5	45.5	46	〃
C	Boom Cylinder Rod	45	44	43.5	45.5	46	〃
D	Arm Cylinder Head	45	44	43.5	45.5	46	〃
E	Boom Front	45	44	43.5	45.5	46	〃
F	Arm Cylinder Rod	45	44	43.5	45.5	46	〃
G	Bucket Cylinder Head	40	39	38.5	40.5	41	〃
H	Arm Link	40	39	38.5	40.5	41	〃
I	Bucket and Arm Link	40	39	38.5	40.5	41	〃
J	Bucket Cylinder Rod	40	39	38.5	40.5	41	〃
K	Bucket Link	40	39	38.5	40.5	41	〃
L	Boom swing post	70	69	68.5	70.5	71	〃
M	Boom swing cylinder	45	44	43.5	45.5	46	〃
N	Blade cylinder	45	44	43.5	45.5	46	〃
O	Blade and frame link	40	39	38.5	40.5	41	〃

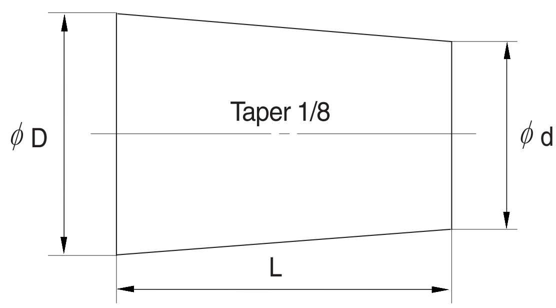
SECTION 7 DISASSEMBLY AND ASSEMBLY

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 mm 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 disulphide 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	6.63±1.0	48±7.2
2		Engine mounting bolt (Engine-Bracket)-RH	M12 × 1.75	11.7±1.8	84.6±13.0
3		Engine mounting bolt (Bracket-Frame)	M12 × 1.75	12.8±3.0	93±22.0
4		Engine mounting bolt (Bracket-Pump housing)	M10 × 1.5	6.63±1.0	48±7.2
5		Radiator mounting bolt, nut	M12 × 1.75	6.9±1.4	50±10.0
6		Coupling mounting bolt	M12 × 1.75	10±1.0	72.3±7.2
7	Hydraulic system	Main pump mounting bolt	M12 × 1.75	14.7±2.2	106±15.9
8		Main pump housing mounting bolt	M10 × 1.25	6.63±1.0	48±7.2
9		Main control valve mounting bolt	M10 × 1.5	6.9±1.4	50±10.0
10		Fuel tank mounting bolt	M10 × 1.5	6.9±1.4	50±10.0
11		Hydraulic oil tank mounting bolt	M12 × 1.75	12.3±2.5	89±18.1
12		Turning joint mounting bolt, nut	M10 × 1.5	6.9±1.4	50±10.0
13		Swing motor mounting bolt	M14 × 2.0	19.6±2.9	142±21.0
14	Power train system	Swing bearing upper mounting bolt	M12 × 1.25	13.3±2.0	96.2±14.5
15		Swing bearing lower mounting bolt	M12 × 1.75	12.8±2.0	93±14.5
16		Travel motor mounting bolt	M12 × 1.75	13.8±1.0	100±7.2
17		Sprocket mounting bolt	M12 × 1.75	12.3±1.2	89±8.7
18	Under carriage	Upper roller mounting bolt, nut	M12 × 1.75	12.3±1.2	89±8.7
19		Lower roller mounting bolt	M16 × 1.5	31.3±3.0	226±21.7
20	Others	Counterweight mounting bolt	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

2. TORQUE CHART

Use following table for unspecified torque.

1) BOLT AND NUT

(1) Coarse thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · 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	
	kgf · m	lbf · ft	kgf · m	lbf · 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.**

(4) Loosen the drain plug under the hydraulic tank and drain the oil from the hydraulic tank.

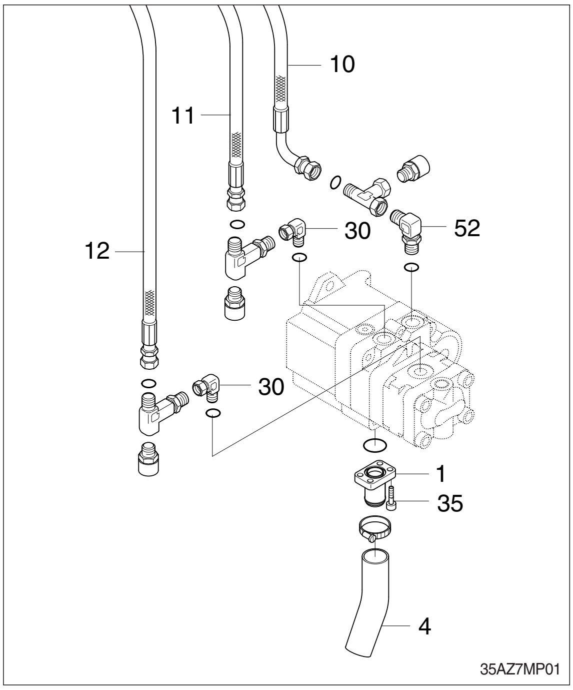
· Hydraulic tank quantity : 36 ℓ (9.5 U.S.gal)

(5) Disconnect hoses (10, 11, 12) and remove connectors (30, 52).

(6) Disconnect pilot line hoses (18, 23) and remove connectors (33,36).

(7) Remove socket bolts (35) and disconnect pump suction tube (1).

※ When pump suction tube is disconnected, the oil inside the piping will flow out, so catch it in oil pan.

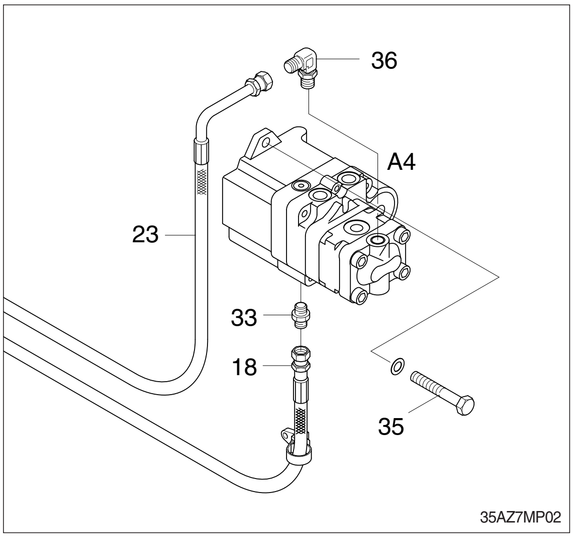


(8) Sling the pump assembly and remove the pump mounting bolts.

· Weight : 19 kg (42 lb)

· Tightening torque : 14.7±2.2 kgf·m (106±15.9 lbf·ft)

※ Pull out the pump assembly from housing. When removing the pump assembly, check that all the hoses have been disconnected.



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.

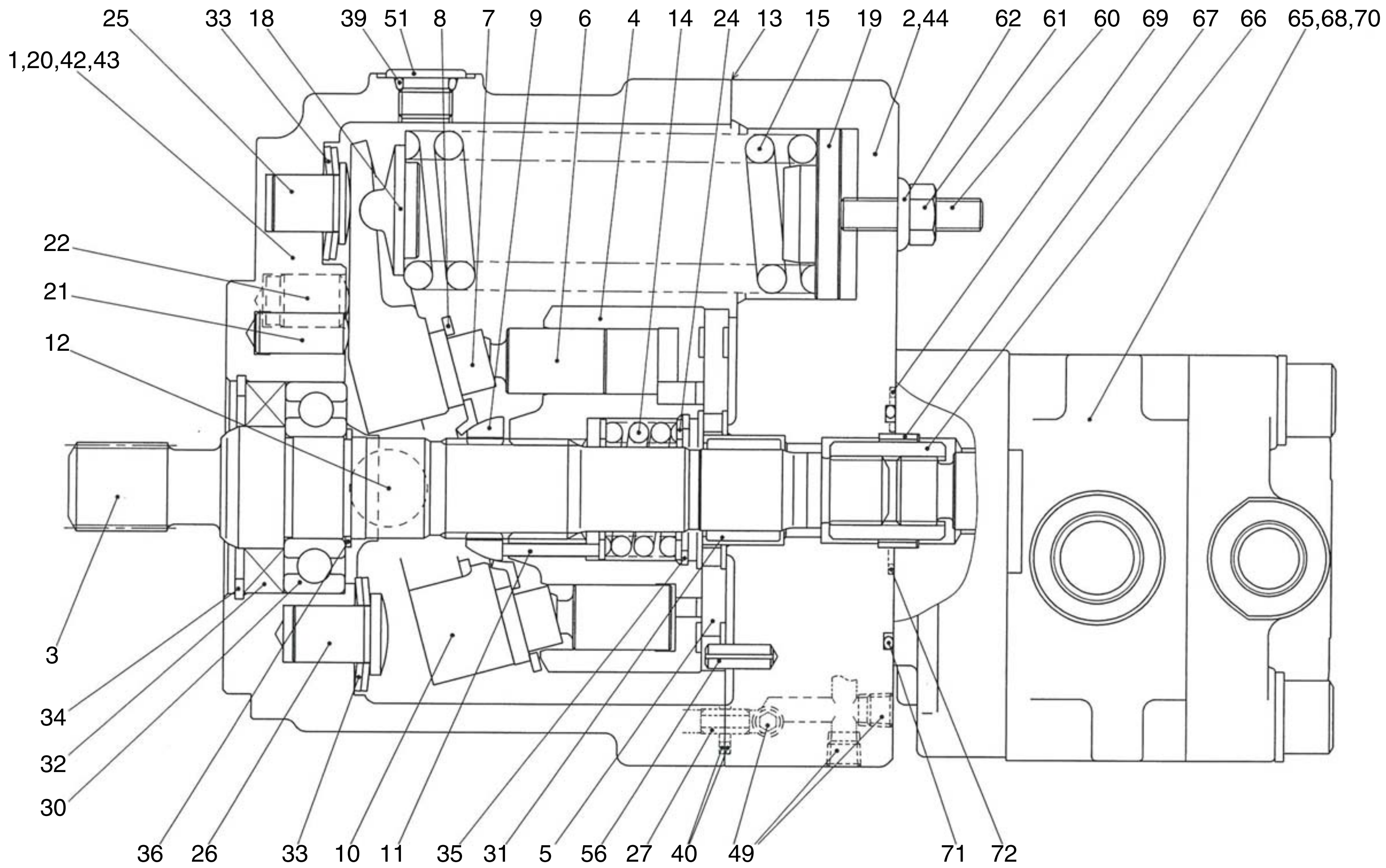
(6) Bleed the air from the hydraulic pump.
  ① Remove the air vent plug (1EA).
  ② Tighten plug lightly.
  ③ Start the engine, run at low idling, and check oil come out from plug.
  ④ Tighten plug.

(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. MAIN PUMP

1) STRUCTURE



35Z9A7MP102

1	Body S	10	Swash plate	21	Rod G	33	Dish spring	49	Plug	68	Screw
2	Body H	11	Needle	22	Rod C	34	Snap ring	51	Plug	69	O-ring
3	Shaft	12	Ball	24	Retainer	35	Snap ring	56	Spring pin	70	Washer
4	Cylinder barrel	13	Packing	25	Stopper pin A	36	Snap ring	60	Screw	71	O-ring
5	Valve plate	14	Spring C	26	Stopper pin B	39	O-ring	61	Nut	72	O-ring
6	Piston	15	Spring T1	27	Pin	40	O-ring	62	Seal washer		
7	Shoe	18	Spring holder	30	Ball bearing	42	Plug	65	Gear pump		
8	Shoe holder	19	Spring guide	31	Needle bearing	43	O-ring	66	Coupling		
9	Barrel holder	20	Pin	32	Oil seal	44	Screw	67	Collar		

3. ASSEMBLE AND DISASSEMBLE

1) General precautions

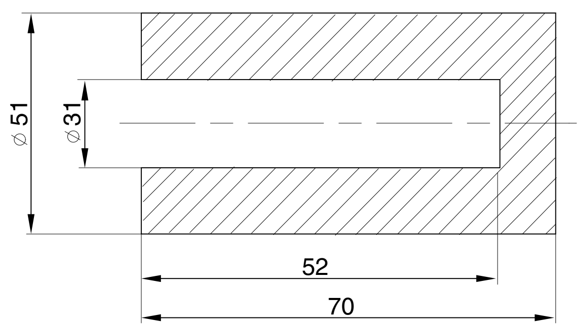
(1) Before disassembling, it is important to have fully understood the internal structure of the pump.

※ The gasket (13), oil seal (32) and O-rings will be probably damaged when you disassemble it, so be sure to have prepared spares.

(2) After having drained oil inside the pump, wash the pump and put it on a working bench covered with clean paper, cloth, or rubber mat for disassembling and assembling. Then, disassemble and assemble the pump slowly and carefully with necessary tools. Use care not to scratch even slightly, and take proper measures to prevent foreign matters from entering the assembly.

2) Tools

Tool name	Size	Quantity
Hexagon wrench	4, 6, 8 mm	1 each
Circlip player	For hole	1
Spanner wrench	13 mm	1
Torque wrench	45N (JIS B 4650) 90N (JIS B 4650)	1 1
Resin hammer	-	1
Special tooling for oil seal	See below	1
Seal kit	-	1 set
Grease	-	Small amount



Special tooling for oil seal

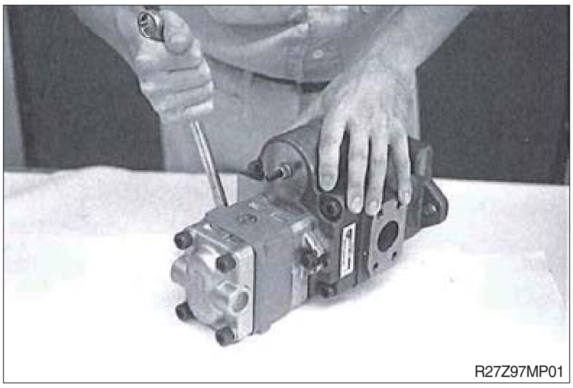
R27Z97MP98

3) DISASSEMBLING

(1) Disassembling of gear pump

Remove two screws (68) with spanner wrench 13 mm, and after that remove gear pump (65), collar (67) and coupling (66).

※ Coupling (66) and collar (67) may be attached with gear pump kit (65).



R27Z97MP01

(2) Remove the adjustment screw

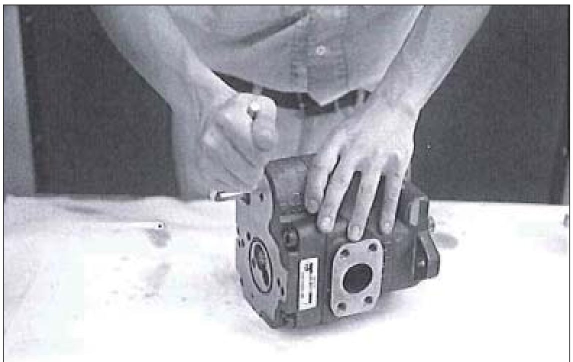
Loose hexagon nut (61) with spanner wrench 13 mm, then remove the adjustment screw (60) with hexagon wrench 4 mm.

※ Suggest you to measure the outside length of the adjustment screw. Because it is a good help when you readjust it after reassembling.

R27Z97MP02

(3) Separation of body S and body H

Remove five screws (44) with hexagon wrench 8 mm.



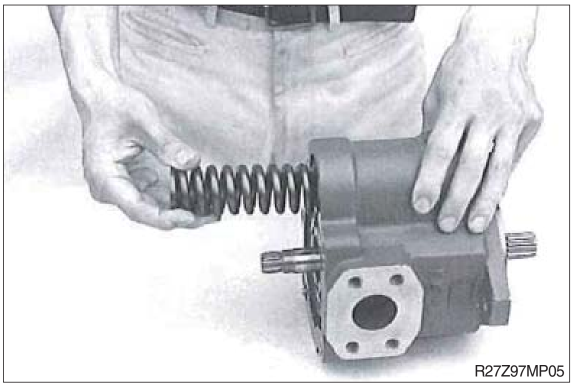
R27Z97MP03

※ If you tap the part of inserted spring of body H with hummer softly, it is easy for separation.

R27Z97MP04

(4) Disassembling of body S kit

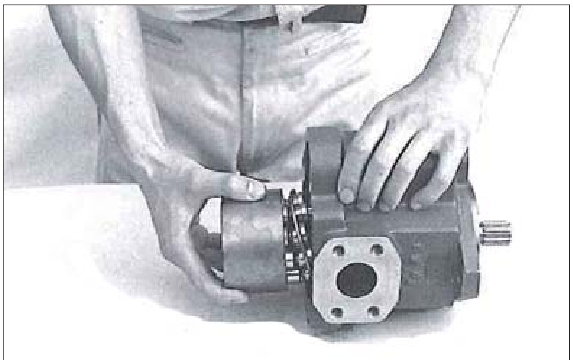
Remove spring T1 (15) from body S kit, then take off spring holder (18).



R27Z97MP05

(5) Disassembling of body S kit

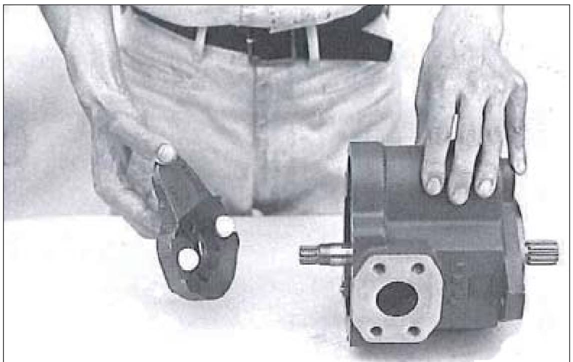
Remove cylinder barrel kit.



R27Z97MP06

(6) Disassembling of body S kit

Remove swash plate (10) and two balls (12).

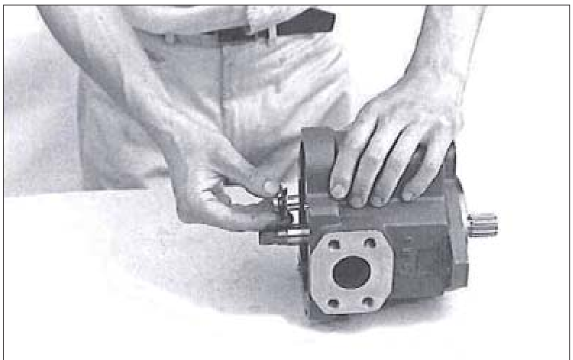


R27Z97MP07

(7) Disassembling of body S kit

Remove stopper pin A (25), stopper pin B (26), dish springs (33), rod G (21) and rod C (22).

※ The length of the stopper pin A and B is different. Pay attention not to swap when reassembling.



R27Z97MP08

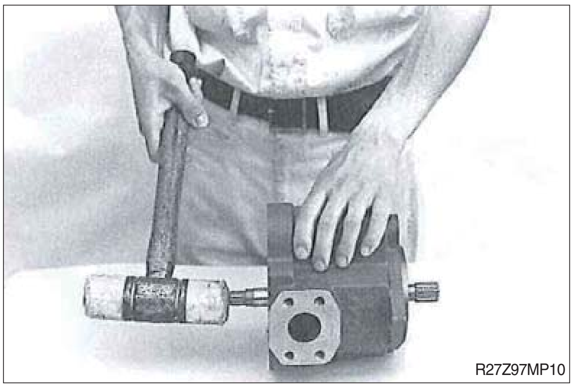
(8) Disassembling of body S kit

Remove snap ring (34) from body S (1).


R27Z97MP09

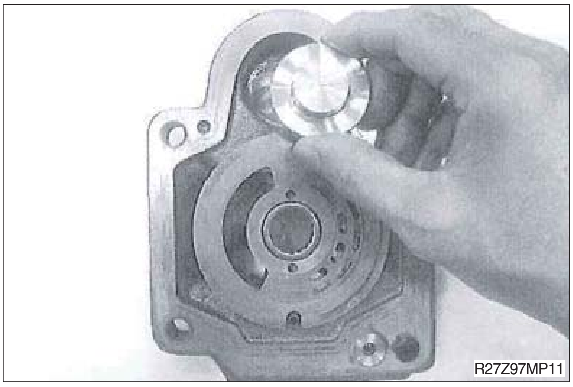
(9) Disassembling of body S kit

Tap the end of shaft (3) with hammer, then oil seal (32) and shaft with bearing (30) come off.


R27Z97MP10

(10) Disassembling of body H kit

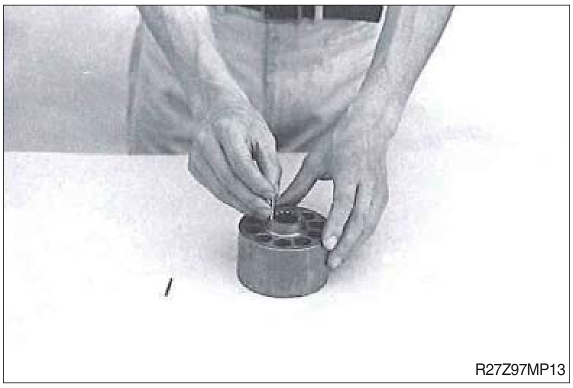
Remove spring guide (19) and valve plate (5) from body H.


R27Z97MP11

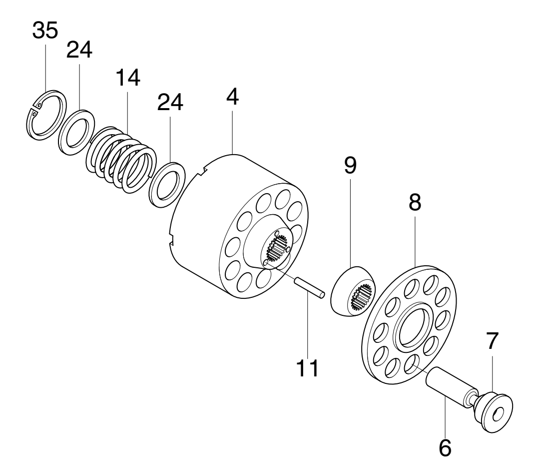
(11) Disassembling of cylinder barrel kit

Remove shoe holder (8) on which piston shoe assemblies (6) and (7) are set and disassemble it in the order of barrel holder (9) and needle (11).
Also, take off snap ring (35), retainer (24), spring C (14) and retainer (24), which are set in the cylinder barrel (4) in this order.

R27Z97MP12



R27Z97MP13



R27Z97MP14

4) ASSEMBLING

(1) Precautions during assembling

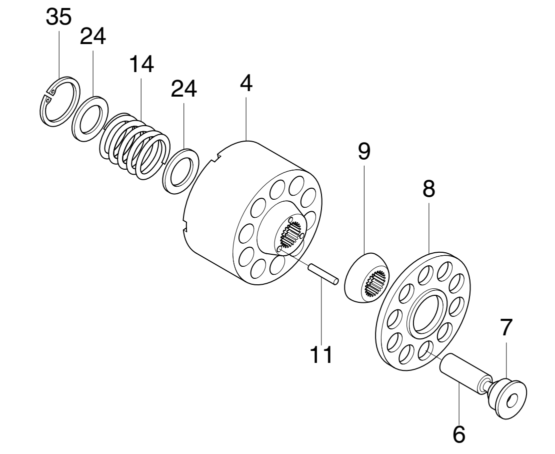
Reverse the above procedures for assembling.

When assembling, be very careful to wash parts in clean oil, to prevent dusts and water from adhering to parts entering assemblies and not to scratch on the sliding surfaces of all parts.

※ Apply small quantity of grease to the periphery of O-rings to be set in socket and spigot joints to prevent the O-rings from being damaged.

(2) Assembling of cylinder barrel kit

Set retainer (24), spring C (14), retainer (24) and snap ring (35) in the shaft center hole of cylinder barrel (4) in this order, and carefully set shoe holder (8), on which needle (11), barrel holder (9) and ten piston shoe assemblies have already been set, in cylinder barrel from the opposite side.



R27Z97MP14

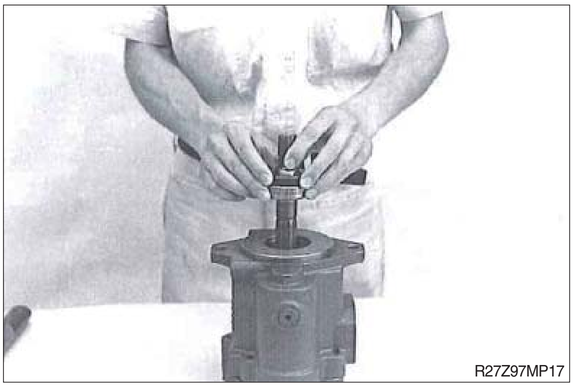
R27Z97MP15

R27Z97MP16

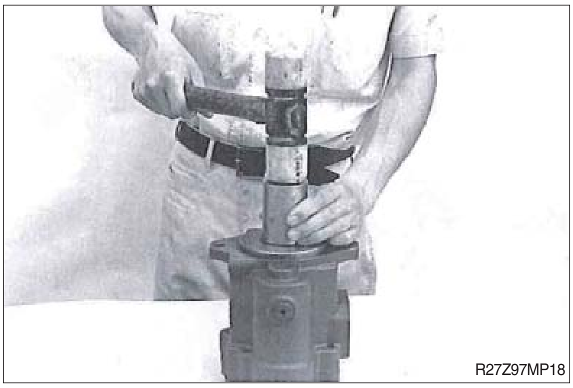
(3) Assembling of body S kit

Set shaft (3) with bearing (30), oil seal (32) and snap ring (34) in this order into body S (1).

※ Use new oil seal for assembling. Before assembling, apply a small quantity of grease to the periphery of oil seal lip and tap it together with the special tooling with hammer.
When assembling, put body S (1) onto body H (2) tentatively for easy work.



R27Z97MP17



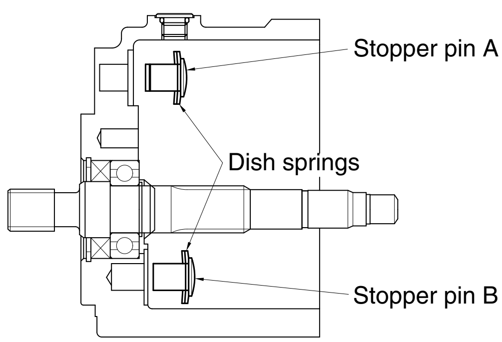
R27Z97MP18

(4) Assembling of body S kit

Set each four dish springs (33) to stopper pin A (25) and stopper pin B (26), then set them into body S (1).

※ Pay attention to the direction of the dish washer.

※ Pin A and pin B have different length. Set them to the original position. Otherwise, pump displacement changes, and engine stall or insufficient speed can occur.

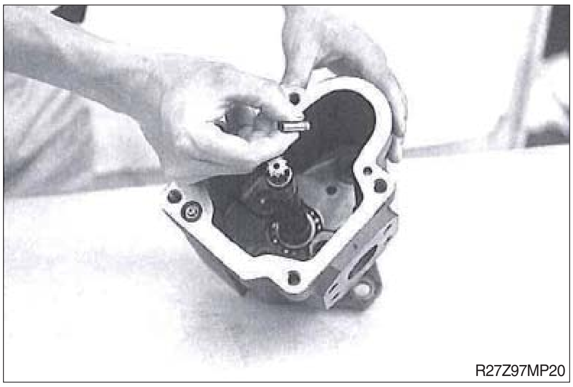


R27Z97MP19

(5) Assembling of body S kit

Set rod G (21) and rod C (22) into body S (1).

※ Pay attention to the direction of the rod G and rod C. (See cross section drawing for the direction.)

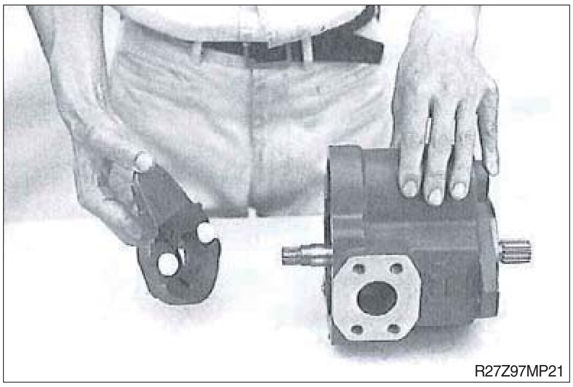


R27Z97MP20

(6) Assembling of body S kit

Put two balls (12) in the hole of swash plate (10) and install it in body S.

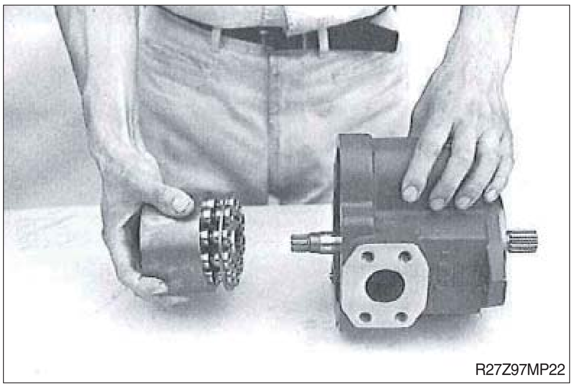
※ Apply grease on the balls if they drop out.



R27Z97MP21

(7) Assembling of body S kit

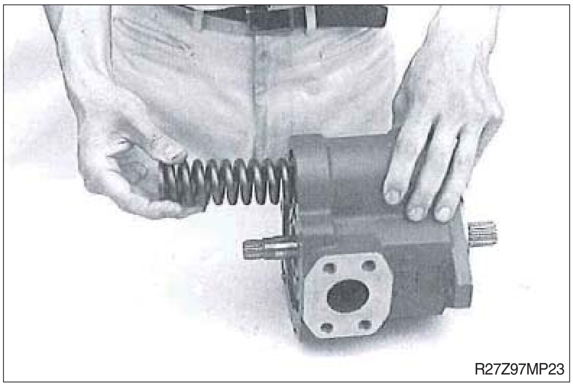
Assemble cylinder barrel kit into the body S (1).



R27Z97MP22

(8) Assembling of body S kit

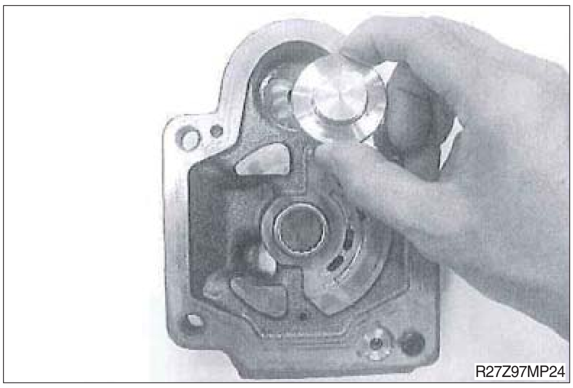
Set spring T1 (15) to spring holder (18), then set them together into the hole on swash plate (10).



R27Z97MP23

(9) Assembling of body H kit

Set spring guide (19) in body H (2).

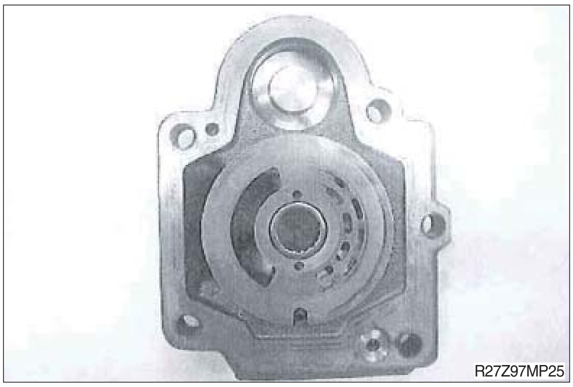


R27Z97MP24

(10) Assembling of body H kit

Place valve plate (5) slowly on body H (2) by positioning it with spring pin (56).

※ V notch copper alloy side of valve plate slides with cylinder barrel (4) and be careful not to set the valve plate to a wrong direction.

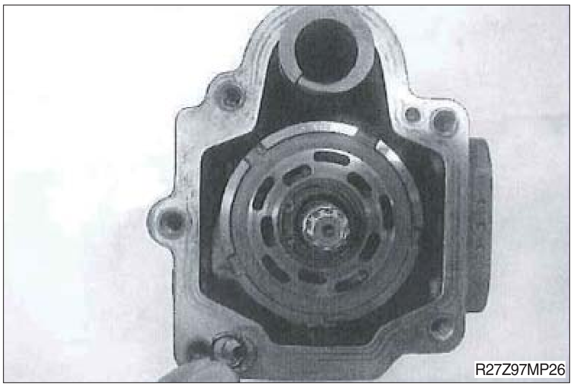


R27Z97MP25

(11) Assembling of body S kit with body H kit

Place O-ring (40) on body S.

※ Use new O-ring for assembling.

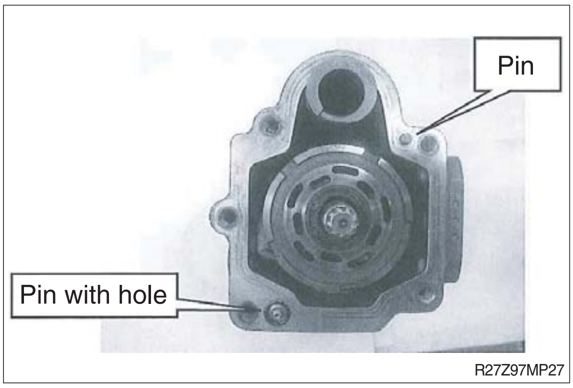


R27Z97MP26

(12) Assembling of body S kit with body H kit

Set pin (20) and pin (27) on body S.

※ Pay attention to the position of each pin. Pin (27) has a hole.

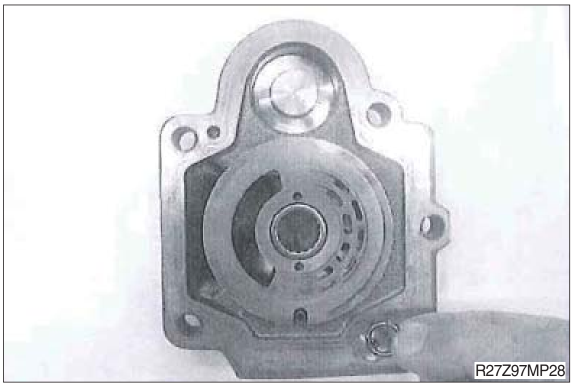


R27Z97MP27

(13) Assembling of body S kit with body H kit

Place O-ring (40) on body H.

※ Use new O-ring for assembling.

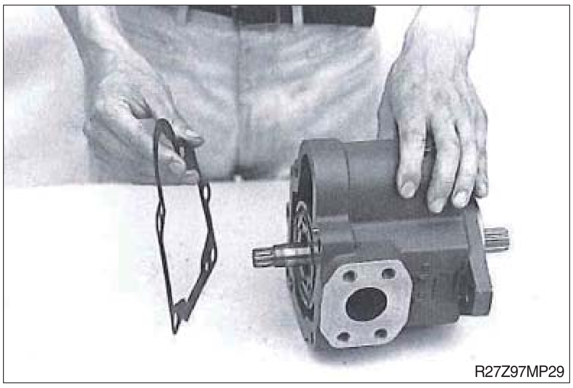


R27Z97MP28

(14) Assembling of body S kit with body H kit

Place packing (13), position it with locating pin (27) on body S.

※ Use new packing for assembling.



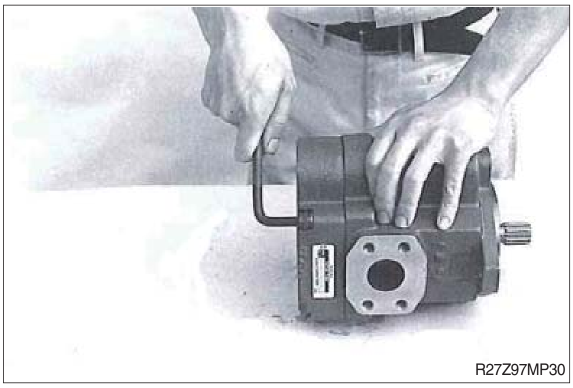
R27Z97MP29

(15) Assembling of body S kit with body H kit

Set two screws (M10×65) into the upper side two screw holes, and tighten them until the distance between body S and body H comes to 5 to 10 mm.

Then set three screws (44) into the three screw holes, after that, replace the upper side two screws (M10×65) to the regular size screws (44) and fix them.

· Tightening torque : 5.2~6.6 kgf · m (37.6~47.7 lbf · ft)

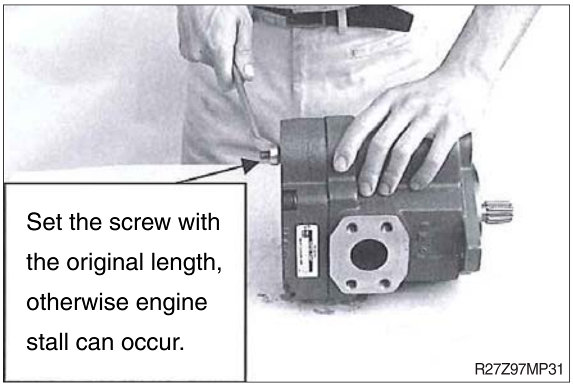


R27Z97MP30

(16) Installation of the adjusting screw

Fasten the adjusting screw (60) with hexagon wrench 4 mm, then adjust the outside length of adjusting screw and fix locknut (61) with spanner wrench 13 mm. At that time, change the seal washer (62) to new one.

· Tightening torque : 1.5~2.0 kgf · m (10.8~14.5 lbf · ft)

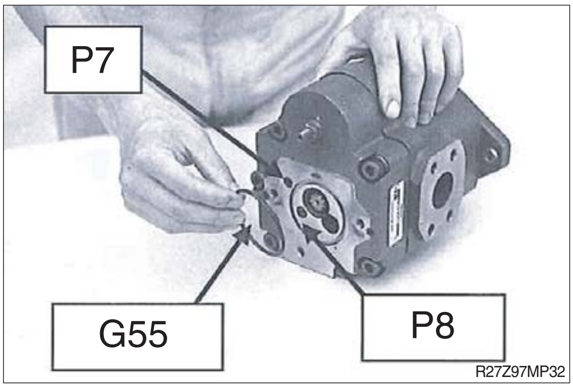


R27Z97MP31

(17) Installation of gear pump kit

Place O-ring (69, 71, 72) on the installation side of body H.

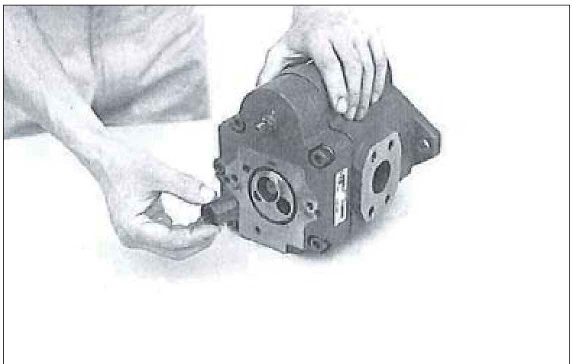
※ Use new O-ring for assembling.



R27Z97MP32

(18) Installation of gear pump kit

Set collar (67) and coupling (66).

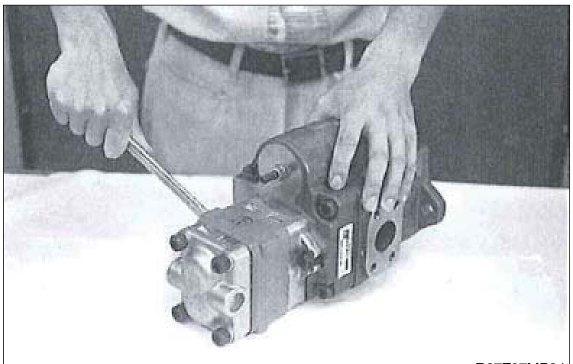


R27Z97MP33

(19) Installation of gear pump kit

Install gear pump kit (65) and fix it by two screws (68) and washers (70) with spanner wrench 13 mm.

· Tightening torque : 2.0~2.4 kgf · m (14.5~17.3 lbf · ft)



R27Z97MP34

(20) Inspection of assembling

After completed the assembling of pump, make sure that pump shaft rotates smoothly by hand.

GROUP 4 MAIN CONTROL VALVE

1. REMOVAL AND INSTALL OF MOTOR

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 hydraulic hose.

(5) Disconnect pilot line hoses.

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

· Weight : 27 kg (60 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.

2) INSTALL

(1) Carry out installation in the reverse order to removal.

(2) Bleed the air from below items.

① Cylinder (boom, arm, bucket)

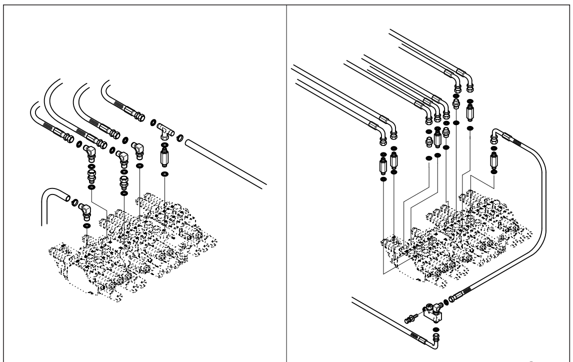
② Swing motor

③ Travel motor

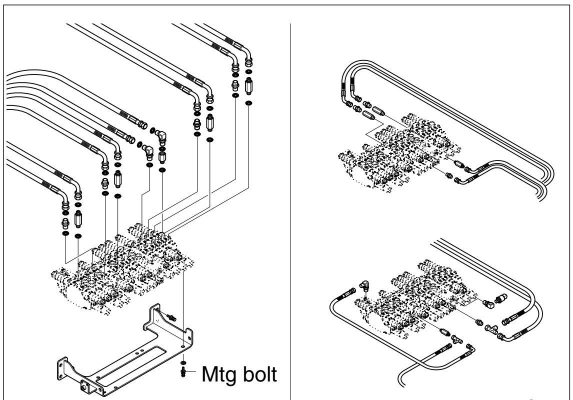
※ See each item removal and install.

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

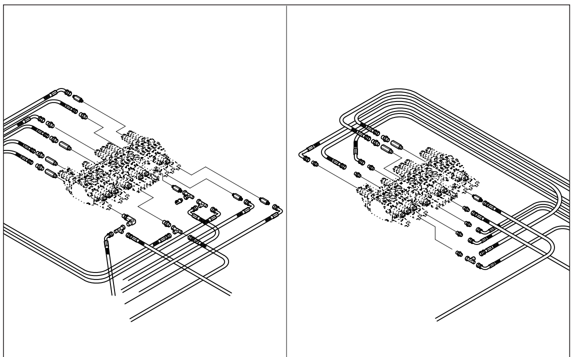
13031GE18



35AZ7MCV01

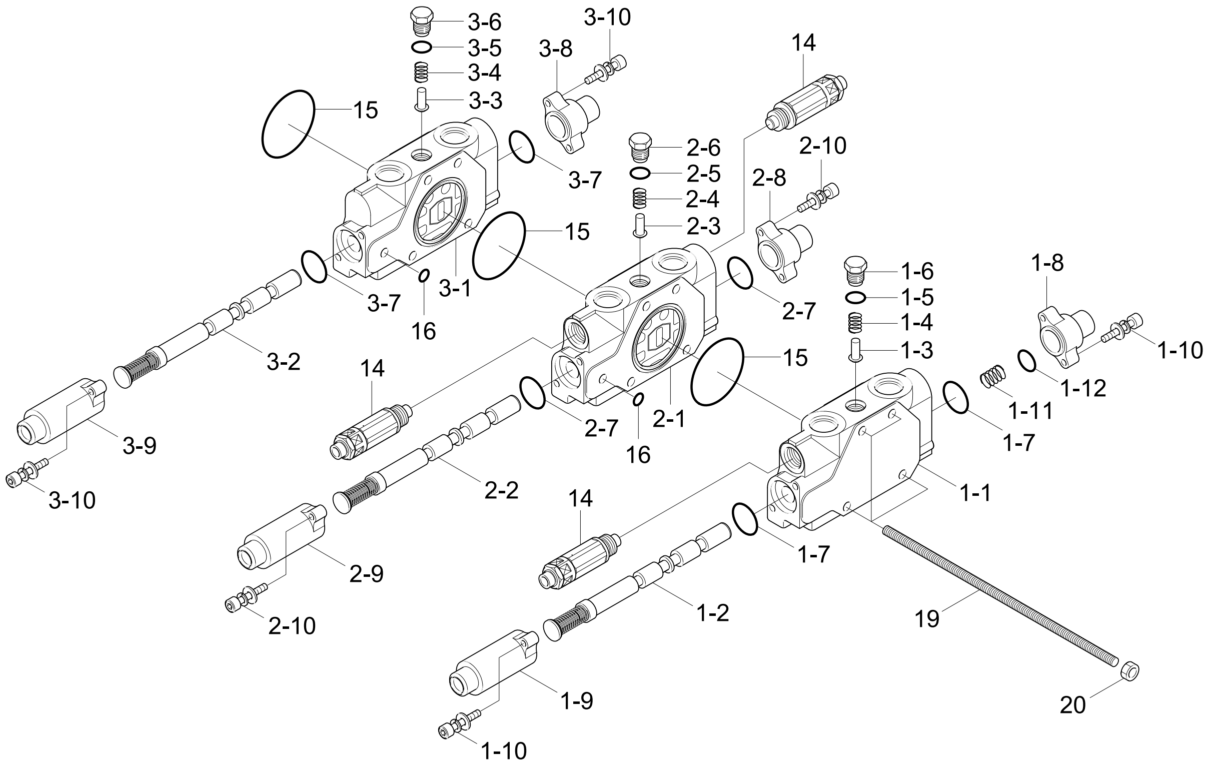


35AZ7MCV02



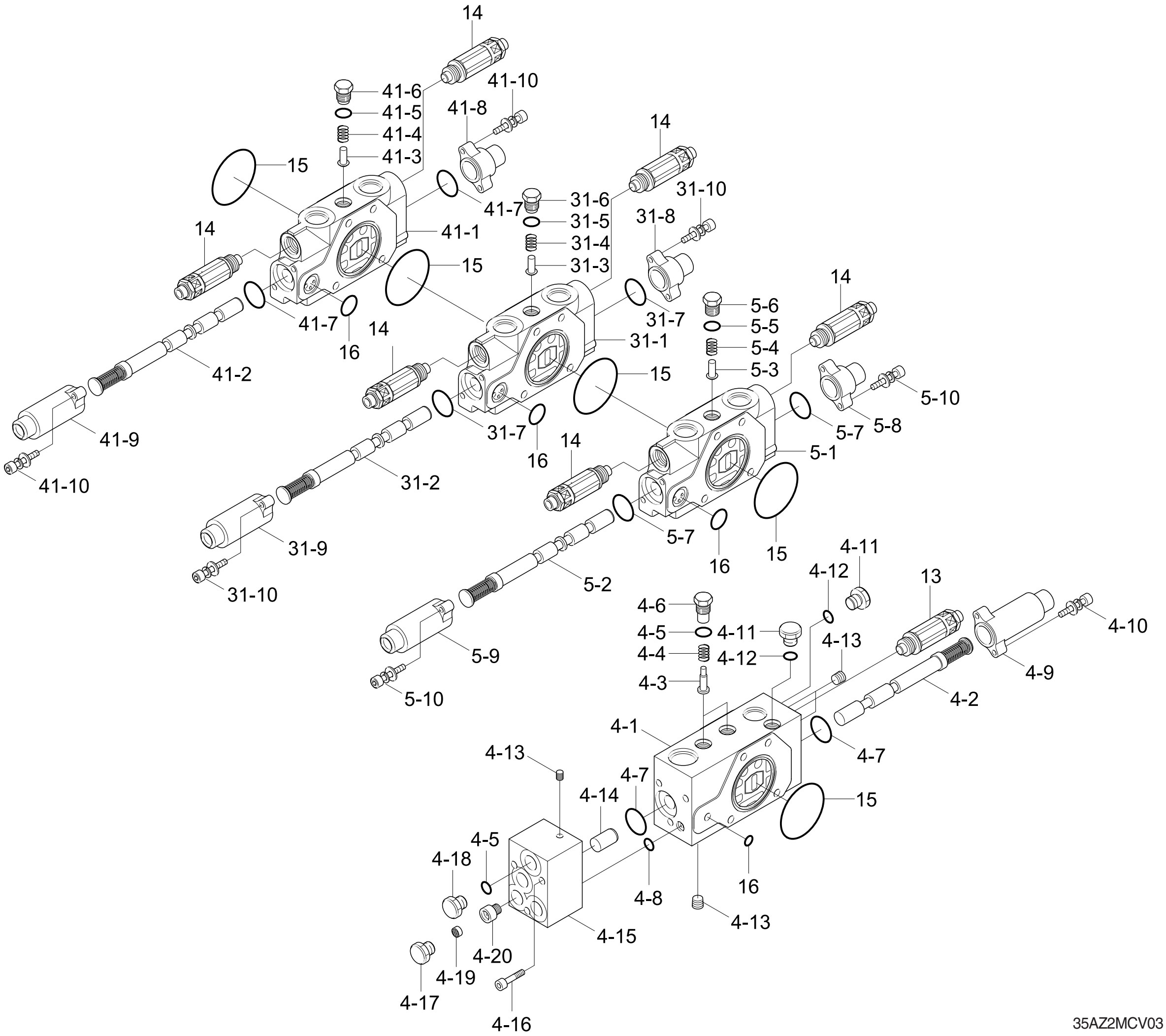
35AZ7MCV03

2. STRUCTURE (1/4)



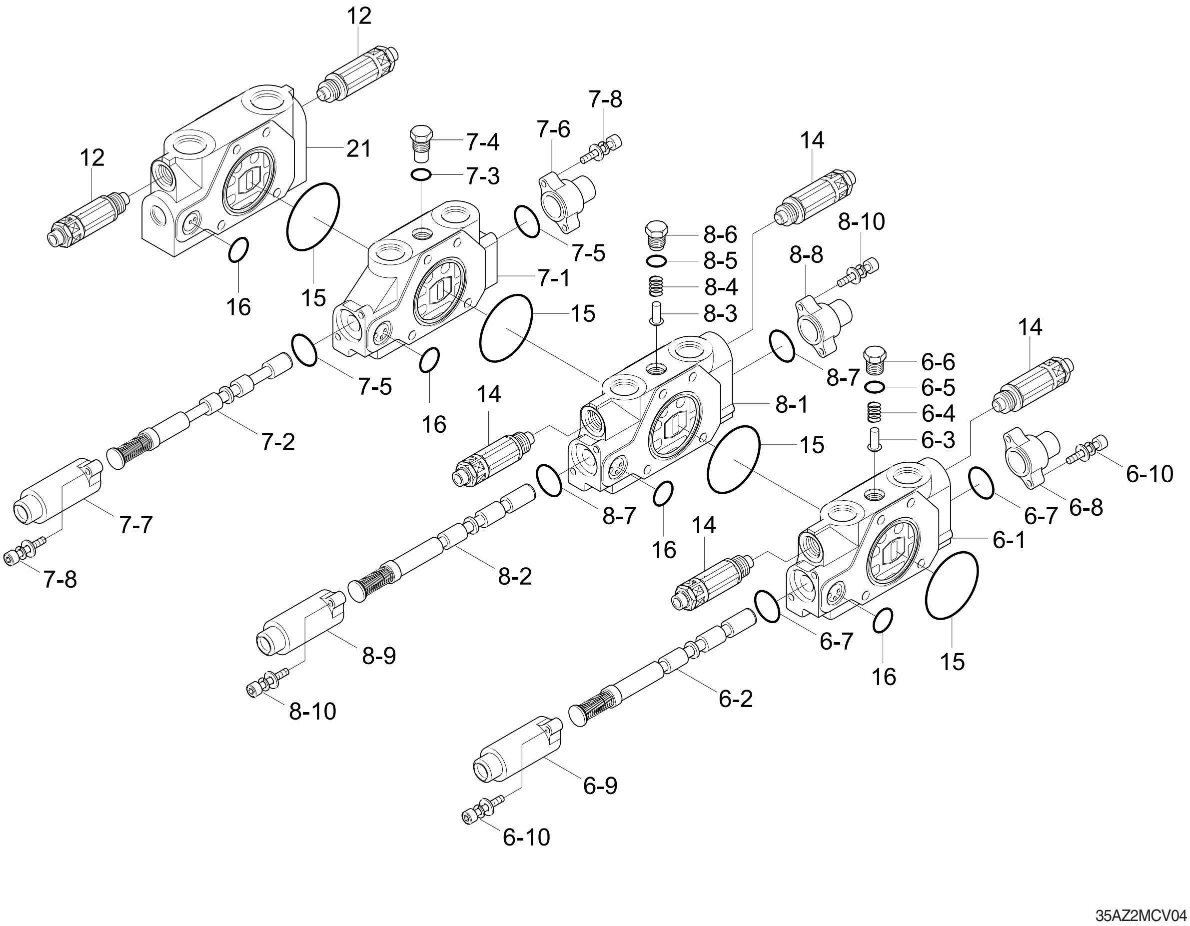
1	Dozer block assy	2-1	Body	3-4	Spring
1-1	Body	2-2	Boom swing spool assy	3-5	O-ring
1-2	Dozer spool assy	2-3	Poppet	3-6	Plug
1-3	Poppet	2-4	Spring	3-7	O-ring
1-4	Spring	2-5	O-ring	3-8	Pilot cover
1-5	O-ring	2-6	Plug	3-9	Pilot cover
1-6	Plug	2-7	O-ring	3-10	Bolt-soc head w/washer
1-7	O-ring	2-8	Pilot cover	14	Overload relief valve assy
1-8	Pilot cover	2-9	Pilot cover	15	O-ring
1-9	Pilot cover	2-10	Bolt-soc head w/washer	16	O-ring
1-10	Bolt-soc head w/washer	3	Swing block assy	19	Bolt-tie
1-11	Spring	3-1	Body	20	Nut-hex
1-12	Spring seat	3-2	Swing spool assy		
2	Boom swing block assy	3-3	Poppet		

STRUCTURE (2/4)



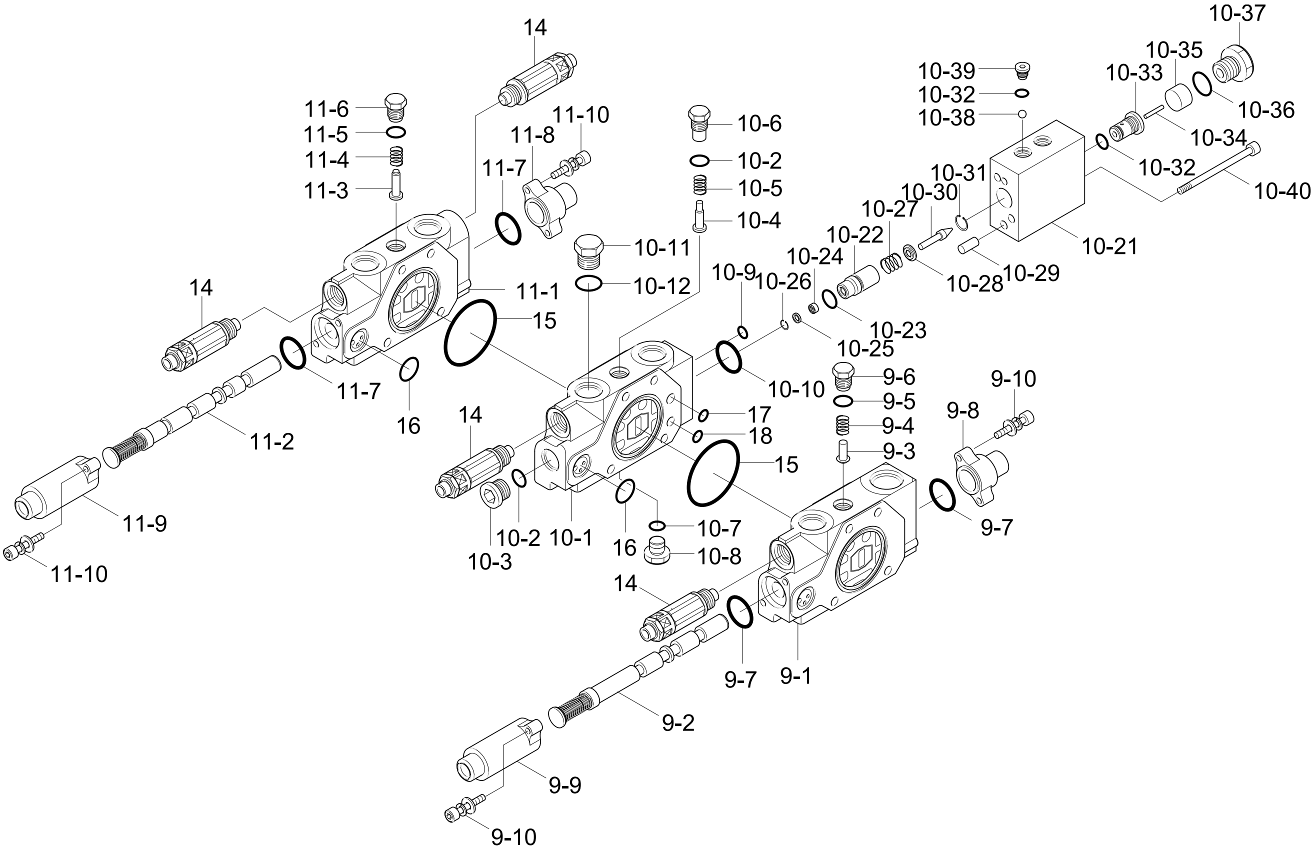
4	Connection block assy
4-1	Body
4-2	Spool assy
4-3	Poppet
4-4	Spring
4-5	O-ring
4-6	Plug
4-7	O-ring
4-8	O-ring
4-9	Pilot cover
4-10	Bolt-soc w/washer
4-11	Plug
4-12	O-ring
4-13	Plug
4-14	Piston
4-15	Body
4-16	Bolt-soc w/washer
4-17	Plug
4-18	Plug
4-19	Filter
4-20	Orifice
13	Relief valve assy
14	Overload relief vlv assy
15	O-ring
16	O-ring
5	PTO block assy
5-1	Body
5-2	PTO spool assy
5-3	Poppet
5-4	Spring
5-5	O-ring
5-6	Plug
5-7	O-ring
5-8	Pilot cover
5-9	Pilot cover
5-10	Bolt-soc w/washer
31	PTO block assy
31-1	Body
31-2	PTO spool assy
31-3	Poppet
31-4	Spring
31-5	O-ring
31-6	Plug
31-7	O-ring
31-8	Pilot cover
31-9	Pilot cover
31-10	Bolt-soc w/washer
41	Angle block assy
41-1	Body
41-2	PTO spool assy
41-3	Poppet
41-4	Spring
41-5	O-ring
41-6	Plug
41-7	O-ring
41-8	Pilot cover
41-9	Pilot cover
41-10	Bolt-soc w/washer

STRUCTURE (3/4)



6	Arm block assy	7-1	Body-block	8-4	Spring
6-1	Body	7-2	Travel spool assy	8-5	O-ring
6-2	Arm spool assy	7-3	O-ring	8-6	Plug
6-3	Poppet	7-4	Plug	8-7	O-ring
6-4	Spring	7-5	O-ring	8-8	Pilot cover
6-5	O-ring	7-6	Pilot cover	8-9	Pilot cover
6-6	Plug	7-7	Pilot cover	8-10	Bolt-soc head w/washer
6-7	O-ring	7-8	Bolt-soc head w/washer	12	Relief valve assy
6-8	Pilot cover	8	Travel block assy	14	Overload relief vlv assy
6-9	Pilot cover	8-1	Body	15	O-ring
6-10	Bolt-soc head w/washer	8-2	Travel spool assy	16	O-ring
7	Travel block assy	8-3	Poppet	21	Travel block assy

STRUCTURE (4/4)



35AZ2MCV05

9	Boom block assy
9-1	Body
9-2	Boom spool assy
9-3	Poppet
9-4	Spring
9-5	O-ring
9-6	Plug
9-7	O-ring
9-8	Pilot cover
9-9	Pilot cover
9-10	Bolt-soc head w/washer
10	Boom lock block assy
10-1	Body
10-2	O-ring
10-3	Plug
10-4	Poppet
10-5	Spring
10-6	Plug
10-7	O-ring
10-8	Plug
10-9	O-ring
10-10	O-ring
10-11	Plug
10-12	O-ring
10-21	Lock valve cover
10-22	Lock valve
10-23	Seal
10-24	Filter
10-25	Spacer
10-26	Retainer ring
10-27	Spring-A
10-28	Spring seat
10-29	Pin
10-30	Poppet
10-31	Retainer ring
10-32	O-ring
10-33	Piston guide
10-34	Piston-A1
10-35	Piston-B
10-36	O-ring
10-37	Connector
10-38	Steel ball
10-39	Plug
10-40	Hex soc bolt
11	Bucket block assy
11-1	Body
11-2	Bucket spool assy
11-3	Poppet
11-4	Spring
11-5	O-ring
11-6	Plug
11-7	O-ring
11-8	Pilot cover
11-9	Pilot cover
11-10	Bolt-soc head w/washer
14	Overload relief vlv assy
15	O-ring
16	O-ring
17	O-ring
18	O-ring

3. DISASSEMBLY

1) PRECAUTIONS FOR DISASSEMBLY

Since hydraulic devices are all machined precisely with clearances being very little, carry out the disassembly and assembly work at a clean place and make sure to prevent the device from being entered with dust, sand, and the like.

(1) Before disassembly work, prepare necessary material such as the structural drawing for control valve to fully understand the structure and others.

(2) When removing the control valve from the machine, put a dustproof cap on each port and then clean the outside of assembly after checking the installation of caps.
Furthermore, prepare a suitable workbench with clean paper or rubber mat on it for the work.

(3) Since there is a possibility of rust when the disassembled parts are left, apply anti-corrosive oil to the parts and seal them.

(4) Hold the control valve body when carrying or moving. Especially, do not hold the exposed spool after removing a pilot cover from the control valve.

(5) Do not hit the control valve even if it does not move smoothly.

(6) It is recommend carrying out various tests (relief valve setting, leak test, internal pressure loss check, etc.) after the disassembly and assembly of the control valve, which requires a hydraulic test device.

(7) Accordingly, when the disassembly might be possible technically but the test and/or adjustment might be impossible, do not carry out the work.

⚠ The control valve becomes high temperature after operating the machine; after checking that the temperature becomes low, start the work.

⚠ Before removing the pipes, attach suitable indications on them to be able to locate their positions later. If there is a mistake in piping between the ports, unintentional movement could result in an accident.

⚠ Falling or hitting the control valve could bend the Spool, which could result in an accident.

⚠ If foreign matter enters each port, there could be a control valve malfunction, resulting in an accident.

**⚠ Since the load side port could hold an empty weight or enclosed pressure, release the inside pressure before loosening the piping.
There could be a fall of attachments or a jet of high-temperature hydraulic fluid.**

**⚠ The control valve has complicated connections and seals through the internal passages, which means that there could be enclosed pressure, resulting in an oil jet after disassembly.
Ware safety goggles during disassembly work because there could be a blow off of parts if they are caught.**

2) NECESSARY TOOLS AND OTHERS

Before disassembling the control valve, prepare the following tools. The tools below are used to disassemble this control valve only; tools for disassembling the port fittings are not included.

Name	Quantity	Application
Hexagonal wrench	Each 1	4 mm, 5 mm, 6 mm, 8 mm
Screw wrench	Each 1	13 mm, 19 mm, 21 mm, 22 mm, 26 mm
Socket wrench	Each 1	13 mm, 19 mm, 21 mm, 22 mm, 26 mm
Torque wrench	1	0.2 ~ 2.0 kgf · m (1.4 ~14.5 lbf · ft)
Torque wrench	1	2.0 ~ 10.0 kgf · m (14.5 ~ 72.3 lbf · ft)
Magnet	1	
Pliers	1	
Slotted screwdriver	1	
Tweezers	1	

※ Prepare clean wash oil, hydraulic fluid, grease, and others before work.

3) DISASSEMBLY OF EACH PART

Before disassembly work, check that there is no dust on the outside of the control valve and then place it on a workbench with actuator ports facing upward.

The numbers in ( ) in the explanation and in ○ in the figures show reference numbers (No.) in the parts table in the specifications and drawings.

(1) Spool draw-out procedures

Except P3 conflux part

Taking the swing spool as an example, the draw-out procedures are as follows (see Fig.2) .

① Remove 2 hex socket head bolts with washers (⑩) with 4 ㎜ hexagonal wrench.
② Remove pilot cover (⑨).
③ With spring in the swing spool exposed, pull out spool assy from the control valve slowly and horizontally (parallel to spool sleeve) by holding spring.
④ The other spools can also be pulled out in the same manner.
 · At this time, check O-ring (⑦) is on the bottom of body side flange.

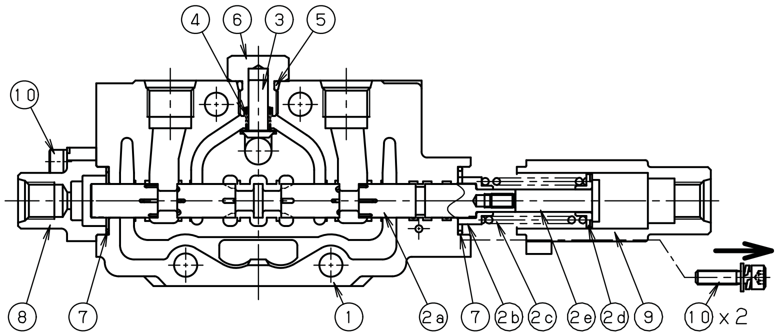


Fig.2 Except P3 Conflux Part

35Z9A7MCV02

1	Body-work	2d	Spring seat	6	Plug-check valve
2	Spool assy (swing)	2e	End-spool	7	O-ring
2a	Spool (swing)	3	Poppet-check valve	8	Pilot cover B1
2b	Spring seat	4	Spring-check valve	9	Pilot cover A1
2c	Spring	5	O-ring	10	Hex socket bolt with washer

P3 Conflux Part

The draw-out procedures for the conflux spool are as follows (see Fig.3).

① Remove 2 hex socket head bolts with washers (⑩) with 4 ㎜ hexagonal wrench.
② Remove pilot cover (⑨).
③ With spring in the connecting spool exposed, pull out spool assy from the control valve slowly and horizontally (parallel to spool sleeve) by holding spring.
 · At this time, check O-ring (⑦) is on the bottom of body side flange.

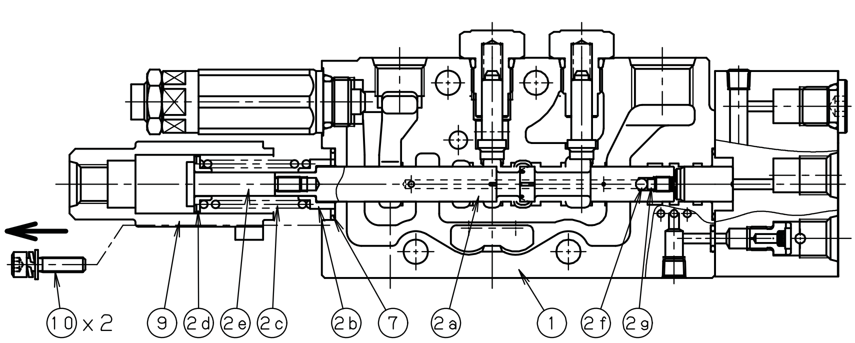


Fig.3 P3 Conflux Part

35Z9A7MCV03

1	Body-work	2c	Spring	2g	Plug
2	Spool assy (conflux)	2d	Spring seat	7	O-ring
2a	Spool (conflux)	2e	End-spool	9	Pilot cover A1
2b	Spring seat	2f	Steel ball	10	Hex socket bolt with washer

(2) Check valve disassembly procedures

Standard type check valve (see Fig.4)

① Hold the control valve body at workbench or hold it by two or more people.
② Loosen and remove check valve plug (⑥) at the center of the control valve upper surface with 19 ㎜ screw wrench or socket wrench. When it is hard to loosen the plug because O-ring (⑤) bites the screw, do not loosen forcibly; refasten it once and then try to loosen again.
③ From the hole where check valve plug has been removed, remove check valve spring (④) and check valve (③) with tweezers or magnet.

· The numbers in fig.4 are the same as those in the dozer component. In the specifications and drawings.
· Except for the dozer component. The shape of check valve is different; however, they can be disassembled in the same manner.
· The numbers in fig.5 are the same as those in the travel component. In the specifications and drawings.
· The numbers in fig.6 are the same as those in the PTO component. In the specifications and drawings.

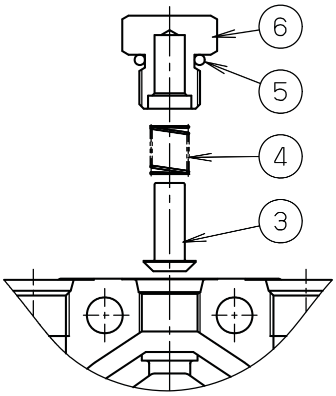


Fig.4 Check valve
(dozer, boom swing, swing, arm, boom, bucket)

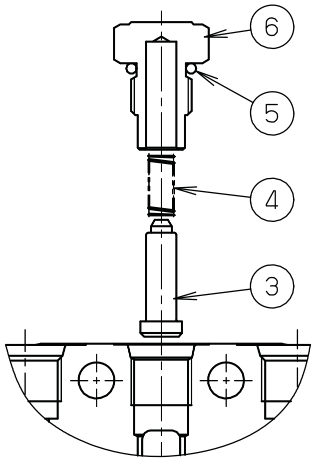
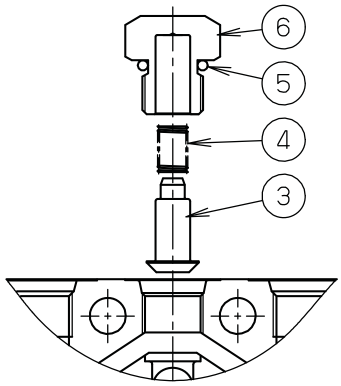


Fig.5 Check valve
(P3 conflux, travel, boom lock valve)



35Z9A7MCV04

Fig.6 Check valve
(PTO 1, PTO 2)

(3) Accessory valve removal procedures

Removing main relief valve (MRV) and overload relief valve (ORV)

Taking ORV in the arm component as an example, the removal procedures are as follows (see Fig.7)

① Loosen and remove ORV (⑮) with 22 mm screw wrench or deep socket wrench.

· Put screw wrench (or deep socket wrench) to 22 mm hexagonal part of pressure regulating body.

· If there is no 22 mm screw wrench (or deep socket wrench), it is also possible to loosen and remove by putting 19 mm screw wrench to the hexagonal part as shown in the fig.7.

※ If using 19 mm screw wrench to remove, do not put it to the lock nut part. Only lock nut is loosened to change the relief valve setting, which could result in the degradation in performance or damage.

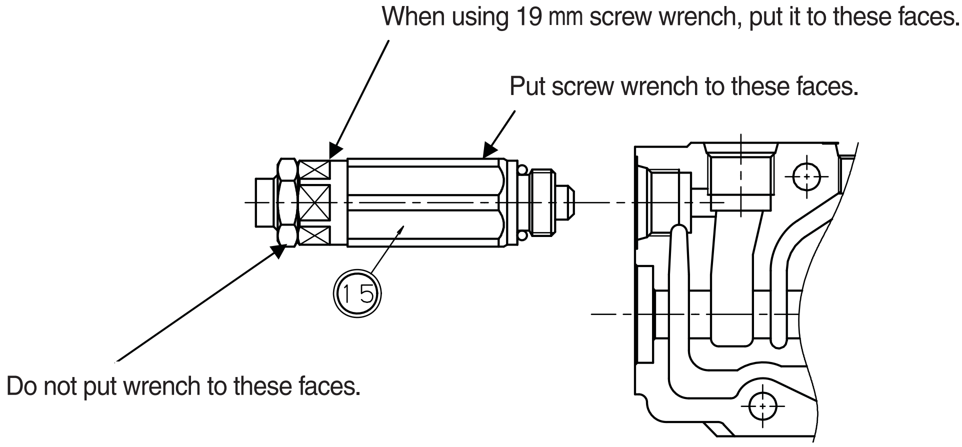


Fig.7 Removing main relief valve and overload relief valve

35Z9A7MCV05

(4) Boom lock valve disassembly procedures

If there is a malfunction, replace the lock valve assy with new one. Disassembly procedures are shown here as reference for investigating malfunction :
(see fig.8 and 9 the reference numbers below except those in double circles are according to "detail of lock valve" in the delivery specifications.)

① Remove 2 hex socket bolts (⑳) by using 5 mm hexagonal wrench.
② Remove lock valve lid (①).
  · Be careful not to fall or lose 2 locating pins (⑨) on lock valve body side.
  · Be careful to handle it to protect the pin from being damaged.
③ When lock valve (②) and needle valve (⑩) are exposed, pull them out.
  · Since the needle valve is easy to fall out, take out it first to store.
  · The lock valve is not to be disassembled but to be stored as a lock valve set (②~⑧, ⑩, ⑪).
④ Hold the lock valve cover in a vise bench or the like, and loosen and remove bush (⑰) by using a 26 mm screw wrench.
  · Hold any two sides except port side in a vise bench or the like.
⑤ From the hole that has been used to pull out the bush, pull out piston B (⑮) and piston A1 (⑭) by using tweezers or a magnet.
  · For piston B and piston A1, arrange them so that their assembled direction can be recognized.
  · Piston guide (⑬) is not to be disassembled but to be stored in a combination with lock valve cover.
⑥ Loosen and remove plug (⑲) by using 4 mm hexagonal wrench.
⑦ From the hole that has been used to pull out plug, pull out steel ball ϕ 7 (⑱) by using a magnet.

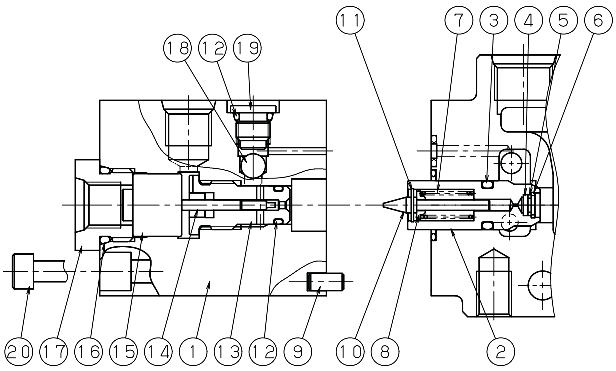


Fig.8 Boom lock valve

35Z9A7MCV06

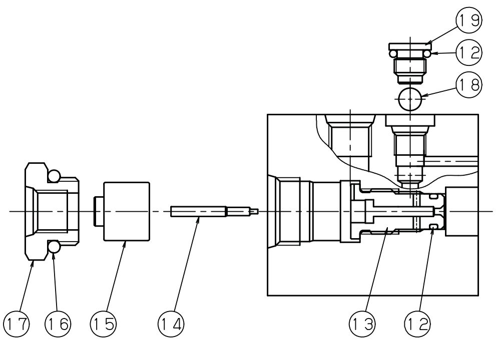


Fig.9 Lock valve cover

35Z9A7MCV07

(5) The other parts disassembly procedures

Remove the other parts that have not been removed at the work (1) through (3) as shown below.

Various plugs in boom lock valve component (see Fig.10).

① Loosen and remove plug (⑪) with 21 mm screw wrench or socket wrench.
  · Check O-ring (⑫) is on the plug side.
② Loosen and remove plug (③) with 6 mm hexagonal wrench.
  · Check O-ring (②) is on the plug side.
③ Loosen and remove plug (⑧) with 6 mm hexagonal wrench.
  · Check O-ring (⑦) is on the body side for falling off, deformation, or damage.

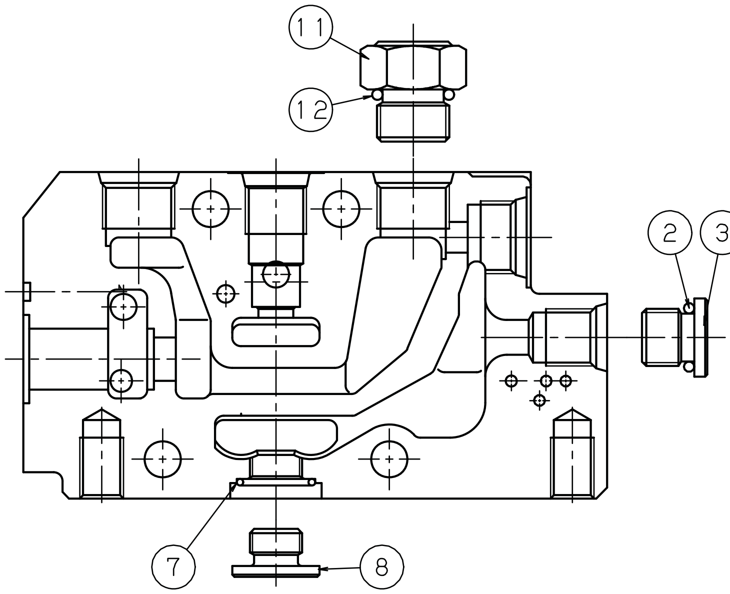


Fig.10 Plugs in boom lock valve component

35Z9A7MCV08

Body-pilot, piston and plugs for P3 conflux component (see Fig.11)

① Remove 3 hex socket head bolts (⑯) with 4 mm hexagonal wrench.

② Body-pilot assy (⑤,⑬,⑮,⑰ ~ ⑳) can be removed.
Since orifice (⑳) and filter (⑲) cannot be removed from body-pilot (⑮), store them in assy condition.
· Check O-ring (⑦,⑧) are on the body side.

③ Remove piston (⑭) from the body by using a magnet or the like.
· When pushing out the piston from the opposite side (left side in the figure blow), be careful not to damage the spool hole. Damaged spool hole could cause a malfunction.

④ Loosen and remove 2 plugs (⑪) by using 4 mm hexagonal wrench.
4 plugs (⑬) cannot be removed from the body.

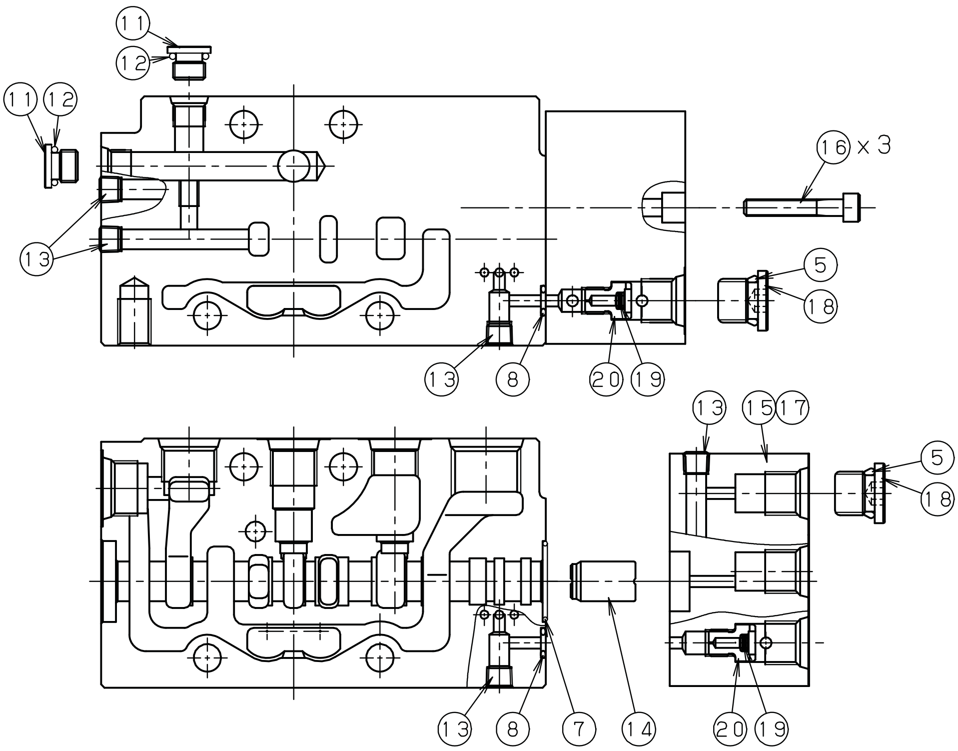


Fig.11 P3 Conflux component

35Z9A7MCV09

Pilot cover (see Fig.12)

① Remove 2 hex socket head bolts with washers (⑩) with 4 mm hexagonal wrench.

② Remove pilot cover (⑧).
· Check O-ring (⑦) is on the bottom of body-side flange.

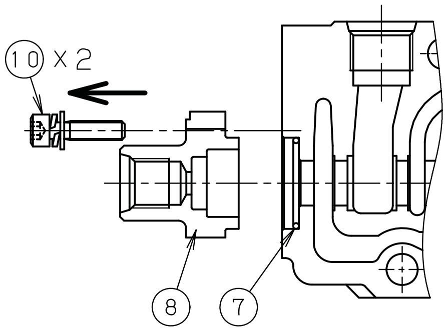


Fig.12 Pilot cover

35Z9A7MCV10

(6) **Component body disassembly procedures** (see Fig.13)

① Loosen and remove 4 M8 hex nuts (㉑) for assembling component bodies on the dozer (body-Work "sC") side with 13 mm screw wrench or socket wrench.

② When 4 tie bolts (⑳) are pulled out from the dozer side, each component body can be removed.

· Be careful not to drop or lose various O-ring (⑯~⑲) installed on the matching surfaces for each component body.

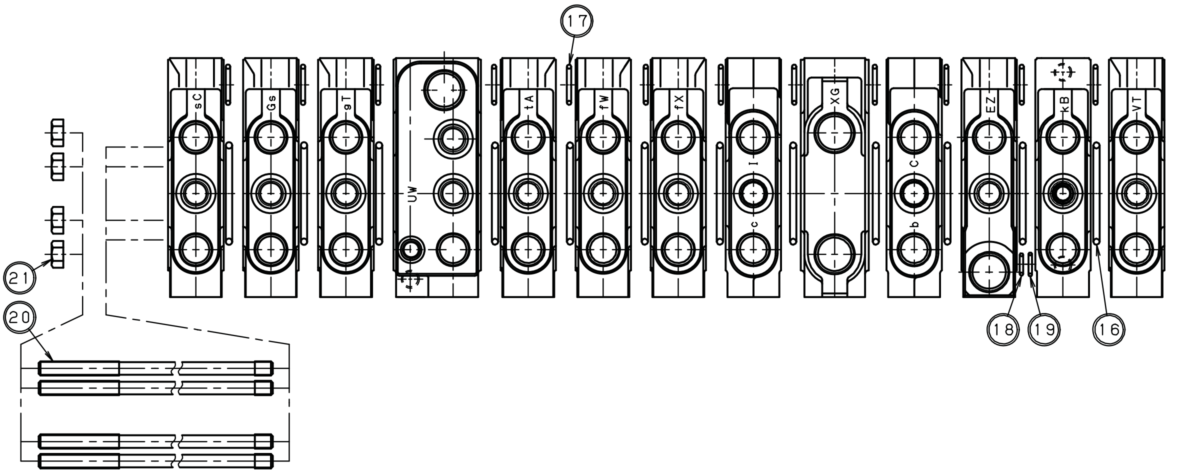


Fig.13 Body Assy

35Z9A7MCV11

16	O-ring	19	O-ring
17	O-ring	20	Tie bolt
18	O-ring	21	Hexagon nut

(7) Precautions after disassembly

▲ Accessory valves are the most important parts for performance and safety; in particular, the relief valve is very difficult to readjust the setting so that replace the accessory valve as assy if any malfunction occurs.

Disassembly procedures are shown here as reference for investigating malfunction.

■ **Disassembling main relief valve and overload relief valve** (see Fig.14)

① Lightly hold any two surfaces of body (⑤) in a vise bench, whose hexagonal intervals are 22 mm.
② Loosen and remove M14 nut (⑧) by using 19 mm screw wrench.
③ Loosen and remove adjustable screw (⑦) by using 4 mm hexagonal wrench.
④ Take out regulating valve spring (⑨) by using tweezers or the like.
⑤ Loosen and remove valve seat (④) by using 19 mm screw wrench.
⑥ The other parts can also be removed in the following order:
Socket (①) → Piston (③) → Spring (⑩) → Valve (②)

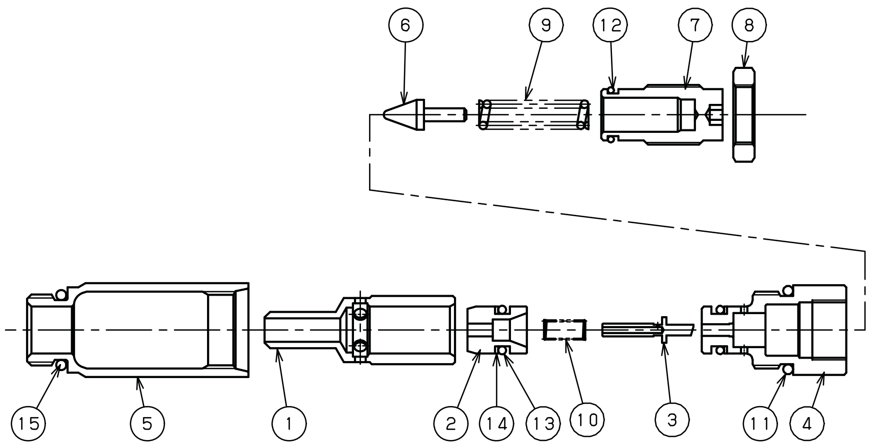


Fig.14 Disassembling main relief valve and overload relief valve

35Z9A7MCV12

1	Socke	6	Pilot poppet	11	O-ring
2	Main valve poppet	7	Adjustable screw	12	O-ring
3	Piston	8	Nut	13	O-ring
4	Pilot valve seat	9	Pilot spring	14	Back-up ring
5	Bod	10	Main valve spring	15	O-ring

(8) Precautions after disassembly

▲ For the parts already removed in the work, store and/or transport them with attention to flaws and dirt. When carrying out another work, storage, or transportation with the parts removed condition, apply caps or plastic tape to the holes from which the parts have been taken out, protecting the holes from being entered with dust or the like.

4. ASSEMBLY

1) PRECAUTIONS FOR ASSEMBLY

Be careful that the unevenness of fastening torque and the contamination of dust during assembly work could result in malfunction.
In addition, observe fastening torque values specified in the specifications and drawings.

(1) During assembly work, compare valves with the specifications and drawings and check the number of parts whether there is any improper assembly and/or the omission of parts.

(2) For the parts to be used in assembly, dip in fluid oil as need arises to reassemble after washing well in washing oil and being dried.

(3) After cleaning and degreasing the surface sufficiently, apply loctite to 2 threads of the screw from the tip (too much loctite could result in malfunction after squeezing out).

(4) For the part to be attached or assembled with two or more bolts and nuts, fastening them evenly and alternately for several times, not once with the specified torque.

(5) The unevenness of fastening torque could result in the leakage of hydraulic fluid to the outside and/or malfunctions.

2) PRECAUTIONS FOR ASSEMBLING SEAL PARTS

(1) All seals are to be renewed at assembly.
(2) Check seals for defects in molding and flaws in handling.
Do not use the seal with defect and/or flaw.
(3) The seals used on sliding surfaces and the places to be installed with seals are to be applied with grease or hydraulic fluid for sufficient lubrication where not specially noted.
(4) Do not make seals longer up to permanent deformation.
(5) O-ring is not to be twisted during assembly.
Kinked O-ring could cause oil leakage after installation because kinks are hard to restore.

3) NECESSARY TOOLS AND OTHERS

Before assembling the control valve, prepare the following tools.
The tools below are used to assemble this control valve only; tools for assembling the port fittings are not included.

Name	Quantity	Application
Hexagonal wrench	Each 1	4 mm, 5 mm, 6 mm, 8 mm
Screw wrench	Each 1	13 mm, 19 mm, 21 mm, 22 mm, 26 mm
Socket wrench	Each 1	13 mm, 19 mm, 21 mm, 22 mm, 26 mm
Torque wrench	1	0.2 ~ 2.0 kgf · m (1.4 ~14.5 lbf · ft)
Torque wrench	1	2.0 ~ 10.0 kgf · m (14.5 ~ 72.3 lbf · ft)
Magnet	1	
Pliers	1	
Slotted screwdriver	1	
Tweezers	1	

※ Prepare clean wash oil, hydraulic fluid, grease, and others before work.

4) ASSEMBLING WORK

※ The numbers in ( ) in the explanation and in ◯ in the figures show reference numbers in the parts table in the specifications and drawings.

※ For the fastening torque values for screws, see the latest specifications and drawings.

(1) **Assembling body work** (see figure 15 and 16)

① On a surface plate with clean rubber plates on it, place component bodies with actuator port surface facing downward in the order shown in "Orders of assembling bodies" on the next page.

※ Check the matching surface in each component body for dust or the like, and check whether O-rings (⑯~⑲) shown in the specifications and drawings are surely put in each groove for O-ring. Kinked O-ring could cause the leakage of hydraulic fluid to the outside due to the malfunction of sealing performance.
If O-rings are not installed surely in O-ring grooves, there would be the nip of O-ring, resulting in the leakage of hydraulic fluid to the outside when assembling the bodies.

② Put and fasten 4 tie bolts (⑳) through the bodies from the side of dozer component (body sC side), and fasten 4 M8 hex nuts (㉑) to the bolts by hand.

③ Check that all the body surfaces are in alignment in this condition.
If not, make all the body surfaces in alignment by hitting them with plastic hammers or the like.
Since the bottom surfaces (the opposite side of actuator port surfaces) of the control valve are not in alignment, place the bodies with actuator port facing downward to align actuator port surfaces when arranging the body surfaces.
Before aligning the body surfaces, remove the rubber plates and others that have been laid at ①.
However, check that there is no dust or no unevenness on the surface from which the above rubber plates have been removed.

※ Do not hit hard when using a plastic hammer.
Hard hitting could cause displacements in the portion that has been aligned.
Check the alignment with a flat plate or the like after aligning.
If there is large displacement in any component, bad connection between internal passages could cause a malfunction.
If any seal position overlaps the passage, there could be the leakage of hydraulic fluid to the outside.

④ After checking that the surfaces are in alignment, fasten 4 M8 hex nuts (㉑) that have been put on in ②. with the torque specified in the specifications and drawings with 13 mm socket wrench.

※ Fasten 4 M8 hex nuts evenly and little by little in several times.
Uneven fastening makes the body assy curve easily, which could result in leakage or malfunction after installation on the machine.
If you find any curve in the body assy, it is necessary to reassemble or to correct it by pressing machine or the like.

ORDERS OF ASSEMBLING BODIES

No.	1	2	3	4	5	6	7	8	9	10	11	12	13
ID	sC	Gs	gT	UW	tA	fW	fX	cI	XG	bC	EZ	kB	VT

※ Identifications (ID) are engraved on the top (actuator port side) of the body.

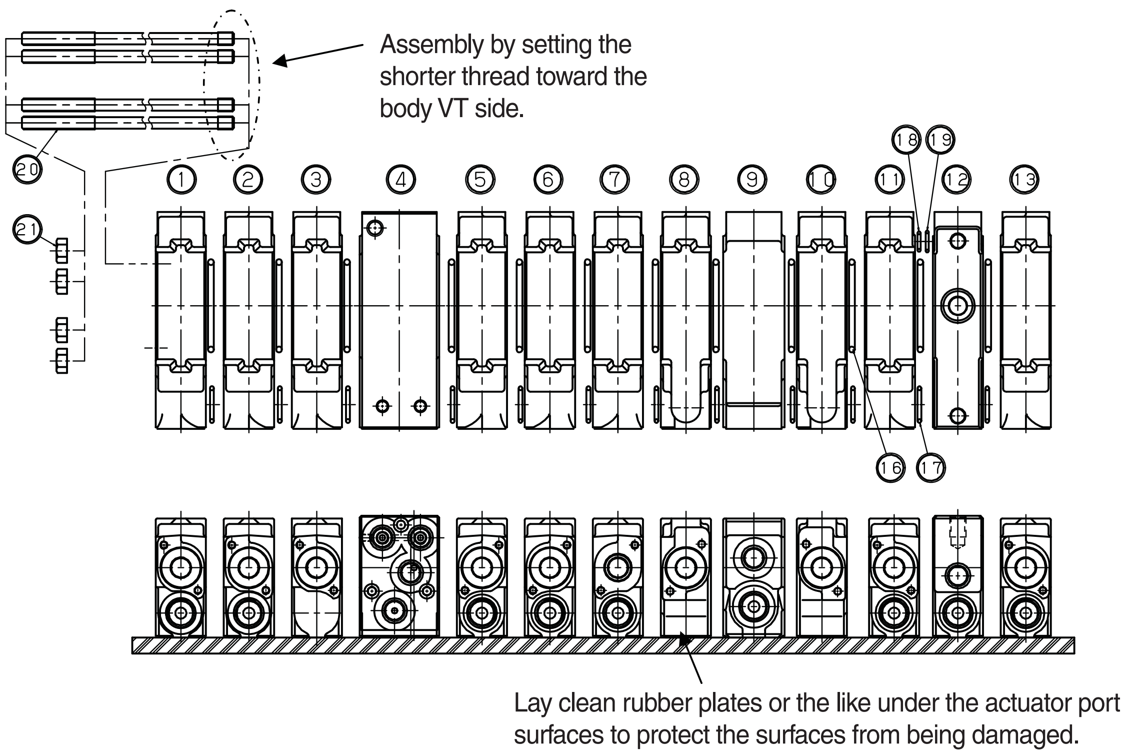


Fig.15 Body assy

35Z9A7MCV13

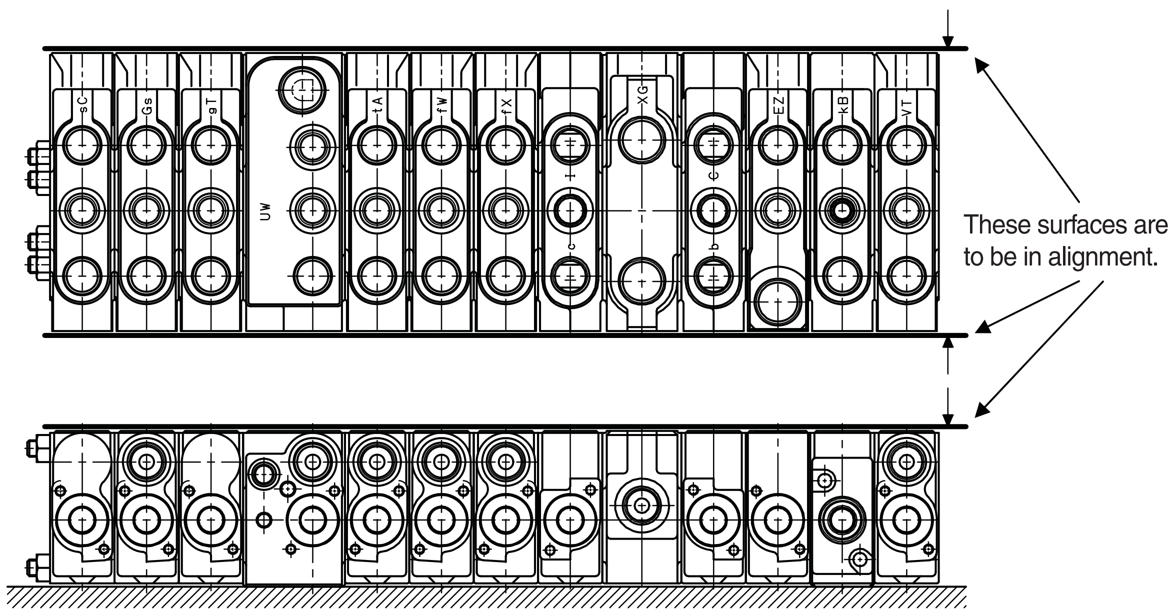


Fig.16 Body assy (after assembly)

35Z9A7MCV14

(2) Assembling small parts

Various plugs in boom lock valve (see Fig.17 and 18)

① Place control valve assy on a workbench with actuator port faces facing downward.
② Install O-ring (⑦) securely into an O-ring groove at the center of body.

※ Then, apply a light coating of grease to O-ring (⑦) as an anti-kink measure when assembling plug (⑧).
Kinked O-rings can cause the malfunction of sealing performance, resulting in the leakage of hydraulic fluid to the outside.
However, too much coating of grease to O-ring could cause the squeezing out of O-ring (leakage of hydraulic fluid to the outside) or suspected grease leakage at high temperature; a light coating of grease to O-ring is recommended.

③ Tighten plug (⑧) with specified torque by using 6 mm hexagonal wrench.
④ Place control valve assy on a workbench with actuator ports surface facing upward.
⑤ Check that plug (③) is securely installed with O-ring (②).
Furthermore, check that there is no damage such as cuts on O-ring (②).
⑥ Tighten plug (③) with specified torque by using 6 mm hexagonal wrench.
⑦ Check that plug (⑪) is securely installed with O-ring (⑫).
Furthermore, check that there is no damage such as cuts on O-ring (⑫).
⑧ Tighten plug (⑪) with specified torque by using 21 mm screw wrench (or socket wrench).

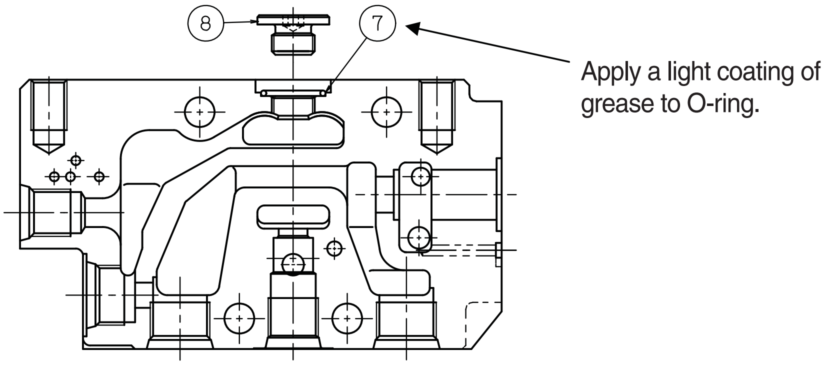


Fig.17 Bottom plug on boom lock valve

35Z9A7MCV15

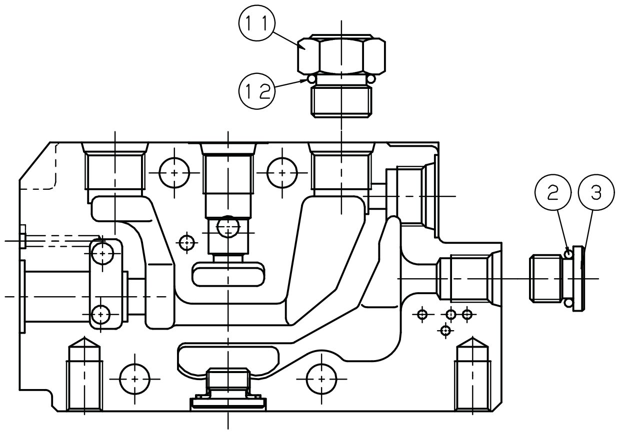


Fig.18 Plug on boom lock valve

35Z9A7MCV16

Body-pilot, piston and plugs for P3 conflux component (see Fig.19).

① Install O-rings (⑦, ⑧) securely into O-ring grooves on the body.
② Insert piston (⑭) into spool sleeve with caution in the direction.

※ Piston (⑭) is to be inserted with small-diameter side (stepped side) facing the spool sleeve. If not, the wrong direction causes malfunction.

③ Insert 3 hex. socket head bolts (⑯) toward the bolt holes of pilot body assy (⑤,⑬,⑮, ⑰~ ⑳). Press and hold pilot body assy (⑤,⑬,⑮,⑰~⑳) to the body.
④ Fasten 3 hex socket head bolts (⑯) with specified torque with 4 mm hexagonal wrench.
⑤ Check that O-ring (⑫) is securely installed with plug (⑪).
⑥ Fasten plug (⑪) with specified torque with 4 mm hexagonal wrench.

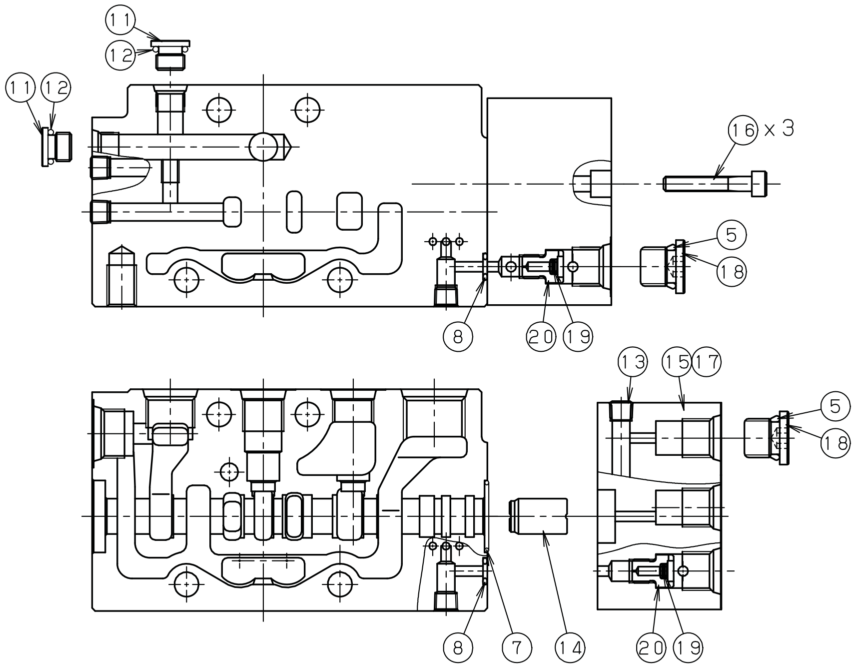


Fig.19 P3 conflux component

35Z9A7MCV17

■ **Pilot cover** (see Fig.20)

① Install O-ring (⑦) securely on the flange bottom of the body.
② Insert pilot cover (⑧) into the flange of the body.
③ Fasten 2 hex socket head bolts with washers (⑩) with specified torque with 4 mm hexagonal wrench.

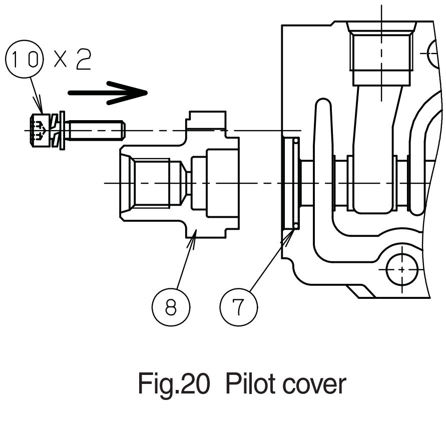


Fig.20 Pilot cover

35Z9A7MCV18

(3) Boom lock valve assembly procedures

(See Fig.21 and 22. The reference numbers below except those in double circles are according to "Detail of lock valve" in the delivery specifications.)

① Hold lock valve cover set (①, ⑫, ⑬) in a vise bench or the like.
② Put steel ball ϕ7 (⑱) into a hole on top surface of lock valve cover set.
③ Check that O-ring (⑫) is securely installed and then tighten plug (⑲) with specified torque by using 4 mm hexagonal wrench.
④ Insert piston A1 (⑭) and piston B (⑮) in sequence from a hole on lock valve cover set side (screw machined).

※ Then, check the direction of those pistons.
If the direction of piston A1 (⑭) is wrong, lock valve will not be released.
If the direction of piston B (⑮) is wrong, lock valve will be left being released.
In addition, since vush (⑰) cannot be tightened to the end, there will be the leakage of hydraulic fluid to the outside.

⑤ Check that vush (⑰) is securely installed with O-ring (⑯) and then screw bush (⑰) to the hole, into which the piston has been inserted, with specified torque by using 26 mm screw wrench (or socket wrench).
⑥ Install O-rings (㉑,㉒) securely into O-ring grooves on lock valve body.
⑦ Insert lock valve set (②~⑧, ⑪) into a hole for lock valve.
⑧ Insert needle valve (⑩) into lock valve set from the rear of lock valve set.
⑨ Install 2 positioning pins (⑨) to the surface facing the body of lock valve cover set.
⑩ Pressing lock valve cover set to the body, screw in 1-2 threads of 2 hex socket bolts (⑳) by hand.

※ Then, make sure that needle valve (⑩) is settled in the seat of piston guide (⑬) in lock valve cover set. If not, needle valve will not be seated so that lock valve will also be released.
To check the settlement, under the condition ⑩, loosen the force that is used to press lock valve cover set to the body and then check whether lock valve cover set can depart from the body by the force of spring inside lock valve set. If there is no feel of spring reaction, remove the unit once and then carry out the assembly again.

⑪ Tighten hex socket bolts (⑳) with specified torque by using hexagonal wrench.

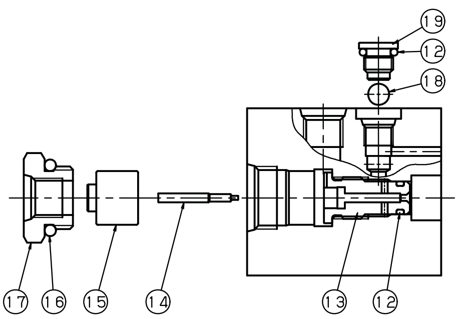


Fig.21 Lock valve cover

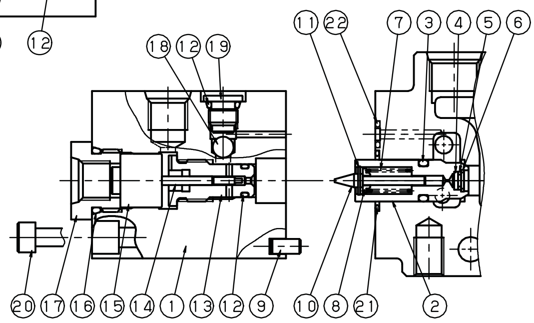


Fig.22 Boom lock valve

35Z9A7MCV19

(4) **Accessory valve installing procedures**

※ Accessory valves are the most important parts for performance and safety; in particular, the relief valve is very difficult to readjust the setting so that replace in assy if any malfunction occurs.

Installing main relief valve (MRV) and overload relief valve (ORV) (see Fig.23)

Taking ORV in the arm component as an example, the installing procedures are as follows.

① Fasten ORV (⑮) with specified torque with 22 ㎜ screw wrench or deep socket wrench.

· Put screw wrench (or deep socket wrench) to 22 ㎜ hexagonal part of pressure regulating body. Screw wrench to put the hexagonal part as shown in the Fig.23.

※ Be careful not to damage the seat of socket that sticks out above the tip when installing MRV and ORV to the body.

If the seat is damaged, there could be internal leakage, resulting in the malfunction of holding attachment.

※ Do not put 19 ㎜ screw wrench to the lock nut part when installing.

Lock nut turns with adjustable screw free turning, resulting in the degradation in performance or damage.

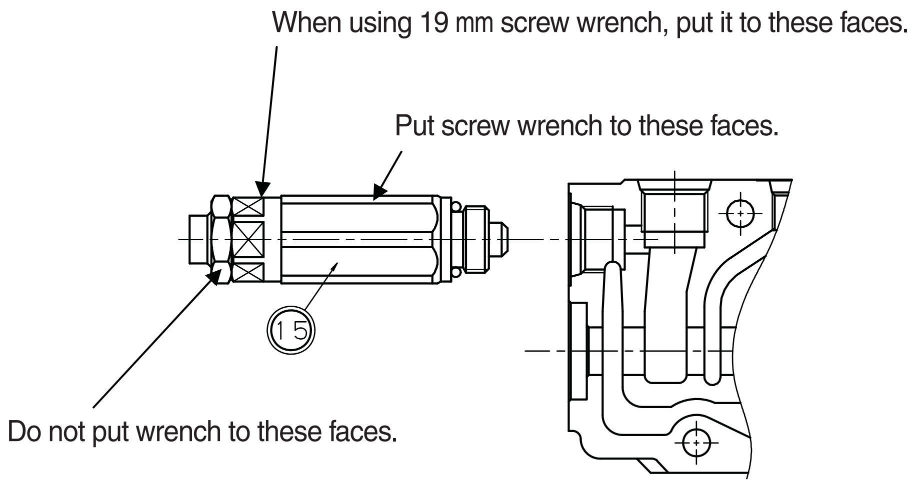


Fig.23 Installing main relief valve and overload relief valve

35Z9A7MCV20

(5) Check valve assembly procedures

Installing main relief valve (MRV) and overload relief valve (ORV) (see Fig.23)

① Hold the control valve body at workbench or hold it by two or more people.
② Assemble check valve (③) and check valve spring (④) in sequence at the center of control valve top surface.
Then, set check valve (③) vertically (check that the check valve is in nearly at the center of hole).
③ Check that O-ring (⑤) is securely installed with check valve plug (⑥) and then screw it into the part where check valve has been assembled.
④ Fasten check valve plug (⑥) with specified torque with 19 mm screw wrench or socket wrench.

· The other check valves can be assembled in the same manner; use suitable parts in the drawing (see Fig.25 and 26.).
If assembly is mistaken, check valve could not function or there could be damage.

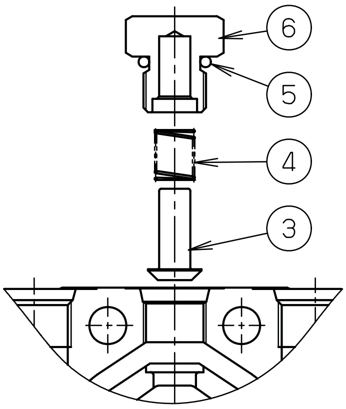


Fig.24 Check walve
(dozer, boom swing, swing, arm, boom, bucket)

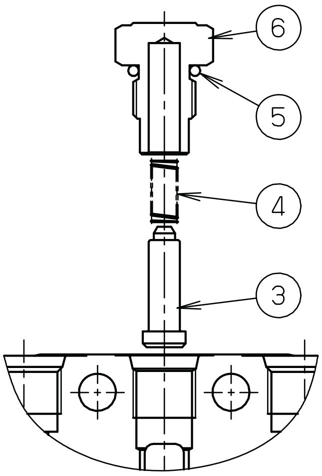
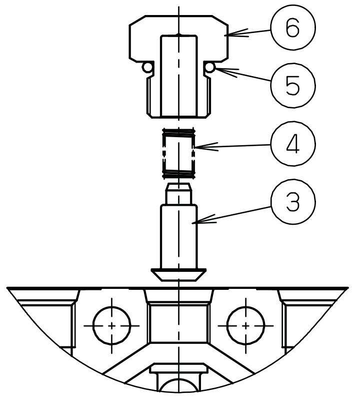


Fig.25 Check valve
(P3 conflux, travel, boom lock valve)



35Z9A7MCV21

Fig.26 Check valve
(PTO 1,PTO 2)

(6) Spool installing procedures

Except P3 conflux part

Taking the swing spool as an example, the installing procedures are as follows (see Fig.27).

① After checking whether there is no dust or the like in the spool sleeve of the body and/or spool assy and O-ring (⑦) is securely installed with that the flange bottom of the body, insert the dozer spool ass'y into spool sleeve of the body with attention to the position and direction.

· Then, apply little hydraulic fluid to the spool before insertion.

※ Carefully insert spool ass'y into the spool sleeve horizontally.
If it is hard to insert, forcible insertion could cause impressions on spool sleeve and/or spool, resulting in malfunction.
If you feel any feeling of wrongness such as catches or strong resistance, pull it out once to check whether there is the adhesion of dust or the development of flaw or burr.
If there are flaws or burrs, there could be malfunction so that replace body and spool in set.

· When there is no feeling of wrongness, move it slowly several times checking the movement and no feeling of wrongness again.

② Press pilot cover (⑨) in a direction from the spring side of spool assy to the flange of the body.
Fasten 2 hex socket head bolts with washers (⑩) with specified torque with 4 ㎜ hexagonal wrench.

③ The other spools can be assembled in the same manner.

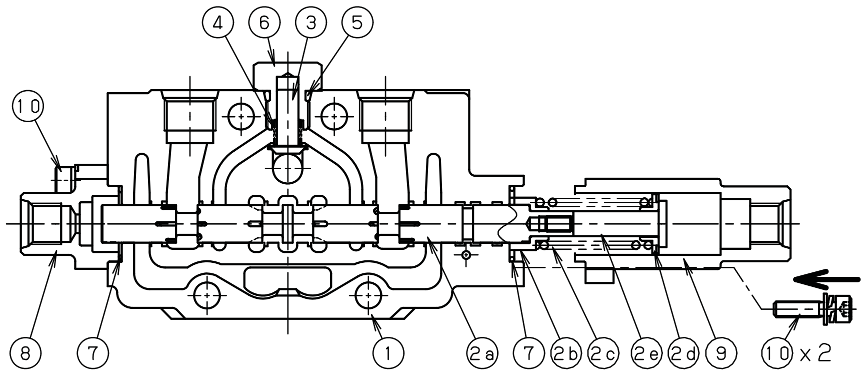


Fig.27 Except P3 conflux part

35Z9A7MCV22

1	Body-work	2d	Spring seat	6	Plug-check valve
2	Spool assy (swing)	2	End-spool	7	O-ring
2a	Spool (swing)	3	Poppet-check valve	8	Pilot cover B1
2b	Spring seat	4	Spring-check valve	9	Pilot cover A1
2c	Spring	5	O-ring	10	Hex socket bolt with washer

(7) Assembling accessory valve

Accessory valves are the most important parts for performance and safety; in particular, the relief valve is very difficult to readjust the setting so that replace in assy if any malfunction occurs.
Assembly procedures are shown here as reference for investigating malfunction:
The accessory valve assembled according to the procedures below should not be used practically.

Assembling main relief valve and overload relief valve (see Fig.29)

① After checking that O-ring (⑫) is securely installed into grooves on the top of adjustable screw (⑦), assemble regulating valve spring (⑨) and regulating valve (⑥) into the hole of adjustable screw (⑦).
② After check that back-up ring (⑭) and O-rings (⑬,⑪) are installed into regulating body (④), put the screw hole side of regulating body (④) on the assy that has been assembled in ①. and then fasten them with screws.

※ Pay attention to the positional relationship between O-ring (⑬) and back-up ring (⑭).
(Back-up ring is installed on the screw machined side of regulating body)
If it is installed oppositely, there would be the squeezing out of O-ring or the like, resulting in internal leakage, malfunction, or damage to other hydraulic devices at worst.
Then, look in the inside from a small-diameter hole of regulating body (④) to check that regulating valve (⑥) is settled in the seat of regulating body (④).
If the regulating valve is not settled, there will be no rise in pressure, resulting in malfunction.

③ Attach M14 nut (⑧) to the adjustable screw (⑦) sticking out from assy that has been assembled in ②.
④ After checking that O-ring (⑬) and back-up ring (⑭) are securely installed into grooves on the peripheral of regulating valve (②), insert regulating valve (②) into socket (①).

※ Pay attention to the positional relationship between O-ring (⑬) and back-up ring (⑭).
(Back-up ring is installed on the seat side of regulating valve)
If it is installed oppositely, there would be the same malfunction in ②.

⑤ Assemble piston (③) and regulating valve spring (⑩) in sequence into a small-diameter hole of the assy that has been assembled until ③.
· Be careful of the direction to install piston.
(The side machined with drill hole is to be the outside)
If it is inserted oppositely, the following assembly work cannot be proceeding.
⑥ Assemble the assy that has been assembled in 5. with the Ass'y that has been assembled in ④.
⑦ Insert the assy that has been assembled in 6. into regulating body (⑤) by turning regulating body.
⑧ Lightly hold any two surfaces of body (⑤) in a vise bench or the like and then fasten regulating body (④) with specified torque by using 19 mm screw wrench.
⑨ Check the installation of O-ring (⑮).

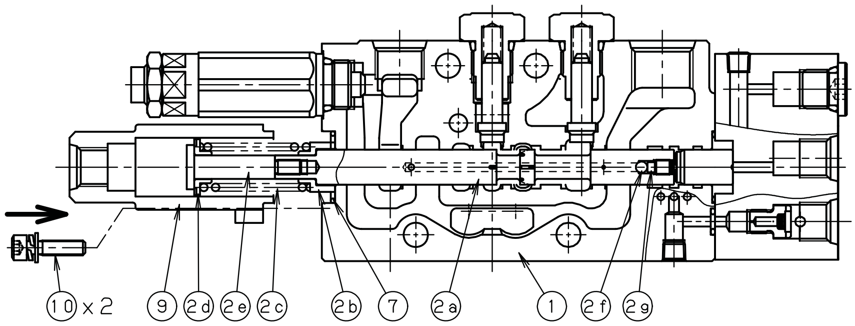


Fig.29 Assembling main relief valve and overload relief valve

35Z9A7MCV23

1	Socket	6	Pilot poppet	11	O-ring
2	Main valve poppet	7	Adjustable screw	12	O-ring
3	Piston	8	Nut	13	O-ring
4	Pilot valve seat	9	Pilot spring	14	Back-up ring
5	Body	10	Main valve spring	15	O-ring

5. MAINTENANCE STANDARD

1) PARTS CHECK

Name	Inspection item	Criterion and treatment
Component body	Presence of scratch, rust, corrosion.	Replace it if any of the followings is damaged. · Sliding parts for spools, especially lands with holding pressure. · Body flanges receiving spools. · Seal parts contacting with O-ring in ports. · Seats in relief and overload relief valves. · Damage spoiling normal functions.
Spool	Presence of scratch, scuff, rust, corrosion. Insert spool into body and stroke it with turning.	Replace it if scratch is on outer sliding part. Replace or correct it if spool does not move smoothly.
Check valve (load check valve)	Damage to check valve or check valve spring. Insert check valve into check valve plug to operate.	Replace or correct it if flaw or dent is on seat. Smooth moving without scratch is normal. Replace it if not.
Spring and related parts	Rust, corrosion, deformation, breakage in return spring seat, plug, cover.	Replace it if there is non-smooth operation or heavy damage.
Sealing of spools	Hardened, deformed, or damaged O-ring.	Replace it.
MRV, ORV	Rust in appearance. Matching surface of valve seat. O-ring, back-up ring.	Replace it. Replace it if there is flaw or dent. 100% replacement in principle.

6. PROBLEM CAUSES AND MEASURES

- If any abnormal condition is found, check whether control valve itself fails or there is problem in pump, cylinder, motor, or hydraulic circuit. for this check, it is necessary to measure pilot pressure, pump discharge pressure, and load pressure. observe the above disassembly and assembly procedures even if any part is disassembled or inspected.
- Be careful of dust proofing. dust is very harmful to hydraulic devices.
- Carefully handle moving movable parts. correct it with oilstone or replace it even if there is a minor flaw.
  Clean it sufficiently after correction.
- Protect the seal surface of o-ring from being damaged. the damage could cause oil leakage.

1) CONTROL VALVE

Phenomenon	Possible causes	Treatment
No movement in each attachment. slow operation (power shortage). Or slow response.	Operation failure in relief valve · Dust between regulating valve and seat★ · Dust between regulating valve seats★ · Stick of regulating valve★ · Breakage or fatigue of spring★ · Loosened adjustable screw★	Measure relief valve pressure · Replacement in assy★ · Replacement in assy★ · Replacement in assy★ · Replacement in assy★ Replacement in assy★
	Dust between body and spool, or stick	Disassemble and clean it. Replace body and spool if damage is big.
Cylinder's empty weight falling in neutral is big.	Excessive gap between comp. Body and spool.	Replacement in spool assy.
	Spool is not returned to neutral completely. · Dust storage between body and spool, or stick. · Breakage or fatigue of spring.	Measure pilot secondary pressure. · Disassemble and clean, or replace body and spool in set for stick. · Replacement in spool assy.
	Operation failure in overload relief valve. (see Maintenance standard)	Measure overload relief valve pressure. (see 8. Maintenance standard)
	Operation failure in lock valve. · Dust between lock valves or needle valve seats. · Stick of lock valve or needle valve. · Orifice clogging in lock valve.	Replace lock valve assy (including lock valve body)
When operating to rise cylinder at starting operation, it lowers.	Operation failure in load check valve. · Dust between load check valve and body. · Stick in load check valve. · Breakage or fatigue of spring.	· Disassemble and clean Replace body and load check valve if damage is big · Disassemble and clean Replace body and load check valve if damage is big · Replace spring

For problem with ★ mark, must replace relief valve in assy.

2) RELIEF VALVE

Relief valve is the most important part for performance and safety, and is very difficult to readjust the setting at a place except maintenance shops with adequate equipment.
Replace in assy if any of the following malfunctions occurs.

Phenomenon	Possible causes	Treatment
Pressure cannot rise	Any pressure regulating valve, regulating valve, or piston in relief valves has stuck to keep opening, or dust presents on any seat in relief valves.	· Replacement in assy.
Relief pressure is unstable	Each regulating valve in relief valves is damaged. Piston has stuck in pressure regulating Valve.	· Replacement in assy.
Relief pressure is out of setting range	Attrition by dust Lock nut and adjustable screw are loosened. Breakage or fatigue of spring. Operation failure in relief valve (main relief valve and overload relief valve)	· Replacement in assy.
Oil leakage	Damage in each seat Attrition in O-ring Stick of each part due to dust	· Replacement in assy.

GROUP 5 SWING DEVICE

1. REMOVAL AND INSTALL OF MOTOR

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 (8, 9, 10, 15, 17, 22).

(5) Disconnect pilot line hoses (22).

(6) Sling the swing motor assembly (1) and remove the swing motor mounting bolts (26).

※ Motor device weight : 39 kg (86 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.

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.

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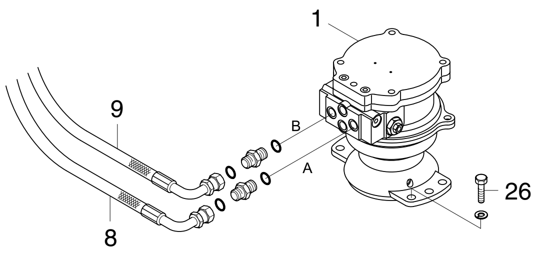

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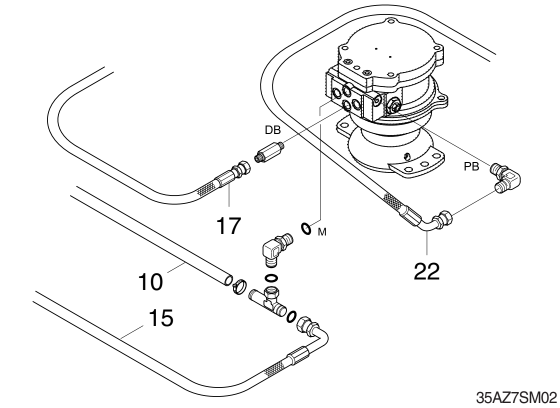

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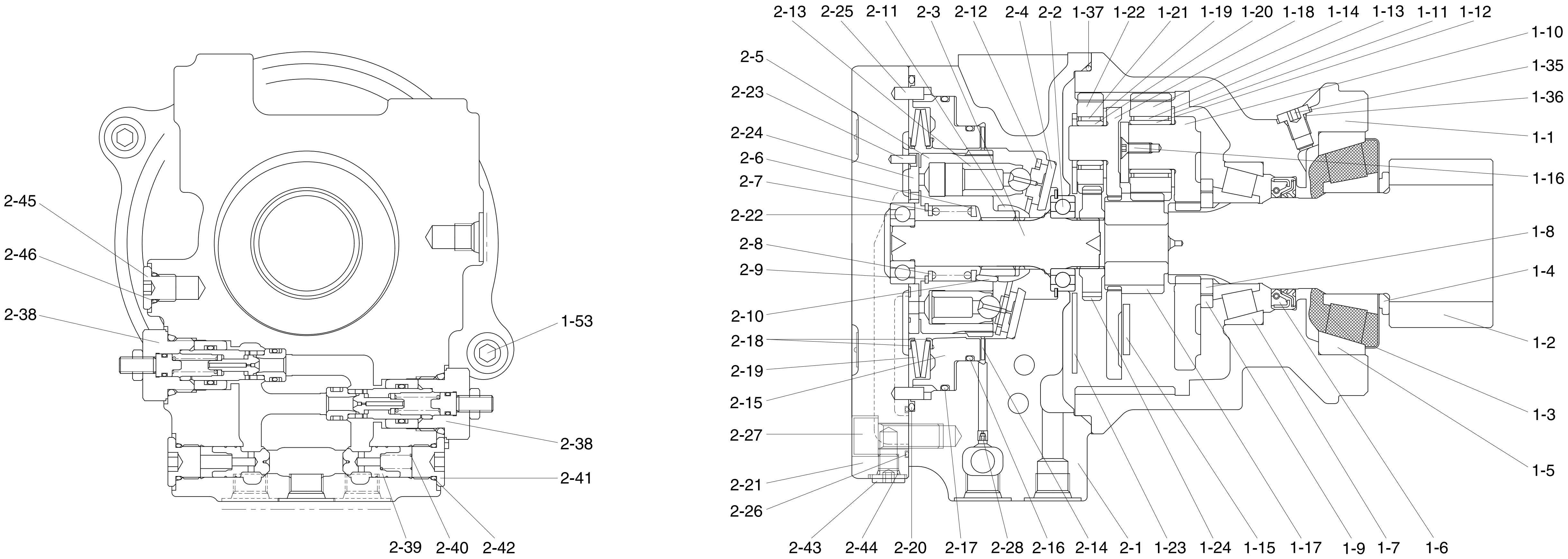
2. DISASSEMBLY AND ASSEMBLY OF SWING MOTOR

1) STRUCTURE



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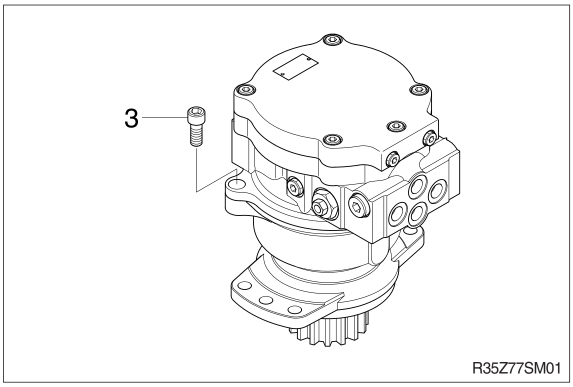
1	Gear box
1-1	Housing
1-2	Pinion shaft
1-3	Plate
1-4	Collar
1-5	Tapper roller bearing
1-6	Oil seal
1-7	Tapper roller bearing
1-8	Plate
1-9	Collar
1-10	Holder
1-11	Thrust washer
1-12	Inner race
1-13	Needle bearing
1-14	Planetary gear B
1-15	Thrust plate
1-16	Screw
1-17	Sun gear B
1-18	Holder
1-19	Thrust washer
1-20	Inner race
1-21	Needle bearing
1-22	Planetary gear
1-23	Thrust plate
1-24	Drive gear
1-35	Plug
1-36	O-ring
1-37	O-ring
1-53	Socket bolt
2	Axial piston motor
2-1	Case
2-2	Ball bearing
2-3	Shaft
2-4	Thrust plate
2-5	Cylinder block
2-6	Collar
2-7	Spring
2-8	Washer
2-9	Snap ring
2-10	Pin
2-11	Retainer holder
2-12	Retainer plate
2-13	Piston assy
2-14	Disc
2-15	Brake piston
2-16	O-ring
2-17	O-ring
2-18	Spring seat
2-19	Spring
2-20	O-ring
2-21	Cover
2-22	Ball bearing
2-23	Pin
2-24	Valve plate
2-25	Pin
2-26	O-ring
2-27	Socket head bolt
2-28	Orifice
2-38	Relief valve assy
2-39	Check valve
2-40	Spring
2-41	Plug
2-42	O-ring
2-43	Plug
2-44	O-ring
2-45	Plug
2-46	O-ring

2) DISASSEMBLY

Disassemble the parts by the following procedure.

(1) Separating the motor and the reduction gear

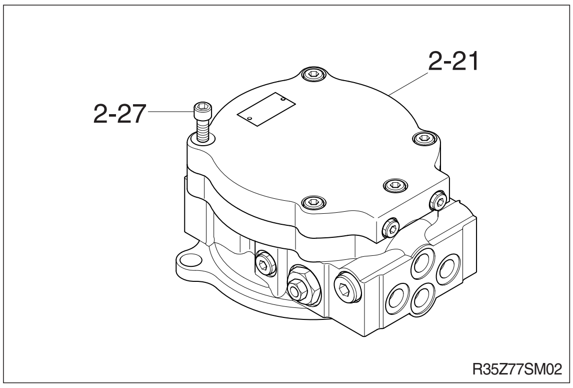
Secure the motor assembly in a vice and remove the socket head bolt (3).



(2) Disassembling the motor

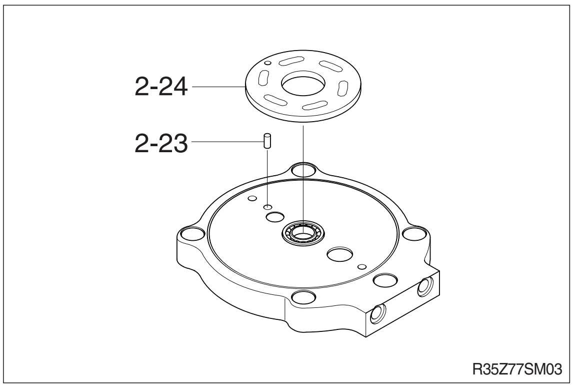
① Secure the motor assembly in a vice. Remove the socket head bolts (2-27) and separate the cover (2-21).

※ When separating the cover (2-21), be careful not to drop the valve plate (2-24).

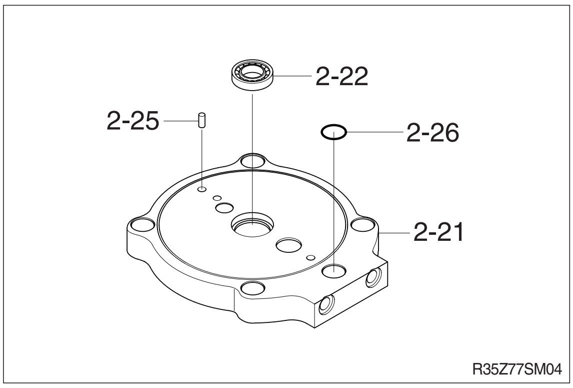


② Remove the valve plate (2-24) and the pin (2-23).

※ The valve plate (2-24) may remain on the motor side.

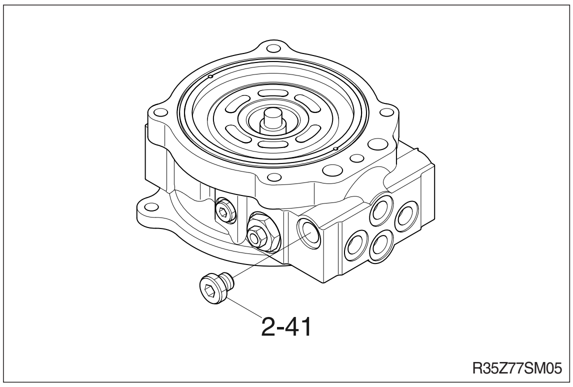


③ Remove the bearing (2-22). Remove the O-ring (2-26).

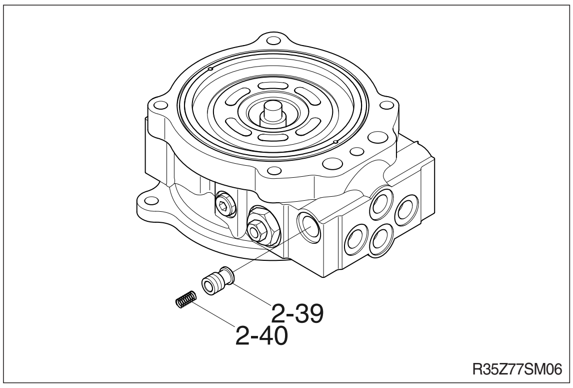


④ Disassemble the check valve.

a. Loosen to remove the plug (2-41).



b. Remove the spring (2-40) and the check valve (2-39).

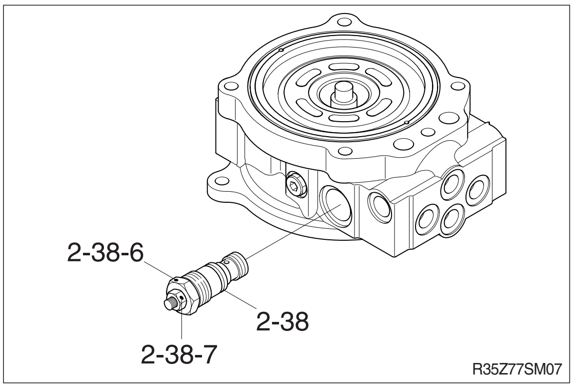


⑤ Remove the relief valve.

a. Loosen the plug (2-38-6) to remove the relief valve assembly (2-38).

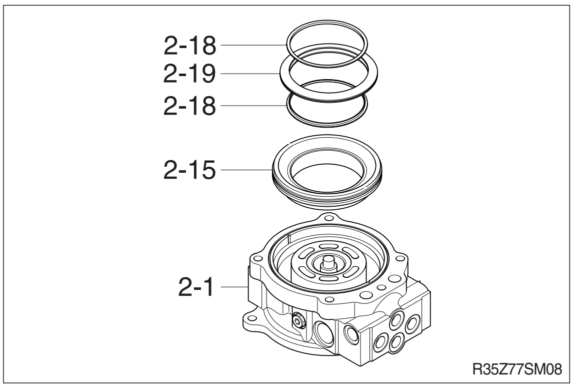
※ Do not move the adjuster kit (2-38-7). Otherwise, the set pressure will change.

※ Do not disassemble the relief valve assembly (2-38) because it is a functional component.



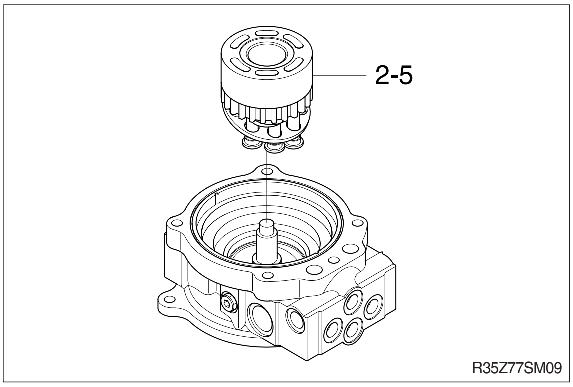
⑥ Remove the disc spring assembly (2-19) and the spring seat (2-18), and utilizing the gage port of the case (2-1), remove the parking brake piston (2-15).

※ The piston may be ejected by the air pressure. Exercise sufficient care during removal. At the beginning of the work, set a lower air pressure and adjust it while checking the piston for ejection.

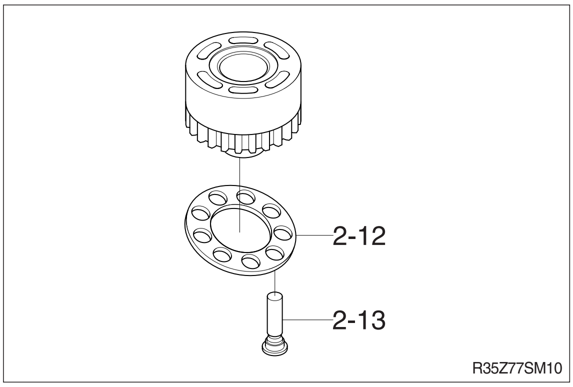


⑦ Remove the cylinder block and other associated parts.

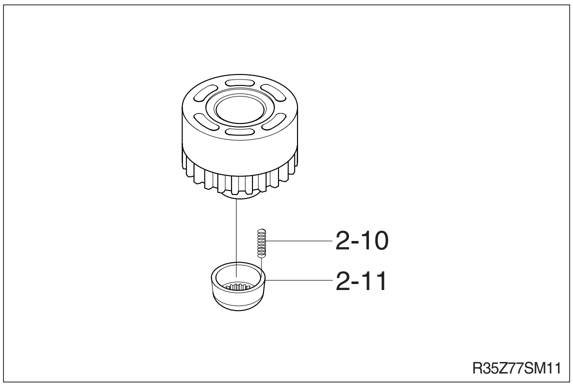
(2-5) Cylinder block
(2-6) Collar
(2-7) Spring
(2-8) Washer
(2-9) Snap ring
(2-10) Pin
(2-11) Retainer holder
(2-12) Retainer plate
(2-13) Piston assembly
(2-14) Disc(Parking brake spec. only)



⑧ Remove the retainer plate (2-12) and the piston assembly (2-13).

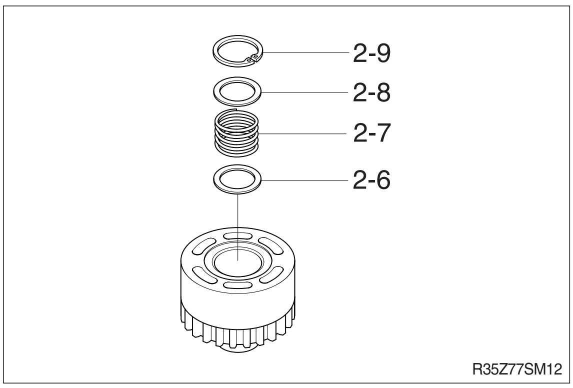


⑨ Remove the pin (2-10) and the retainer holder (2-11).

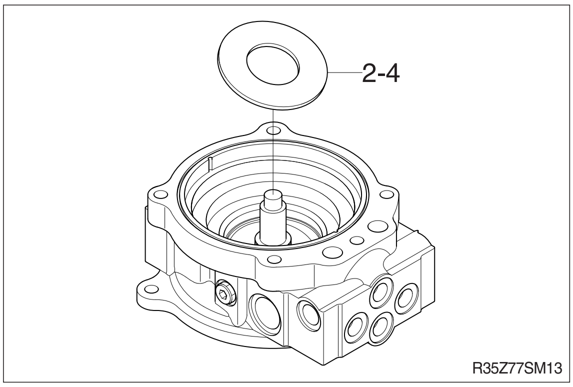


⑩ While pushing the washer (2-8), remove the snap ring (2-9).

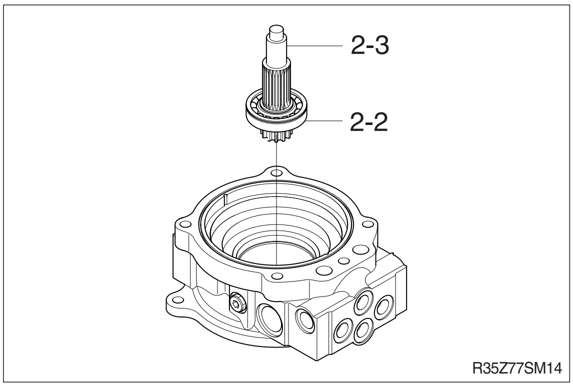
⑪ Remove the collar (2-6), the spring (2-7) and the washer (2-8).



⑫ Remove the thrust plate (2-4).

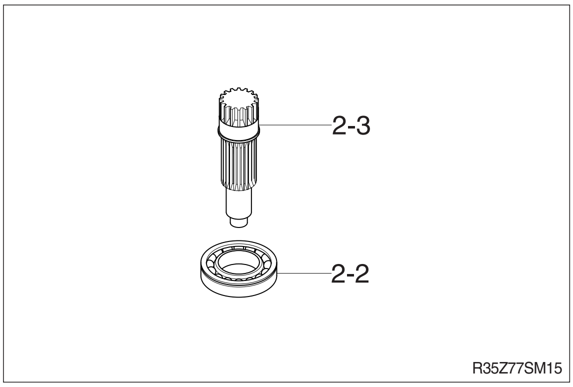


⑬ Lightly strike the end of the shaft (2-3) with a plastic hammer to remove the shaft.



⑭ Disassemble the ball bearing (2-2) and the shaft (2-3).

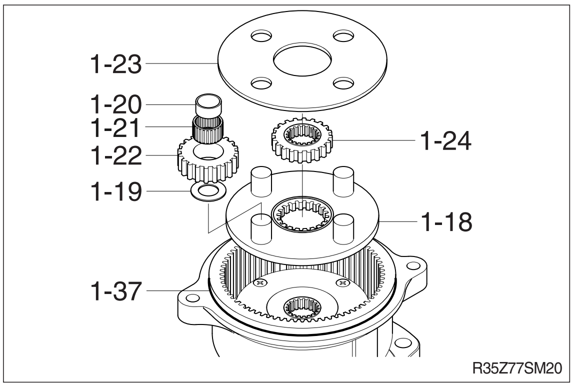
※ The disassembled bearing must not be used.



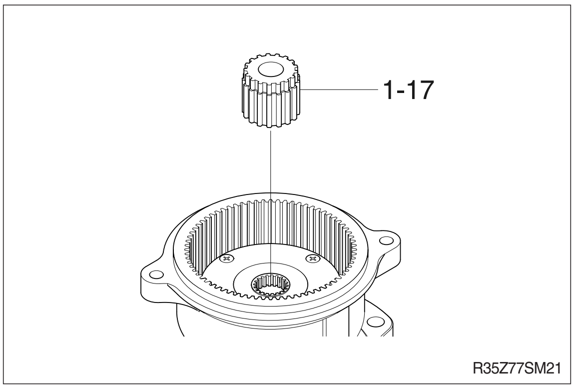
(3) Disassembling the reduction gear

① Remove the following parts.

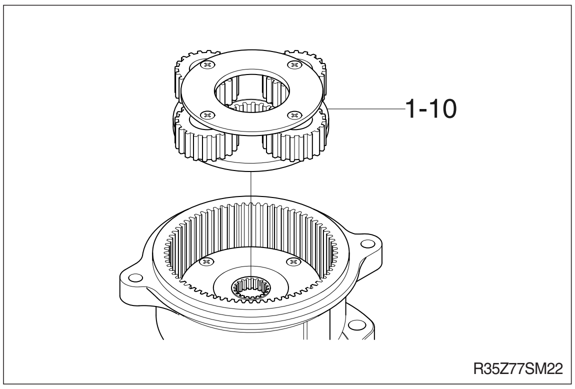
(1-37) O-ring
(1-24) Drive gear
(1-23) Thrust plate
(1-22) Planetary gear
(1-21) Needle bearing
(1-20) Inner race
(1-19) Thrust washer
(1-18) Holder



② Remove the sun gear (1-17).



③ Remove the holder (1-10) and other associated parts.

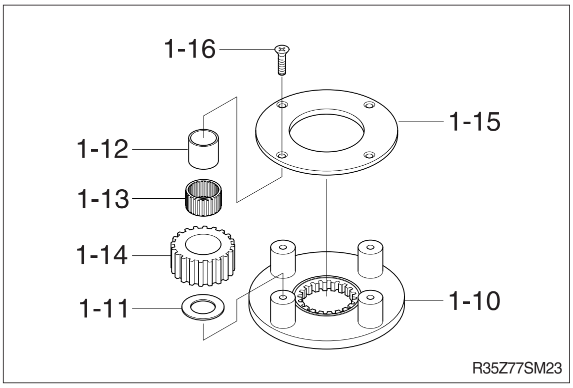


④ Secure the holder (1-10) in a vice and loosen the screw (1-16) to remove the thrust plate (1-15).

※ The screw is hard to remove because loctite was used during assembly. To facilitate the removal of the screw, warm the screw with a drier.

⑤ Remove the following parts.

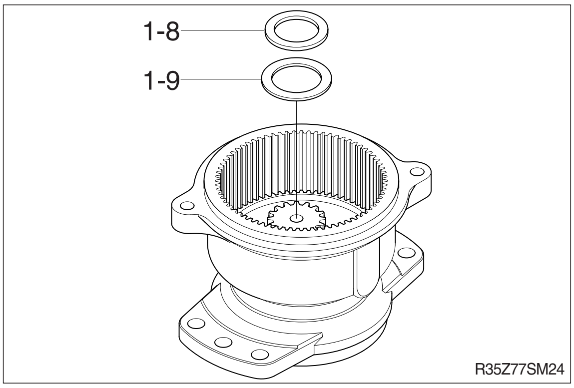
(1-14) Planetary gear
(1-13) Needle bearing
(1-12) Inner race



※ When replacing the taper roller bearings (1-5) and (1-7), the collar (1-9) and the plate (1-8), they are to be replaced by the body assembly.

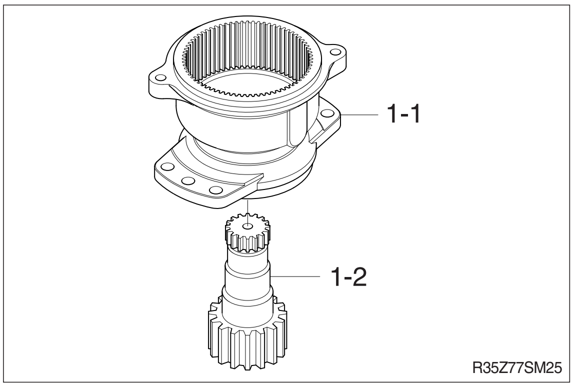
⑥ Remove the following parts.

(1-8) Plate
(1-9) Collar

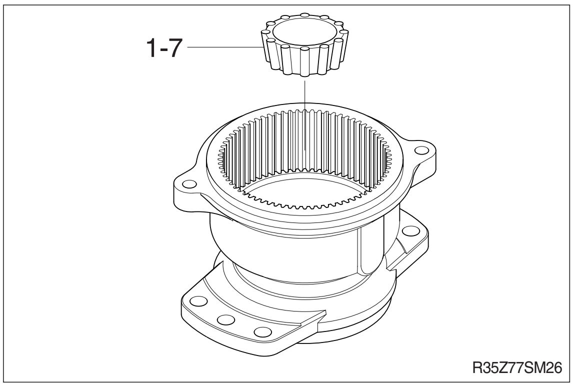


⑦ Remove the pinion shaft (1-2)

※ When removing the shaft, be careful not to drop it. If it is hard to remove, lightly strike it with a plastic hammer.

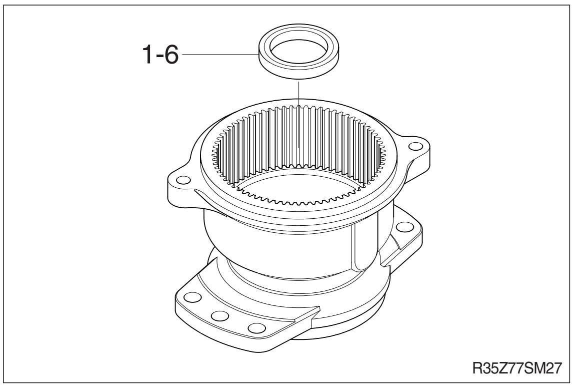


⑧ Remove the inner race of the taper roller bearing (1-7).

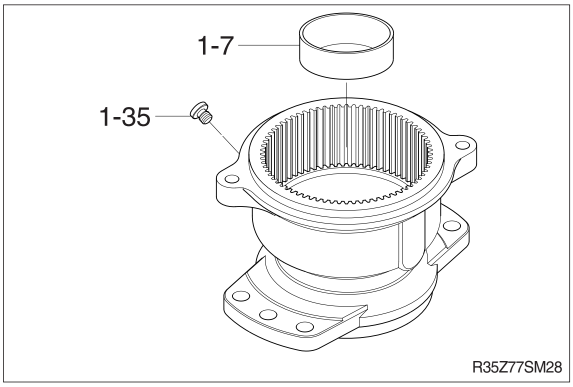


⑨ Break the oil seal (1-6) to remove it.

※ The removed oil seal must not be used again.
When removing it, exercise care to prevent damage to the outer races of the taper roller bearing (1-8) and (1-6).



⑩ Remove the outer race of the taper roller bearing (1-7) and the plug (1-35).



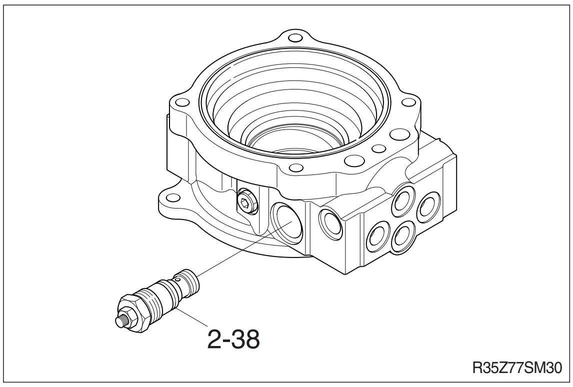
3) ASSEMBLY

Assemble the parts by the following procedure.

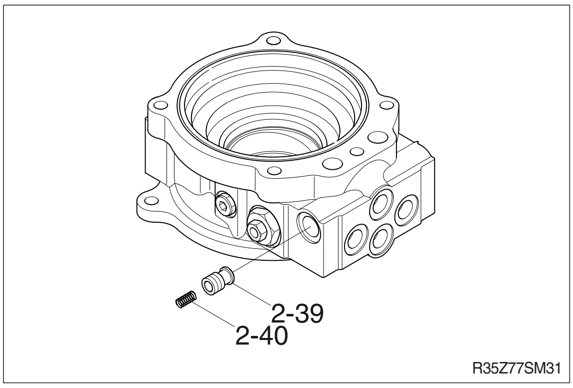
(1) Assembling the motor

① Install the relief valve assembly (2-38).

· Tightening torque : 157±10 N · m
161±1 kgf · m

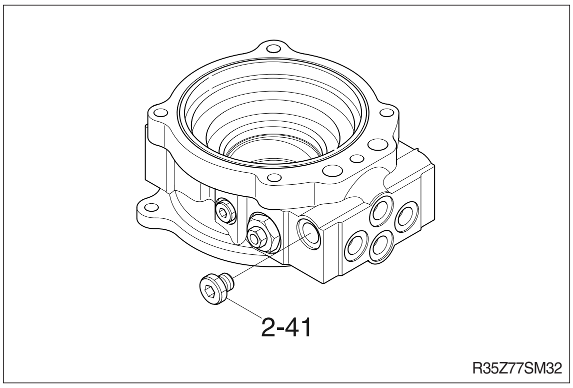


② Assemble the check valve (2-39) and the spring (2-40).



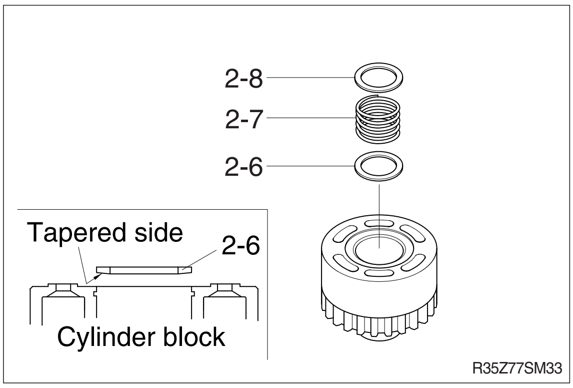
③ Install the plug (2-41).

· Tightening torque : 39.2±2.0 N · m
4.0±0.2 kgf · m

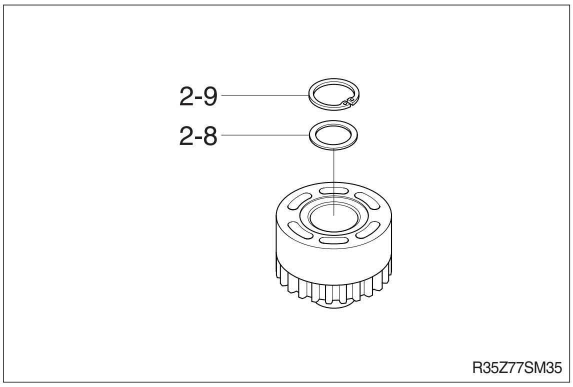


④ Assemble the collar (2-6), the spring (2-7) and the washer (2-8) in the cylinder block (2-5).

※ Be sure to assemble the collar (2-6) in the correct direction.

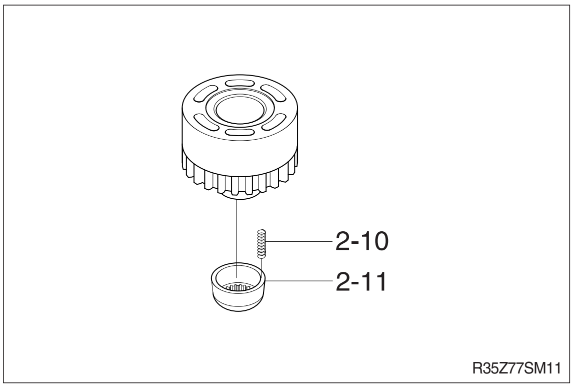


⑤ While pushing the washer (2-8), assemble the snap ring (2-9).



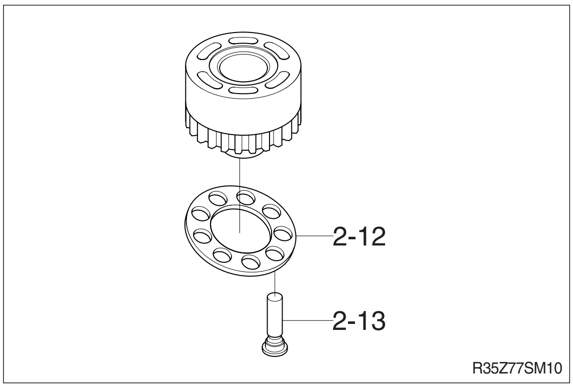
⑥ Apply grease to the pin (2-10) and assemble it in the cylinder block (2-5).

⑦ Assemble the retainer holder (2-11).



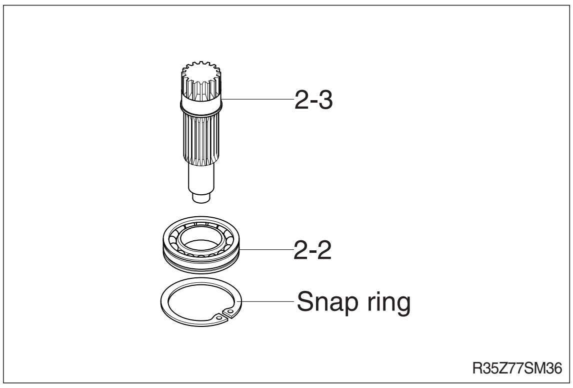
⑧ Set the piston assembly (2-13) on the retainer plate (2-12) and assemble it in the cylinder block (2-5).

※ Apply an ample amount of hydraulic fluid to the sliding part before assembly.

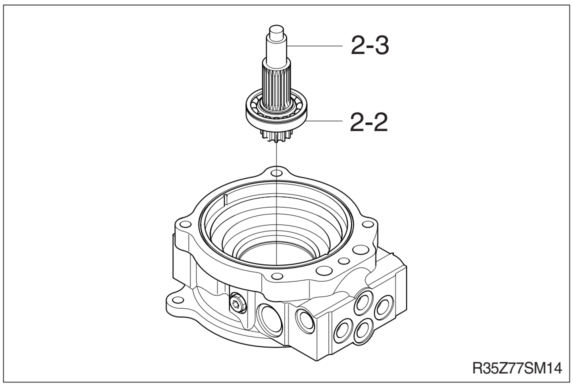


⑨ Press-fit the ball bearing (2-2) on the shaft (2-3).

※ Press-fit the ball bearing (2-2) with the attached snap ring facing as shown in the figure.

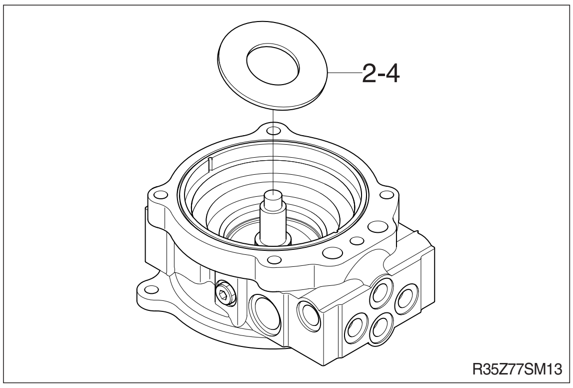


⑩ Press-fit the shaft (2-3) and the ball bearing (2-2) in the case (2-1).



⑪ Apply grease to the back side of the thrust plate (2-4) and assemble it.

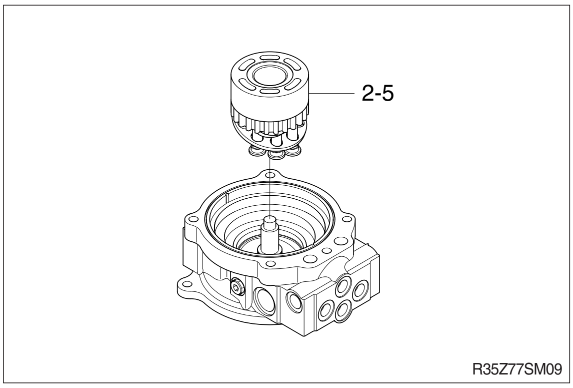
※ The thrust plate must be assembled in the correct direction.



⑫ Assemble the cylinder block (2-5) and other associated parts.

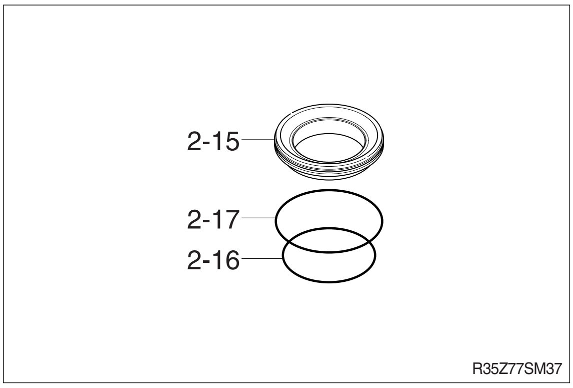
※ During assembly, be sure that the pin (2-10) will not come out.

※ The disc (2-14) is assembled only for the parking brake spec only.

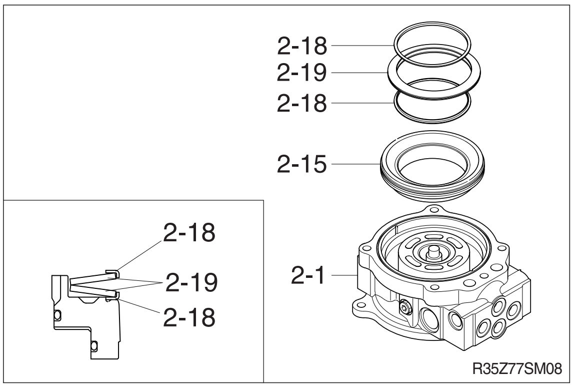


⑬ Apply grease to the O-ring (2-16) and the O-ring (2-17) and assemble them on the brake piston (2-15).

⑭ While paying attention to the location of the hole of the pin (2-25), assemble the brake piston (2-15) in the case (2-1).

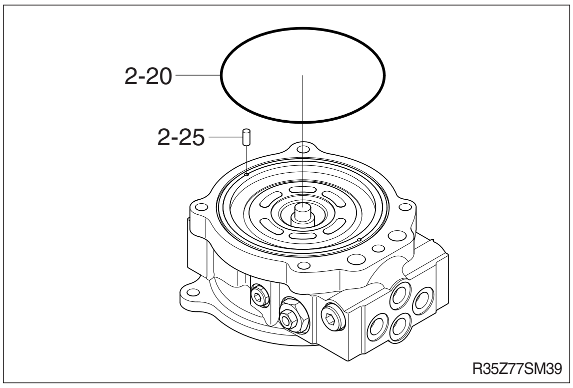


⑮ Assemble the spring seat (2-18) and the disc spring (2-19) in the correct direction.

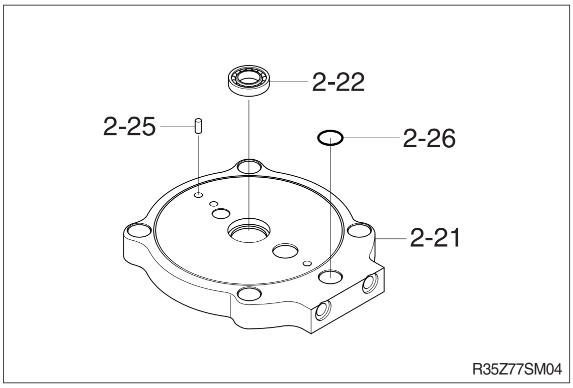


⑯ Apply grease to the O-ring (2-20) and assemble it in the case (2-1).
Check to see if the pin (2-25) can be assembled in the brake piston and case hole. If not, remove the brake piston (2-15) and re-orient it, then reassemble.

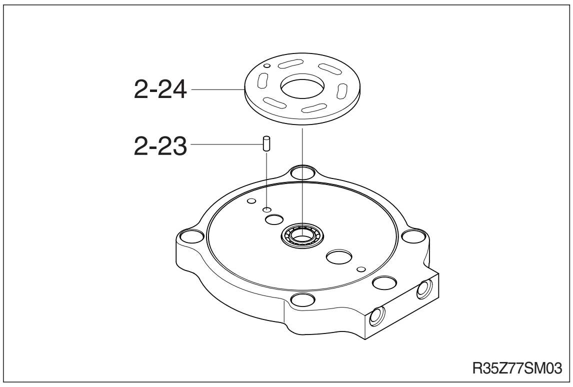
※ Assemble the pin (2-25) while being attached on the cover.



⑰ Apply grease to the O-ring (2-26) and the pin (2-25), then assemble them in the cover (2-21).
Press-fit the ball bearing (2-22).

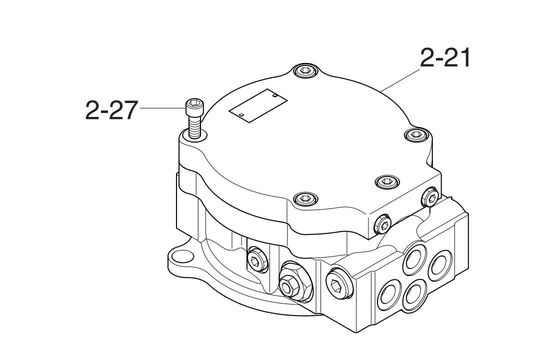


⑱ Install the pin (2-23), then install the valve plate (2-24).
To prevent it from falling, apply grease to the back side.



⑲ While paying attention to the location of the pin (2-25), install the cover (2-21) and other associated parts to the case (2-1).

※ Exercise care so that the pin (2-25) and the valve plate (2-24) will not fall.



R35Z77SM02

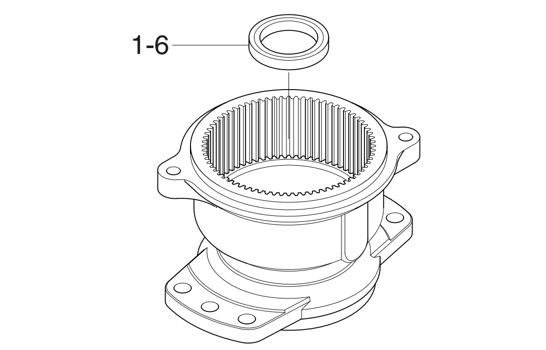
⑳ Loosely tighten the socket head bolts (2-27), then using a torque wrench, tighten them to the specified torque.

· Tightening torque : 13±0.7 kgf · m (94.4±5 lbf · ft)

(2) Assembling the reduction gear

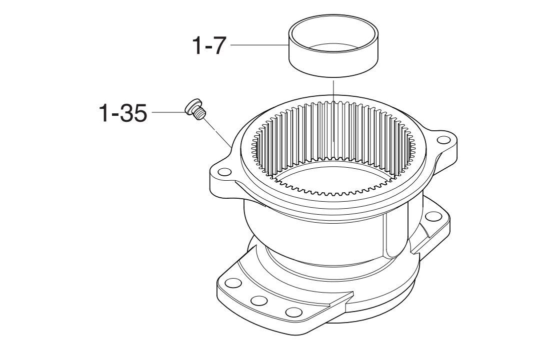
① Press-fit the oil seal (1-6).

※ Prior to press-fit, apply grease to the oil seal mounting area of the housing and the periphery of the oil seal.



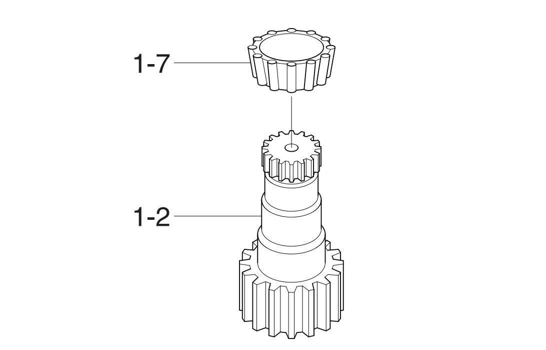
R35Z77SM27

② Press-fit the taper roller bearing (1-7) and install the plug (1-35).



R35Z77SM28

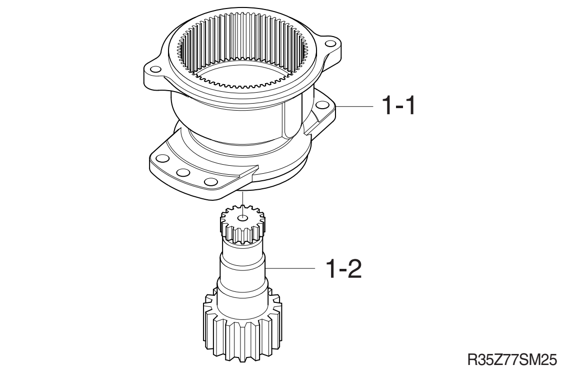
③ Apply grease to the inner race of the taper roller bearing (1-7) assembled on the pinion shaft (1-2).



R35Z77SM41

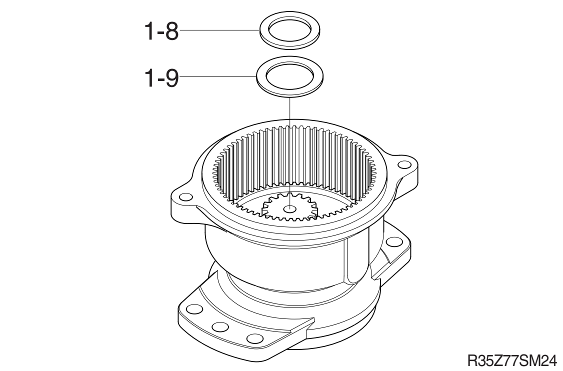
④ Install the pinion shaft (1-2) and other associated parts. Install the taper roller bearing inner race (1-7).

※ Prior to assembling the pinion shaft (1-2), etc. apply grease to the lip of the oil seal (1-6).



R35Z77SM25

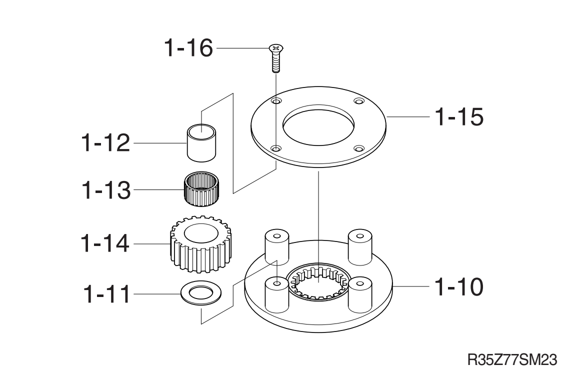
⑤ Install the collar (1-9) and the plate (1-8).



R35Z77SM24

⑥ Install the following parts on the holder.

(1-10) Holder
(1-11) Thrust washer
(1-12) Inner race
(1-13) Needle bearing
(1-14) Planetary gear B
(1-15) Thrust plate
(1-16) Screw

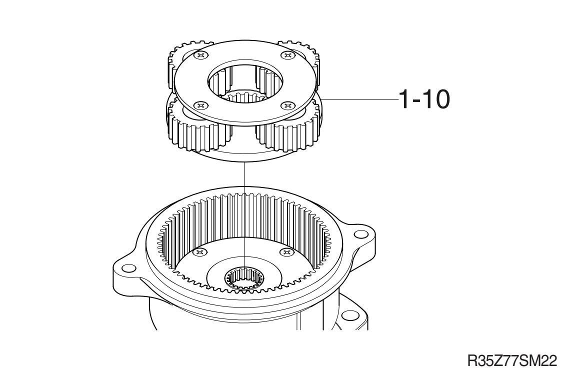


R35Z77SM23

※ Apply loctite 242 to the screw prior to tightening it.

· Tightening torque : 0.4±0.05 kgf · m
2.9±0.3 lbf · ft

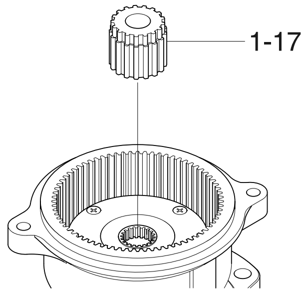
⑧ Install the holder (1-10) and other associated parts.



R35Z77SM22

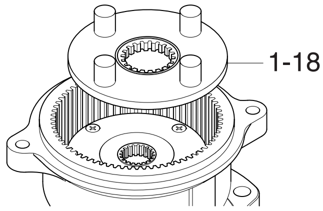
⑨ Install the sun gear (1-17).

※ Install the sun gear (1-17) with the snap ring facing as shown in the figure.



R35Z77SM21

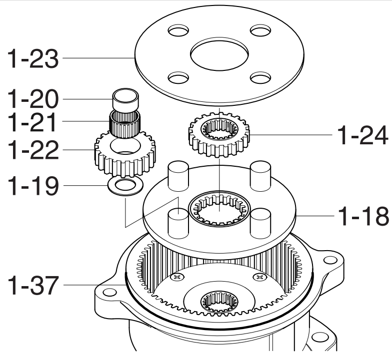
⑩ Install the holder (1-18).



R35Z77SM42

⑪ Install the following parts.

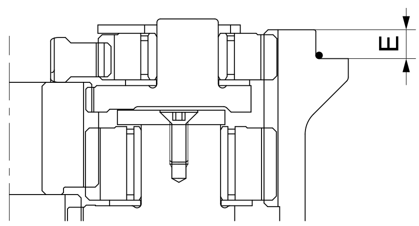
(1-19) Thrust washer
(1-20) Inner race
(1-21) Needle bearing
(1-22) Planetary gear A
(1-23) Thrust plate
(1-24) Drive gear
(1-37) O-ring



R35Z77SM20

※ Selection for thrust plate (1-15).
When any consisting parts of reduction unit were changed, select and install thrust plate corresponding to the measured value "E" referring to the below table.

E dimension (measured value)	Less than 6.6	6.6~7.2	More than 7.2
Part no. of thrust plate 1-23 (plate thickness)	XJBV-00129 (3.2 mm)	XJBV-00130 (2.8 mm)	XJBV-00131 (2.3 mm)

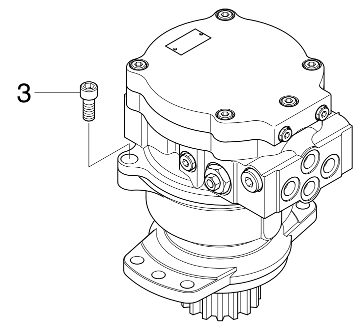


R35Z77SM43

(3) Assembling the whole motor assembly

Place the reduction gear assembly on the motor assembly and loosely tighten the socket head bolt (3), then tighten it to the specified torque.

· Tightening torque : 13±0.7 kgf · m
(94.4±5 lbf · ft)



R35Z77SM01

1. REMOVAL AND INSTALL

1) REMOVAL

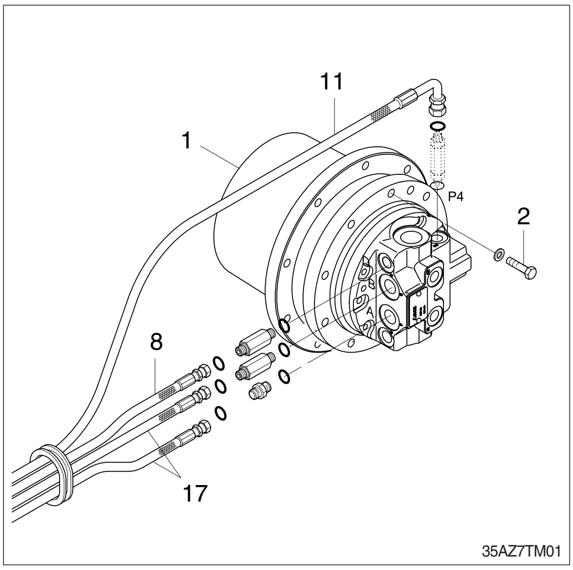
(1) Swing the work equipment 90° and lower it completely to the ground.

(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.**

(5) Remove the cover.

(6) Remove the hose.

※ Fit blind plugs to the disconnected hoses (8, 11, 17).

(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 : 37 kg (82 lb)

· Tightening torque : 13.8±1.0 kgf·m (100±7.2 lbf·ft)

2) INSTALL

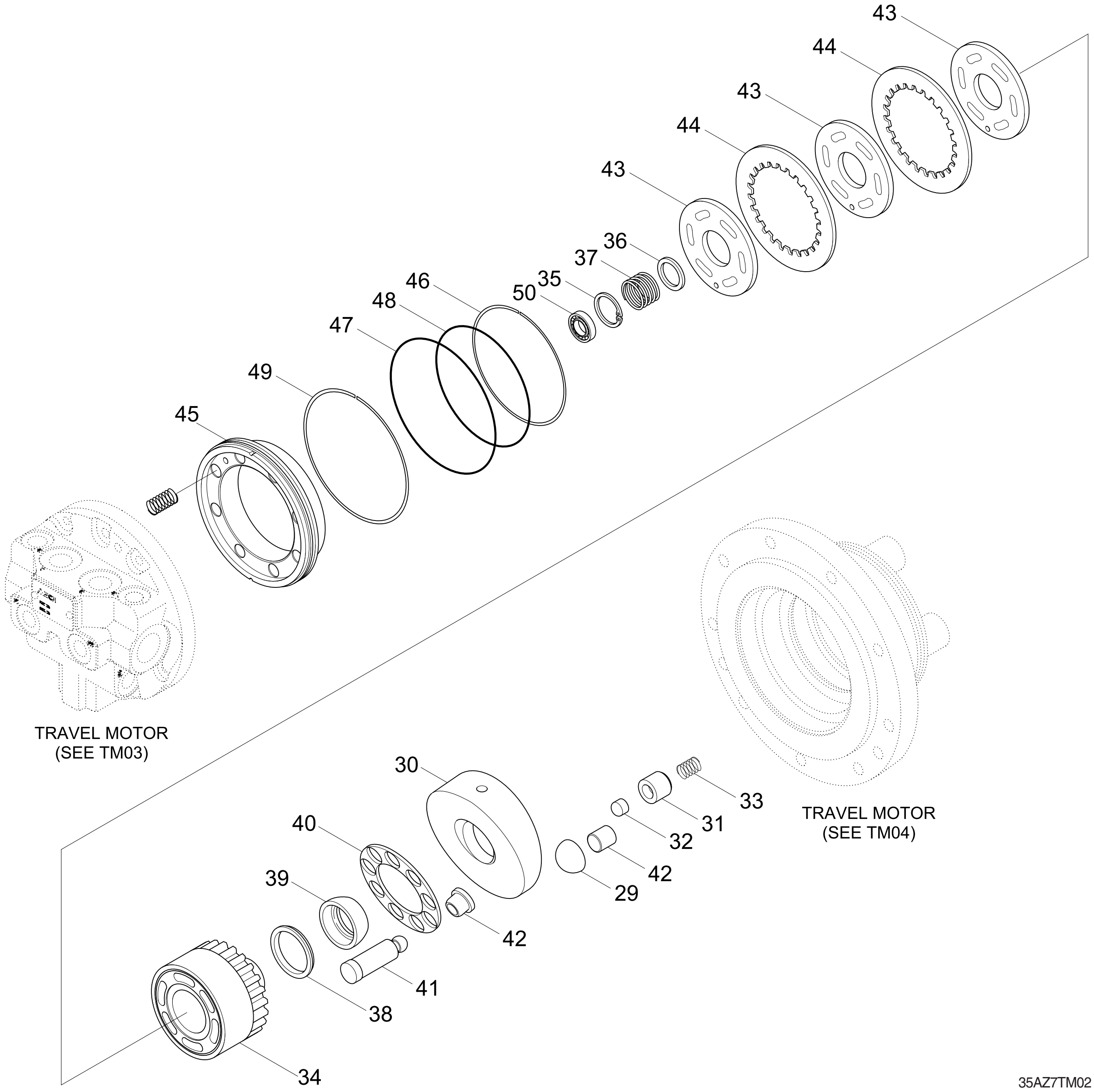
(1) Carry out installation in the reverse order to removal.

(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.

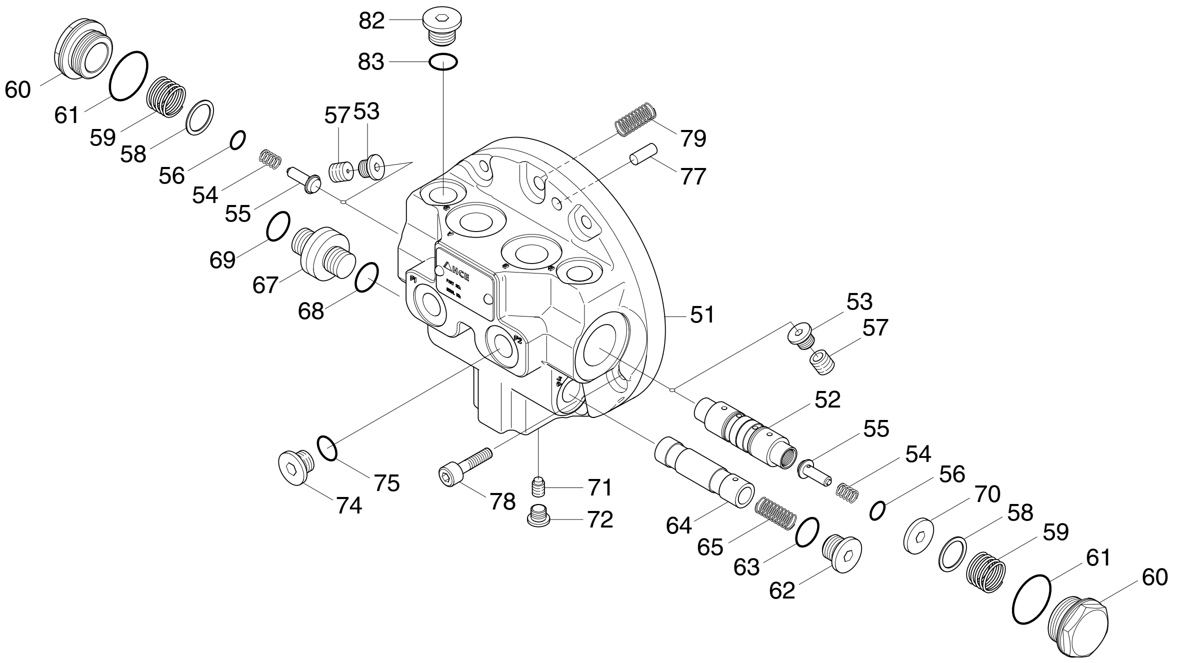
(3) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2. STRUCTURE (1/3)



29	Steel ball	37	Spring	44	Friction plate
30	Swash plate	38	Roller	45	Parking piston
31	Piston	39	Thrust ball	46	Backup ring
32	Shoe	40	Retainer plate	47	O-Ring
33	Spring	41	Piston	48	O-Ring
34	Cylinder block	42	Shoe	49	Backup ring
35	Snap ring	43	Separation plate	50	Timing plate
36	Washer				

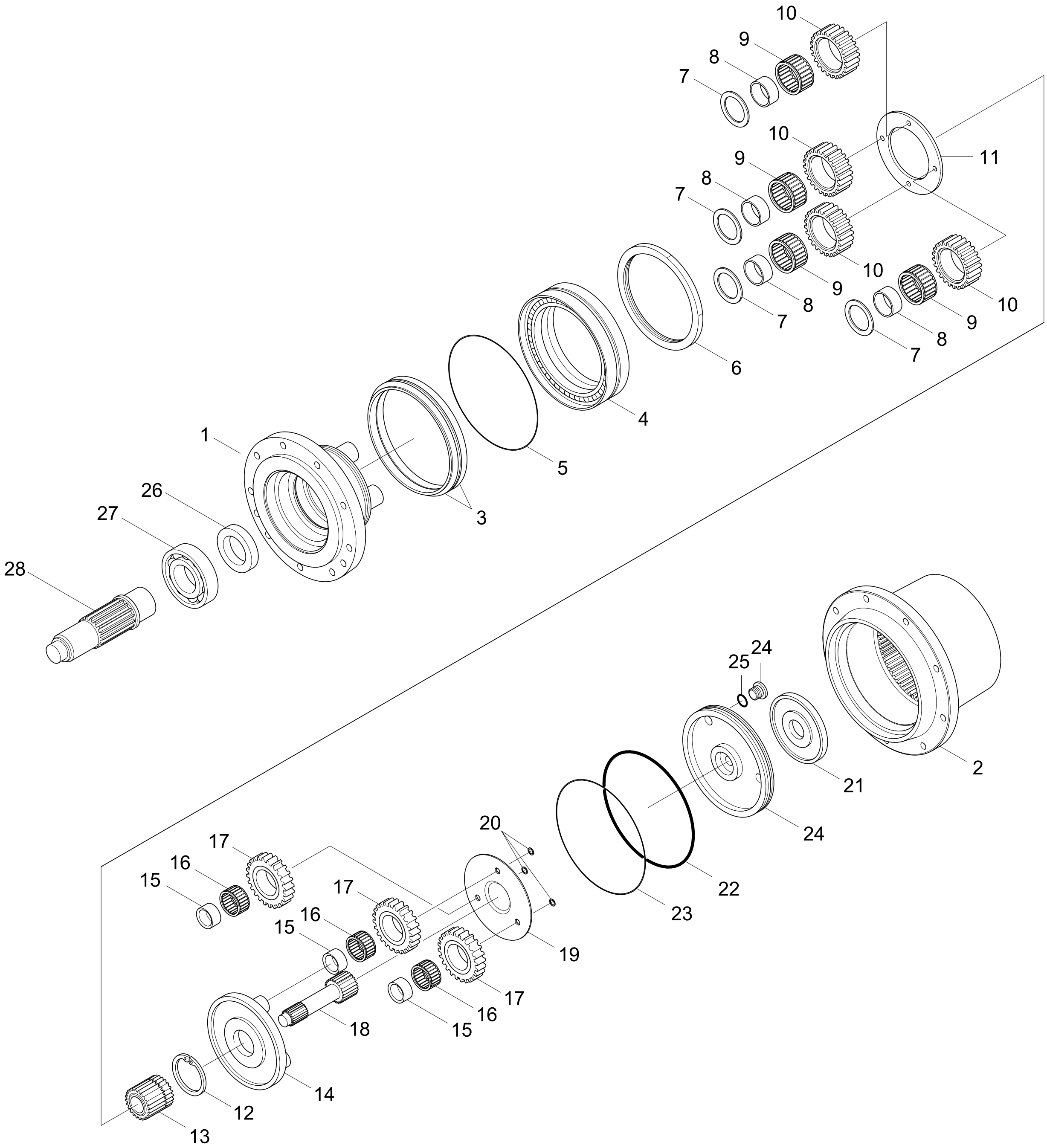
STRUCTURE (2/3)



35AZ7TM03

51	Valve casing	61	O-ring	72	Plug
52	Spool	62	Plug	73	O-ring
53	Plug	63	O-Ring	74	Plug
54	Spring	64	2 Speed spool	75	O-ring
55	Poppet	65	Spring	76	Parallel pin
56	O-Ring	66	Spool guide-2 speed	77	Parallel pin
57	Orifice	67	Plug	78	Socket bolt
58	Washer	69	O-ring	79	Spring
59	Spring	70	Ball bearing	80	O-Ring
60	Plug	71	Orifice	81	O-Ring

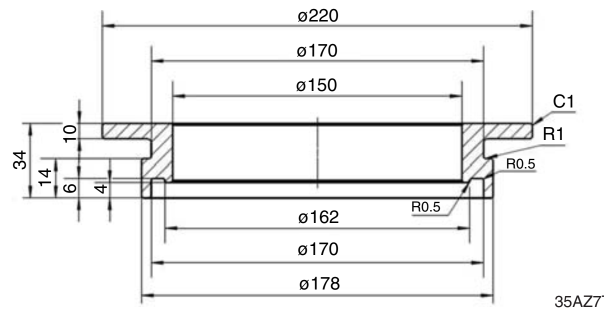
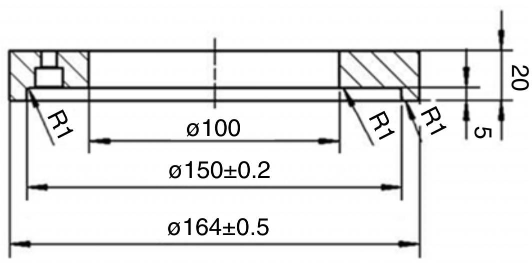
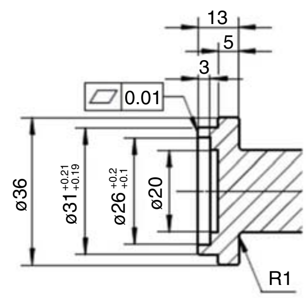
STRUCTURE (3/3)



1	Spindle	11	Thrust washer	21	Cover
2	Hub	12	Snap ring	22	O-Ring
3	Floating seal	13	Sun sear No.2	23	Clip
4	Angular ball bearing	14	Carrier No.1	24	Plug
5	Snap ring	15	Inner race	25	O-ring
6	Shim plate	16	Needle bearing	26	Oil seal
7	Washer	17	Planet gear No.1	27	Ball bearing
8	Inner race	18	Sun gear No.1	28	Drive shaft
9	Needle bearing	19	Thrust plate No.1		
10	Planet gear No.2	20	Snap ring		

3. DISASSEMBLY AND ASSEMBLY

1) REQUIRED TOOLS

Tool name	Tool number	Specification
Torque wrench	T1	3~36 kgf·m (21.7~260 lbf·ft)
Hex bit	T2	6 mm
	T3	8 mm
Hex socket	T4	22 mm
	T5	36 mm
Plastic hammer	T6	Head material : Soft plastic
Plier	T7	Snap ring, general type, tip thickness Ø1.3, length 25 mm
	T8	Snap ring, gear type tip thickness Ø3.8, length 165 mm
Driver	T9	Flat-head, small
	T10	Flat-head, large (2 EA)
Round bar	T11	O.D. Ø25, length 130 mm
Air gun	T12	Nozzle type
Eye bolt	T13	M14×1.5 (2 EA)
Ball bearing disassembly/ press-fit jig	T14	O.D. Ø27, I.D. Ø24, length 110 mm hollow cylinder
Guide pin	T15	M10×1.5×50
Floating seal assembly jig	T16	 35AZ7TM06
Augular bearing press-fit jig	T17	 35AZ7TM07
Shaft seal press-fit jig	T18	 35AZ7TM08

2) TIGHTENING TORQUE

Item no.	Size	Tightening torque	
		kgf·m	lbf·ft
24	M14 x 1.5	4.0±0.5	28.9±3.6
57	M 5 x 0.8	0.18±0.02	1.3±0.14
60	M30 x 1.5	36.0±4.0	260±28.9
62	PF 3/8	6.0±1.0	43.4±7.2
67	PF 3/8	6.0±1.0	43.4±7.2
71	M 6 x 1.0	0.28±0.02	2.0±0.14
72	PF 1/8	1.9±0.2	13.7±1.15
74	PF 1/4	4.3±0.3	31.1±2.17
78	M10 x 1.5	5.9±1.0	42.7±7.2
82	PF 1/4	3.0±0.5	21.7±3.6

3) PRECATIONS

(1) Be careful not to damage the seal contact surface of the floating seal, O-ring, shaft seal, etc. and the contact surface of the gear, pin, bearing.

(2) When disassembling after mounted on the equipment, make sure no foreign substances enter the equipment.

(3) Clean each part with oil sufficiently and dry it with the compressed air before assembly.

(4) When using oil absorbent or oil mop, be careful not to scratch the parts. Clean it thoroughly with lint-free cloths before assembly.

(5) When tightening the bolt and plug, use a torque wrench and tighten the bolt and plug to the specified tightening torque.

(6) Use a plastic hammer to tap the non-functional parts.

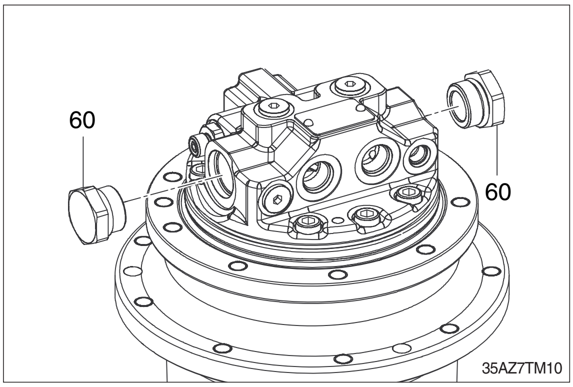
(7) Replace the floating seal, O-ring, shaft seal with a new one when disassembly.

(8) For the assembly of bearing preload, floating seal, please contact us for the detailed assembly method.

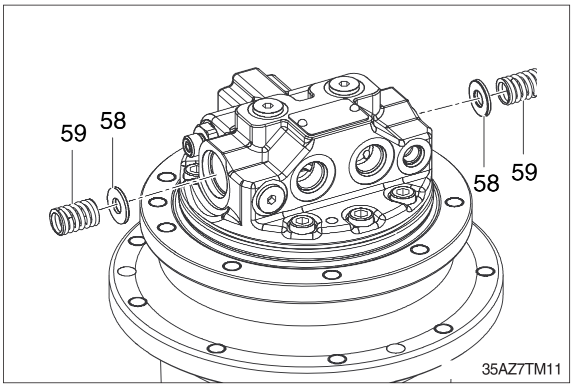
4) DISASSEMBLY PROCEDURES

(1) Diassemble plug (60).

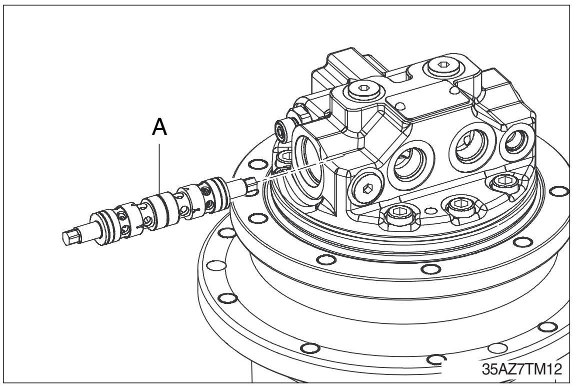
※ Required tools :
Troque wrench (T1), hex. socket (T5).



(2) Diassemble spring (59) and washer (58).

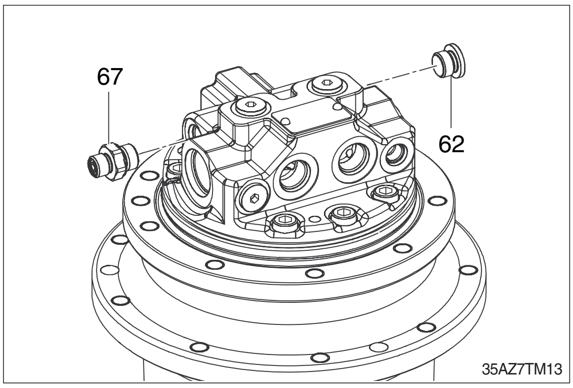


(3) Turn the spool assembly (A) slowly to disassemble. Be careful not to damage the spool O.D.

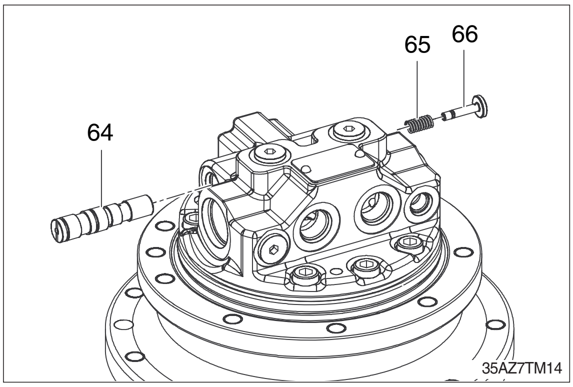


(4) Disassemble plug (62), (67).

※ Required tools :
Troque wrench (T1), hex. socket (T4), hex bit (T3).

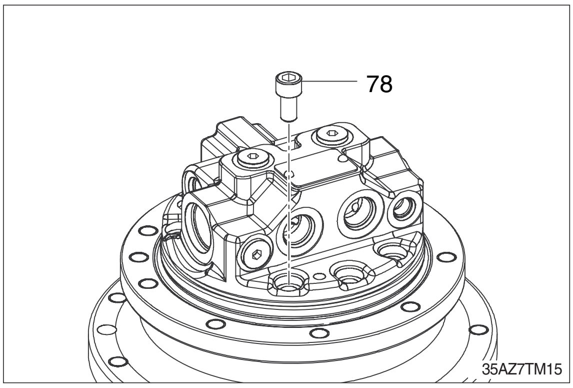


(5) Disassembly spool (64), spring (65), and guide (66). Be careful not to damage the surface of the spool and guide.

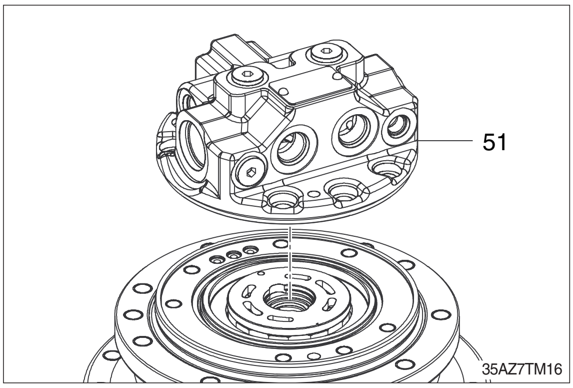


(6) Loosen each socket bolt (78) evenly to disassemble.

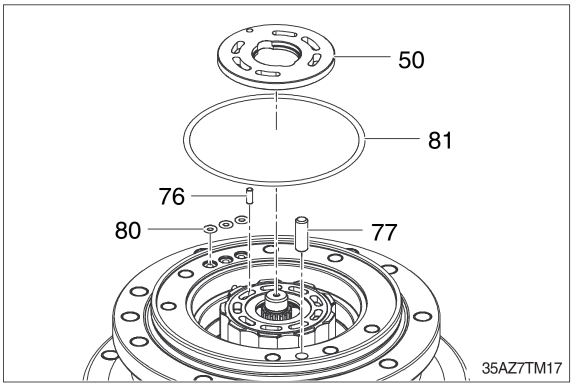
※ Required tools :
Troque wrench (T1), hex. bit (T3).



(7) Disassemble valve casing (51).

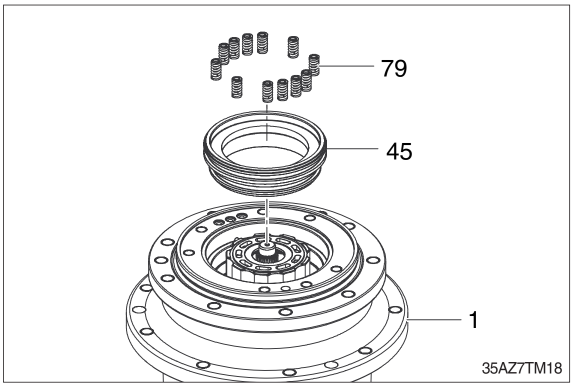


(8) Disassemble pin (76), (77), O-ring (80), (81) and valve plate (50).

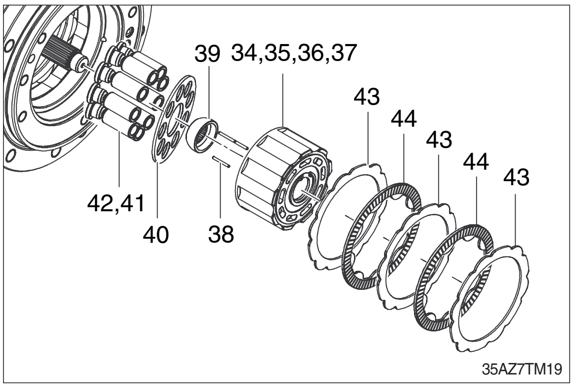


(9) Disassemble spring (79). Cover the top of a motor with cloths and disassemble the brake piston (45) by blowing compressed air into the brake releasing line of the motor casing (1).

※ Required tools :
Compressed air, air gun (T12).

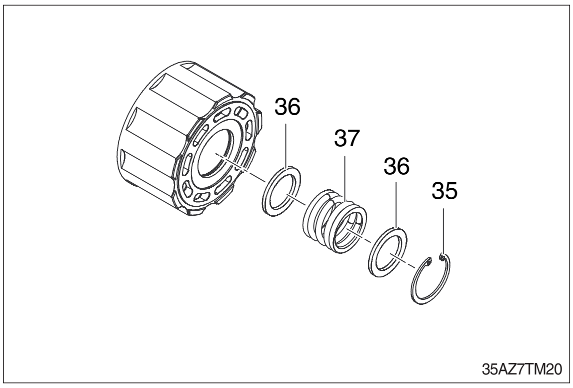


(10) Disassemble cylinder block assembly (34)~(37), roller (38), thrust ball (39), retainer plate (40), piston assembly (41)~(42), separation plate (43), and friction plate (44).

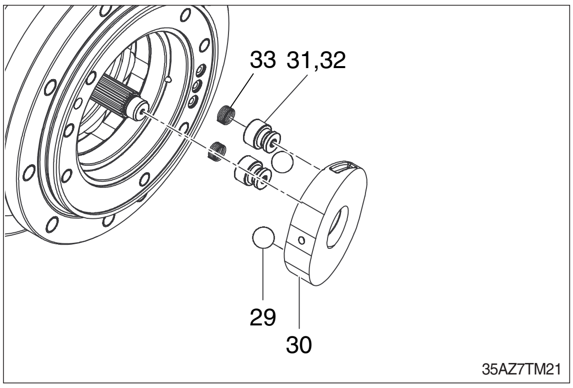


(11) Disassemble snap ring (35), washer (36) and spring (37).

※ Required tools : Plier (T7)

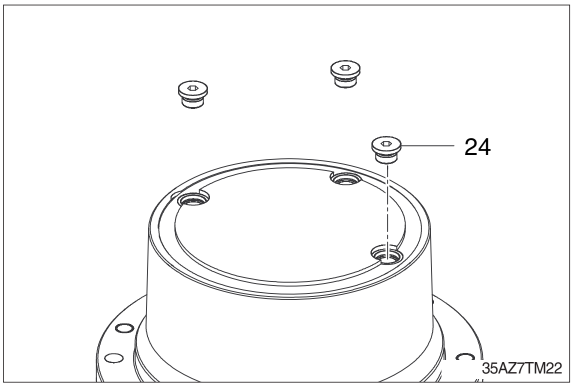


(12) Disassemble swash plate (30), steel ball (29), transmission piston assembly (31)~(32), and spring (33).



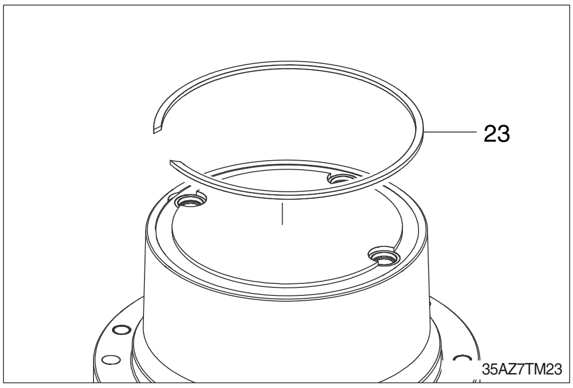
(13) Disassemble plug (24) and discharge the reduction gear oil.

※ Required tools :
Torque wrench (T1), hex bit (T12).



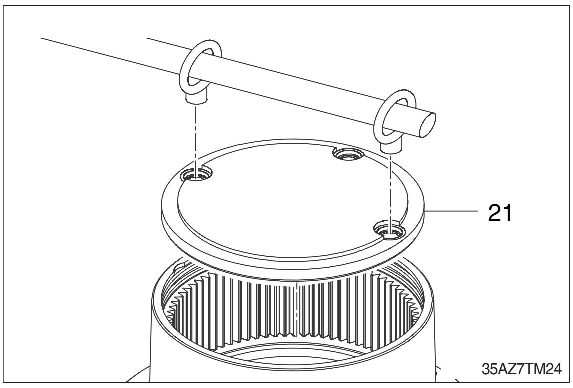
(14) Disassemble clip (23).

※ Required tools : Screwdriver (T9).



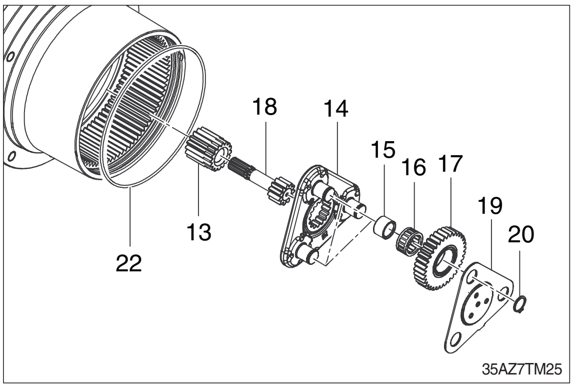
(15) Assemble two eye bolts into the plug hole in the opposite direction and hang the round bar to disassemble the cover (21).

※ Required tools :
Eye bolt (T13), round bar (T11).



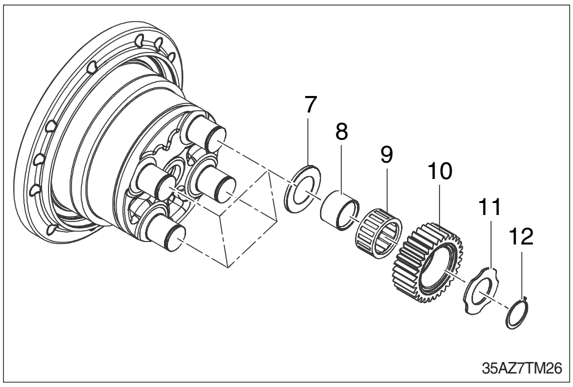
(16) Disassemble O-ring (22), the first stage sun gear (18), the first stage carrier (14), snap ring (20), thrust plate (19), the first stage planet gear (17), needle bearing (16), inner race (15), and the second stage sun gear (13).

※ Required tools : Plier (T7).



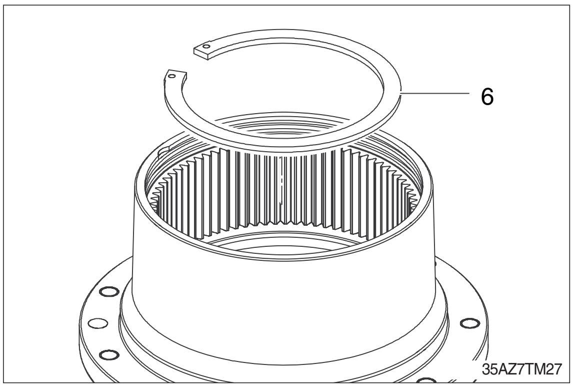
(17) Disassemble snap ring (12), washer (11), the second stage planet gear (10), needle bearing (9), inner race (8), and washer (7).

※ Required tools : Plier (T7).

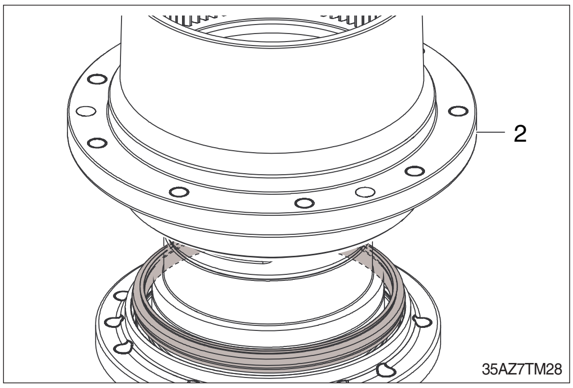


(18) Disassemble the shim plate (6).

※ Required tools : Plier (T8).

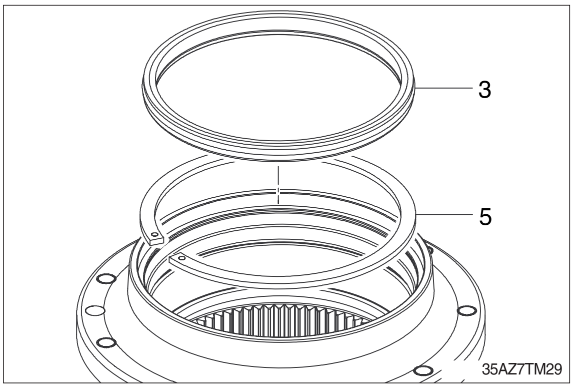


(19) Disassemble the hub (2).



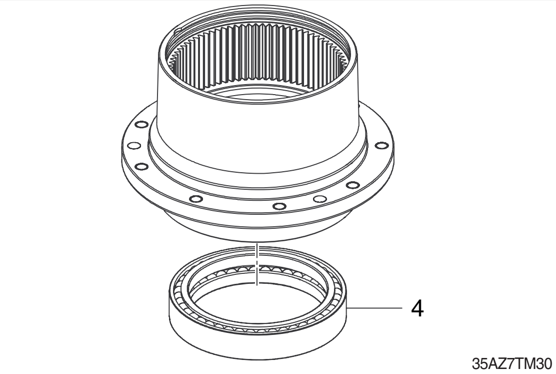
(20) Disassemble the floating seat (3) and snap ring (5). Be careful not to damage the contact surface of the floating seal.

※ Required tools :
Screwdriver (10), plier (T8).



(21) Disassemble the angular ball bearing (4) by tapping the inner ring of the bearing with a plastic hammer and a bar.

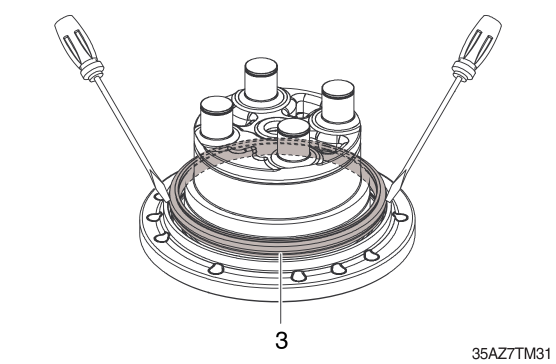
※ Required tools :
Round bar (T11), plastic hammer (T6).



35AZ7TM30

(22) Disassemble floating seal (3).

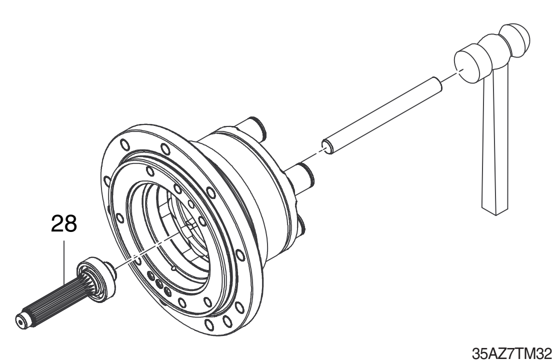
※ Required tools : Screwdriver (T10).



35AZ7TM31

(23) Disassemble drive shaft (28) by tapping the spline hole with a bar and a plastic hammer.

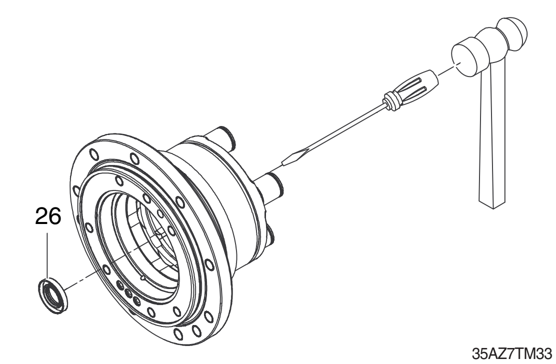
※ Required tools :
Round bar (T11), plastic hammer (T6).



35AZ7TM32

(24) Disassemble shaft seal (26).

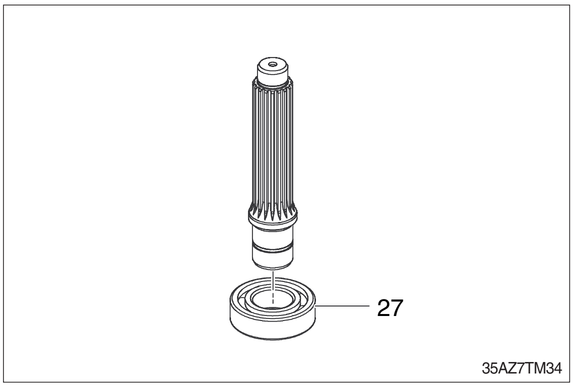
※ Required tools :
Screwdriver (T9), plastic hammer (T6).



35AZ7TM33

(25) Disassemble ball bearing (27).

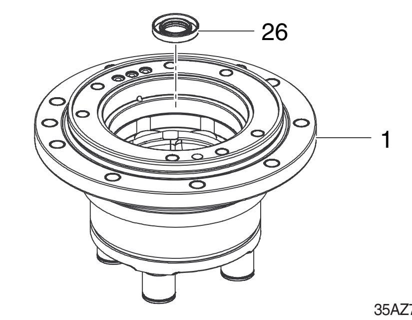
※ Required tools :
Ball bearing disassembly, press-fit jig (T14).



5) ASSEMBLY PROCEDURES

(1) Apply a small amount of hydraulic fluid to the outer diameter of the shaft seal (26) and assemble it to the motor casing (1).

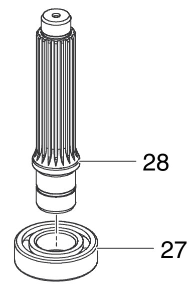
※ Required tools :
Shaft seal press-fit jig (T18).



35AZ7TM40

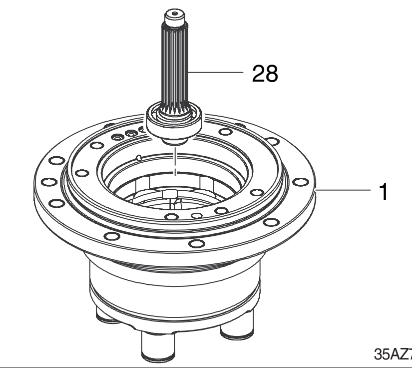
(2) Assemble the ball bearing (27) to the drive shaft (28).

※ Required tools :
Ball bearing disassembly, press-fit jig (T14).



35AZ7TM41

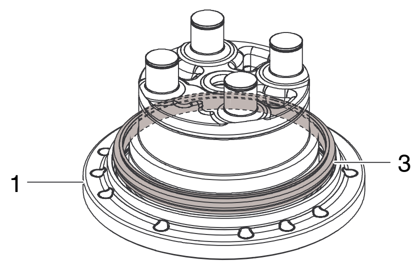
(3) Assemble the drive shaft (28) to the motor casing (1).



35AZ7TM42

(4) Apply vaporizing lubricant to the O-ring outside of the floating seal (3) and assemble it to the motor casing (1) so that the parallelism can be 0.5 mm or less. After assembly, apply a small amount of hydraulic fluid to the polishing surface.

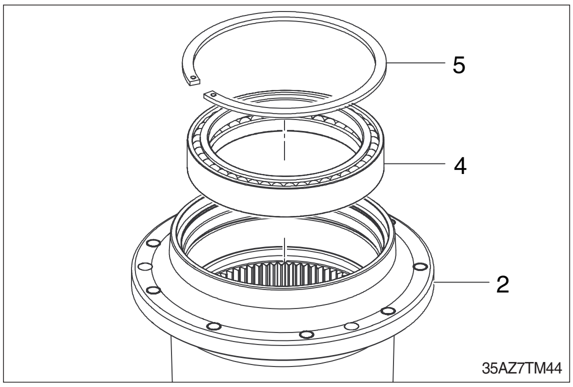
※ Required tools :
Floating seal assembly jig (T16).



35AZ7TM43

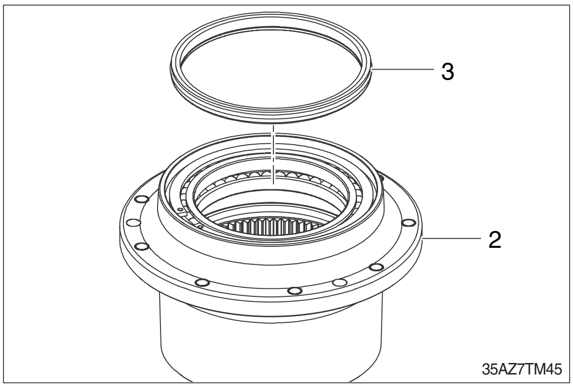
(5) Insert angular ball bearing (4) into the hub (2) and then secure with a snap ring (5).

※ Required tools :
Angular gearing, press-fit jig (T17), Plier (T8).

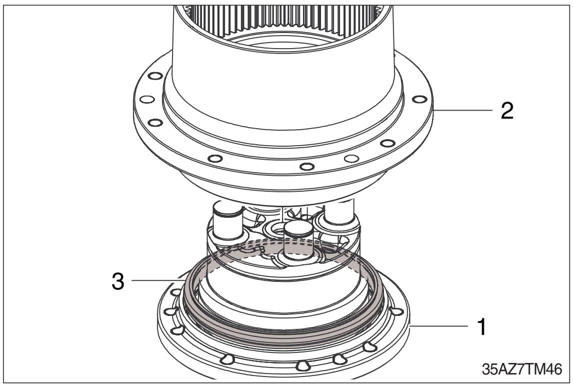


(6) Apply vaporizing lubricant to the O-ring outside of the floating seal (3) and assemble it to the hub (1) so that the parallelism can be 0.5 mm or less. After assembly, apply a small amount of hydraulic fluid to the polishing surface.

※ Required tools :
Floating seal assembly jig (T16).

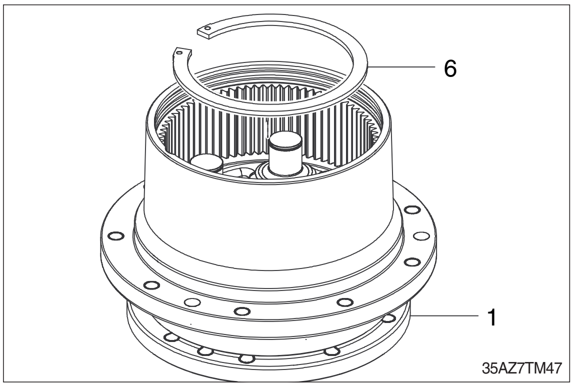


(7) Assemble a hub (2) to motor casing (1). Be careful not to impact the floating seal (3).



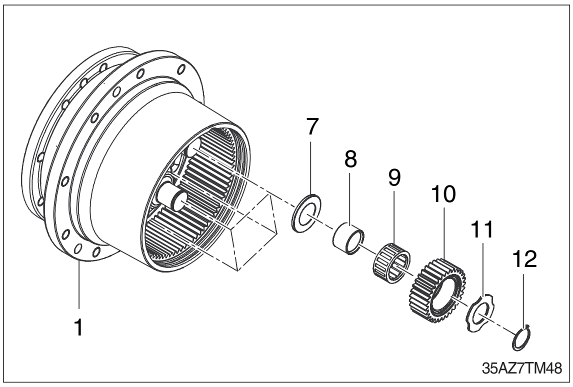
(8) Assemble shim plate (6) to motor casing (1).

※ Required tools : Plier (T8).



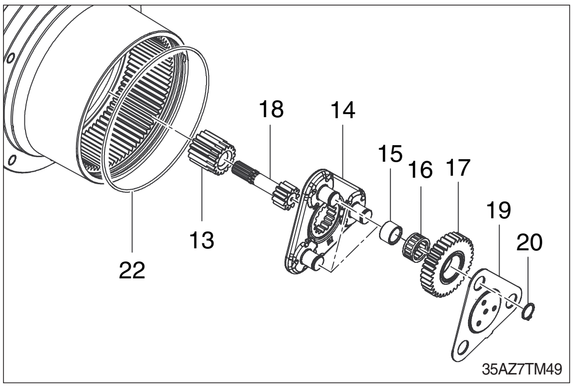
(9) Assemble washer (7), inner race (8), needle bearing (9), the second stage planet gear (10), washer (11), and snap ring (12) to motor casing (1).

※ Required tools : Plier (T7).



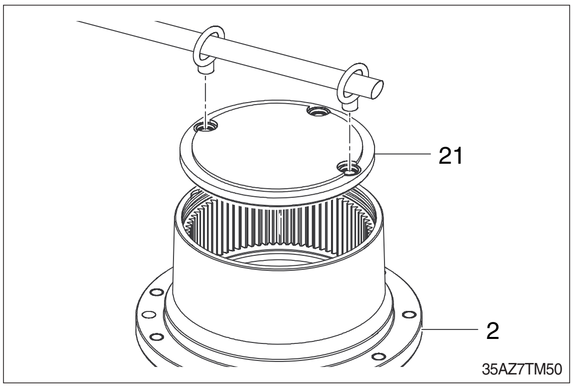
(10) Assemble in the order of the second stage sun gear (13), the first stage carrier (14), inner race (15), needle bearing (16), the first stage planet gear (17), the first stage sun gear (18), thrust plate (19), snap ring (20), and O-ring (22).

※ Required tools : Plier (T7).

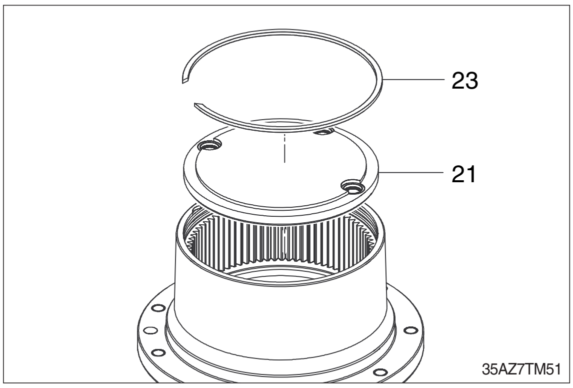


(11) Assemble cover (21) to hub (2).

※ Required tools :
Eye bolt (T13), round bar (T11).

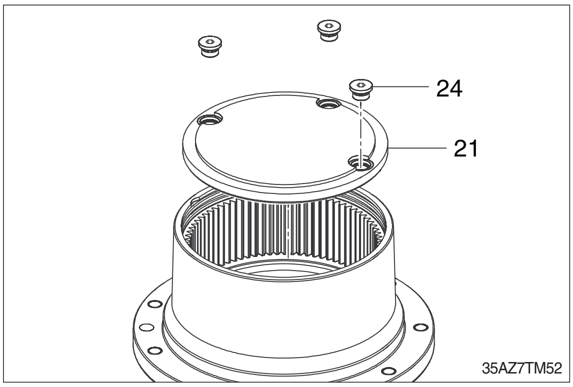


(12) Secure the cover (21) with clip (23).

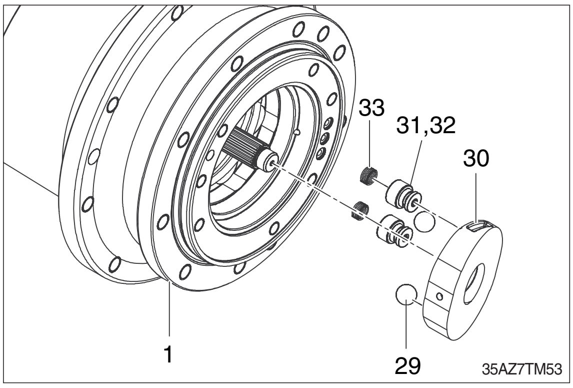


(13) Fill reduction gear oil of 0.6 liter and assemble plug (24) to cover (21).

※ Required tools :
Torque wrench (T1), hex bit (T2).

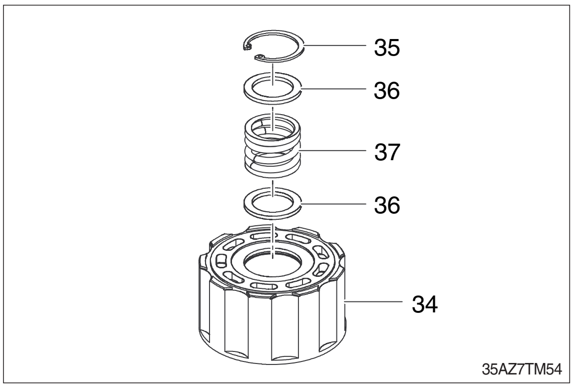


(14) Apply hydraulic fluid to the transmission piston outer diameter (31) and swash plate (30) polishing surface. Apply grease to spring (33) and assemble it to transmission piston assembly (31)~(32) and then to motor casing (1). Assemble steel ball (29) and swash plate (30) to motor casing (1).

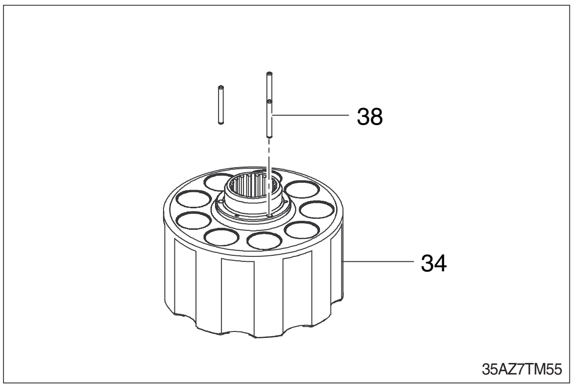


(15) Assemble washer (36), spring (37), snap ring (35) to cylinder block (34).

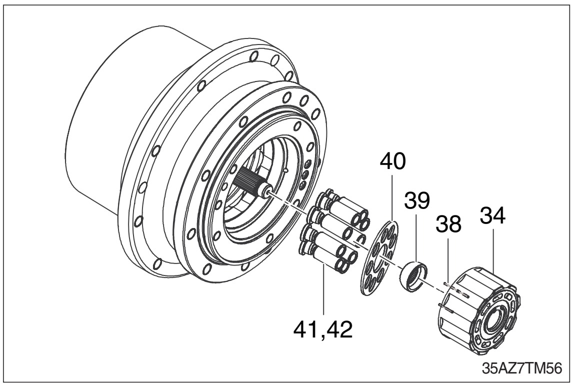
※ Required tools : Plier (T7).



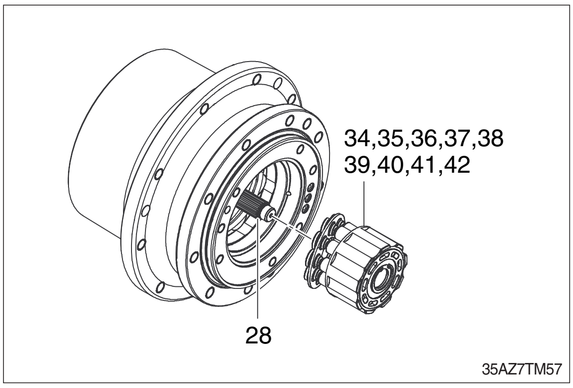
(16) Apply grease to roller (38) and assemble it to cylinder block (34).



(17) Assemble thrust ball (39) to roller (38) and piston (41), shoe (42) to retainer plate (40) and then assemble them to cylinder block (34). Apply hydraulic fluid to the shoe (42).

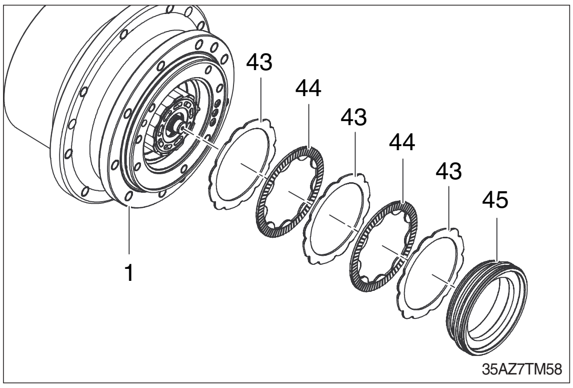


(18) Assemble the cylinder block assembly (34)~(42) to drive shaft (28). Apply hydraulic fluid to cylinder block (34) polishing surface.

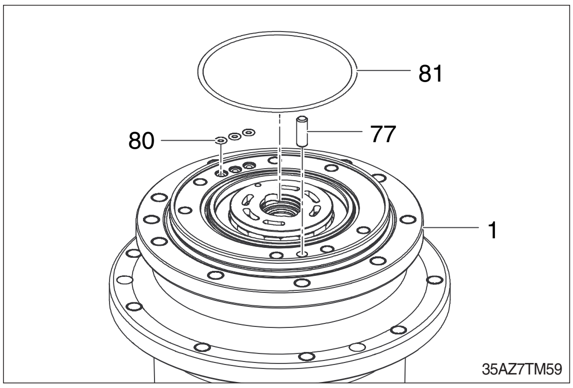


(19) Assemble separation plate (43) and friction plate (44) to motor casing (1) in turn and then assemble brake piston (45) to a motor casing. Tap brake piston (45) evenly with a plastic hammer and check if it is assembled completely.

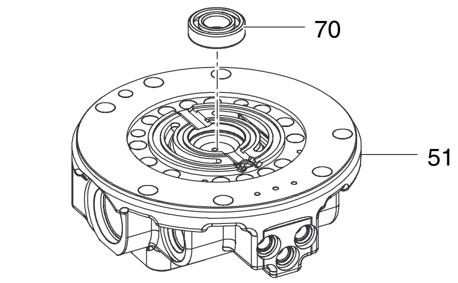
※ Required tools : Plastic hammer (T6).



(20) Assemble pin (77) and O-ring (80), (81) to motor casing (1).

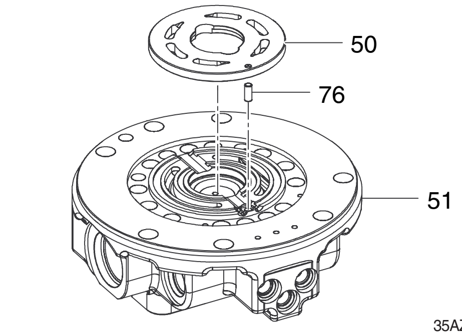


(21) Assemble ball bearing (70) to valve casing (51). Apply grease to the inner race of ball bearing (70).



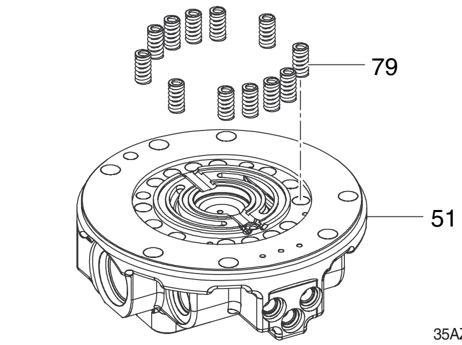
35AZ7TM60

(22) Apply grease to the other side of the valve plate (50) and assemble a valve plate (50) and pin (76) to valve casing (51).



35AZ7TM61

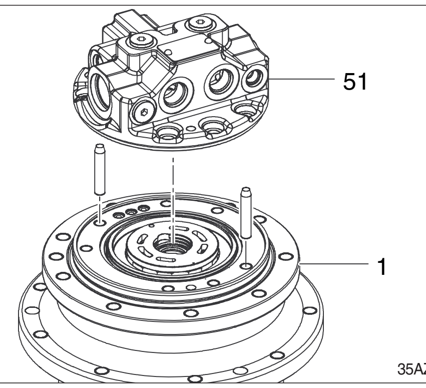
(23) Apply grease to spring (79) and assemble it to valve casing (51).



35AZ7TM62

(24) Assemble valve casing (51) to motor casing (1).

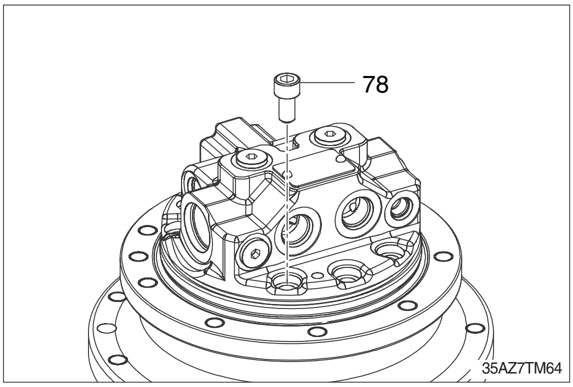
※ Required tools : Guide pin (T15).



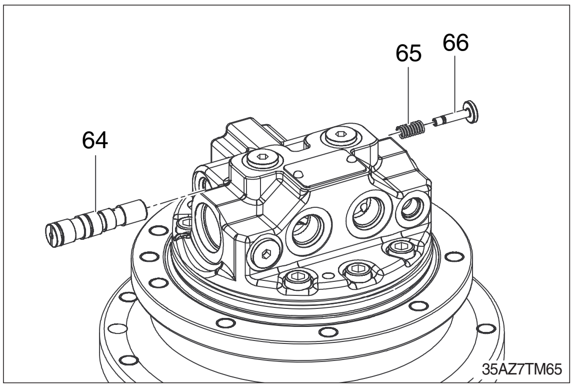
35AZ7TM63

(25) Tighten each socket bolt (78) evenly to assemble.

※ Required tools :
Torque wrench (T1), hex bit (T3).

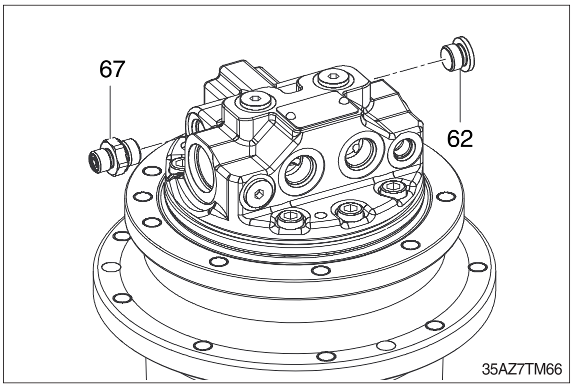


(26) Apply hydraulic fluid to spool (64) and the guide (66) outer diameter and assemble spool (64), spring (65), and guide (66). Be careful not to damage the surface of the spool and guide.

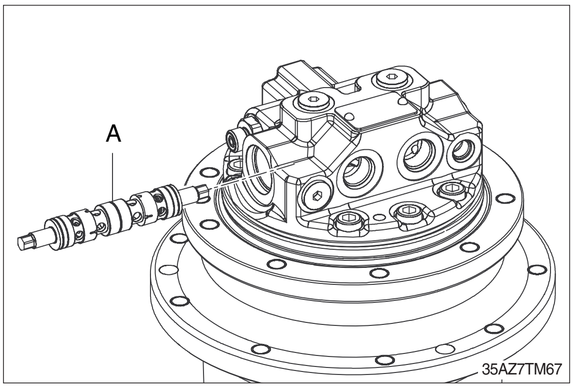


(27) Assemble plug (62), (67).

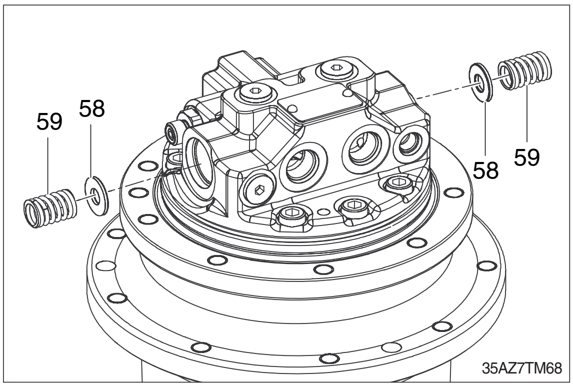
※ Required tools :
Torque wrench (T1), hex socket (T22), hex bit (T3).



(28) Apply hydraulic fluid to spool (52) outer diameter and turn the spool assembly (A) slowly to assemble.
Be careful not to damage the outer diameter of the spool.

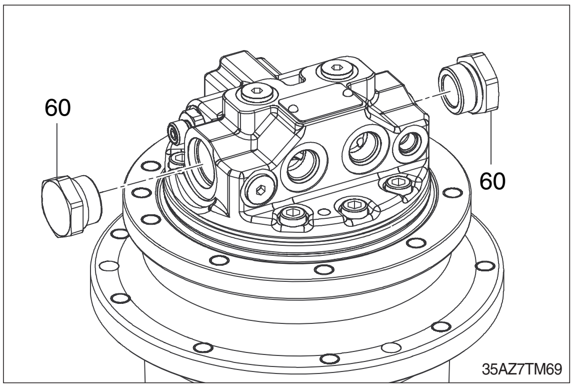


(29) Assemble spring (59) and washer (58).



(30) Assemble plug (60).

※ Required tools : Torque wrench (T1), hex. socket (T5).



GROUP 7 RCV LEVER

1. REMOVAL AND INSTALL

1) REMOVAL

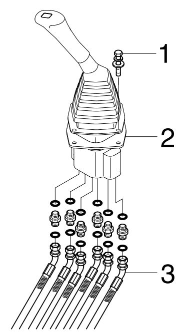

13031GE18

(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.



R25Z9AK8DA06

(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.

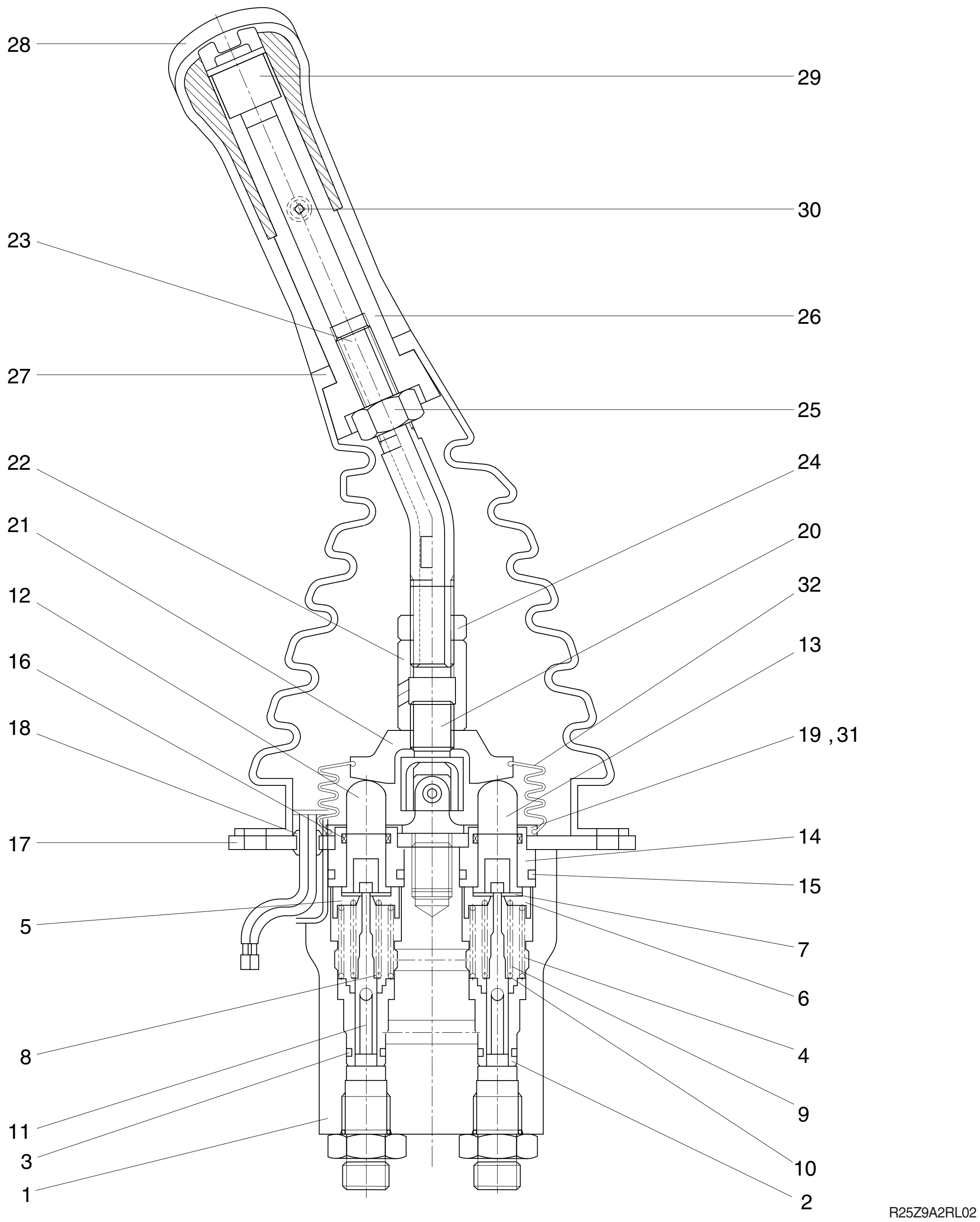
2) INSTALL

(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 (Type 1)

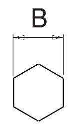
1) STRUCTURE



1	Case	12	Push rod (1, 3)	23	Connector
2	Plug	13	Push rod (2, 4)	24	Nut
3	O-ring	14	Plug	25	Nut
4	Spring	15	O-ring	26	Insert
5	Spring seat (1, 3)	16	Rod seal	27	Boot
6	Spring seat (2, 4)	17	Plate (A)	28	Handle
7	Stopper	18	Bushing	29	Switch assembly
8	Spring (1, 3)	19	Machine screw	30	Screw
9	Spring (2, 4)	20	Joint assembly	31	Plate
10	Spring seat	21	Swash plate	32	Boot
11	Spool	22	Hex nut		

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

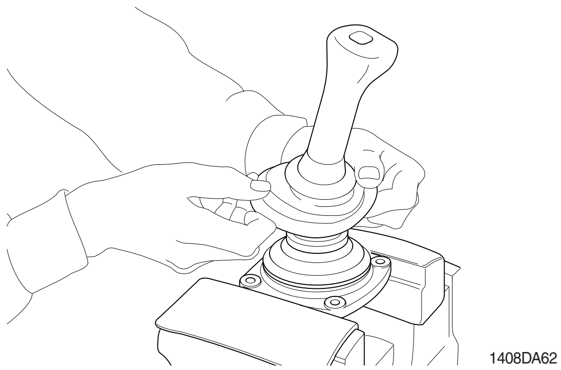
Tool name	Remark	
(L) Hexagonal wrench	10	
Spanner	22	
	27	
(+) Driver	Length 150	
(-) Driver	Width 4~5	
Torque wrench	Capable of tightening with the specified torques	

3) DISASSEMBLY

(1) Clean pilot valve with kerosene.
※ Put blind plugs into all ports.

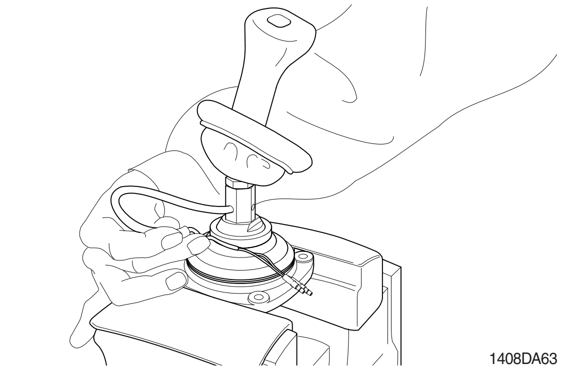
(2) Fix pilot valve in a vise with copper (or lead) sheets.

(3) Remove end of boot (32) from case (1) and take it out upwards.



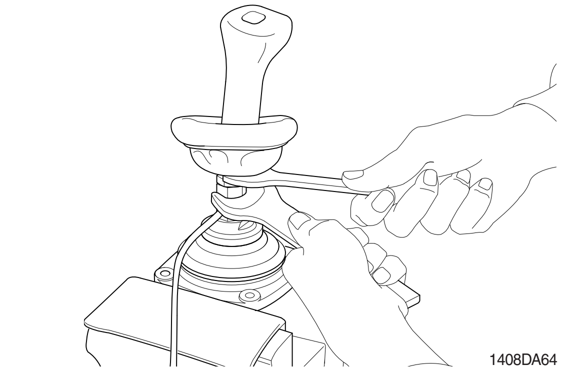
1408DA62

※ For valve with switch, remove cord also through hole of casing.



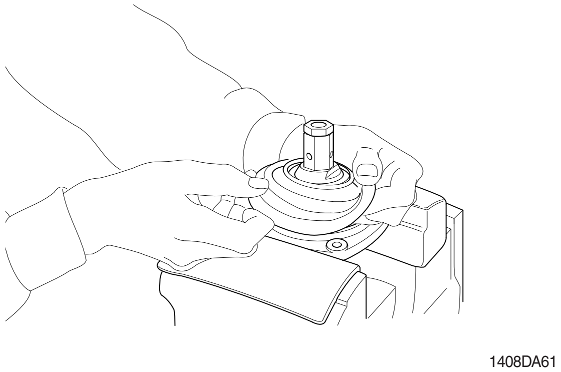
1408DA63

(4) Loosen lock nut (24) and adjusting nut (22) with spanners on them respectively, and take out handle section as one body.



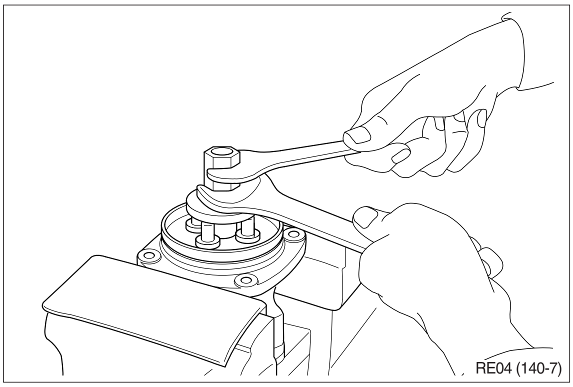
1408DA64

(5) Remove the boot (32).

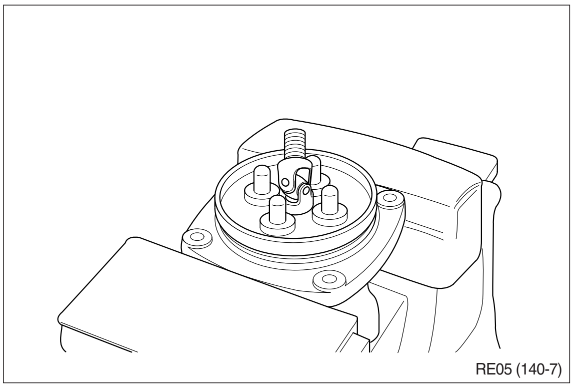


1408DA61

(6) Loosen adjusting nut(22) and plate(31) with spanners on them respectively, and remove them.



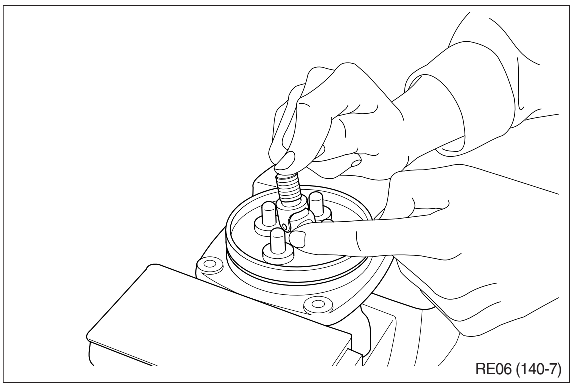
RE04 (140-7)



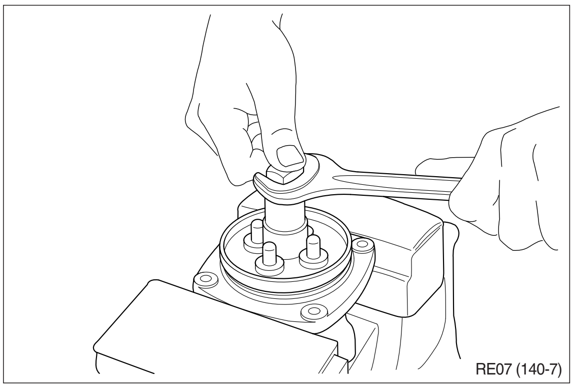
RE05 (140-7)

(7) Turn joint anticlockwise to loosen it, utilizing jig (special tool).

※ When return spring(8, 9) is strong in force, plate(31), plug(14) and push rod(12, 13) will come up on loosening joint.
Pay attention to this.

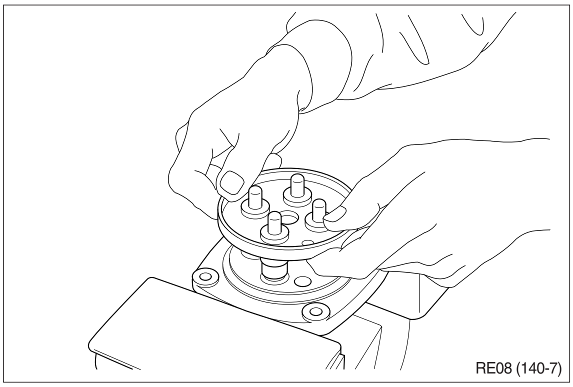


RE06 (140-7)



RE07 (140-7)

(8) Remove plate (31).

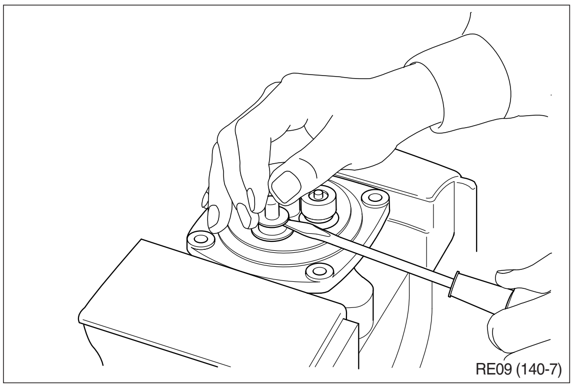


RE08 (140-7)

(9) When return spring (8, 9) is weak in force, plug (14) 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.

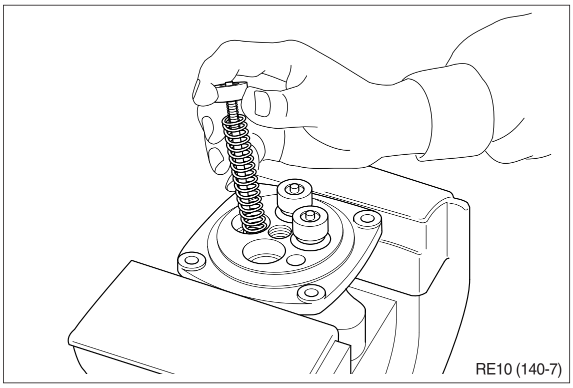
※ During taking out, plug may jump up due to return spring (8, 9) force. Pay attention to this.



RE09 (140-7)

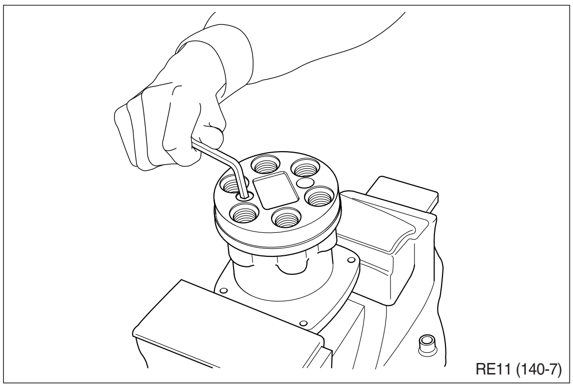
(10) Remove reducing valve subassembly and return spring (8, 9) out of casing.

※ Record relative position of reducing valve subassembly and return springs.



RE10 (140-7)

(11) Loosen hexagon socket head plug (2) with hexagon socket screw key.



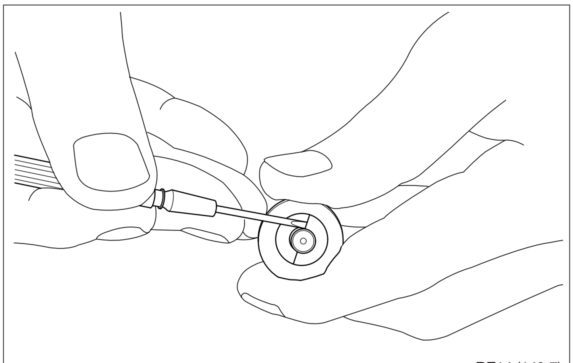
RE11 (140-7)

(12) For disassembling reducing valve section, stand it vertically with spool (11) bottom placed on flat workbench. Push down spring seat (5, 6) and remove two pieces of semicircular stopper (7) with tip of small minus screwdriver.

※ Pay attention not to damage spool surface.

※ Record original position of spring seat (5, 6).

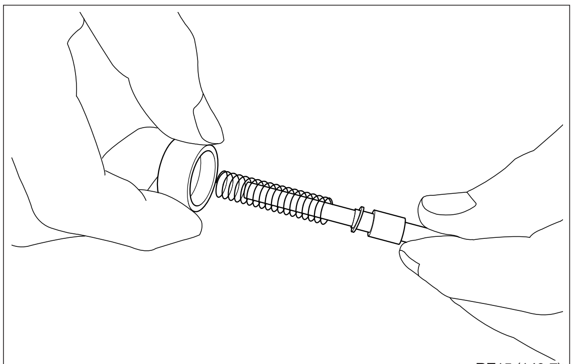
※ Do not push down spring seat more than 6 mm.



RE14 (140-7)

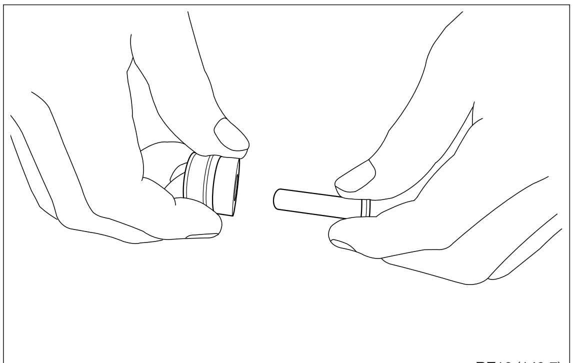
(13) Separate spool (11), spring seat (5, 6), spring (8, 9) and spring seat (10) individually.

※ Until being assembled, they should be handled as one subassembly group.



RE15 (140-7)

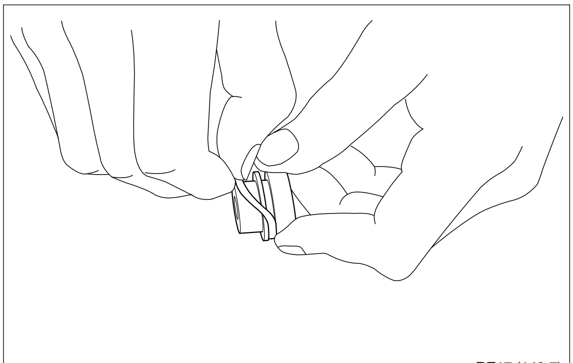
(14) Take push rod (12, 13) out of plug (14).



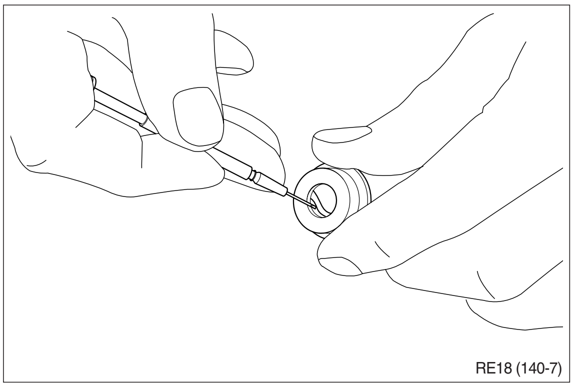
RE16 (140-7)

(15) Remove O-ring (15) and seal (16) from plug (14).

Use small minus screwdriver or so on to remove this seal.

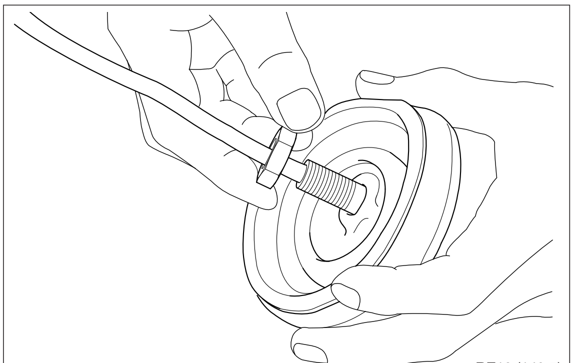


RE17 (140-7)

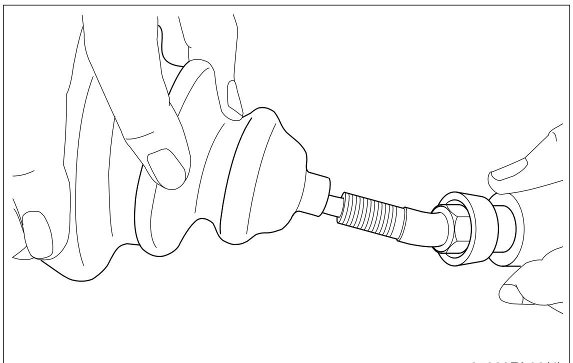


RE18 (140-7)

(16) Remove lock nut (24) and then boot (27).



RE19 (140-7)



25038RL02(4)

(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.

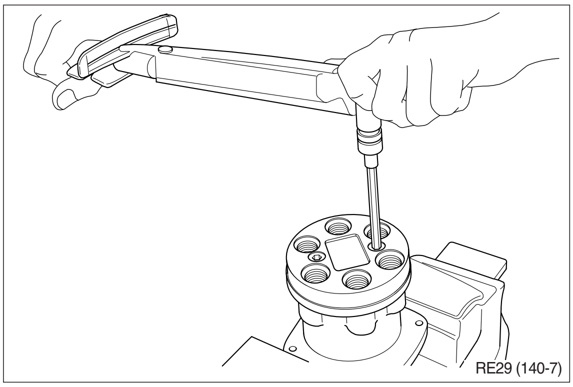
(18) Rust prevention of parts.
Apply rust-preventives to all parts.

※ If left as they after being cleaned, they will be rusted and will not display their functions fully after being reassembled.

4) ASSEMBLY

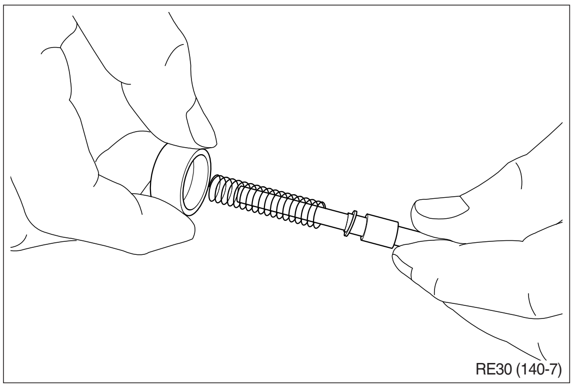
(1) Tighten hexagon socket head plug (2) to the specified torque.

※ Tighten two bolts alternately and slowly.



RE29 (140-7)

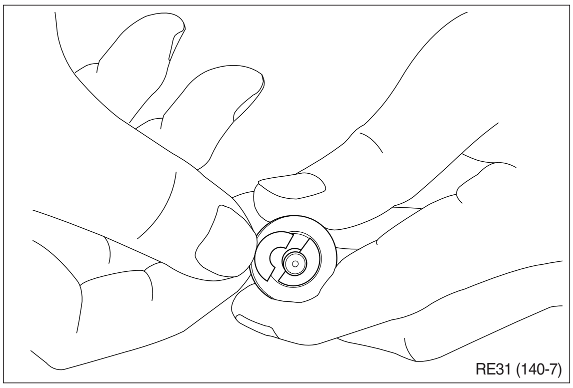
(2) Put spring seat (10), springs (8, 9) and spring seat (5, 6) onto spool (11) in this order.



RE30 (140-7)

(3) Stand spool vertically with its bottom placed on flat workbench, and with spring seat pushed down, put two pieces of semicircular stopper (7) on spring seat without piling them on.

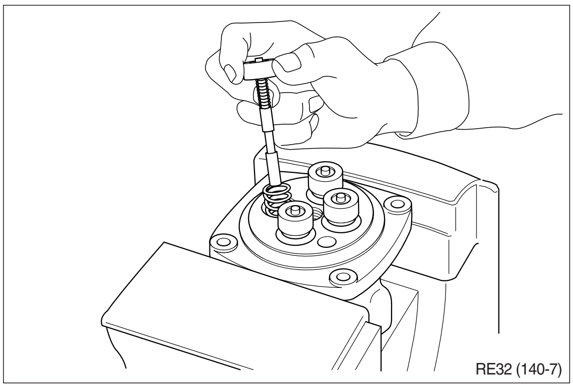
※ Assemble stopper (7) so that its sharp edge side will be caught by head of spool. Do not push down spring seat more than 6 mm.



RE31 (140-7)

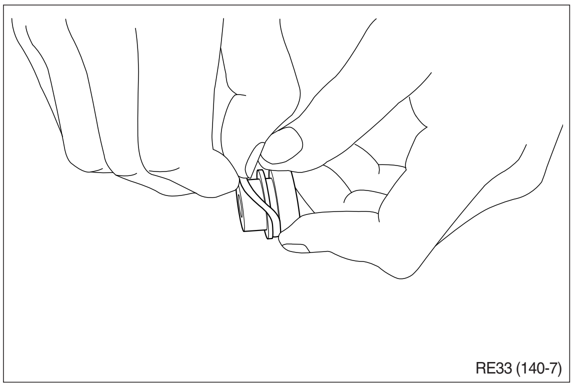
(4) Assemble spring (8, 9) into casing. Assemble reducing valve subassembly into casing.

※ Assemble them to their original positions.



RE32 (140-7)

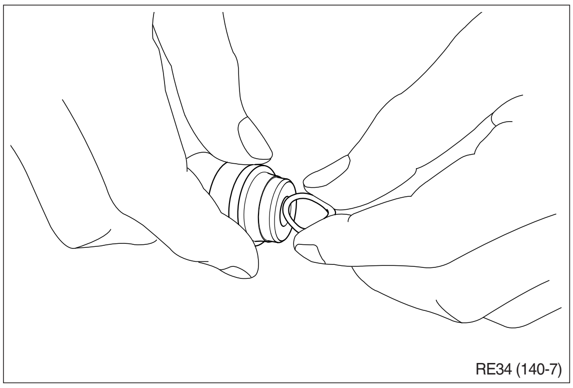
(5) Assemble O-ring (15) onto plug (14).



RE33 (140-7)

(6) Assemble seal (16) to plug (14).

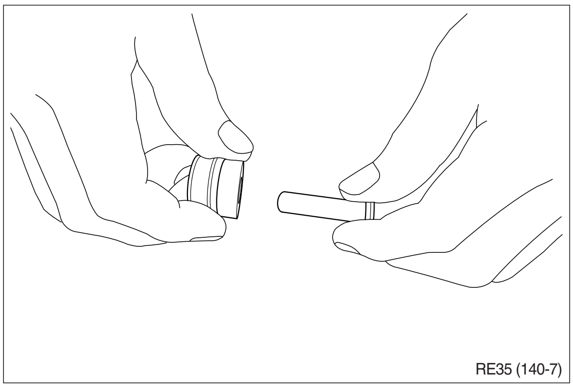
※ Assemble seal in such lip direction as shown below.



RE34 (140-7)

(7) Assemble push rod (12, 13) to plug (14).

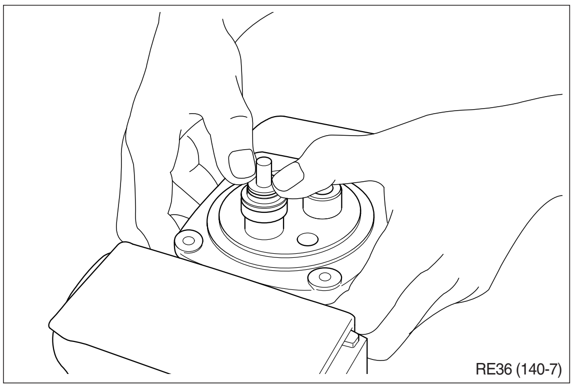
※ Apply working oil on push-rod surface.



RE35 (140-7)

(8) Assemble plug subassembly to casing.

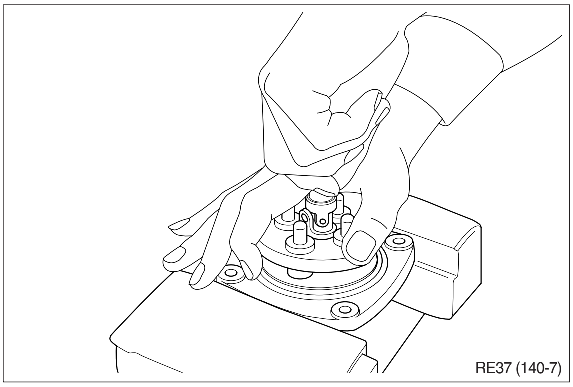
※ When return spring is weak in force, subassembly stops due to resistance of O-ring.



RE36 (140-7)

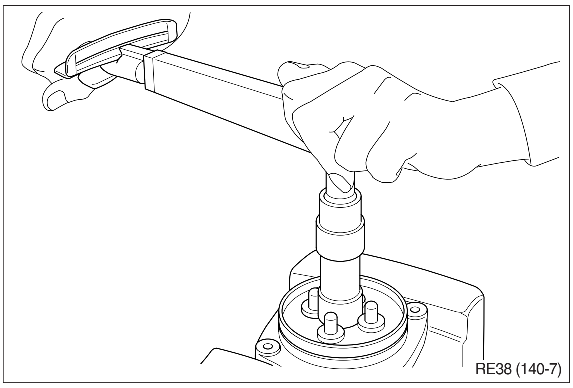
(9) When return spring is strong in force, assemble 4 sets at the same time, utilizing plate (31), and tighten joint (20) temporarily.

(10) Fit plate (31).



RE37 (140-7)

(11) Tighten joint (20) with the specified torque to casing, utilizing jig.

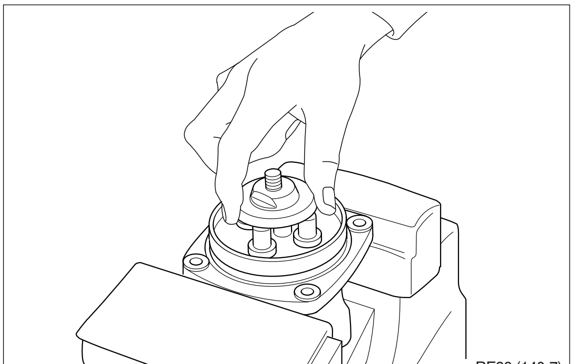


RE38 (140-7)

(12) Assemble plate (21) to joint (20).

※ Screw it to position that it contacts with 4 push rods evenly.

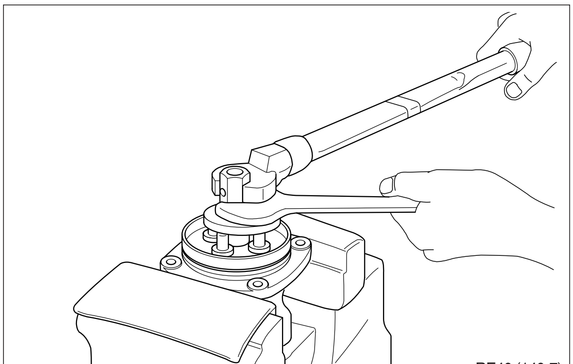
※ Do not screw it over.



RE39 (140-7)

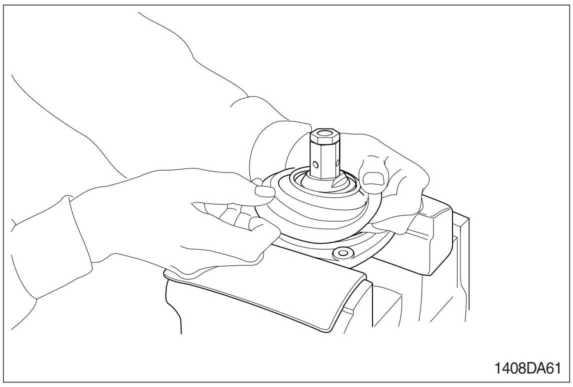
(13) Assemble adjusting nut (22), apply spanner to width across flat of plate (21) to fix it, and tighten adjusting nut to the specified torque.

※ During tightening, do not change position of disk.



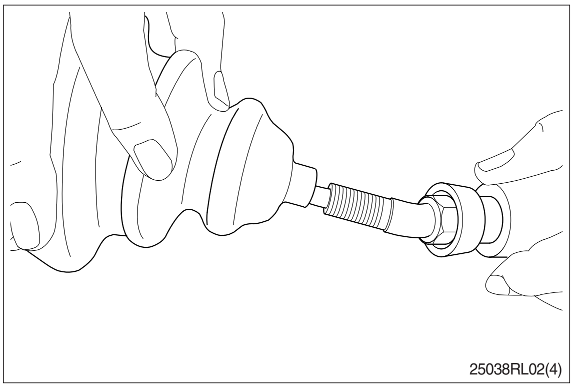
RE40 (140-7)

(14) Fit boot (32) to plate.



1408DA61

(15) Fit boot (27) and lock nut (24), and handle subassembly is assembled completely.



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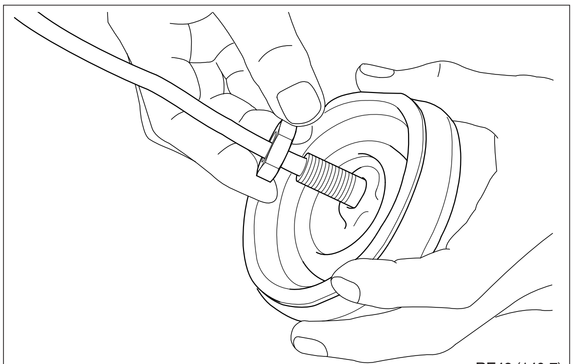
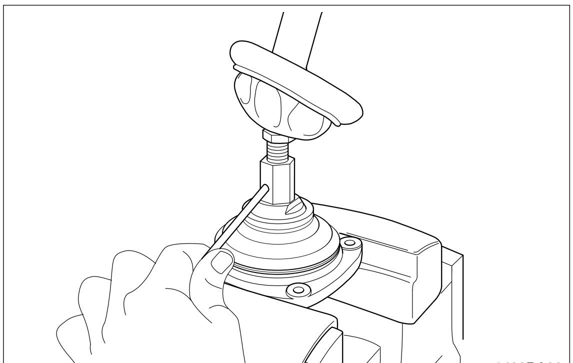


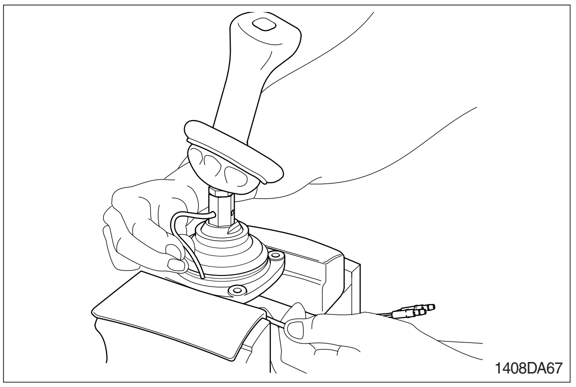
RE48 (140-7)

(16) Pull out cord and tube through adjusting nut hole provided in direction 60° to 120° from casing hole.



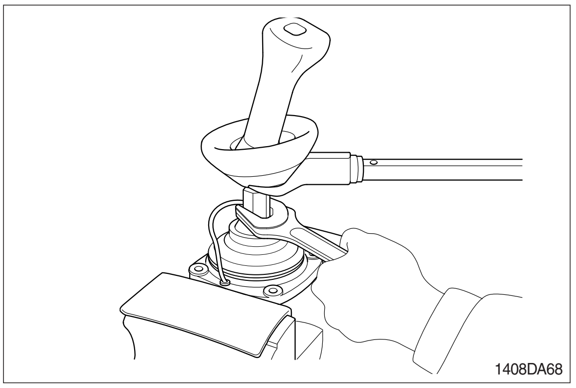
1408DA66

(17) Assemble bushing (18) to plate and pass cord and tube through it.
※ Provide margin necessary to operation.



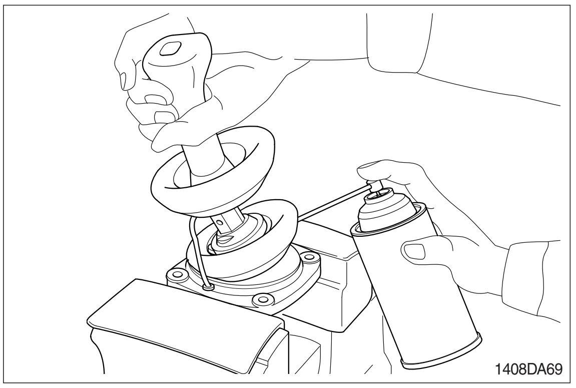
1408DA67

(18) Determine handle direction, tighten lock nut (21) to specified torque to fix handle.



1408DA68

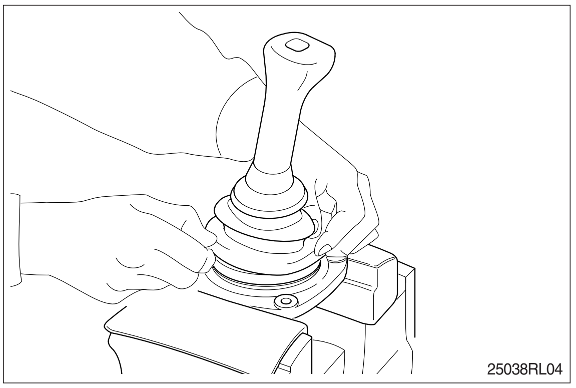
(19) Apply grease to rotating section of joint and contacting faces of disk and push rod.



1408DA69

(20) Assemble lower end of bellows to casing.

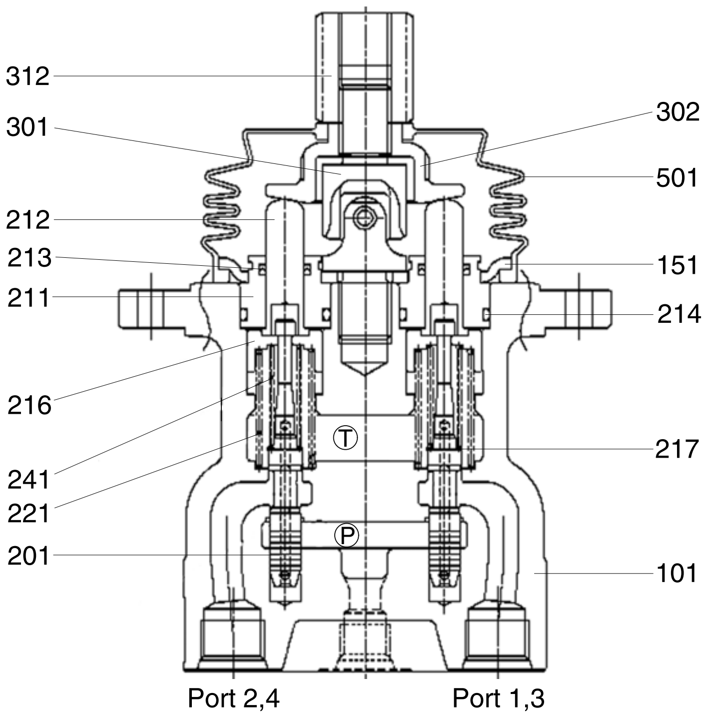
(21) Inject volatile rust-preventives through all ports and then put blind plugs in ports.



25038RL04

3. DISASSEMBLY AND ASSEMBLY (Type 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).

17Z9A7RCV01

(4) Use a spanner applied to both the adjustment nut (312) and disc (302) and loosen and then remove them.

17Z9A7RCV02

17Z9A7RCV03

17Z9A7RCV04

⚠ 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.


17Z9A7RCV05


17Z9A7RCV06

(6) Remove the plate (151).
- When the return spring (221) is strong


17Z9A7RCV07

- When the return spring (221) is weak


17Z9A7RCV08

▲ 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.

17Z9A7RCV09

(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.

(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

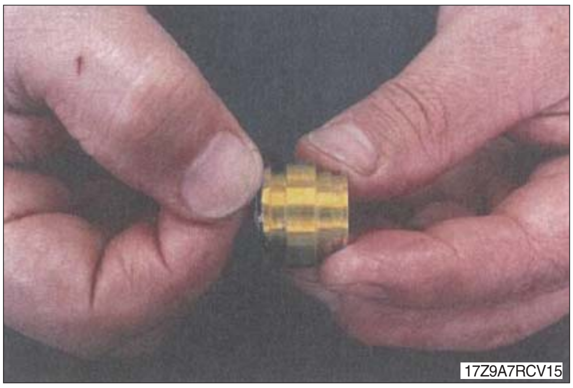
(10) Take the spool (201), spring seat (216), secondary pressure spring (241) and washer #2 (217) apart.

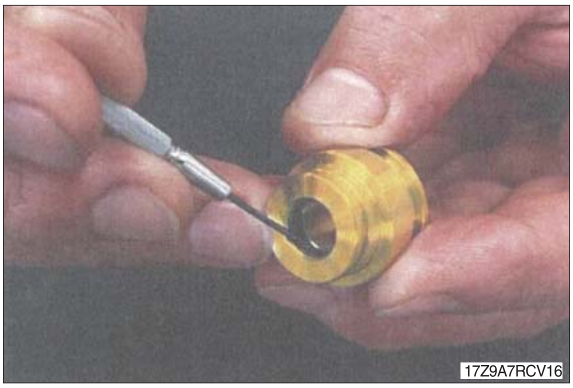
※ Take care not to damage the surface of the spool (201).

※ Keep these parts together until reassembly.

(11) Extract the push-rod (212) from the plug (211).

(12) Detach the O-ring (214) and seal (213) from the plug (211). Detach the 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).


17Z9A7RCV17

(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.


17Z9A7RCV18

(3) Fit the reduction valve assembly into the casing (101).

※ Fit in the locations noted in step 8 of the disassembly procedure.


17Z9A7RCV19

(4) Fit the O-ring (214) into the plug (221).


17Z9A7RCV20

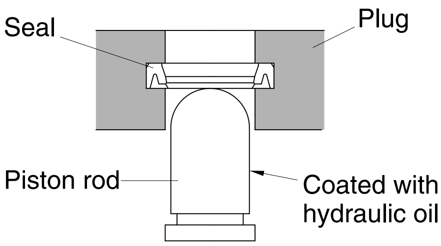
(5) Fit the seal (213) into the plug (211).

※ Fit the lip of the seal (213) as shown right.


17Z9A7RCV21

(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


17Z9A7RCV22


17Z9A7RCV23

⚠ 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 mishandling. Take care not to damage the surface of either during assembly.

17Z9A7RCV24

(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).

17Z9A7RCV25

(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.

17Z9A7RCV26

17Z9A7RCV27

※ Excessive tightening or wrong positioning of the disc can cause the valve to malfunction.

(10) Attach the disc (302) onto the joint (301).

17Z9A7RCV28

(11) Install the adjustment nut (312), tighten up the discs (302) with a spanner on both and tighten the adjustment nut to the specified torque.

※ Do not allow the position of the disc (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

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 all hoses.

(5) Sling the turning joint assembly (1) and remove the mounting bolt (2).

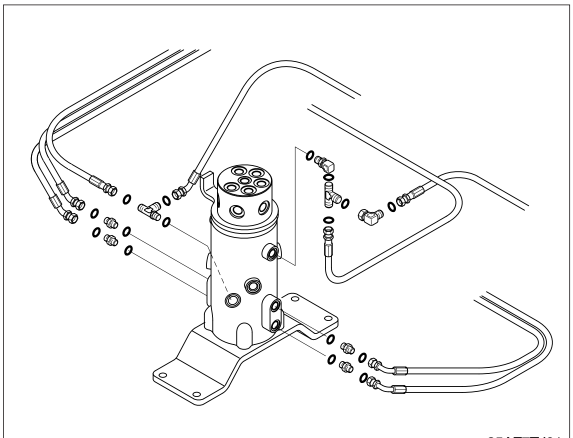
· Weight : 27 kg (60 lb)

· Tightening torque : 6.9±1.4 kgf · m (49.9±10.1 lbf · ft)

(6) Remove the turning joint assembly.

※ When removing the turning joint, check that all the hoses have been disconnected.

13031GE18



35AZ7TJ01

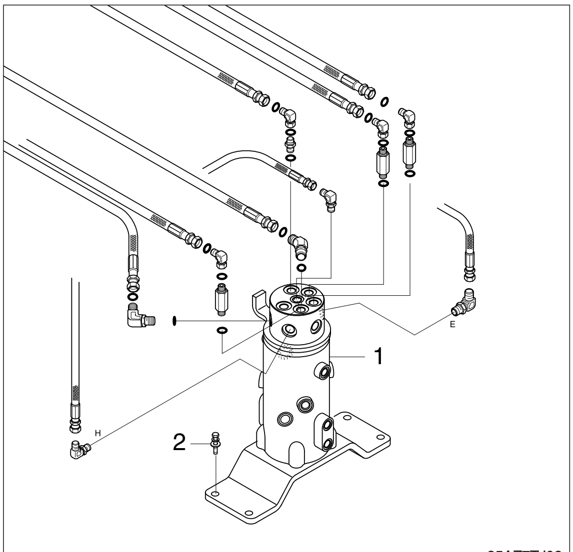
2) INSTALL

(1) Carry out installation in the reverse order to removal.

※ Take care of turning joint direction.

※ Assemble hoses to their original positions.

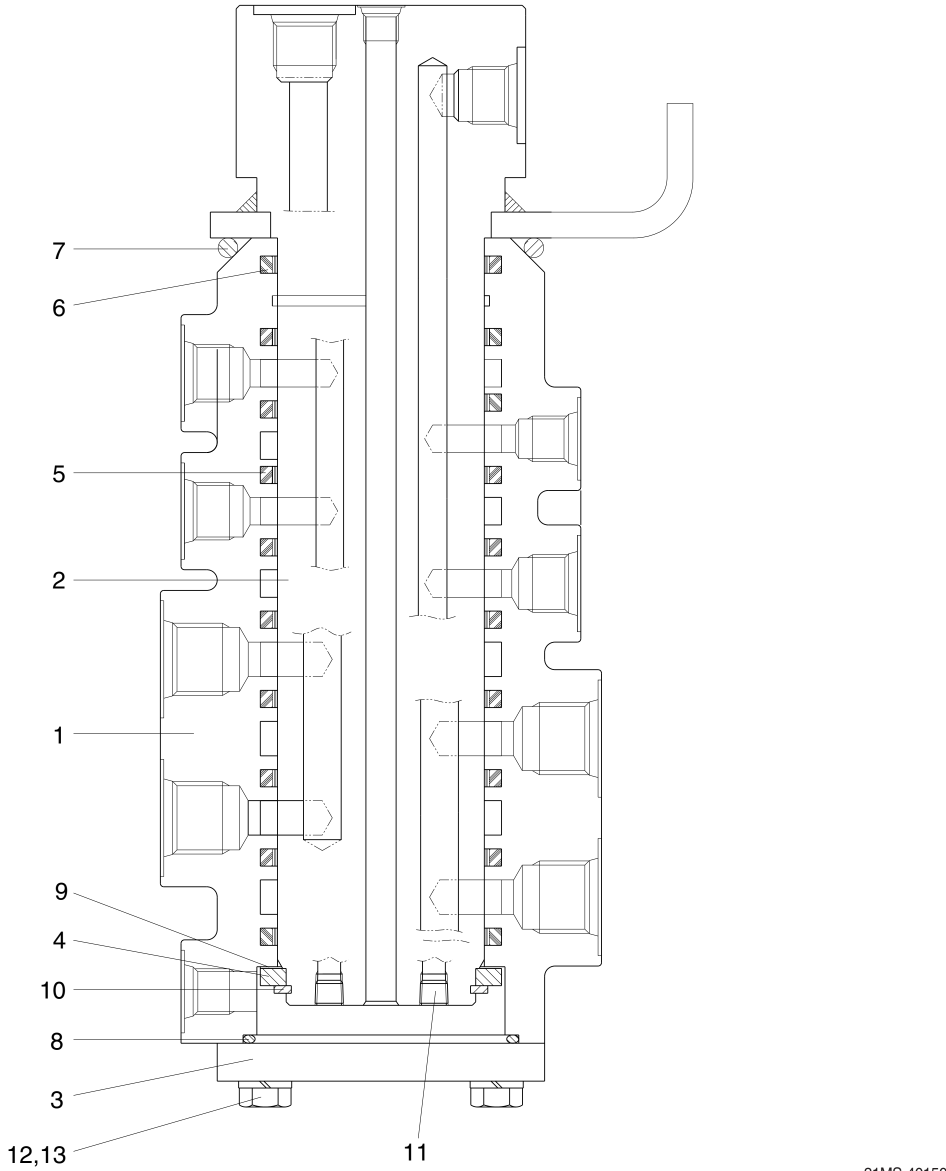
※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.



35AZ7TJ02

2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

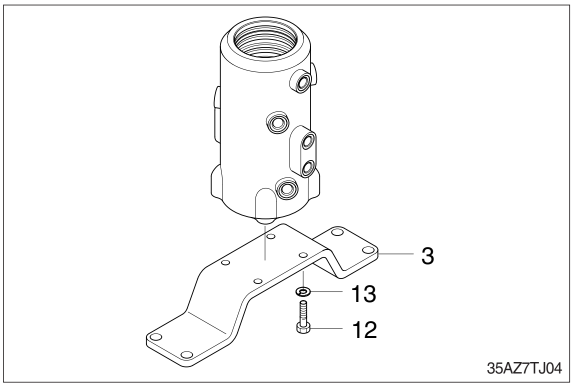


1	Hub	6	O-ring	11	Plug
2	Shaft	7	O-ring	12	Hexagon bolt
3	Cover	8	O-ring	13	Spring washer
4	Ring	9	Shim		
5	Slipper seal	10	Retainer ring		

2) DISASSEMBLY

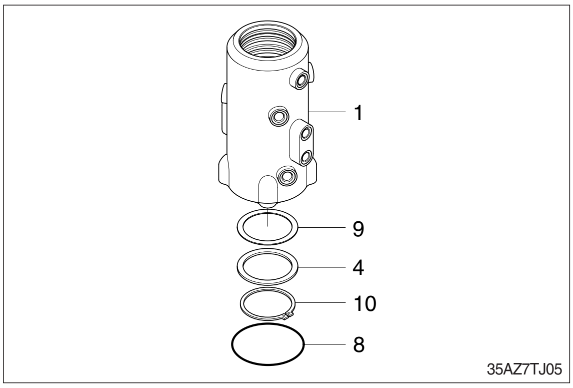
※ Before the disassembly, clean the turning joint.

(1) Remove bolts (12), washer (13) and cover (3).



(2) Remove O-ring (8).

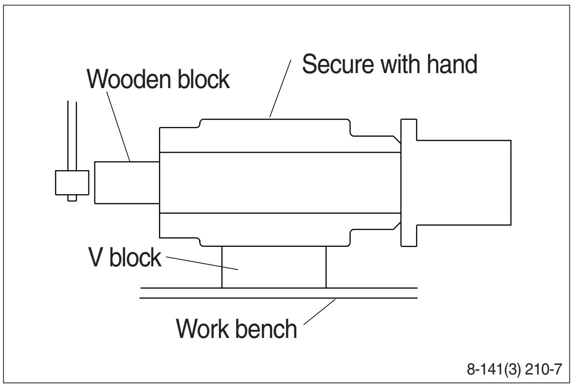
(3) Remove retainer ring (10), ring (4) and shim (9).



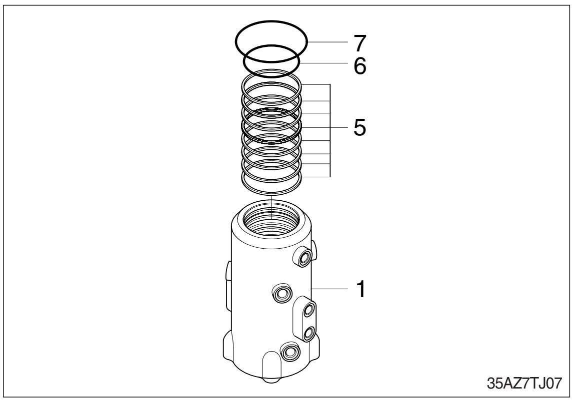
(4) Place hub (1) on a V-block and by using a wood buffer at the shaft end, hit out shaft (2) to about 1/2 from the body with a hammer.

※ 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).



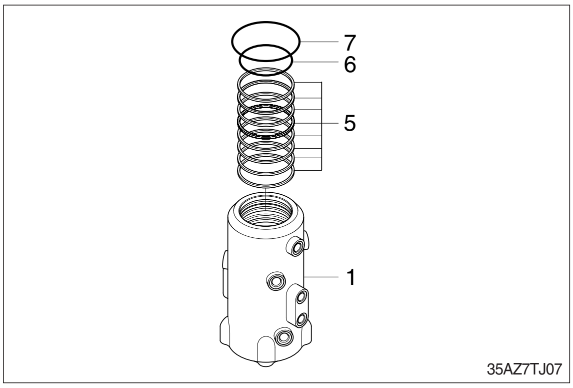
(5) Remove eight slipper seals (5) and O-ring (6, 7) from hub (1).



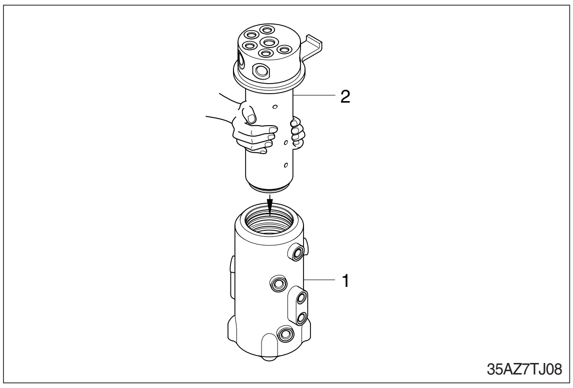
3) ASSEMBLY

※ 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).

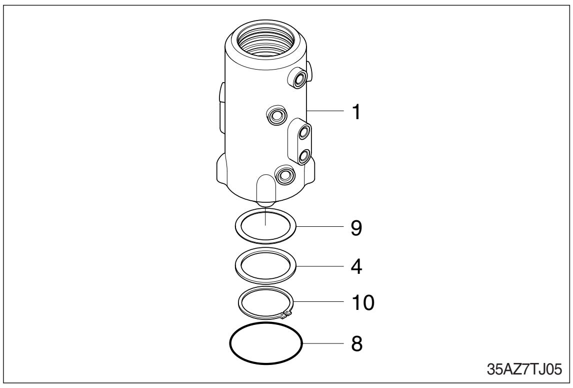


(2) Set hub (1) on block, install shaft (2) into hub (1) by hand.



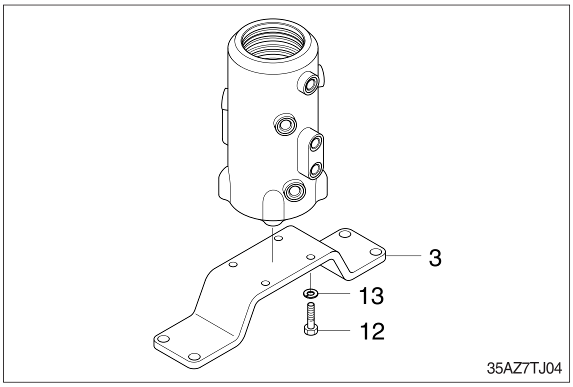
(3) Fit ring (4), shim (9) and retainer ring (10) to shaft (2).

(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.

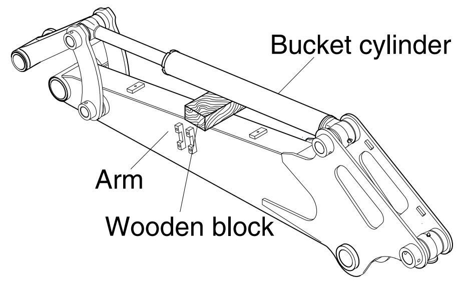
※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

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.

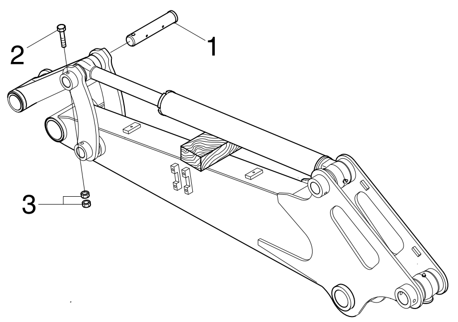


R35Z77CY03

② Remove bolt (2), nut (3) and pull out pin (1).

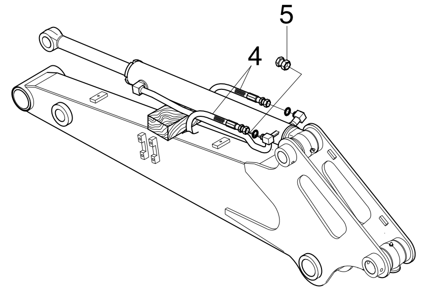
· Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)

※ 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.



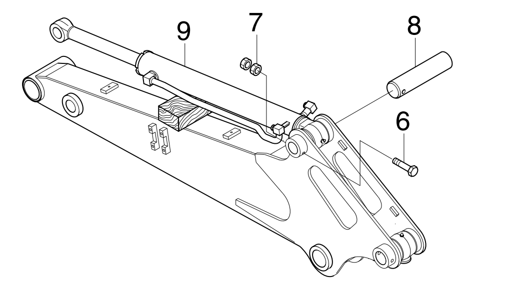
R35Z77CY04

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 : 23 kg (51 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.

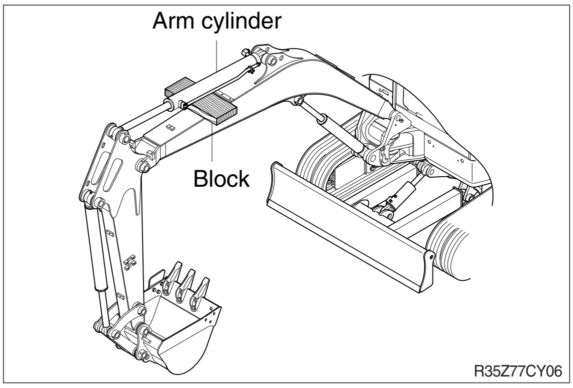
13031GE18

⚠ 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.

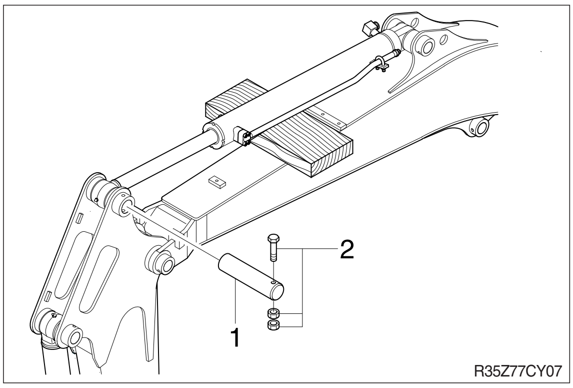


R35Z77CY06

② Remove bolt and nut (2) and pull out pin (1).

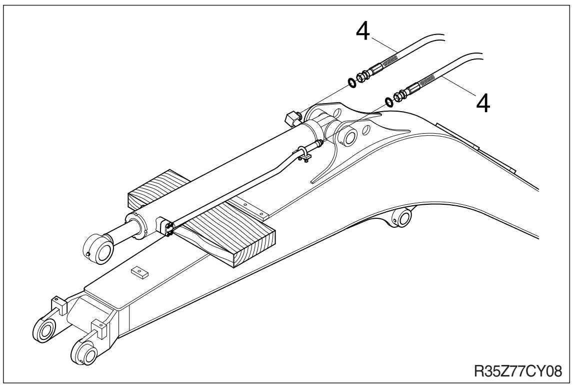
· Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)

※ Tie the rod with wire to prevent it from coming out.



R35Z77CY07

③ Disconnect arm cylinder hoses (4) and put plugs on cylinder pipe.



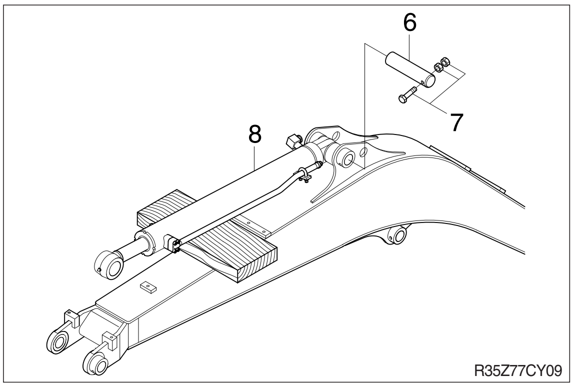
R35Z77CY08

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 : 32 kg (71 lb)



R35Z77CY09

(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

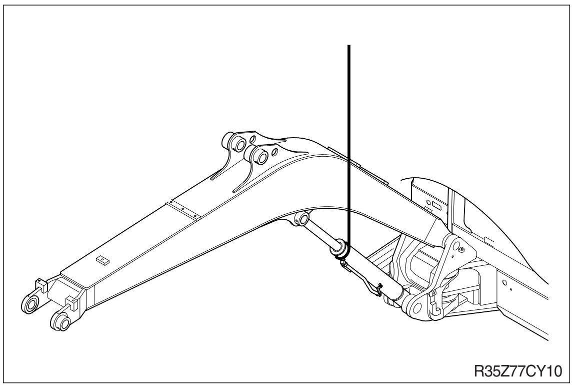
※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.


13031GE18

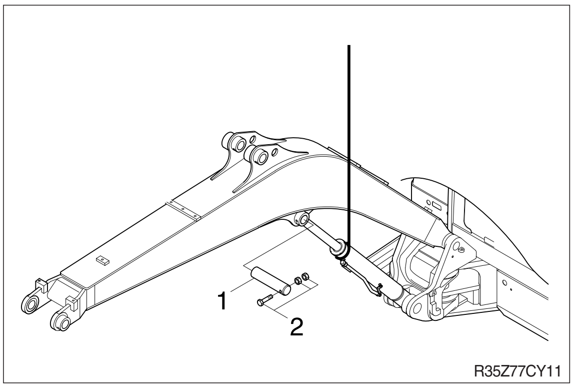
⚠ Loosen the breather slowly to release the pressure inside the hydraulic tank.

⚠ 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.

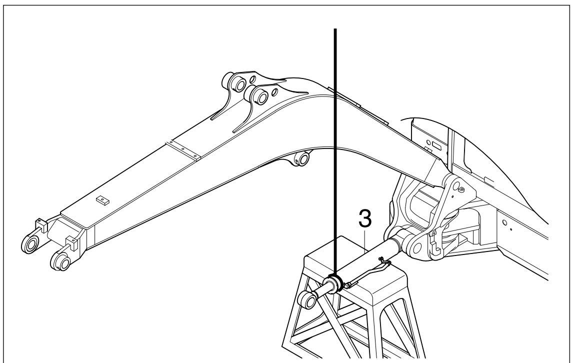

R35Z77CY10

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.



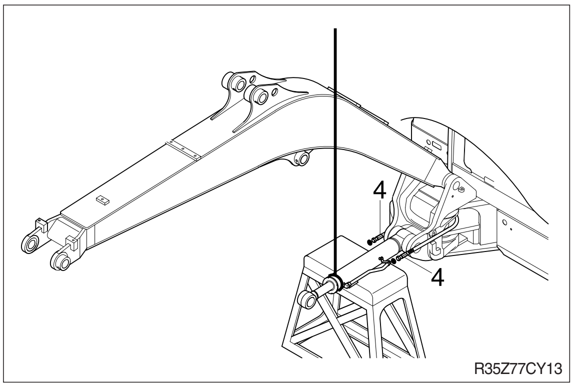
R35Z77CY11

④ Lower the boom cylinder assembly (3) on a stand.



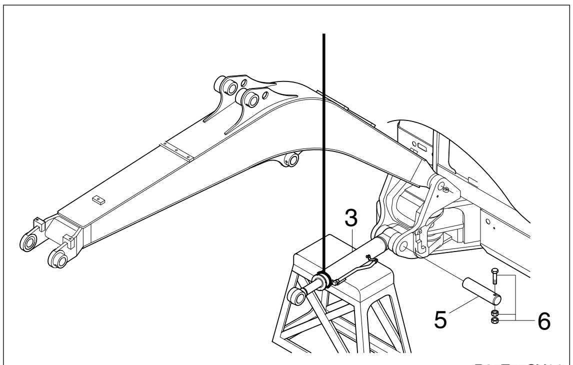
R35Z77CY12

⑤ Disconnect boom cylinder hoses(4) and put plugs on cylinder pipe.



R35Z77CY13

⑥ Remove bolt (6) and pull out pin (5).
· Tightening torque : 12.8±3.0 kgf·m
(92.6±21.7 lbf·ft)
⑦ Remove boom cylinder assembly (3).
· Weight : 32 kg (71 lb)



R35Z77CY14

(2) Install
① Carry out installation in the reverse order to removal.

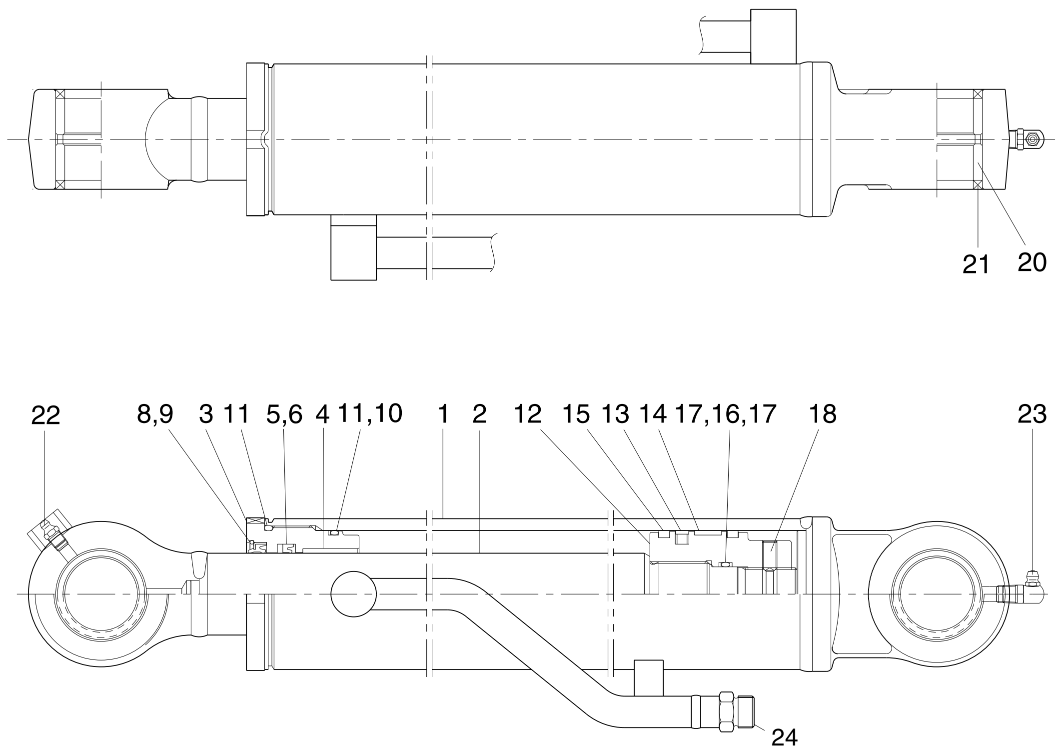
⚠ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.

※ 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

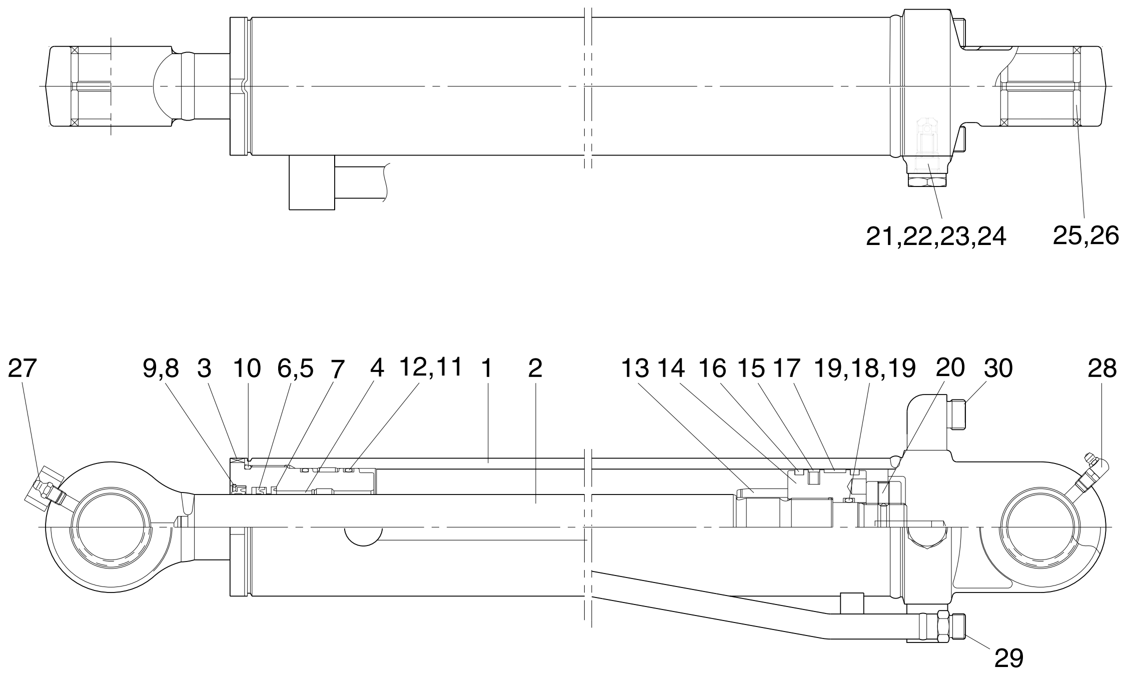
(1) Bucket cylinder



HCMS-50031

1	Tube assembly	9	Snap ring	17	Back up ring
2	Rod assembly	10	O-ring	18	Set screw
3	Gland	11	Back up ring	19	O-ring
4	DU bushing	12	Piston	20	Pin bushing
5	Rod seal	13	Piston seal	21	Dust seal
6	Back up ring	14	Wear ring	22	Grease nipple
7	Buffer ring	15	Dust seal	23	Grease nipple
8	Dust wiper	16	O-ring	24	O-ring

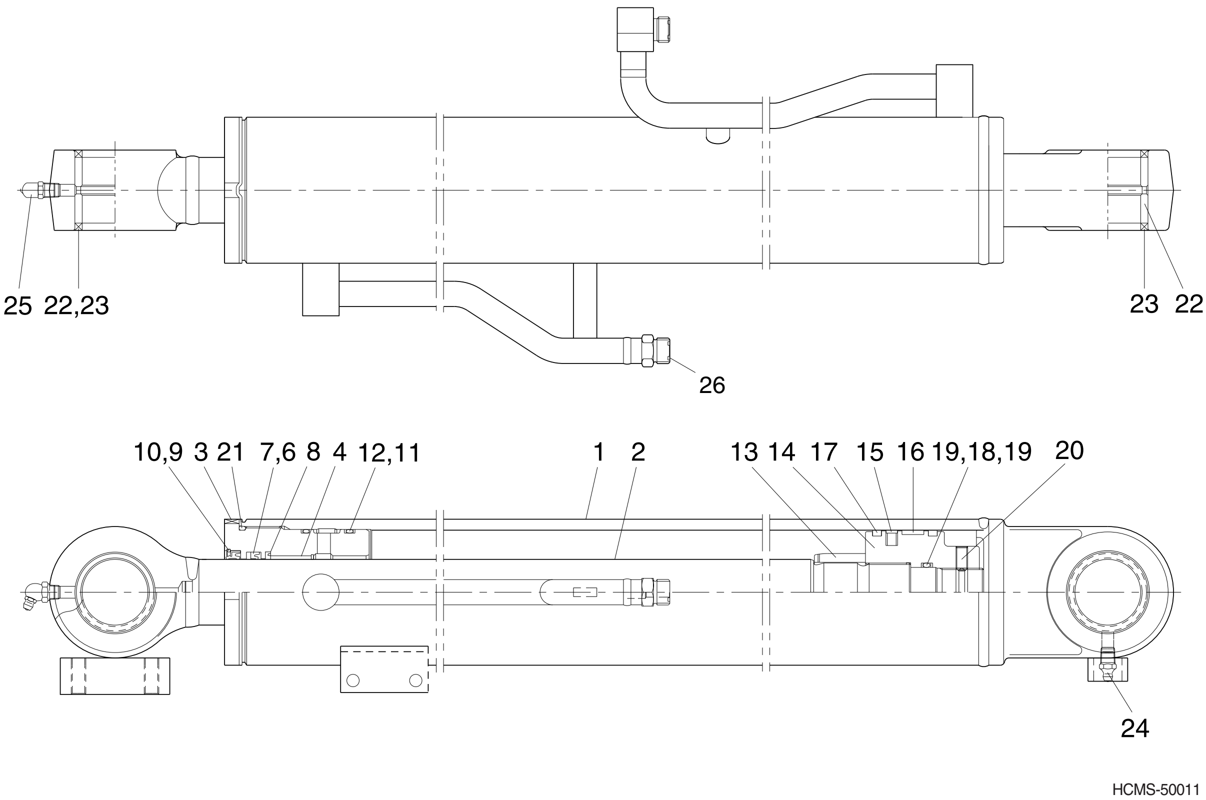
(2) Arm cylinder



HCMS-50021

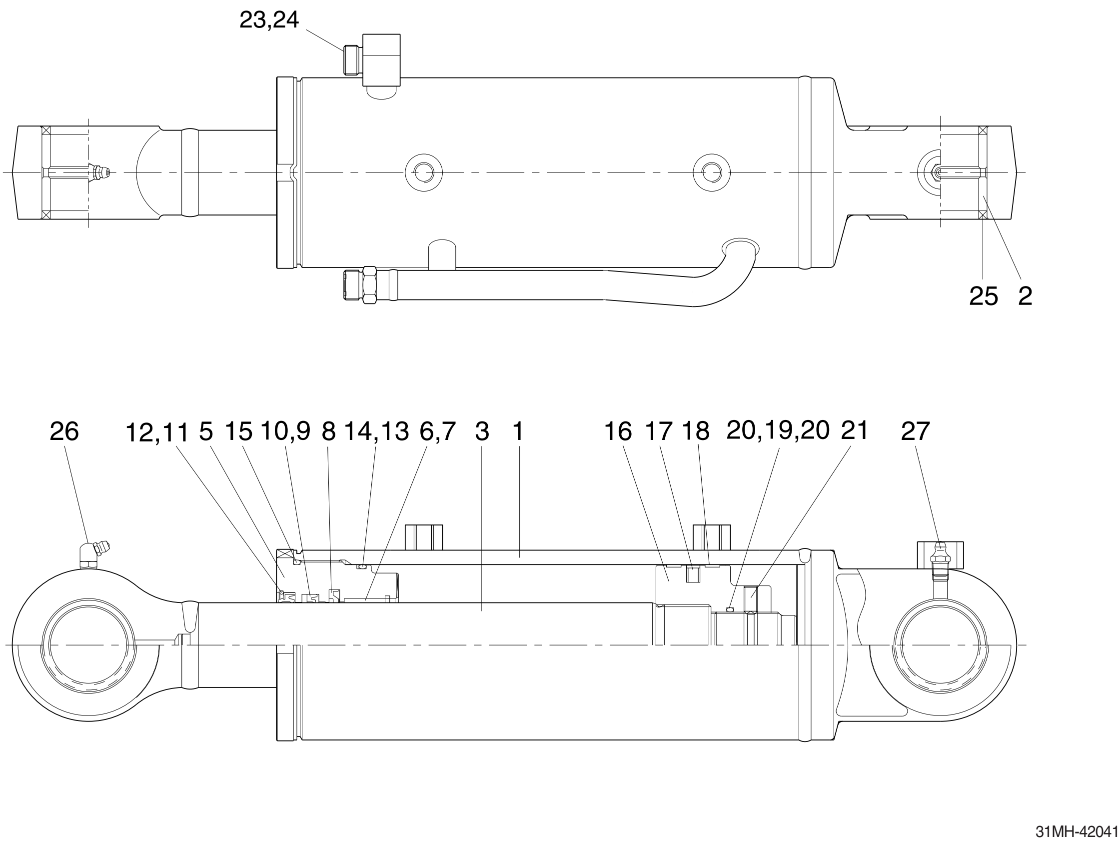
1	Tube assembly	11	O-ring	21	Check valve
2	Rod assembly	12	Back up ring	22	Coil spring
3	Gland	13	Cushion ring	23	O-ring
4	DU bushing	14	Piston	24	Socket plug
5	Rod seal	15	Piston seal	25	Pin bushing
6	Back up ring	16	Dust seal	26	Dust seal
7	Buffer ring	17	Wear ring	27	Grease nipple
8	Dust wiper	18	O-ring	28	Grease nipple
9	Snap ring	19	Back up ring	29	O-ring
10	O-ring	20	Set screw	30	O-ring

(3) Boom cylinder



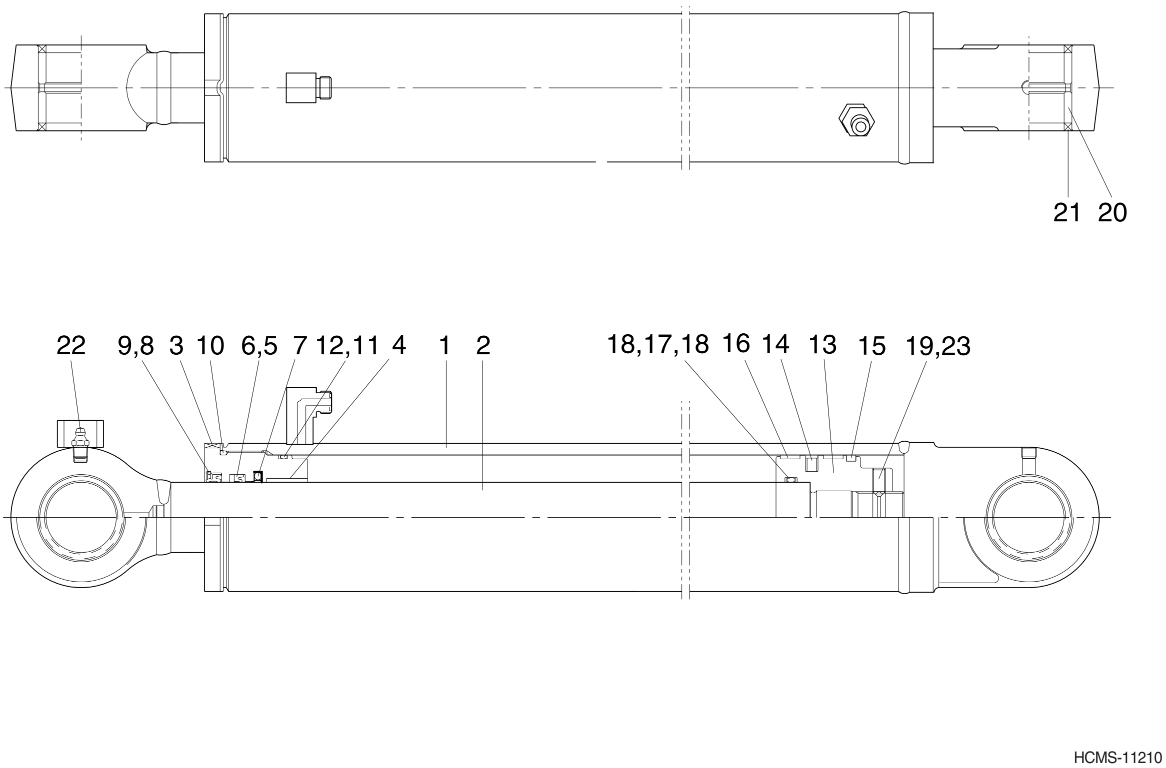
1	Tube assembly	10	Snap ring	19	Back up ring
2	Rod assembly	11	O-ring	20	Set screw
3	Gland	12	Back up ring	21	O-ring
4	DU bushing	13	Cushion ring	22	Pin bushing
5	Snap ring	14	Piston	23	Dust seal
6	Rod seal	15	Piston seal	24	Grease nipple
7	Back up ring	16	Wear ring	25	Grease nipple
8	Buffer ring	17	Dust seal	26	O-ring
9	Dust wiper	18	O-ring		

(4) Dozer cylinder



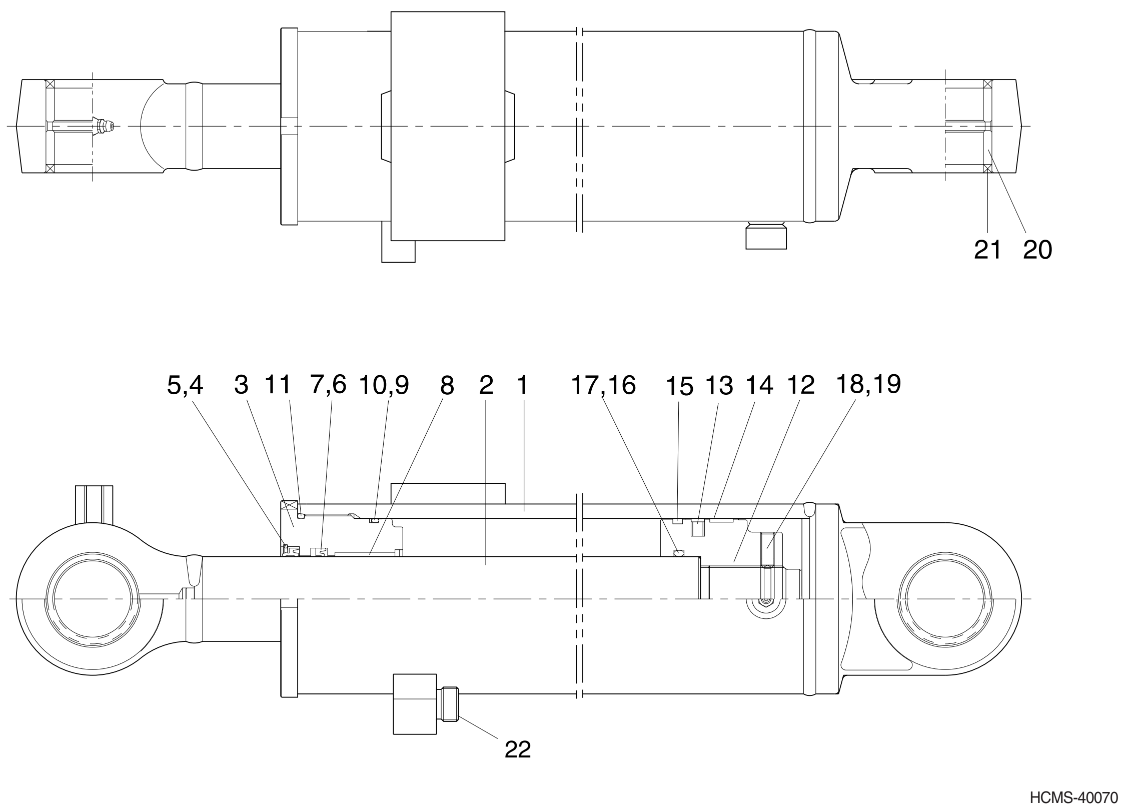
1	Tube assembly	11	Dust seal	20	Back up ring
2	Pin bushing	12	Retainer ring	21	Set screw
3	Rod assembly	13	O-ring	22	O-ring
5	Rod cover	14	Back up ring	23	Dust cap
6	Rod bushing	15	O-ring	24	O-ring
7	Retainer ring	16	Piston	25	Pin wiper
8	Buffer seal	17	Piston seal	26	Grease nipple
9	U-packing	18	Wear ring	27	Grease nipple
10	Back up ring	19	O-ring		

(5) Boom swing cylinder



1	Tube assembly	9	Snap ring	17	O-ring
2	Rod assembly	10	O-ring	18	Back up ring
3	Gland	11	O-ring	19	Set screw
4	DU bushing	12	Back up ring	20	Pin bushing
5	Rod seal	13	Piston	21	Dust seal
6	Back up ring	14	Piston seal	22	Grease nipple
7	Buffer ring	15	Dust seal	23	Steel ball
8	Dust wiper	16	Wear ring		

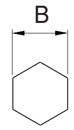
(6) Angle dozer cylinder



1	Tube assembly	9	O-ring	17	Back up ring
2	Rod assembly	10	Back up ring	18	Set screw
3	Gland	11	O-ring	19	Steel ball
4	Dust wiper	12	Piston	20	Pin bushing
5	Retaining ring	13	Piston seal	21	Dust seal
6	Rod seal	14	Wear ring	22	O-ring
7	Back up ring	15	Dust ring		
8	Dry bearing	16	O-ring		

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	8	
	3	
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	3	M90	72±7.5	521±54.2
	Arm cylinder	3	M85	68±6.8	492±49.2
	Bucket cylinder	3	M75	60±6	434±43.4
	Dozer cylinder	5	M100	70±7	506±50.6
	Boom swing cylinder	3	M85	68±6.8	492±49.2
	Angle dozer cylinder	3	M60	48±4.8	347±34.7
Piston	Boom cylinder	14	M30	93±9.3	673±67.3
	Arm cylinder	14	M40	100±10	723±72.3
	Bucket cylinder	12	M39	90±9	651±65.1
	Dozer cylinder	16	M48	75±7.5	542±54.2
	Boom swing cylinder	13	M40	100±10	723±72.3
	Angle dozer cylinder	12	M24	60±6.0	434±43.4
Set screw	Boom cylinder	20	M8	1.7±0.2	12.3±1.4
	Arm cylinder	20	M8	1.7±0.2	12.3±1.4
	Bucket cylinder	18	M8	1.7±0.2	12.3±1.4
	Dozer cylinder	21	M12	4~5	28.9~36.2
	Boom swing cylinder	19	M8	1.7±0.2	12.3±1.4
	Angle dozer cylinder	18	M6	0.8±0.1	5.8±0.7

3) DISASSEMBLY

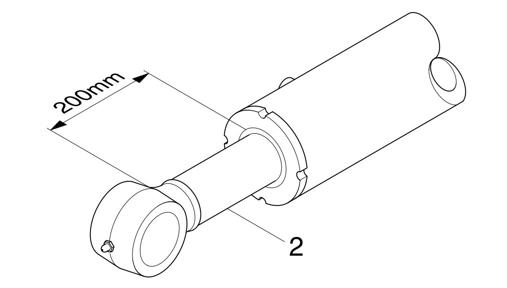
※ Procedures are based on the boom cylinder.

(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.

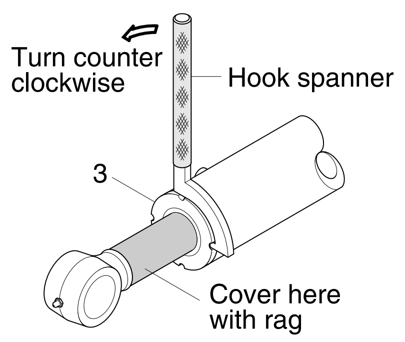
② Pull out rod assembly (2) about 200 mm (7.1 in). Because the rod assembly is rather heavy, finish extending it with air pressure after the oil draining operation.



R35Z77CY20

③ Loosen and remove the gland (3) by hook spanner.

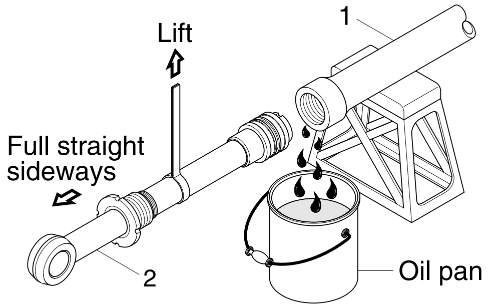
※ Cover the extracted rod assembly (2) with rag to prevent it from being accidentally damaged during operation.



R35Z77CY21

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 (2) with a crane or some means and draw it out. However, when rod assembly (2) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.

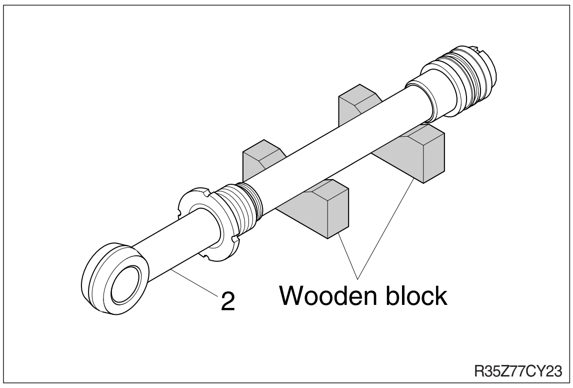


R35Z77CY22

Note that the plated surface of rod assembly (2) 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.



(2) Remove piston and gland

① Remove set screw (20)

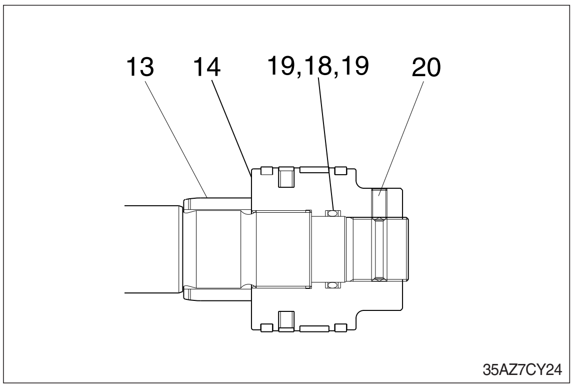
② Remove piston assembly (14), back up ring (19), O-ring (18) and cushion ring (13).

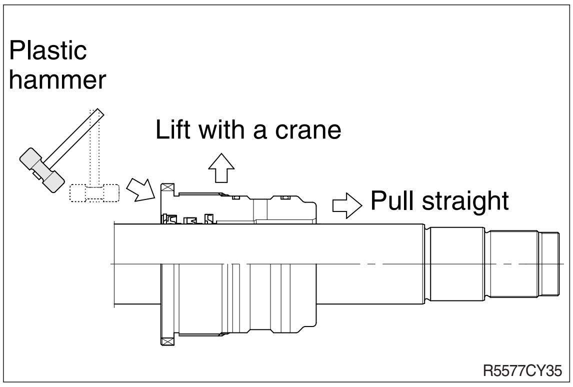
③ Remove the gland assembly from rod assembly (2).

※ If it is too heavy to move, move it by striking the flanged part of gland with a plastic hammer.

※ Pull it straight with gland assembly lifted with a crane.

Exercise care so as not to damage the lip of DU bushing (4) and packing (6, 7, 8, 9, 10) by the threads of rod assembly (2).



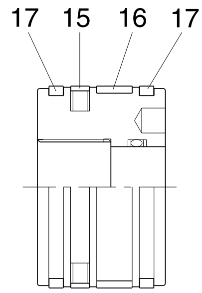


(3) Disassemble the piston assembly

① Remove wear ring (16).

② Remove dust ring (17) and piston seal (15).

※ Exercise care in this operation not to damage the grooves.



35AZ7CY25

(4) Disassemble gland assembly

① Remove back up ring (12) and O-ring (11).

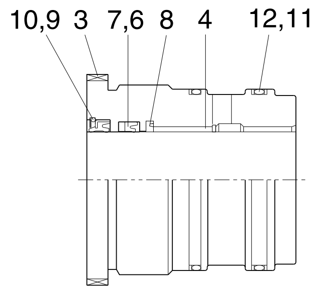
② Remove snap ring (10), dust wiper (9).

③ Remove back up ring (7), rod seal (6).

④ Remove the DU bushing (4) and buffer ring (8).

※ Exercise care in this operation not to damage the grooves.

※ Do not remove seal and ring, if does not damaged.



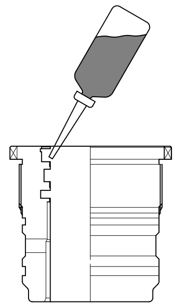
35AZ7CY26

4) ASSEMBLY

(1) Assemble cylinder head assembly

※ Check for scratches or rough surfaces if found smooth with an oil stone.

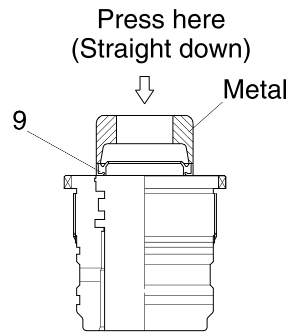
① Coat the inner face of gland (3) with hydraulic oil.



R5577CY38

② Coat dust wiper (9) with grease and fit dust wiper (9) to the bottom of the hole of dust seal.
At this time, press a pad metal to the metal ring of dust seal.

③ Fit retain ring (10) to the stop face.

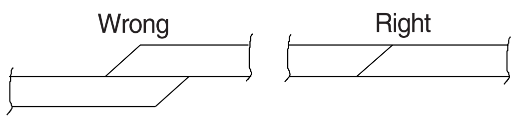


35AZ7CY29

④ Fit back up ring (7), rod seal (6) to corresponding grooves, in that order.

※ Coat each packing with hydraulic oil before fitting it.

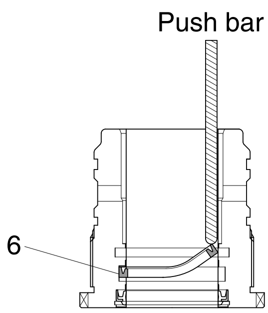
※ Insert the backup ring until one side of it is inserted into groove.



8-157(3) 210-7

※ Rod seal (6) has its own fitting direction. Therefore, confirm it before fitting them.

※ Fitting rod seal (6) upside down may damage its lip. Therefore check the correct direction that is shown in fig.

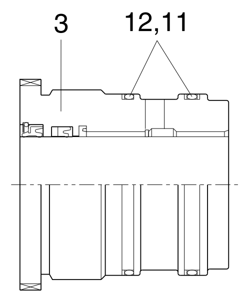


R35Z77CY35

⑤ Fit back up ring (12) to gland (3).

※ Put the backup ring in the warm water of 30~50°C .

⑥ Fit O-ring (11) to gland (3).

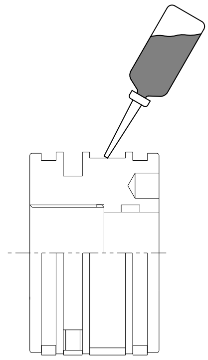


35AZ7CY27

(2) Assemble piston assembly

※ Check for scratches or rough surfaces. If found smooth with an oil stone.

① Coat the outer face of piston (14) with hydraulic oil.

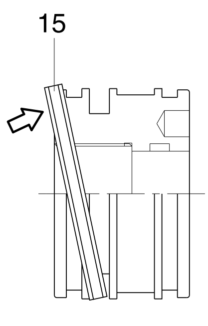


R35Z77CY28

② Fit piston seal (15) to piston.

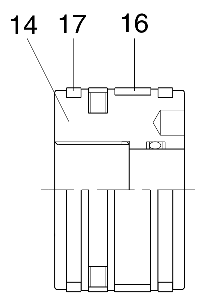
※ Put the piston seal in the warm water of 60~100°C for more than 5 minutes.

※ After assembling the piston seal, press its outer diameter to fit in.



35AZ7CY30

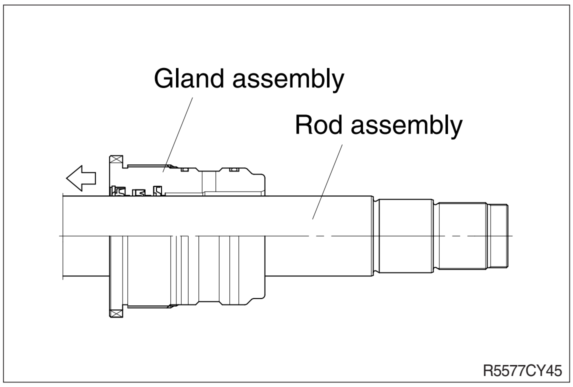
③ Fit wear ring (16) and dust ring (17) to piston (14).



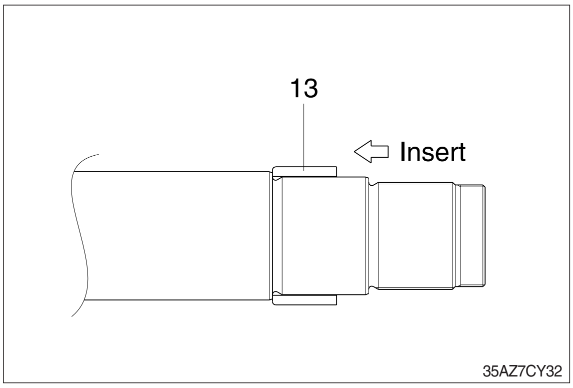
35AZ7CY31

(3) Install piston and cylinder head

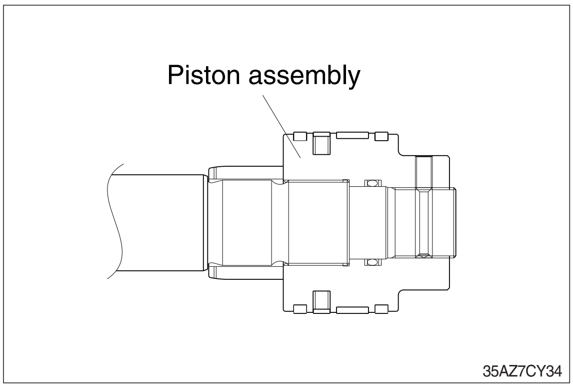
① Fix the rod assembly to the work bench.
② Apply hydraulic oil to the outer surface of rod assembly (2), the inner surface of piston and gland.
③ Insert gland assembly to rod assembly.



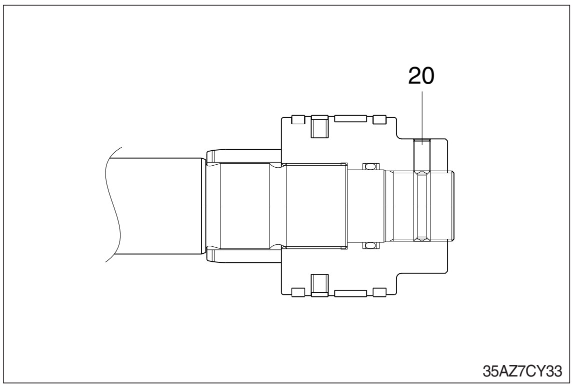
④ Insert cushion ring (13) to rod assembly.
※ Note that cushion ring (13) has a direction in which it should be fitted.



⑤ Fit piston assembly to rod assembly.
· Tightening torque : refer to page 7-129.



⑥ Tightening set screw (20).
· Tightening torque : refer to page 7-129.

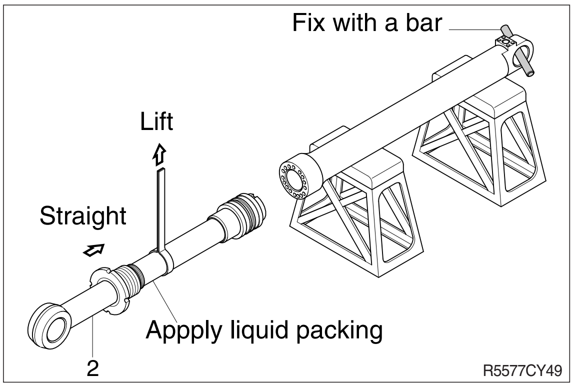


(3) Overall assemble

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.

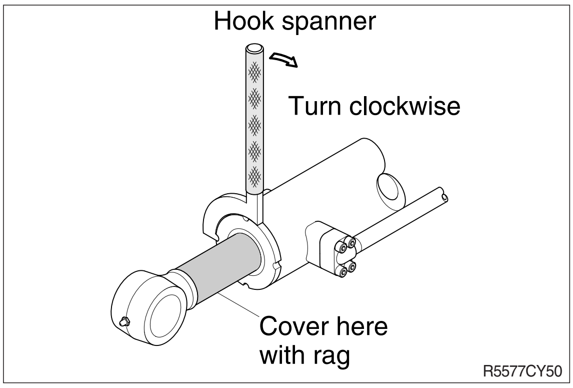
② Insert the rod assembly in to the tube assembly, while lifting and moving the rod assembly with a crane.

※ 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.



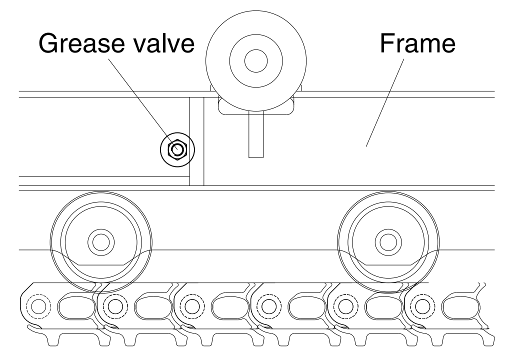
GROUP 10 UNDERCARRIAGE

1. RUBBER TRACK

1) REMOVAL

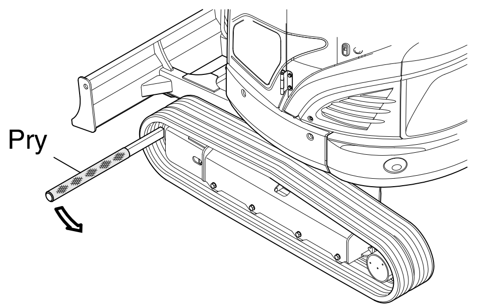
(1) Loosen tension of the rubber track.

※ 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.

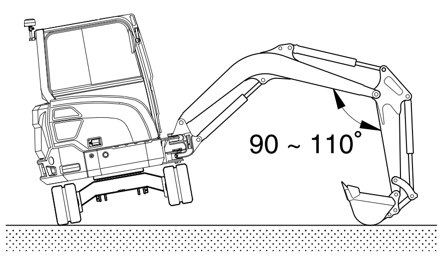


R35Z77TR22

2) INSTALL

(1) Carry out installation in the reverse order to removal.

※ Adjust the tension of the rubber track.

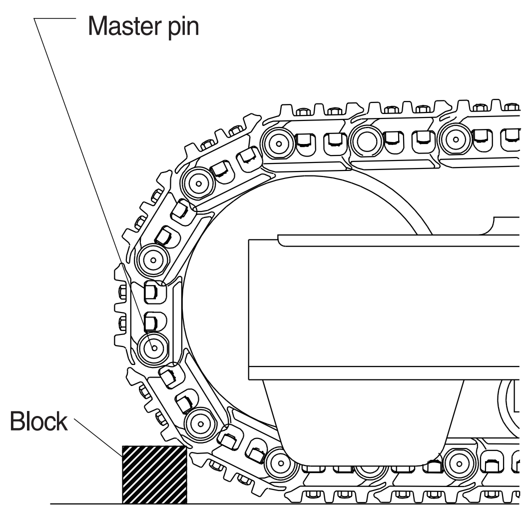


35AZ4OP19

2. TRACK LINK

1) REMOVAL

(1) Move track link until master pin is over front idler in the position put wooden block as shown.



8-161(1) 140-7

(2) Loosen tension of the track link.

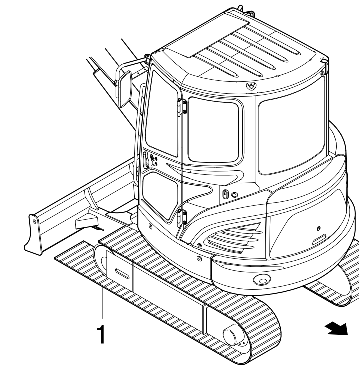
※ If track tension is not relieved when the grease valve is loosened, move the machine backwards and forwards.

(3) Push out master pin by using a suitable tool.

(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.

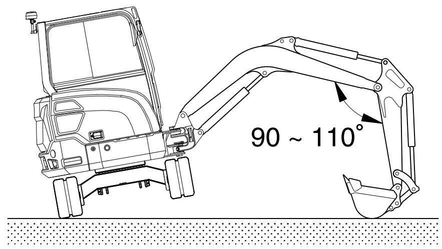


R35Z77TR01

2) INSTALL

(1) Carry out installation in the reverse order to removal.

※ Adjust the tension of the track link.

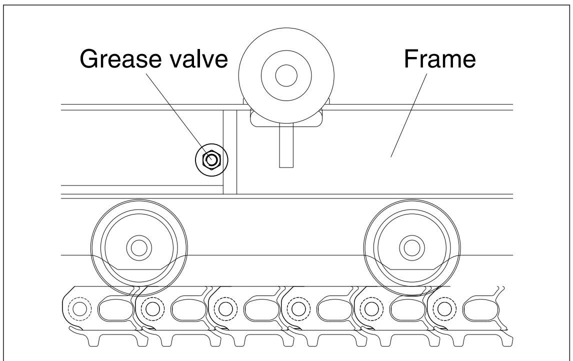


35AZ4OP19

3. UPPER ROLLER

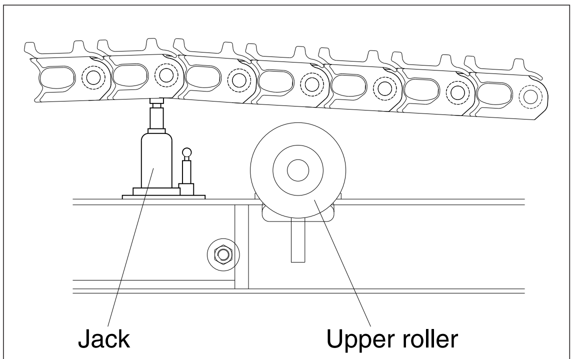
1) REMOVAL

(1) Loosen tension of the track link.



R35Z77TR04

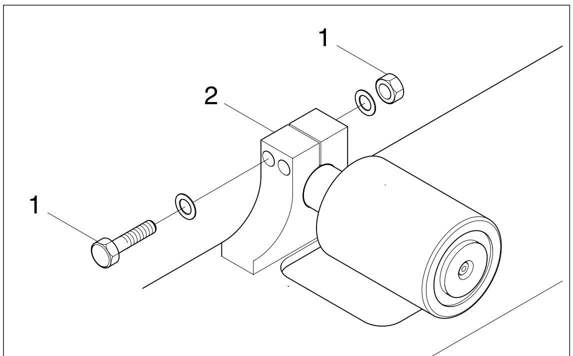
(2) Jack up the track link height enough to permit upper roller removal.



35AZ7TR05

(3) Loosen the bolt and nut (1)
  · Tightening torque : 12.3±1.2 kgf·m
                                (89±8.7 lbf·ft)

(4) Open bracket (2) with a screwdriver, push out from inside, and remove upper roller assembly.
  · Weight : 2.5 kg (5.5 lb)



R35Z77TR06

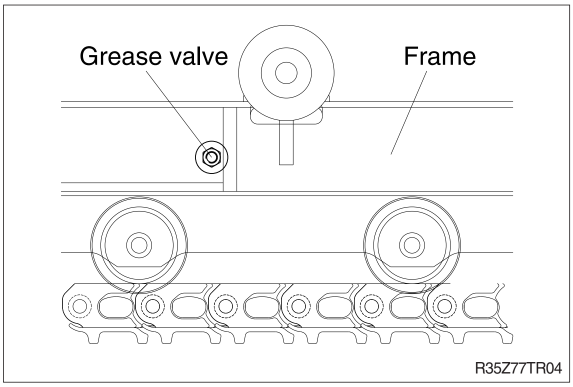
2) INSTALL

(1) Carry out installation in the reverse order to removal.

4. LOWER ROLLER

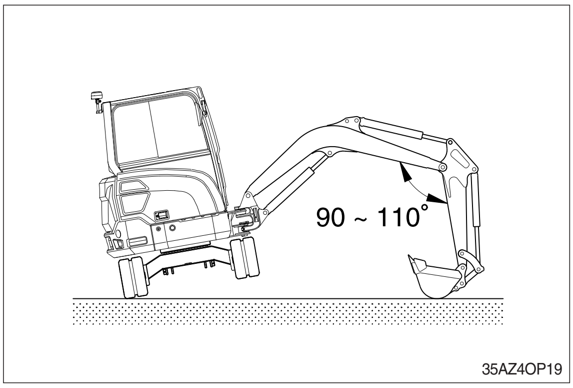
1) REMOVAL

(1) Loosen tension of the rubber track.



(2) Using the work equipment, push up track frame on side which is to be removed.

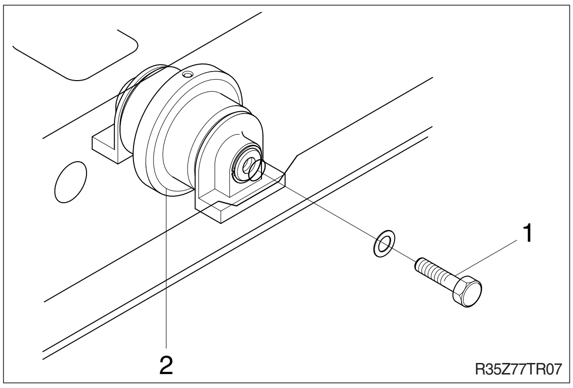
※ After jack up the machine, set a block under the unit.



(3) Remove the mounting bolt (1) and draw out the lower roller (2).

· Weight : 7.3 kg (16.1 lb)

· Tightening torque : 31.3±3.0 kgf·m (226±21.7 lbf·ft)



2) INSTALL

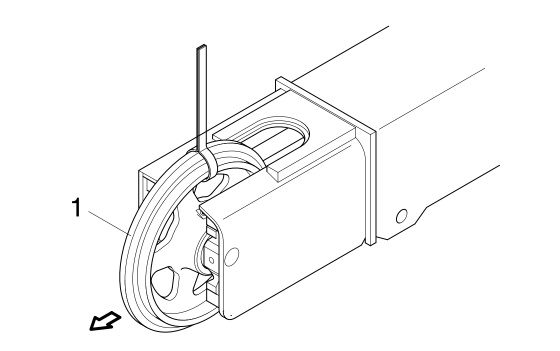
(1) Carry out installation in the reverse order to removal.

5. IDLER AND RECOIL SPRING

1) REMOVAL

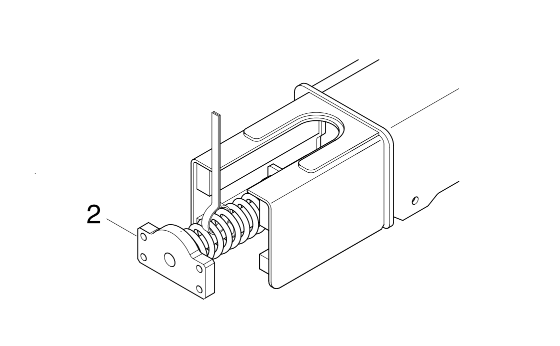
(1) Remove the track link.
For detail, see removal of track link.

(2) Sling the idler (1) and pull out idler and recoil spring assembly from track frame, using a pry.
- Weight : 42.5 kg (93.7 lb)



R35Z77TR08

(3) Pull out yoke and recoil spring assembly (2) from track frame, using a pry.
- Weight : 17 kg (37.5 lb)

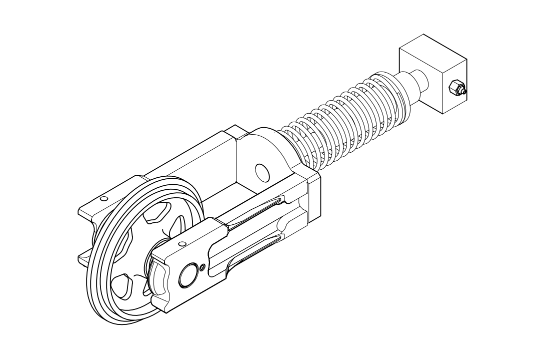


35AZ7TR10

2) INSTALL

(1) Carry out installation in the reverse order to removal.

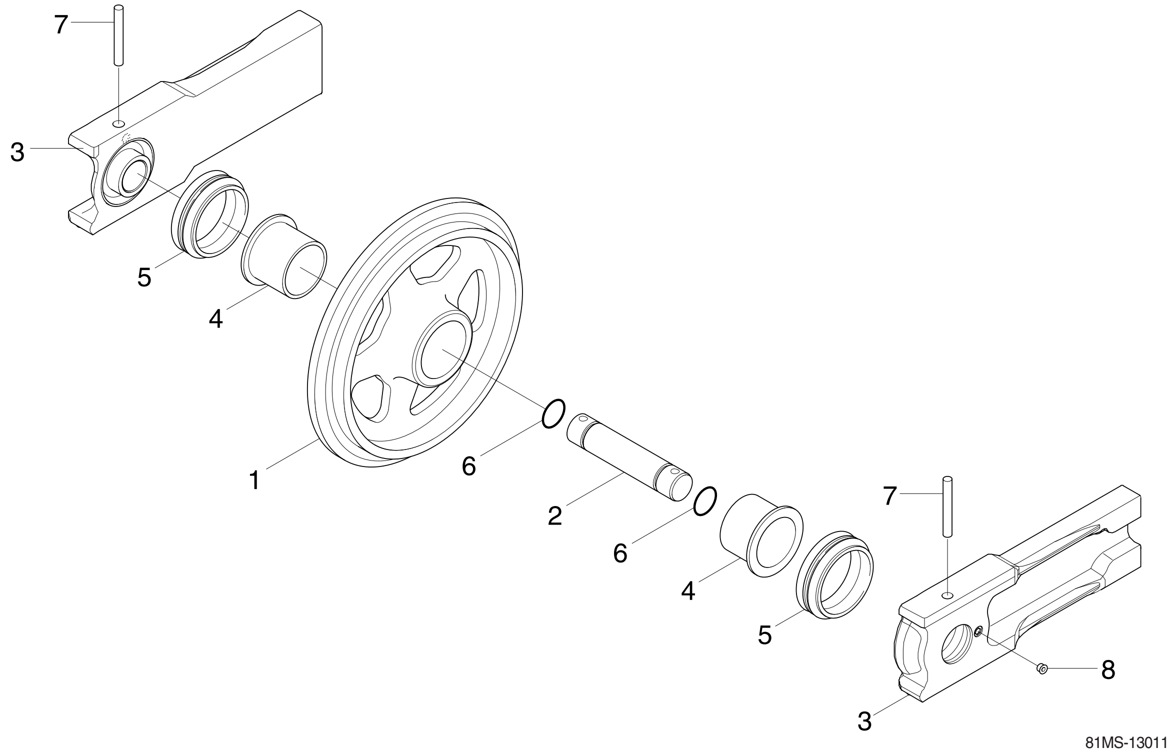
※ Make sure that the boss on the end face of the recoil cylinder rod is in the hole of the track frame.



35AZ7TR09

3) DISASSEMBLY AND ASSEMBLY OF IDLER

(1) Structure

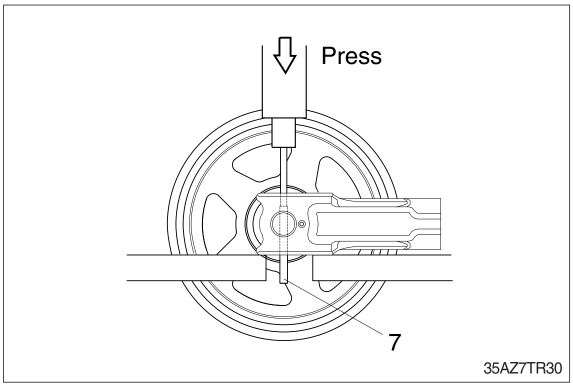


1	Idler shell	4	Bushing	7	Spring pin
2	Shaft	5	Floating seal	8	Plug
3	Bracket	6	O-ring		

(2) Disassembly

Remove plug (8) and drain oil.

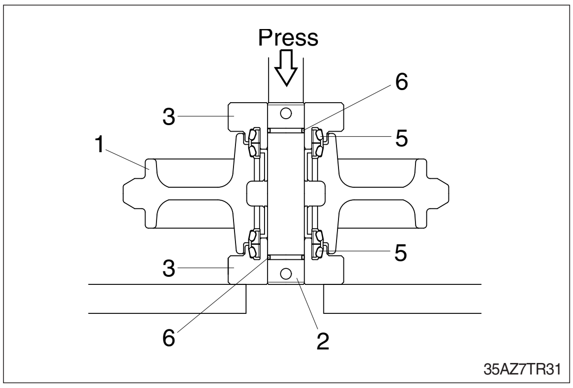
Draw out the spring pin (7), using a press.



③ Pull out the shaft (2) with a press.

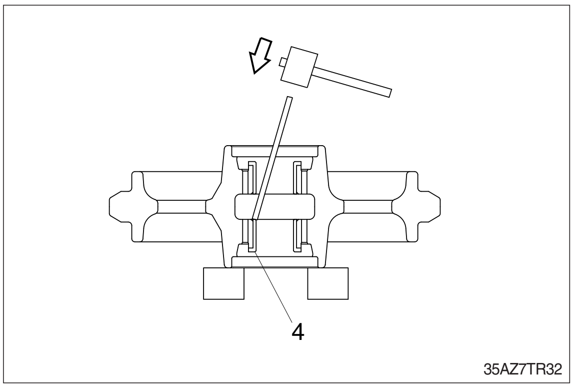
④ Remove floating seal (5) from idler shell (1) and bracket (3).

⑤ Remove O-ring (6) from shaft.



Remove the bushing (4) from idler, using a special tool.

Only remove bushing if replacement is necessity.

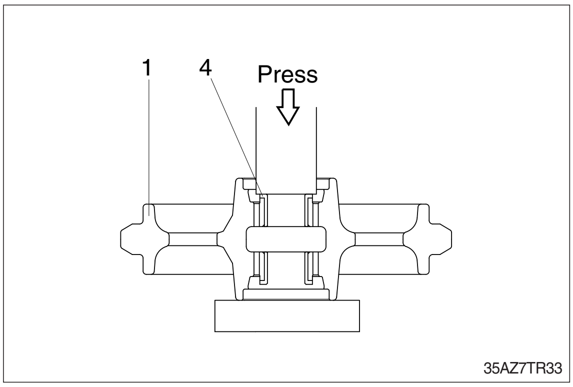


(3) **Assembly**

※ Before assembly, clean the parts.

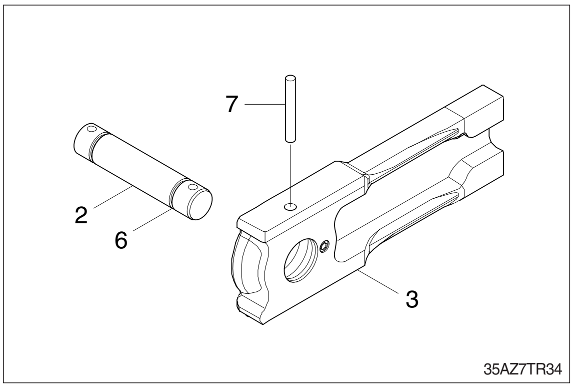
※ Coat the sliding surfaces of all parts with oil.

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.

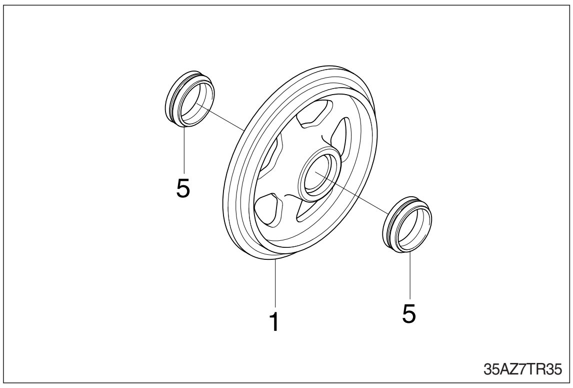


② Coat O-ring (6) with grease thinly, and install it to shaft (2).

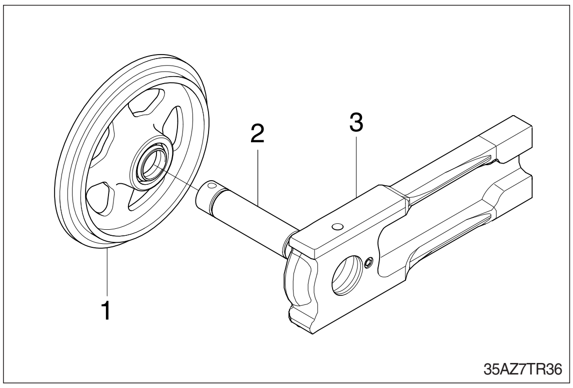
③ Insert shaft (2) into brakcet (3) and drive in the spring pin (7).



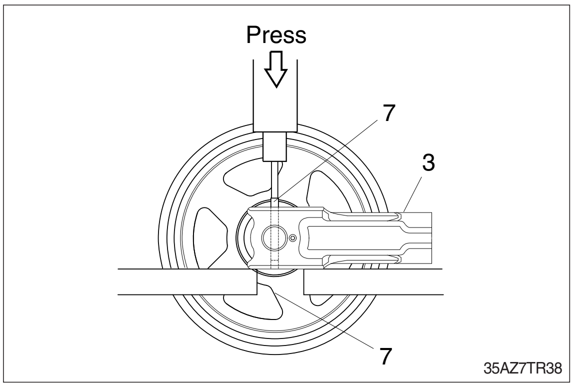
④ Install floating seal (5) to idler shell (1).



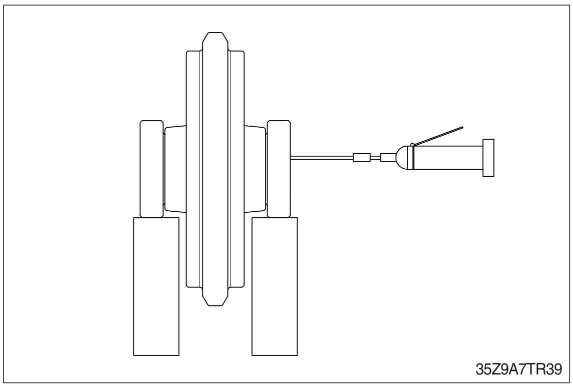
⑤ Install shaft (2) and bracket (3) to idler shell (1).



⑥ Lay bracket (3) on its side. Knock in the spring pin (7) with a hammer.

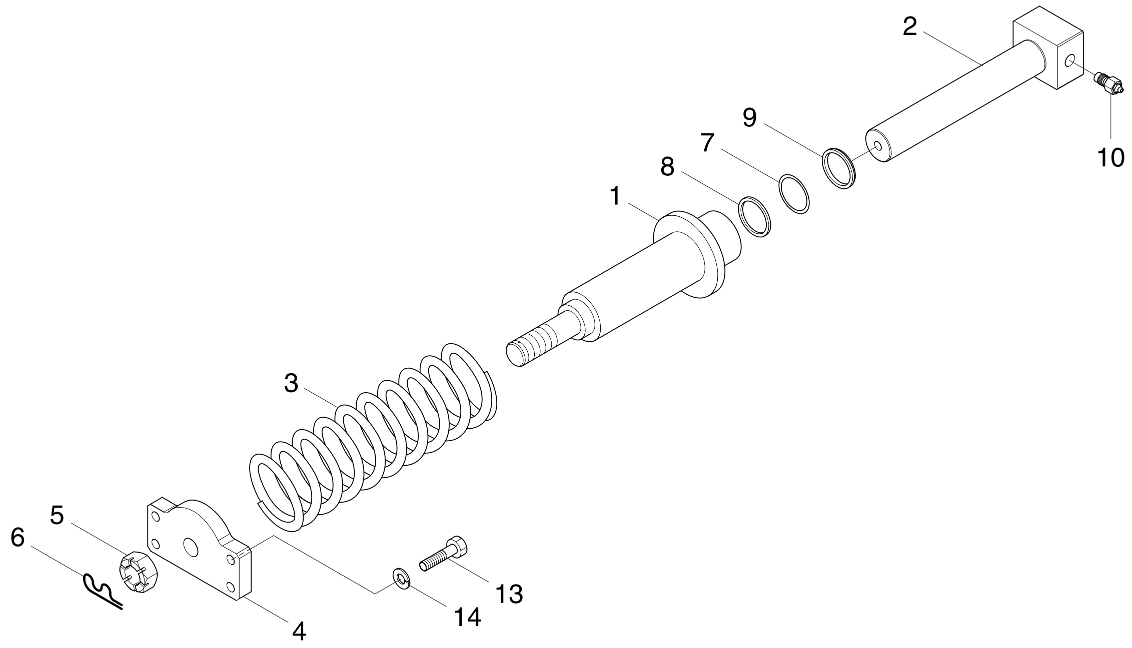


⑦ Supply engine oil to the specified level, and tighten plug.



4) DISASSEMBLY AND ASSEMBLY OF RECOIL SPRING

(1) Structure



1	Tension cylinder	5	Castle nut	9	Dust seal
2	Piston	6	Split pin	10	Grease valve
3	Tension spring	7	Rod seal	13	Hexagon bolt
4	Yoke plate	8	Back up ring	14	Spring washer

(2) Disassembly

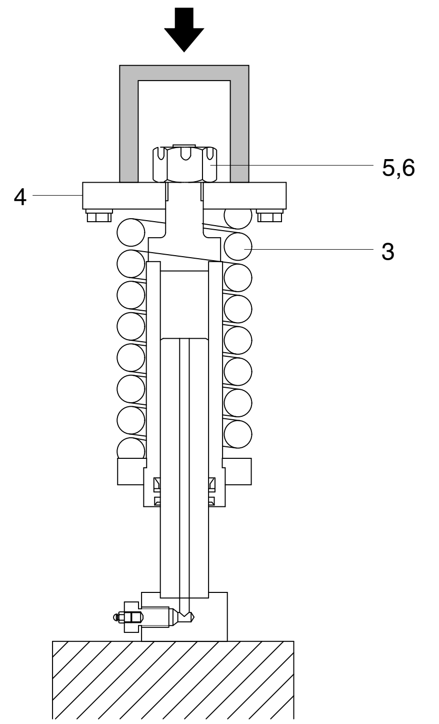
① Apply pressure on yoke plate (4) with a press.

※ The spring is under a large installed load. This is dangerous, so be sure to set properly.

· Spring set load : 2700 ㎏ (6000 ℔)

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.

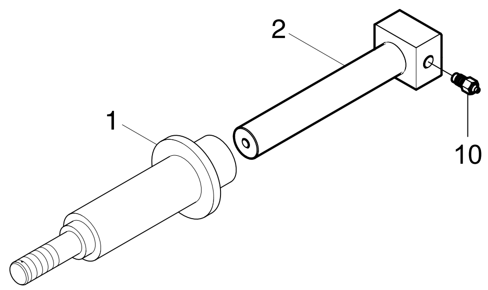
③ Lighten the press load slowly and remove yoke plate (4) and spring (3).



35AZ7TR13

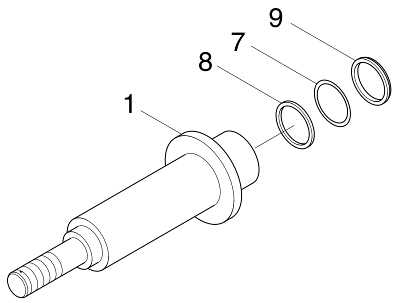
⑤ Remove piston (2) from tension cylinder (1).

⑥ Remove grease valve (10) from piston (2).



35AZ7TR14

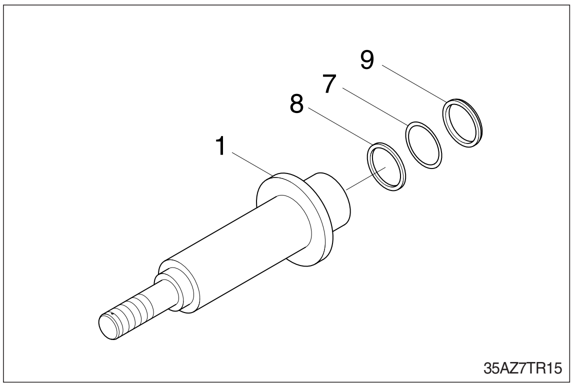
⑦ Remove dust seal (9), rod seal (8) and snap ring (7) from tension cylinder (1) .



35AZ7TR15

(3) Assembly

① Install dust seal (9), rod seal (8) and snap ring (7) into tension cylinder (1).

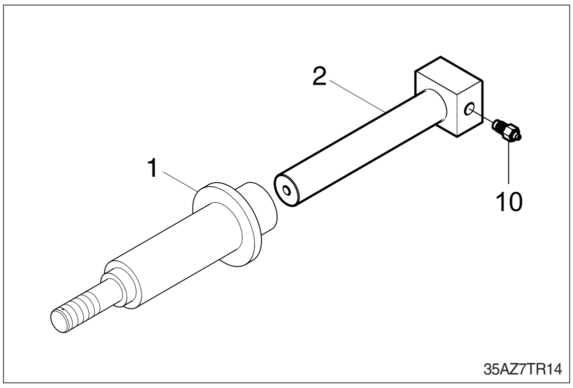


② Pour grease into body tension cylinder (1), then push in piston (2) by hand. After take grease out of grease valve mounting hole, let air out.

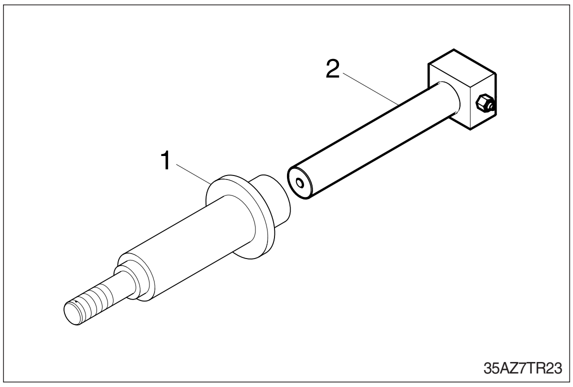
※ If air letting is not sufficient, it may be difficult to adjust the tension of crawler.

③ Fit grease valve (10) to piston (2).

· Tightening torque : 8 kgf·m (57.9 lbf·ft)



④ Install piston (2) to tension cylinder (1).



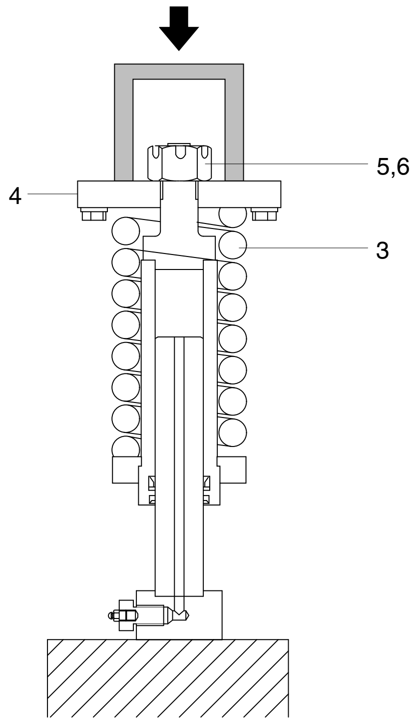
⑤ Install tension spring (3) and yoke plate (4) to tension cylinder (1).

⑥ Apply pressure to tension spring (3) 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).

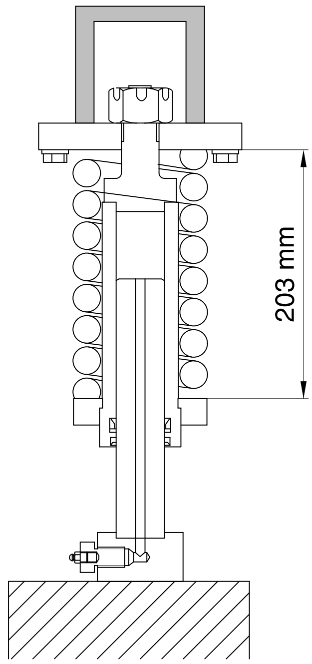
· Tightening torque : 10.3±1.1 kgf · m (74.5±8.0 lbf · ft)



35AZ7TR13

⑧ Lighten the press load and confirm the set length of tension spring (3).

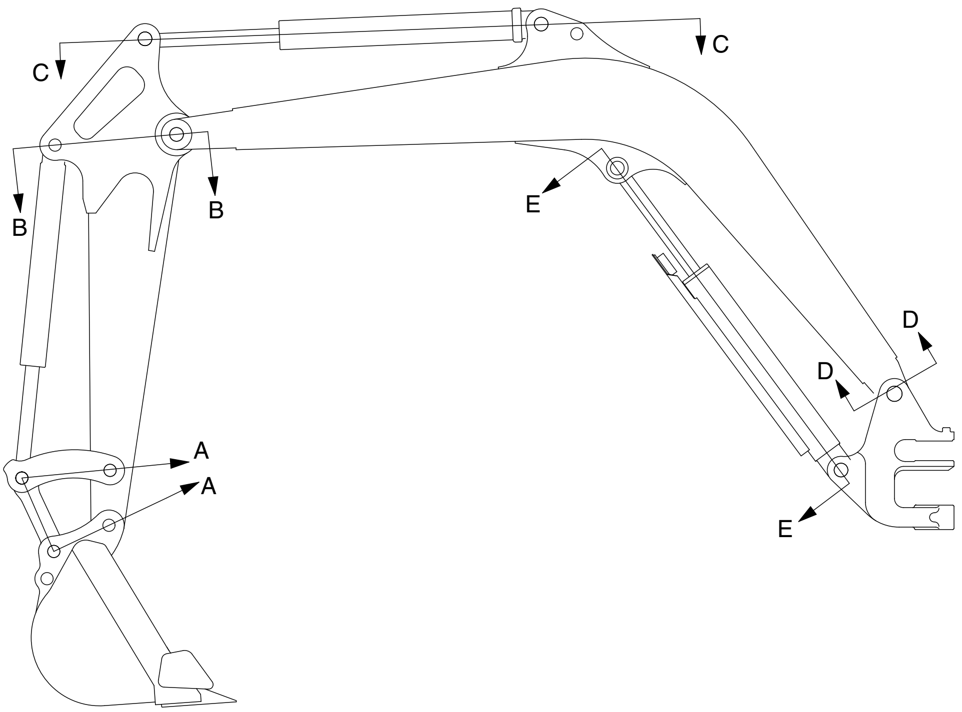
· Spring length : 203 mm

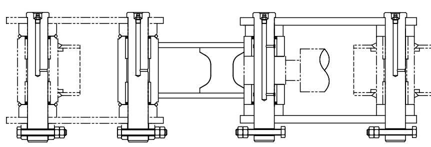


35AZ7TR16

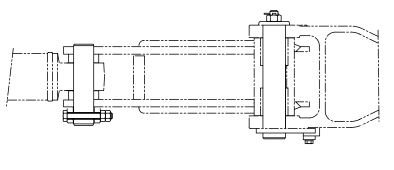
GROUP 11 WORK EQUIPMENT

1. STRUCTURE

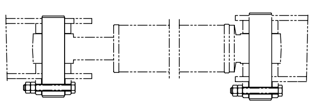




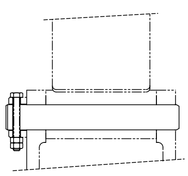
SECTION A-A



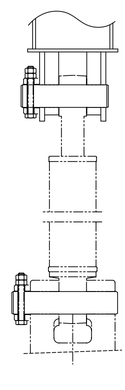
SECTION B-B



SECTION C-C



SECTION D-D



SECTION E-E

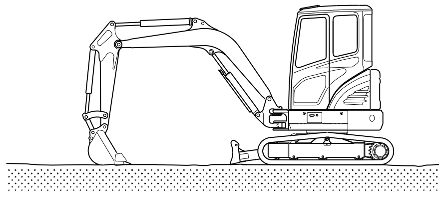
35Z9A7AT01

2. REMOVAL AND INSTALL

1) BUCKET ASSEMBLY

(1) Removal

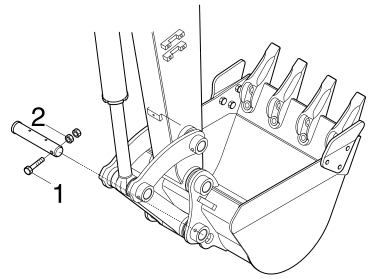
① Lower the work equipment completely to ground with back of bucket facing down.



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)

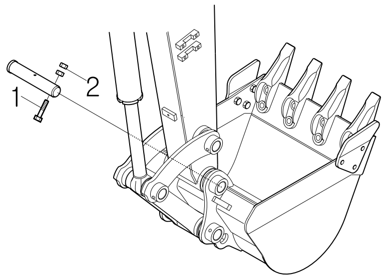


R35Z77AT03

③ Remove nut (1), bolt (2) and draw out the pin (3) then remove the bucket assembly (0.11 m^3).

· Weight : 87 kg (192 lb)

· Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)



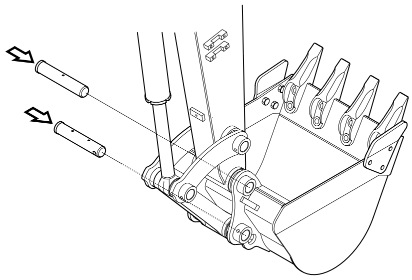
R35Z77AT04

(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

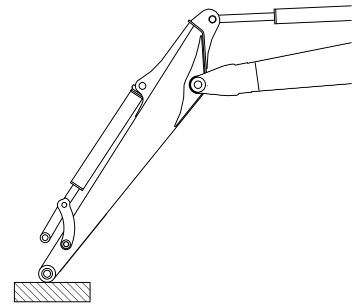
2) ARM ASSEMBLY

(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.

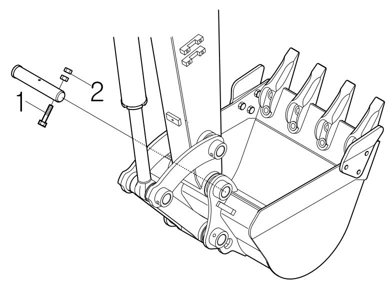


R5577AT06

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.



R35Z77AT04

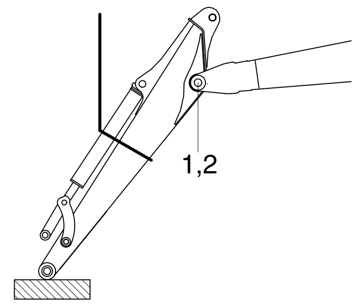
※ Tie the rod with wire to prevent it from coming out.

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 m).

- Weight : 133 kg (290 lb)
- 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.**

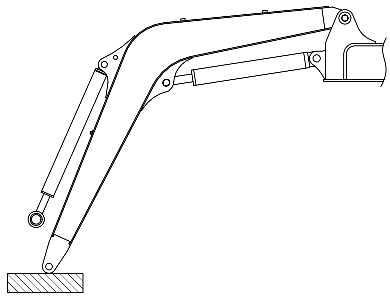
※ Bleed the air from the cylinder.

3) BOOM CYLINDER

(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.



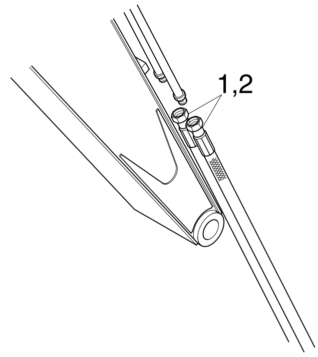
R5577AT08

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).



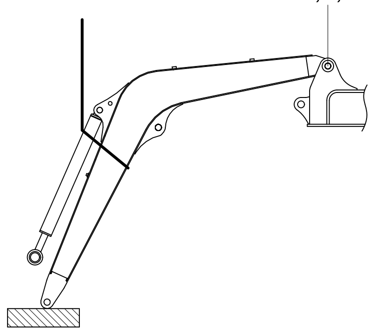
R5577AT10

⑥ Remove bolt (3), nut (4) and pull out the pin (5) then remove boom assembly (2.4 m).

· Weight : 209 kg (460 lb)

· 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.



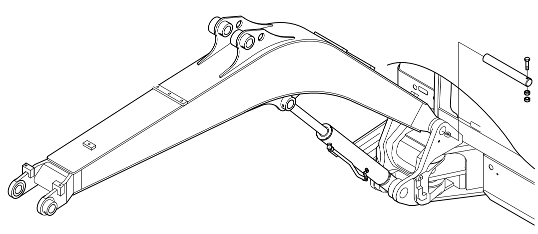
R5577AT09

(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