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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.

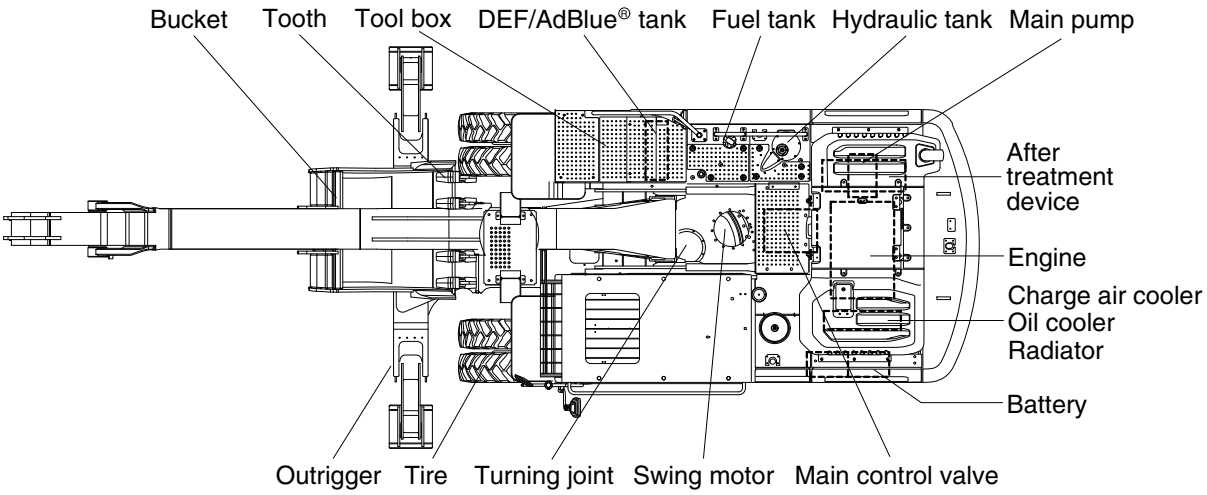
If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left.

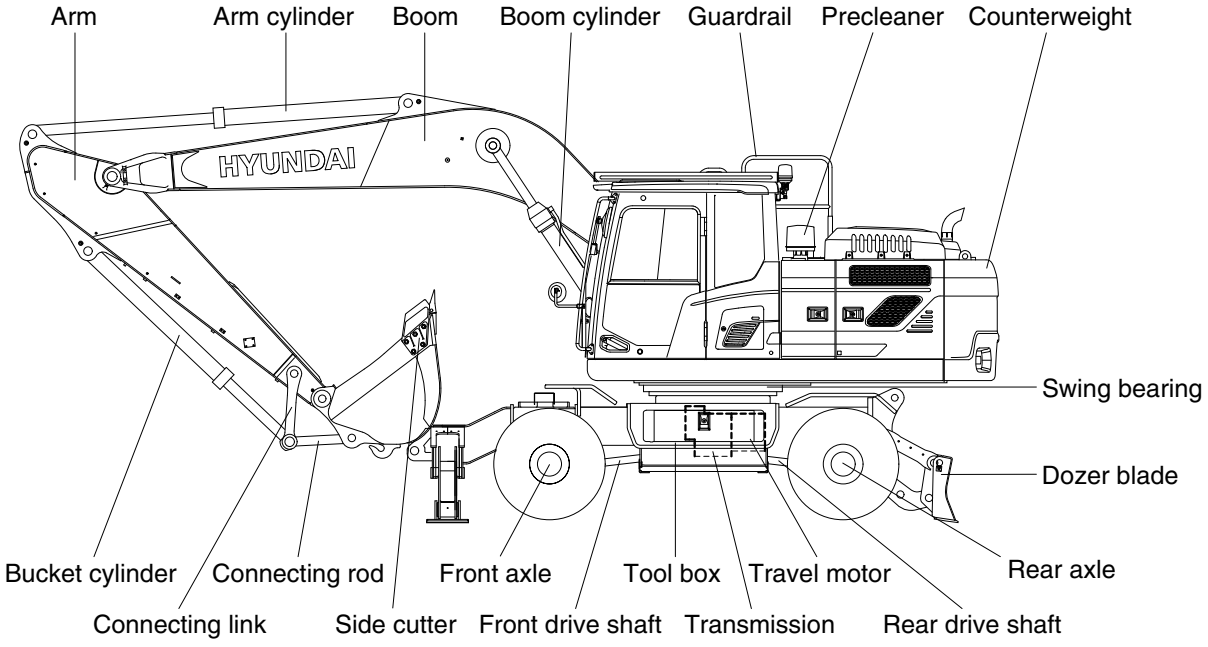
If it is desired to convert from Centigrade to Fahrenheit degrees, consider the center column as a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

˚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

GROUP 2 SPECIFICATIONS

1. MAJOR COMPONENT

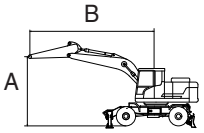




210WA2SP01

Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
HW210A	MONO BOOM	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		5650	2400	3400	-	310	-	-	Down	Down

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



Lift-point height (A)		Lift-point radius (B)								At max. reach		
		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		7.5 m (24.6 ft)		Capacity		Reach
												m (ft)
7.5 m (24.6 ft)	kg lb									*4820 *10630	*4820 *10630	5.72 (18.8)
6.0 m (19.7 ft)	kg lb					*5520 *12170	*5520 *12170			*4400 *9700	*4400 *9700	6.89 (22.6)
4.5 m (14.8 ft)	kg lb			*7190 *15850	*7190 *15850	*5960 *13140	*5960 *13140	*5130 *11310	4570 10080	*4300 *9480	*4300 *9480	7.59 (24.9)
3.0 m (9.8 ft)	kg lb			*8800 *19400	*8800 *19400	*6640 *14640	6310 13910	*5630 *12410	4490 9900	*4390 *9680	4100 9040	7.94 (26.1)
1.5 m (4.9 ft)	kg lb			*10000 *22050	9380 20680	*7260 *16010	6070 13380	*5870 *12940	4380 9660	*4680 *10320	3980 8770	8.00 (26.2)
0.0 m (0.0 ft)	kg lb			*10280 *22660	9170 20220	*7540 *16620	5920 13050	*5900 *13010	4320 9520	*5240 *11550	4120 9080	7.76 (25.5)
-1.5 m (-4.9 ft)	kg lb	*11990 *26430	*11990 *26430	*9780 *21560	9160 20190	*7290 *16070	5890 12990			*5710 *12590	4570 10080	7.21 (23.7)
-3.0 m (-9.8 ft)	kg lb	*11220 *24740	*11220 *24740	*8410 *18540	*8410 *18540	*6070 *13380	6000 13230			*5610 *12370	*5610 *12370	6.25 (20.5)

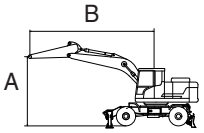
Note 1. Lifting capacity are based on ISO 10567.
2. Lifting capacity of the HX series does not exceed 75% of tipping load with the machine on firm, level ground or 87% of full hydraulic capacity.
3. The Lift-point is bucket pivot mounting pin on the arm (without bucket mass).
4. *Indicates load limited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

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

Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
HW210A	MONO BOOM	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		5650	2920	3400	-	310	-	Down	Down	-

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



Lift-point height (A)		Lift-point radius (B)										At max. reach		
		1.5 m (4.9 ft)		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		7.5 m (24.6 ft)		Capacity		Reach
														m (ft)
7.5 m (24.6 ft)	kg lb							*4680 *10320	*4680 *10320			*3140 *6920	*3140 *6920	6.39 (21.0)
6.0 m (19.7 ft)	kg lb							*5020 *11070	*5020 *11070			*2900 *6390	*2900 *6390	7.45 (24.5)
4.5 m (14.8 ft)	kg lb					*6500 *14330	*6500 *14330	*5520 *12170	*5520 *12170	*5030 *11090	3910 8620	*2840 *6260	*2840 *6260	8.10 (26.6)
3.0 m (9.8 ft)	kg lb					*8160 *17990	*8160 *17990	*6270 *13820	5340 11770	*5340 *11770	3800 8380	*2890 *6370	*2890 *6370	8.43 (27.7)
1.5 m (4.9 ft)	kg lb					*9580 *21120	7740 17060	*6990 *15410	5080 11200	*5680 *12520	3670 8090	*3070 *6770	3050 6720	8.49 (27.8)
0.0 m (0.0 ft)	kg lb			*6650 *14660	*6650 *14660	*10180 *22440	7460 16450	*7420 *16360	4910 10820	*5850 *12900	3580 7890	*3400 *7500	3120 6880	8.27 (27.1)
-1.5 m (-4.9 ft)	kg lb	*7190 *15850	*7190 *15850	*11250 *24800	*11250 *24800	*9980 *22000	7380 16270	*7370 *16250	4840 10670	*5620 *12390	3560 7850	*4010 *8840	3410 7520	7.75 (25.4)
-3.0 m (-9.8 ft)	kg lb	*11870 *26170	*11870 *26170	*12450 *27450	*12450 *27450	*8950 *19730	7460 16450	*6600 *14550	4880 10760			*5240 *11550	4090 9020	6.86 (22.5)
-4.5 m (-14.8 ft)	kg lb			*9040 *19930	*9040 *19930	*6580 *14510	*6580 *14510					*4960 *10930	*4960 *10930	5.43 (17.8)

Note 1. Lifting capacity are based on ISO 10567.

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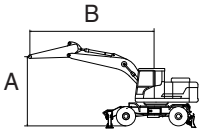
Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
HW210A	2-PIECE BOOM	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		5400	2700	4100	-	310	Down	-	-	Down

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



Lift-point height (A)		Lift-point radius (B)								At max. reach		
		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		7.5 m (24.6 ft)		Capacity		Reach
9.0 m (29.5 ft)	kg									*5310	*5310	3.87
	lb									*11710	*11710	(12.7)
7.5 m (24.6 ft)	kg									*4030	*4030	5.87
	lb									*8880	*8880	(19.3)
6.0 m (19.7 ft)	kg			*4450	*4450	*4510	*4510			*3610	*3610	7.02
	lb			*9810	*9810	*9940	*9940			*7960	*7960	(23.0)
4.5 m (14.8 ft)	kg	*7030	*7030	*5540	*5540	*4940	*4940	*4820	4520	*3460	*3460	7.71
	lb	*15500	*15500	*12210	*12210	*10890	*10890	*10630	9960	*7630	*7630	(25.3)
3.0 m (9.8 ft)	kg			*7250	*7250	*5720	*5720	*5100	4440	*3480	*3480	8.05
	lb			*15980	*15980	*12610	*12610	*11240	9790	*7670	*7670	(26.4)
1.5 m (4.9 ft)	kg			*8940	*8940	*6580	5970	*5530	4330	*3640	*3640	8.11
	lb			*19710	*19710	*14510	13160	*12190	9550	*8020	*8020	(26.6)
0.0 m (0.0 ft)	kg	*6490	*6490	*10010	8850	*7270	5820	*5890	4270	*3990	*3990	7.88
	lb	*14310	*14310	*22070	19510	*16030	12830	*12990	9410	*8800	*8800	(25.8)
-1.5 m (-4.9 ft)	kg	*12120	*12120	*10360	8790	*7590	5770			*4660	4410	7.33
	lb	*26720	*26720	*22840	19380	*16730	12720			*10270	9720	(24.1)
-3.0 m (-9.8 ft)	kg			*9890	8900							
	lb			*21800	19620							

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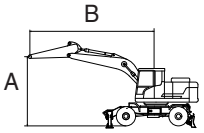
⚠ Failure to comply to the rated load can cause surious injury, death, or property damage. Make adjustments to the rated load as necessory for non-standard configurations.

Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
HW210A	2-PIECE BOOM	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		5400	2920	4100	-	310	-	-	Down	Down

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



Lift-point height (A)		Lift-point radius (B)								At max. reach		
		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		7.5 m (24.6 ft)		Capacity		Reach
												m (ft)
9.0 m (29.5 ft)	kg									*4500	*4500	4.31
	lb									*9920	*9920	(14.2)
7.5 m (24.6 ft)	kg					*4450	*4450			*3510	*3510	6.17
	lb					*9810	*9810			*7740	*7740	(20.3)
6.0 m (19.7 ft)	kg					*4230	*4230			*3160	*3160	7.27
	lb					*9330	*9330			*6970	*6970	(23.9)
4.5 m (14.8 ft)	kg			*5190	*5190	*4680	*4680	*4560	*4560	*3030	*3030	7.93
	lb			*11440	*11440	*10320	*10320	*10050	*10050	*6680	*6680	(26.0)
3.0 m (9.8 ft)	kg			*6890	*6890	*5480	*5480	*4890	*4890	*3040	*3040	8.27
	lb			*15190	*15190	*12080	*12080	*10780	*10780	*6700	*6700	(27.1)
1.5 m (4.9 ft)	kg			*8620	*8620	*6370	*6370	*5350	4810	*3180	*3180	8.33
	lb			*19000	*19000	*14040	*14040	*11790	10600	*7010	*7010	(27.3)
0.0 m (0.0 ft)	kg	*6800	*6800	*9780	*9780	*7100	6520	*5750	4730	*3470	*3470	8.10
	lb	*14990	*14990	*21560	*21560	*15650	14370	*12680	10430	*7650	*7650	(26.6)
-1.5 m (-4.9 ft)	kg	*11610	*11610	*10240	10030	*7480	6450	*5030	4730	*4010	*4010	7.57
	lb	*25600	*25600	*22580	22110	*16490	14220	*11090	10430	*8840	*8840	(24.8)
-3.0 m (-9.8 ft)	kg			*9920	*9920	*7230	6520					
	lb			*21870	*21870	*15940	14370					

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7. SPECIFICATIONS FOR MAJOR COMPONENTS

1) ENGINE

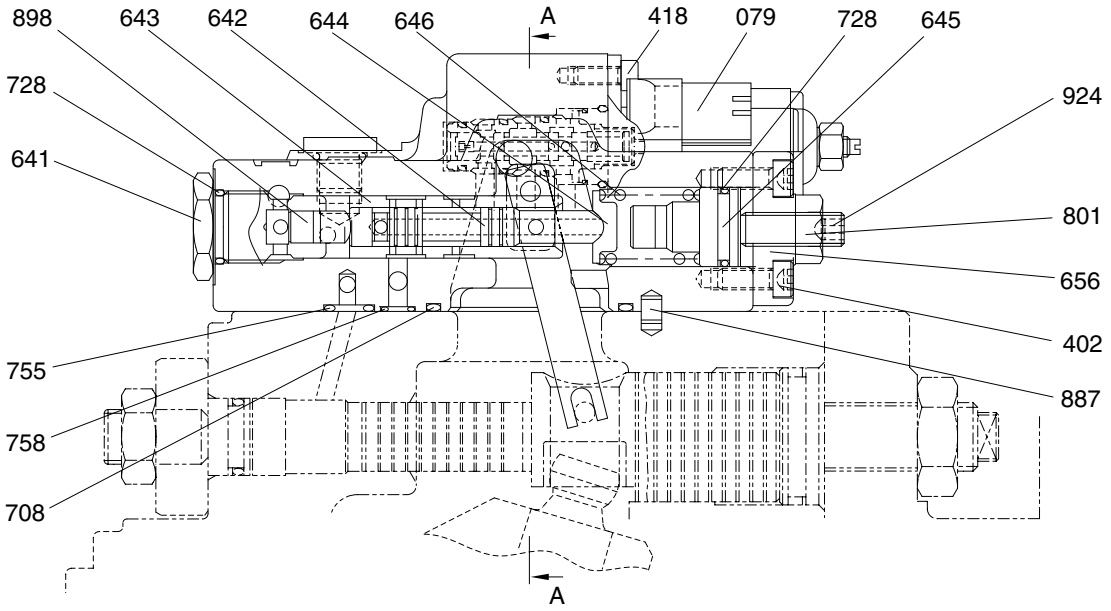
Item	Specification
Maker / Model	CUMMINS / B6.7
Type	4-cycle, turbocharged, charge air cooled, electronic controlled diesel engine
Cooling method	Water cooled
Number of cylinders and arrangement	6 cylinders, in-line
Firing order	1-5-3-6-2-4
Combustion chamber type	Direct injection type
Cylinder bore × stroke	107 × 124 mm (4.21" × 4.88")
Displacement	6.7 ℓ (408 cu in)
Compression ratio	17.3 : 1
Gross power	173 Hp (129 kW) at 2200 rpm
Net power	170 Hp (127 kW) at 2200 rpm
Max. power	195 Hp (145 kW) at 2000 rpm
Peak Torque	881 N · m (650 lb · ft) at 1300 rpm
Engine oil quantity	24.4 ℓ (6.4 U.S. gal)
Wet weight or Dry weight	583 kg (1285 lb)
Starter motor	24 V-4.8 kW
Alternator	24 V-95 A
Battery	2 × 12 × 100 Ah

2) MAIN PUMP

Item	Specification
Type	Variable displacement piston pump
Capacity	2 × 130 cc/rev
Maximum pressure	350 kgf/cm^2 (4980 psi) [380 kgf/cm^2 (5400 psi)]
Rated oil flow	2 × 208 ℓ/min (55.0 U.S. gpm / 45.8 U.K. gpm)
Rated speed	1600 rpm

[ ]: Power boost

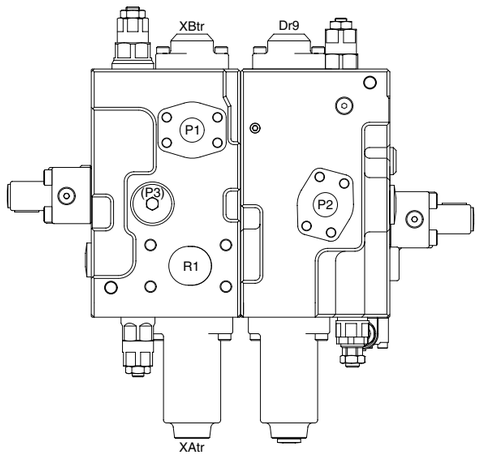
REGULATOR (2/2)

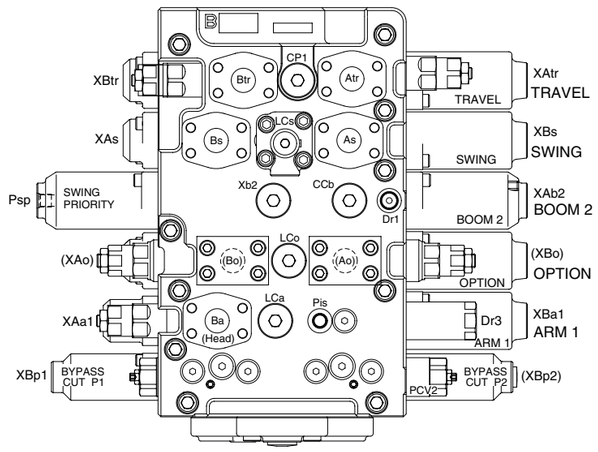


210WA2MP09

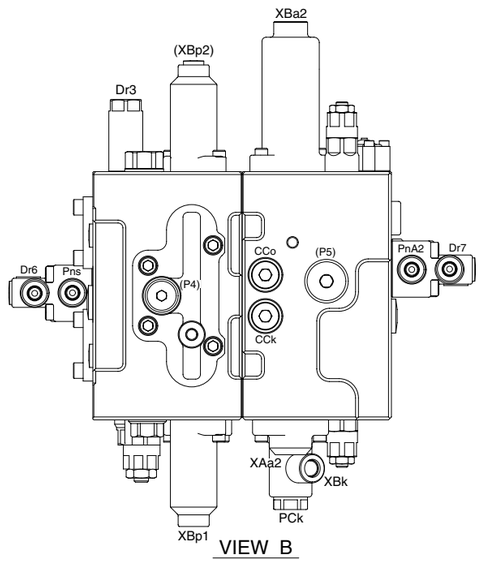
079	EPPR valve	644	Spring seat (Q)	755	O-ring
402	Hexagon socket screw	645	Adjust stem (Q)	758	Square ring
418	Hexagon socket screw	646	Pilot spring	801	Nut
641	Pilot plug	656	Cover	887	Pin
642	Pilot spool	708	O-ring	898	Piston piston
632	Pilot sleeve	728	O-ring	924	Hexagon socket set screw

1. STRUCTURE



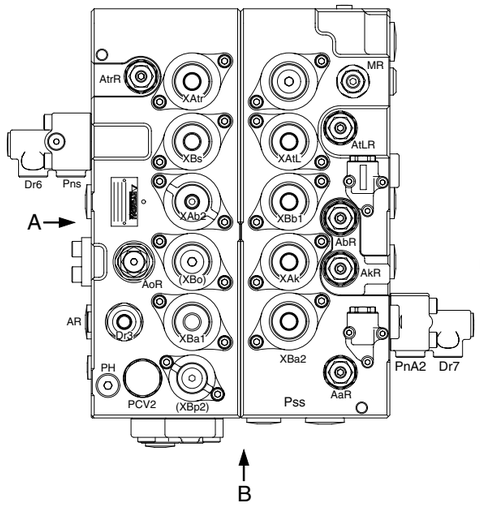


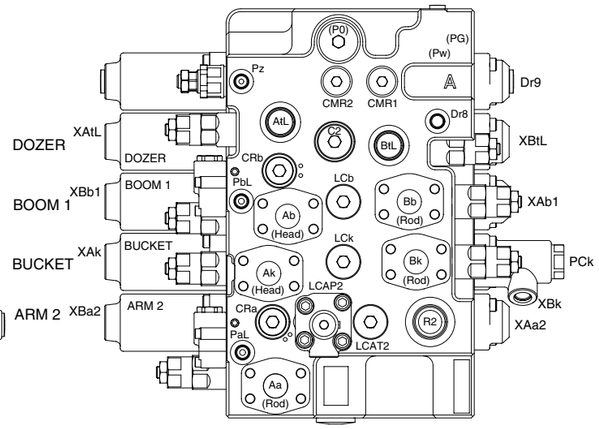
VIEW A

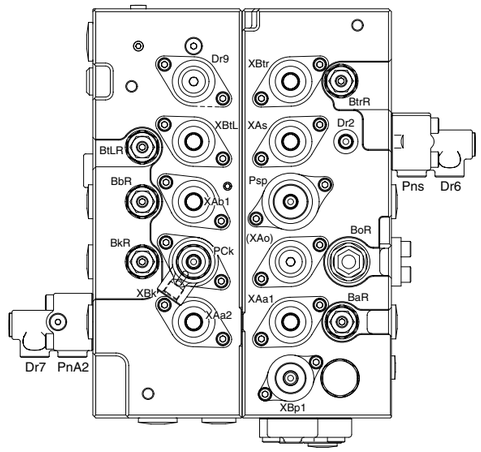


VIEW B

Mark	Port name	Port size	Tightening torque
R2	Make up port for swing	PF 1	20~25 kgf · m (115~180 lbf · ft)
XAtr XBtr (XAo) (XBo) XAk XBk XAb1 XBb1 XAa2 XBa2 XAtL XBtL XAs XBs XAa1 XBa1 Dr1 Dr9	Travel forward pilot port Travel reverse pilot port Optional pilot port Optional pilot port Bucket in pilot port Bucket out pilot port Boom up pilot port Boom down pilot port Arm out confluence pilot port Arm in confluence pilot port Dozer down pilot port Dozer up pilot port Swing right pilot port Swing left pilot port Arm out pilot port Arm in pilot port Drain port Drain port	PF 3/8	7~8 kgf · m (50.6~57.8 lbf · ft)
(Pw) Dr8 Pz (PG) Dr3 Dr6 Dr7 Pns PaL PbL XAb2 Psp XBp1 (XBp2) PCk Pis PnA2	Pressure port for auto idle signal Drain port Main relief set pressure up pilot pressure port Pilot pressure port Drain port Drain port Drain port Swing logic valve pilot port Lock valve pilot port (arm rod side) Lock valve pilot port (boom head side) Boom up confluence pilot port Swing priority pilot port Bypass cut spool pilot port (P1 side) Bypass cut spool pilot port (P2 side) Bucket in stroke limiter pilot port Arm regeneration cut pilot port Arm 2 logic valve pilot port	PF 1/4	3.5~3.9 kgf · m (25.3~28.2 lbf · ft)
Atr Btr (Ao) (Bo) Ak Bk Ab Bb As Bs Aa Ba P1 P2	Travel forward port Travel reverse port Optional port Optional port Bucket cylinder head side port Bucket cylinder rod side port Boom cylinder head side port Boom cylinder rod side port Swing motor right port Swing motor left port Arm cylinder rod side port Arm cylinder head side port Pump port (P1 side) Pump port (P2 side)	M10	5~6.6 kgf · m (36.1~47.7 lbf · ft)
R1	Return port	M12	8.5~11.2 kgf · m (61.5~81.1 lbf · ft)
AtL BtL (P0) (P3) (P5)	Dozer cylinder head side port Dozer cylinder rod side port Quick clamp solenoid valve supply port - -	PF 3/4	15.3~18.4 kgf · m (110.6~133 lbf · ft)
(P4)	-	PF 1/2	10~12.2 kgf · m (72.3~88.2 lbf · ft)

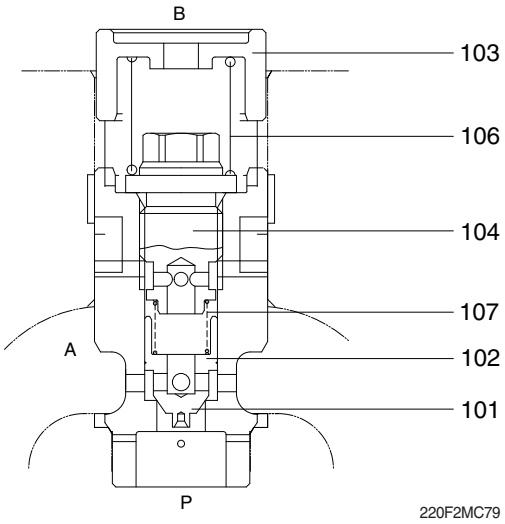






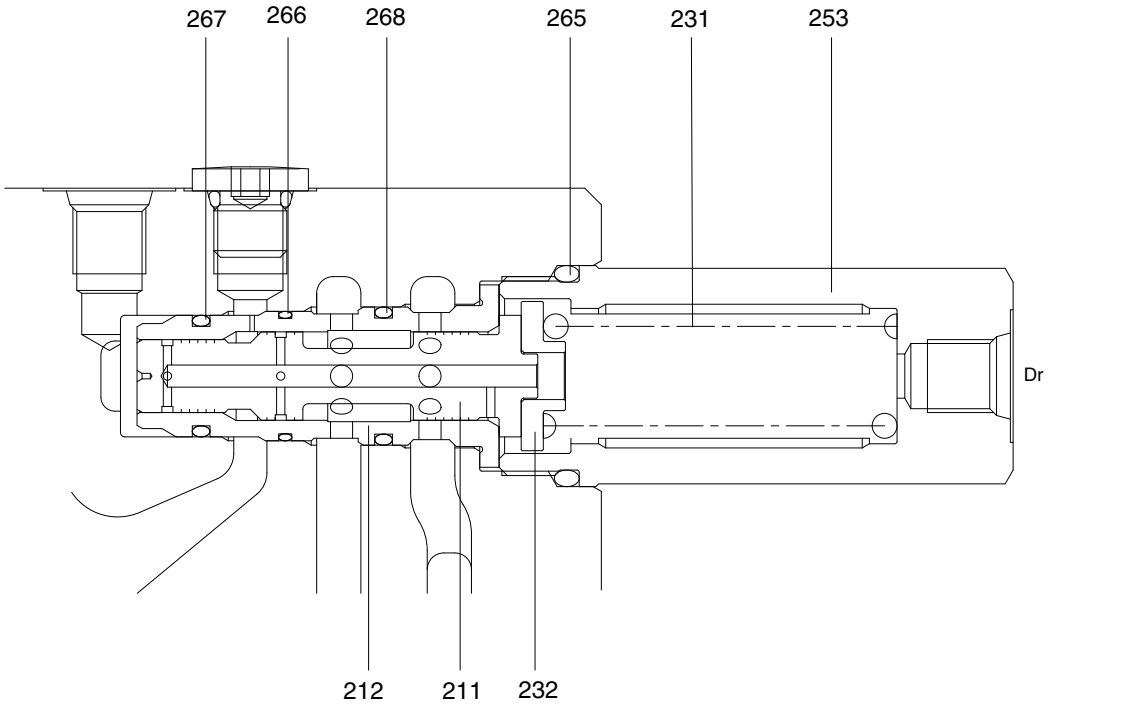
210WF2MC01

19) ARM 2 LOGIC POPPET ASSY (256)



101 Logic poppet
102 Poppet
103 Spring seat
104 Plug
106 Spring
107 Spring

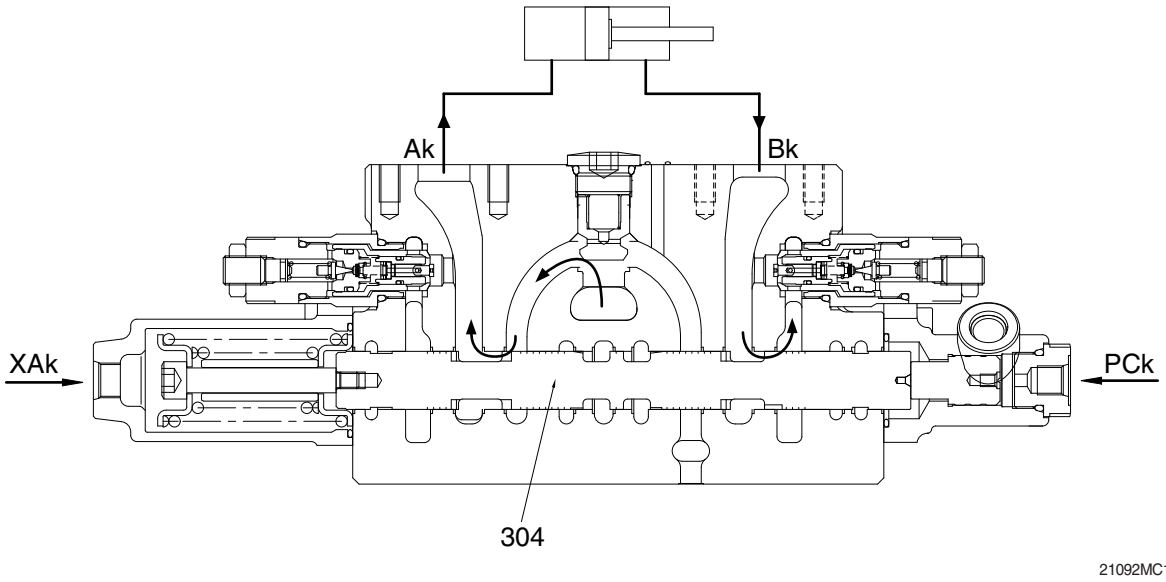
20) ARM REGENERATION CUT SUB ASSY (257)



211 Spool
212 Sleeve
231 Spring
232 Spring seat
253 Plug
265 O-ring
266 O-ring
267 O-ring
268 O-ring

(3) Bucket control

① Bucket in operation



During the bucket in operation, the pilot pressure enters through Port XAk and transfers the bucket spool (304) in the right direction. The pressurized oil entering through Port P2 passes through the main path (3) and flows through the bypass circuit (2), but the bypass circuit (2) is shut off due to transfer of the bucket spool (304). Therefore, the pressurized oil flows into the parallel circuit, pushes open the check valve (511), and flows through the U-shaped path to the bucket spool (304). Then, it flows through the periphery of the spool to Port Ak and is supplied to the bucket cylinder head side.

On the other hand, the return oil from the bucket cylinder rod side enters through Port Bk, passes around the periphery of the spool, and returns to the hydraulic oil tank through the tank port (R1).

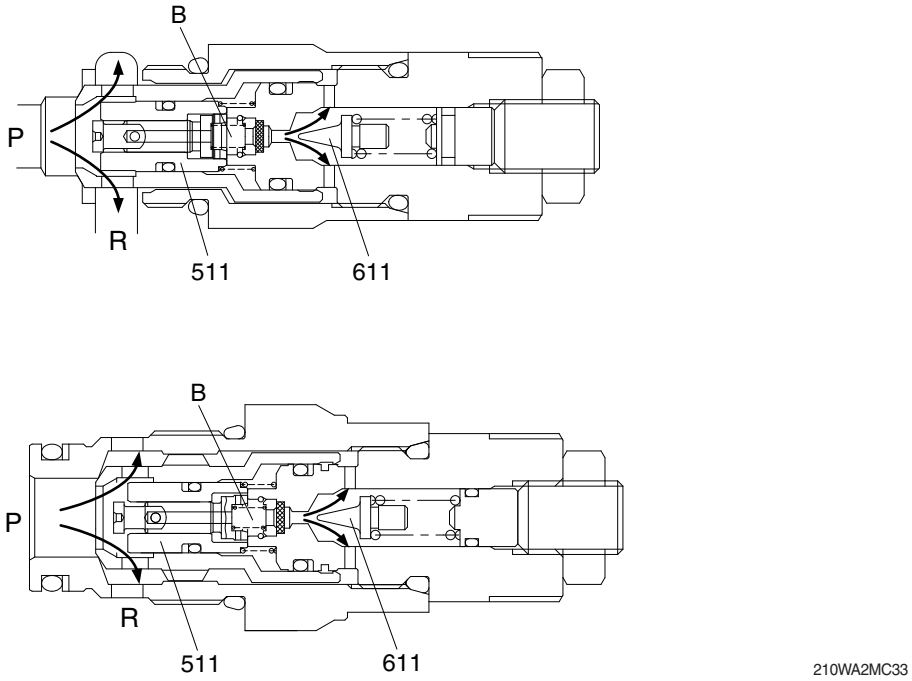
During both the boom up operation and bucket in operation, the pilot pressure enters through Port PCk and the bucket spool transfers in the half stroke not full stroke. Therefore, the most of pressurized oil entering through Port P2 flows to the boom 1 spool (303) than the bucket spool (304) to make the boom up operation most preferential.

② Bucket in confluence

During the bucket out operation, the pilot pressure enters also through Port XBp1 and transfers the bypass-cut spool.

The pressurized oil entering through Port P1 passes through the main path (1) and flows through the bypass circuit (2), but the bypass circuit (2) is shut off due to transfer of the bypass-cut spool (313). Therefore, the pressurized oil pushes open the check valve (514), and flows through inside path and the U-shaped path to the bucket spool (304).

c. Opening of the poppet (611) causes the pressure in Chamber B to fall and the plunger (511) to open. As the result the pressurized oil in the path (P) runs into the low pressure path (R) directly.

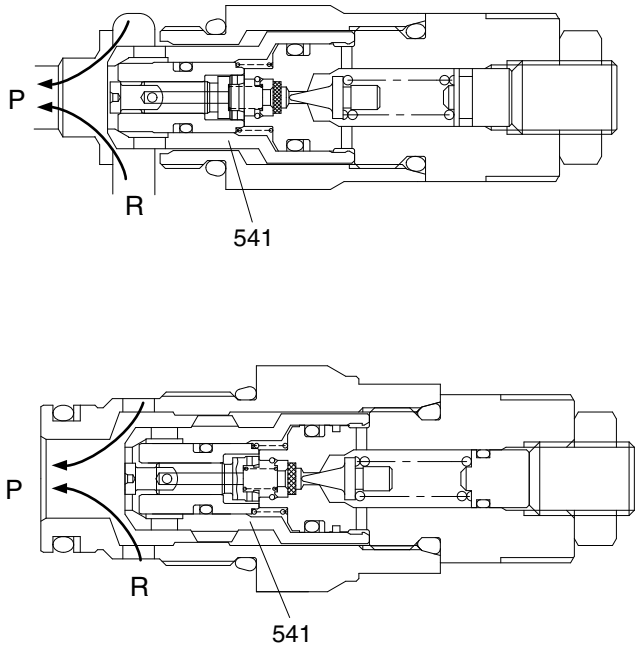


210WA2MC33

d. When the pressurized oil higher than pressure 25 kgf/cm^2 enters through the port PL, it pushes the piston (624) to change the relief set pressure of the spring (622) to the high pressure.

② **Function as Anti-Cavitation Check Valve**

When any negative pressure exists in the path (P), the oil is supplied through the path (R). When the pressure at (R) becomes higher than that in the path (P), the seat (541) moves in the right direction. Then, sufficient oil passes around the seat (541) from the path (R) to the path (P) and prevents cavitation.

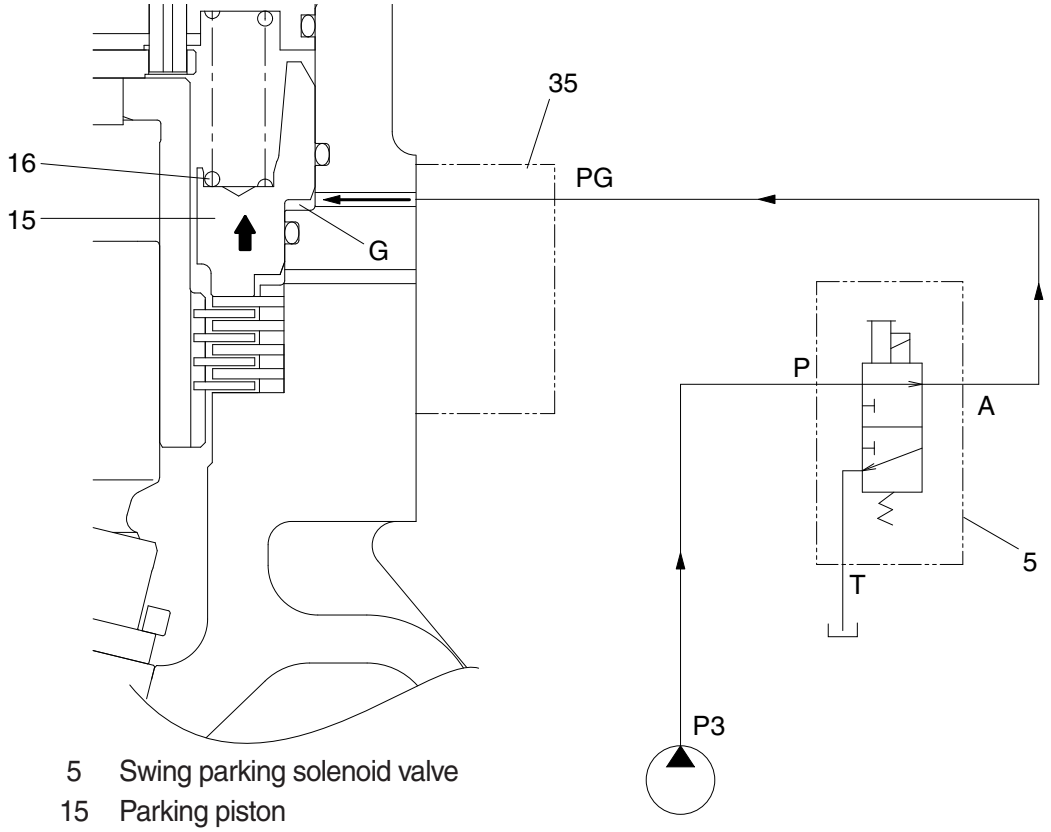


210WA2MC34

② Operating principle

a. When any of the swing, arm in, travel and boom up function is operated, the swing parking solenoid valve (5) is shifted to the swing position, so pilot pump charged oil (P3) goes to the chamber G through port PG.
This pressure is applied to move the brake piston (15) to the upward against the force of the brake spring (16). Thus, it releases the brake force.

b. Stop operation and a few second has been elapsed, the swing parking solenoid valve (5) is shifted to the swing parking position and swing brake works.



5 Swing parking solenoid valve
15 Parking piston
16 Brake spring
35 Port block assy

210WA2SM10

③ Electric control swing prarking system

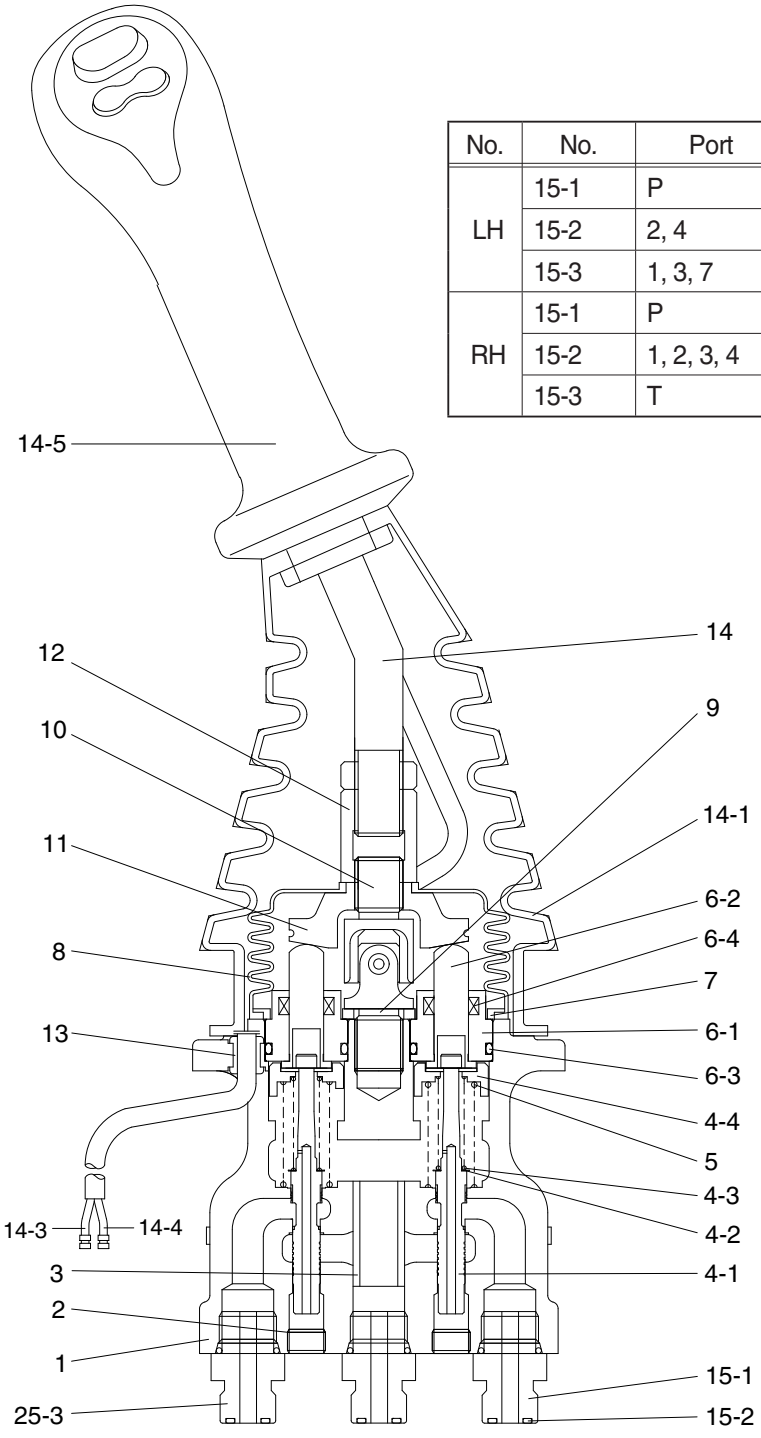
a. A safety is ensured by recognizing the swing operation and canceling the swing parking only under specific conditions by releasing parking electronically.

b. After receiving the RCV pressure, the MCU applies the parking release signal.

c. Depending on each RCV operation, there is a time difference between re-entry into swing parking.

Mode	Fine swing switch	RCV operation	Parking delay time
Work mode	ON or OFF (No condition)	Swing	5 sec
		Arm in	1 sec
	ON	Boom up	2 sec
		Travel	3 sec
	OFF	Boom up / Travel	Not applied

3) CROSS SECTION



No.	No.	Port
LH	15-1	P
	15-2	2, 4
	15-3	1, 3, 7
RH	15-1	P
	15-2	1, 2, 3, 4
	15-3	T

1 Case
2 Plug
3 Bushing
4-1 Spool
4-2 Shim
4-3 Spring
4-4 Spring seat
5 Spring
6-1 Plug
6-2 Push rod
6-3 O-ring
6-4 Rod seal
7 Spacer
8 Boot
9 Spacer
10 Joint Assy
11 Swash plate
12 Adjusting nut
13 Bushing
14-1 Boot
14-2 Spring pin
14-3 Housing
14-4 Housing
14-5 Handle
15-1 Filter
15-2 Connector
15-3 Connector

140WA2RL06

Item numbers are based on the type M6.

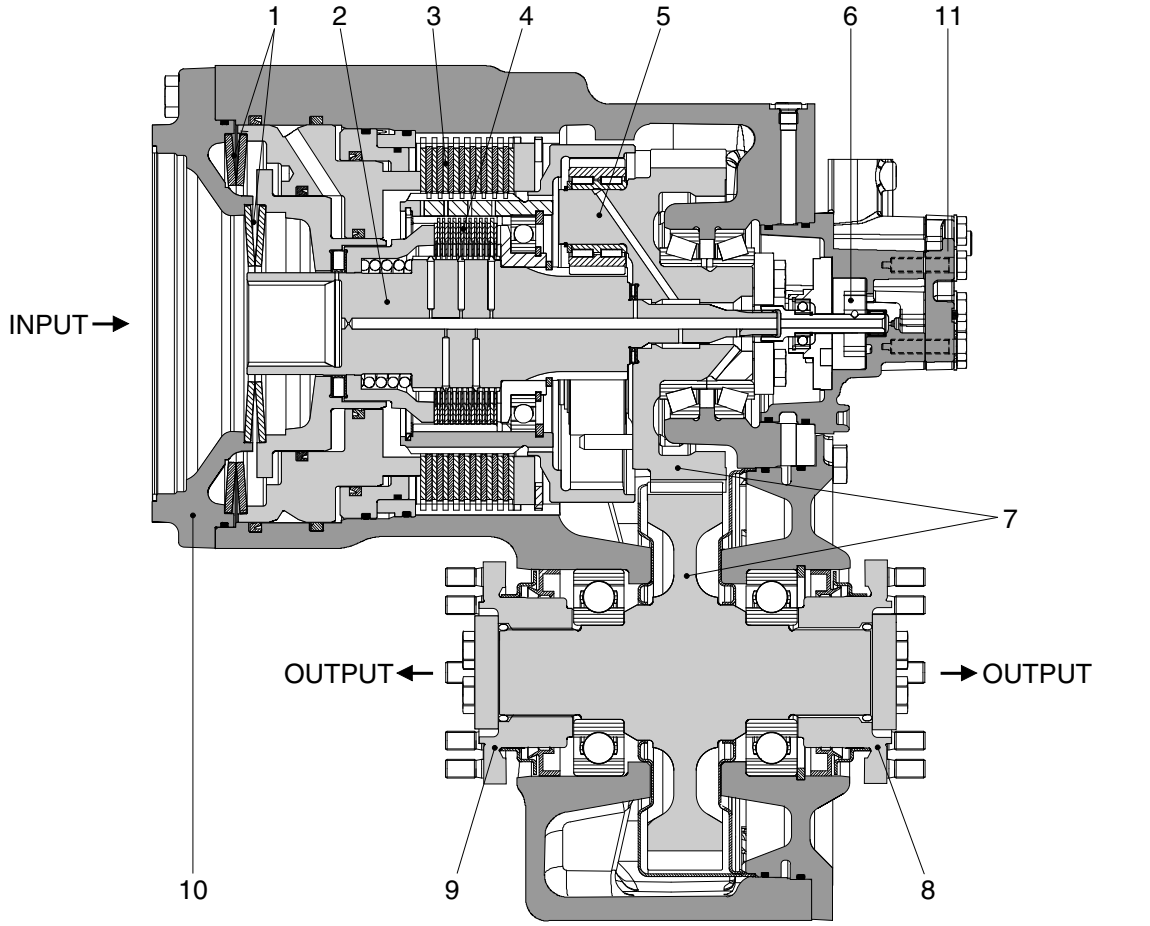
The construction of the pilot valve is shown in the attached cross section drawing. The casing has vertical holes in which reducing valves are assembled.

The pressure reducing section is composed of the spool (4-1), spring (4-3) for setting secondary pressure, return spring (5), spring seat (4-4) and shim (4-2). 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 (6-2) 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.

3. OPERATION OF TRANSMISSION

1) DESCRIPTION



1	Cup spring	5	Planetary drive	9	Output flange-Front axle
2	Input shaft	6	Lub oil pump	10	Travel motor attachment
3	Disk brake	7	Spur gear drive	11	Shift interlock
4	Disk clutch	8	Output flange-Rear axle		

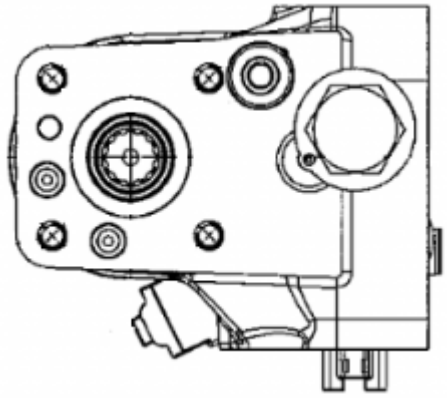
Coaxially-mounted variable displacement travel motor (10) with specific displacement 107 cm^3/rev.

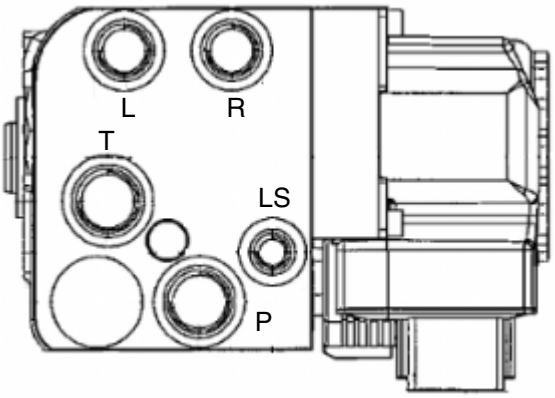
The 2-speed powershift transmission comprises a planetary drive (5), a 2 shaft spur gear drive (7) with output flanges to front and rear axle.

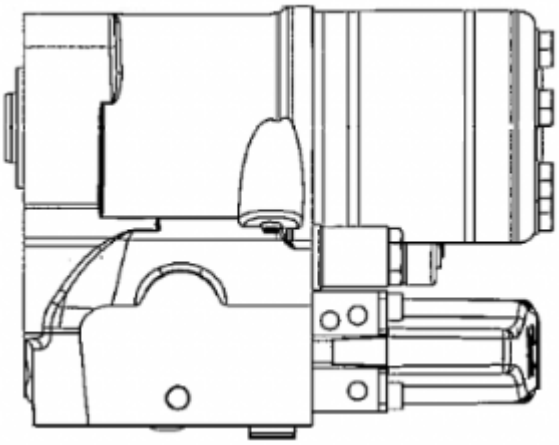
The powershift mechanism for the planet drive comprises a rotating multi-disk clutch (4) underneath a multi-disk brake (3) rigidly connected to the housing. Both are closed by spring pressure (2) and released hydraulically.

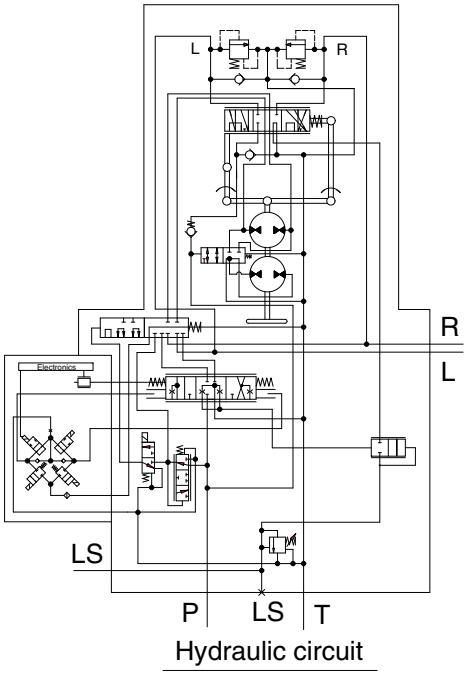
The shift interlock (11) prevents downshifts at high machine speeds and thus prevents over-rotation of the travel motor. If the low speed gear is selected while the high speed gear is engaged and input speed is above approx. 1000 rpm, the low speed gear shift is inhibited and only performed if input speed is below this limit. With higher viscosity oil (cold starting), the downshift is performed at a lower input speed. Upshifts are always possible.The speed-dependent interlock is effective in both directions. It does not prevent the possibility of over-rotation when the machine is coasting. For this, a drive brake valve should be fitted to the travel motor.

4) TYPE 4 (Joystick steering)







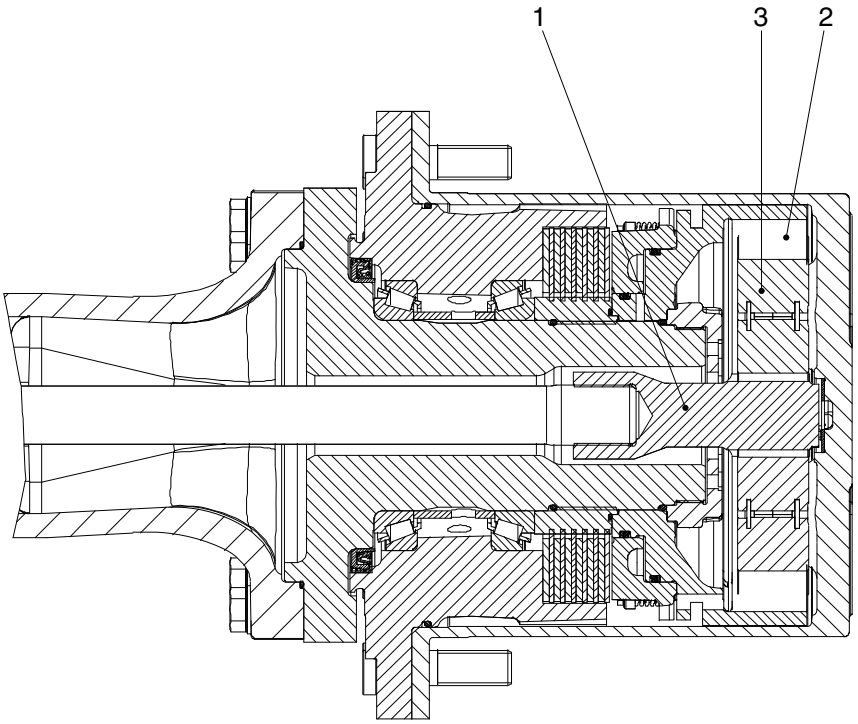


Hydraulic circuit

Port	Port name	Port size
L	Left port	M18x1.5
R	Right port	M18x1.5
T	Tank port	M22x1.5
P	Pump port	M22x1.5
LS	Load sensing port	M12x1.5

81K5-00040-E

2) REAR AXLE



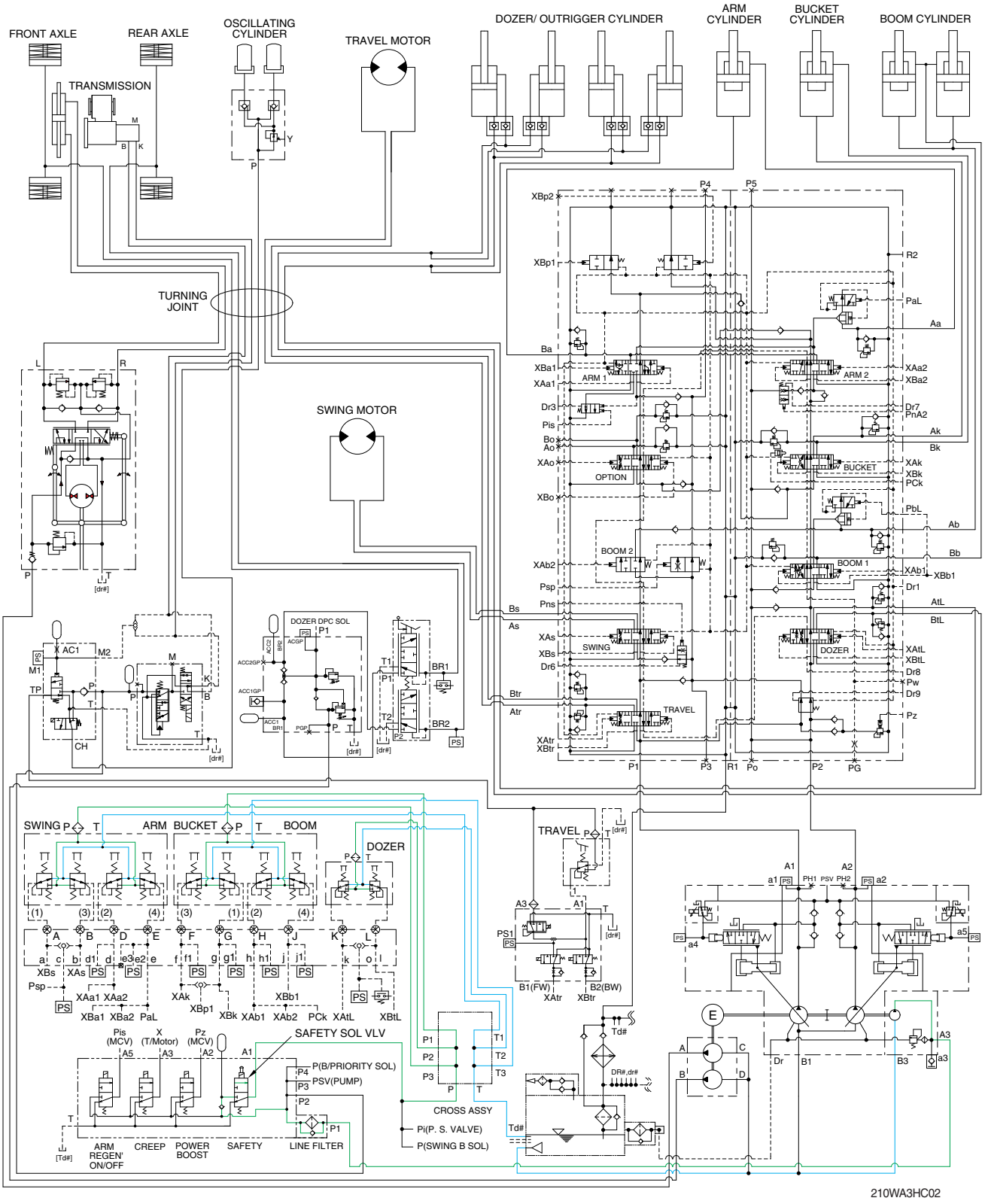
17W7A2AX05

1 Sun gear shaft 2 Planetary gear 3 Ring gear

(1) To gain a large drive force, the final drive uses a planetary gear system to reduce the speed and send drive force to the tires.

(2) The power transmitted from the differential through sun gear shaft (1) is transmitted to planetary gear (2). The planetary gear rotates around the inside of a fixed ring gear (3) and in this way transmits rotation at a reduced speed to the planetary carrier.
This power is then sent to the wheels which are installed to the planetary carriers.

1. SUCTION, DELIVERY AND RETURN CIRCUIT



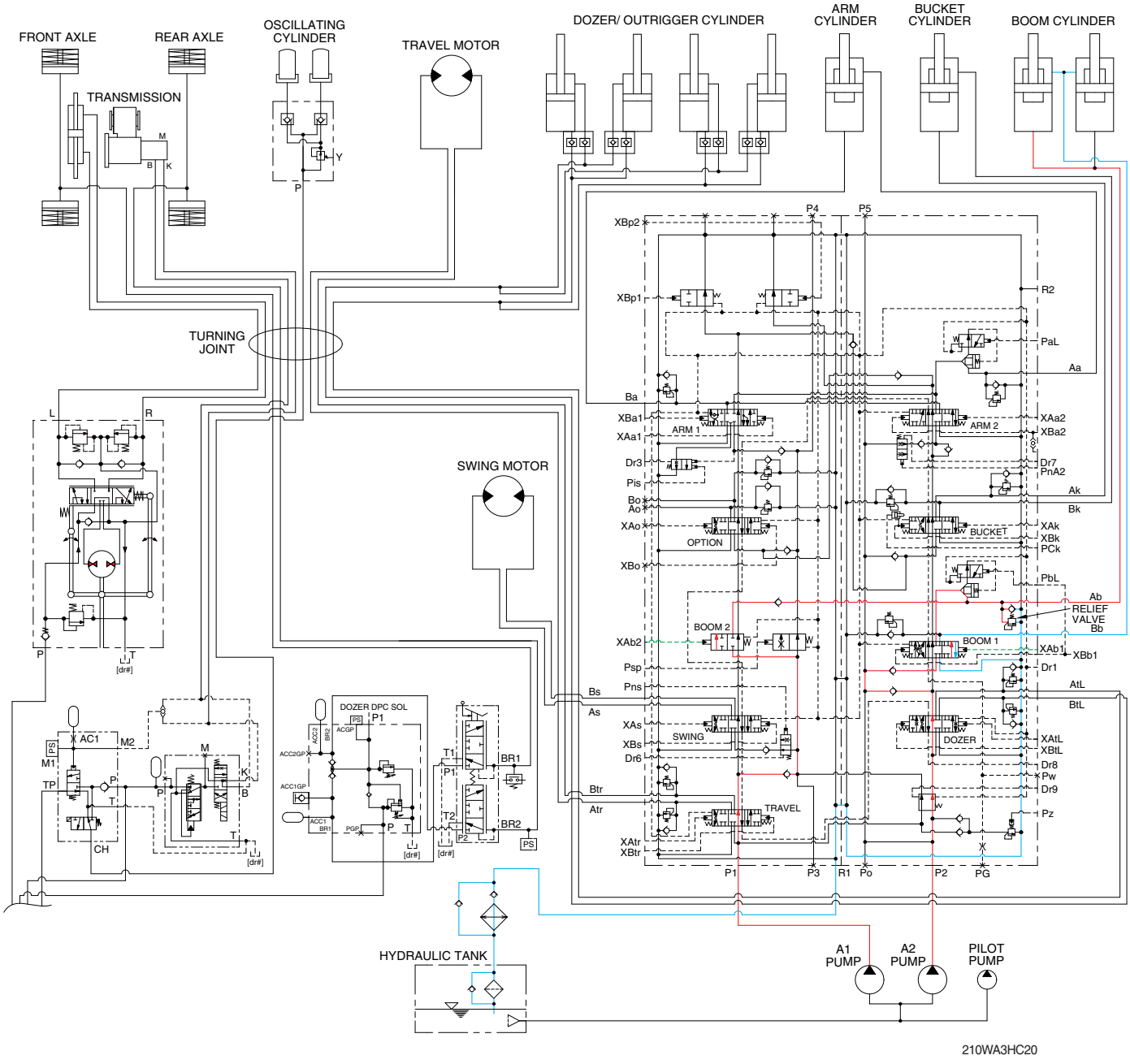
The pilot pump receives oil from the hydraulic tank. The discharged oil from the pilot pump flows to the safety solenoid valve through the line filter. The oil is filtered by the line filter. The pilot relief valve is provided in the pilot pump for limiting the pilot circuit pressure.

The oil filtered by line filter flows remote control valve through safety solenoid valve and cross assy.

The return oil from remote control valve flows into the hydraulic tank through the cross assy.

GROUP 4 SINGLE OPERATION

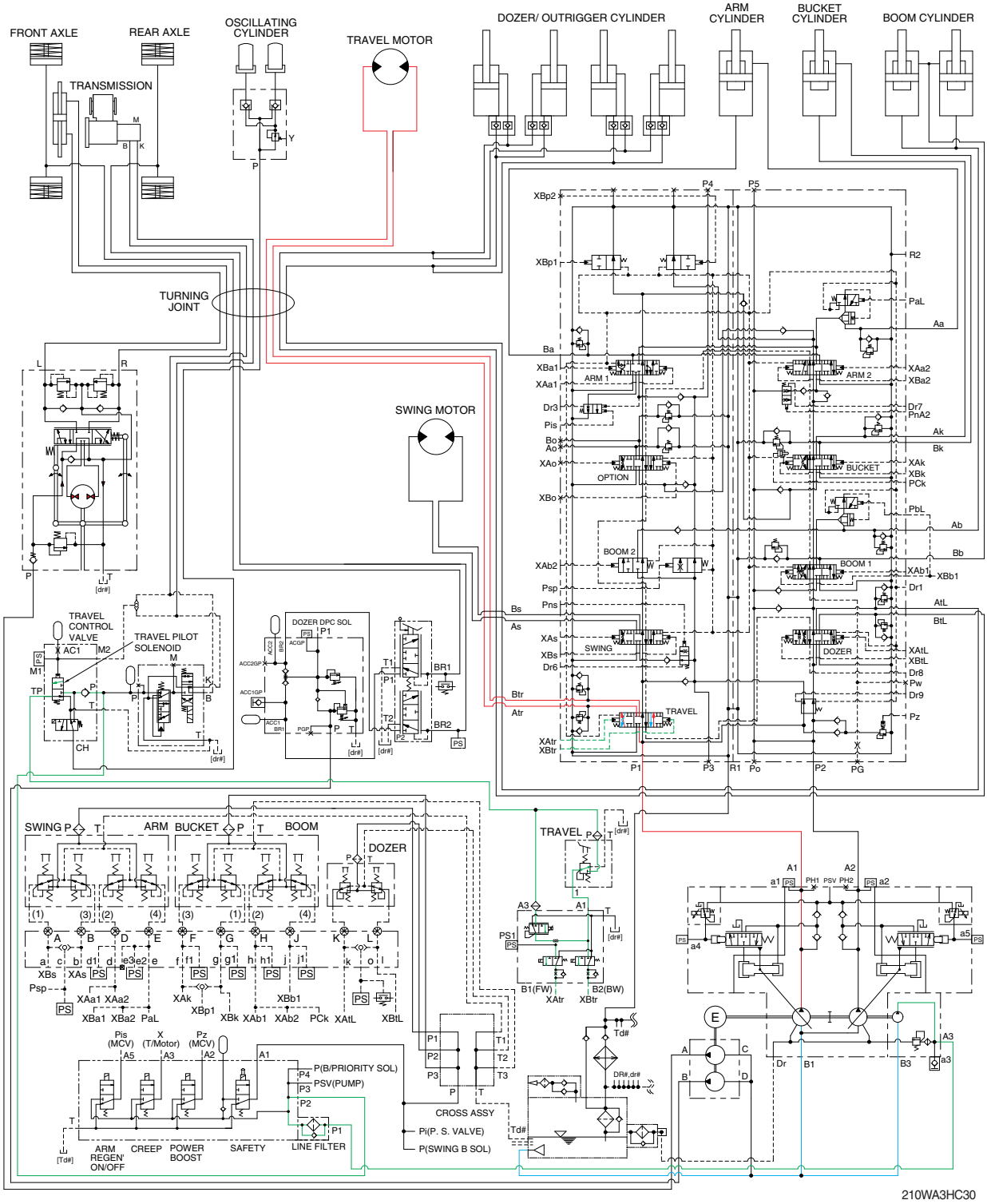
1. BOOM UP OPERATION



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 (XAb1, XAb2) from the remote control valve.

The oil from the A1 and A2 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 1 spool in the main control valve. When this happens, the boom goes up. The excessive pressure in the boom cylinder head side 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 head side of the boom cylinder is closed by the boom holding valve. This prevents the hydraulic drift of boom cylinder.

10. TRAVEL FORWARD AND REVERSE OPERATION



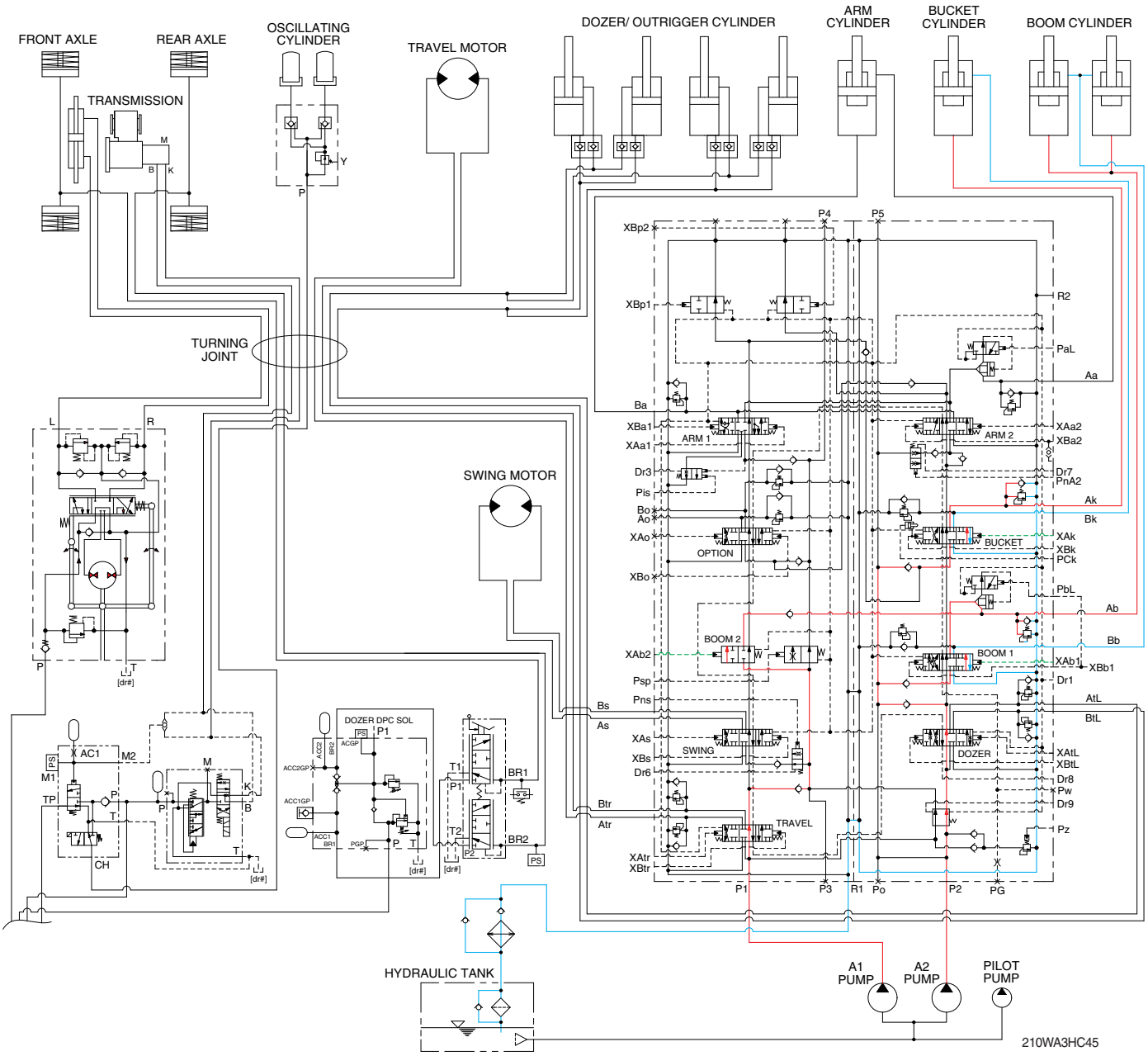
210WA3HC30

When the FNR switch of the RH RCV lever is placed in forward or reverse position, the travel spool in the main control valve is moved to the forward or reverse position by the pilot oil pressure (XAtr, XBtr) from pilot pump through the travel pilot solenoid of travel control valve. The oil from the A1 pump flows into the main control valve and then goes to the travel motor. At the same time, the oil returned from the travel motor returns to the hydraulic oil tank through the turning joint and travel spool in the main control valve.

When this happens, the machine moves forward or reverse.

The cavitation which will happen to the travel motor is prevented by the make-up valve in the main control valve.

6. COMBINED BOOM UP AND BUCKET IN OPERATION



When the boom up and bucket in functions are operated simultaneously, the boom spools and bucket spool in the main control valve are moved to the functional position by the pilot oil pressure (XAb1, XAb2, XAk) from the remote control valve.

The oil from the A2 pump flows into the boom cylinders through the boom 2 spool in the left control valve.

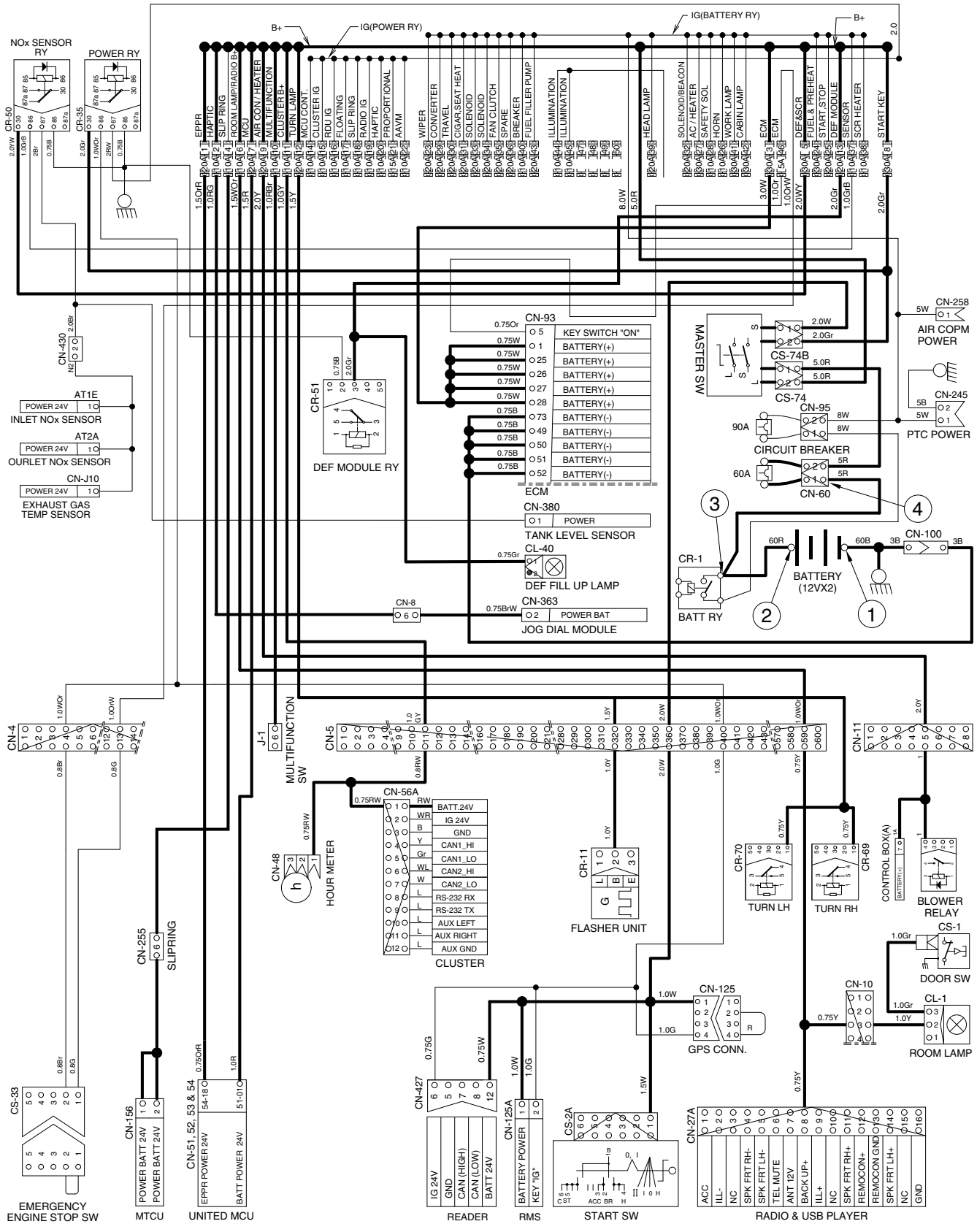
The oil from the A1 pump flows into the boom cylinders and bucket cylinder through the boom 1 spool and bucket spool and the parallel and confluence oil passage in the right control valve.

During the boom up and bucket in functions are operated simultaneously, the pilot pressure flows into the bucket spool limit piston through port PCk. This transfers the bucket spool in the half stroke not full stroke.

Therefore, the most of pressurized oil from the A1 pump flows into boom 1 spool than the bucket spool to make the boom up operation more preferential. This is called the boom up operation preference function.

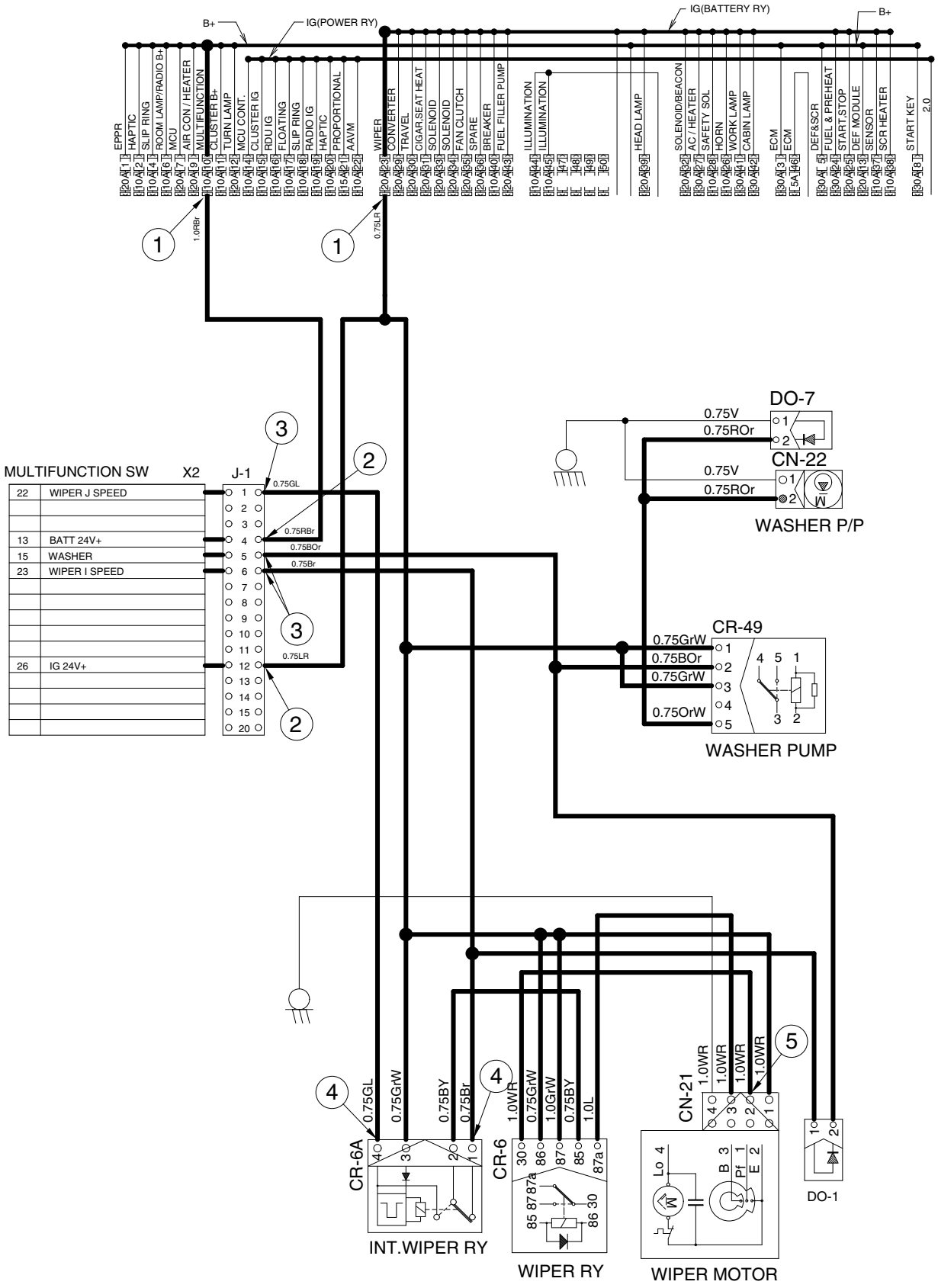
The boom up and bucket in are operated.

POWER CIRCUIT

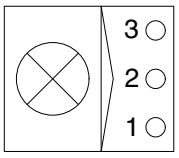
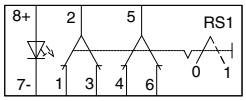
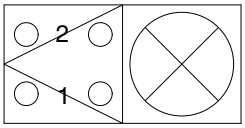
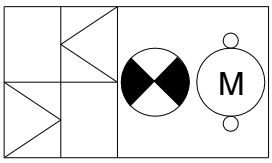
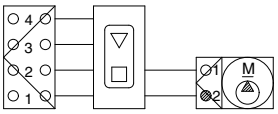
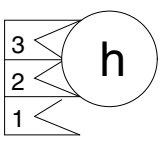


210WA4EL03

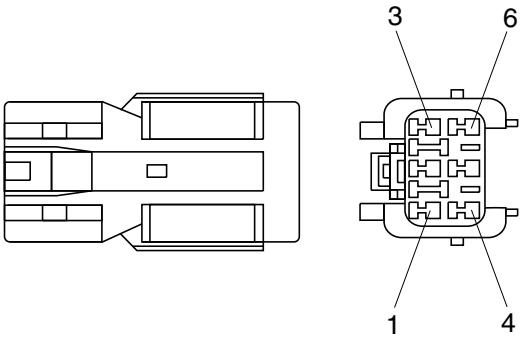
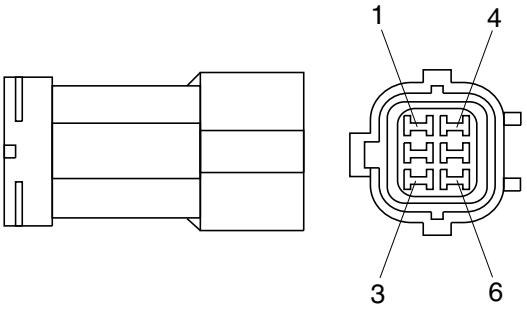
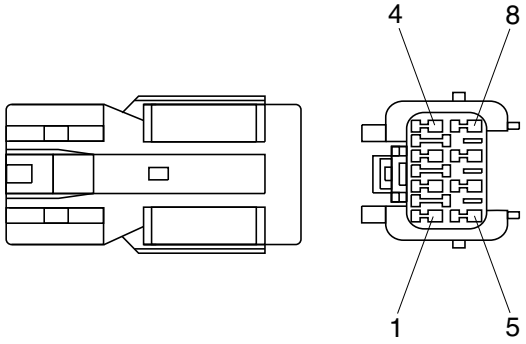
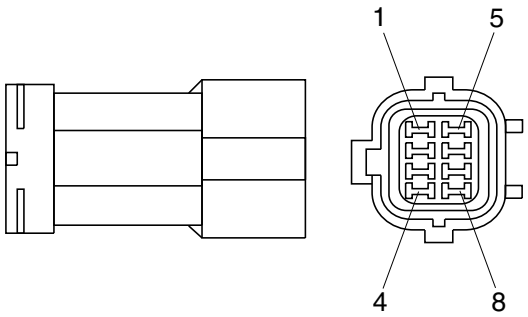
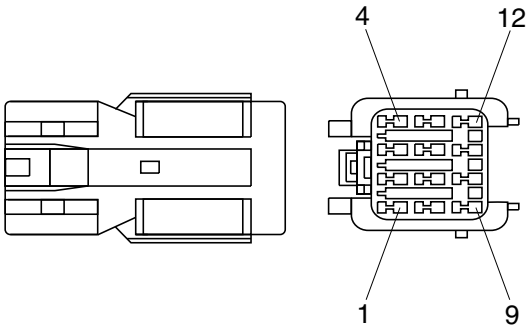
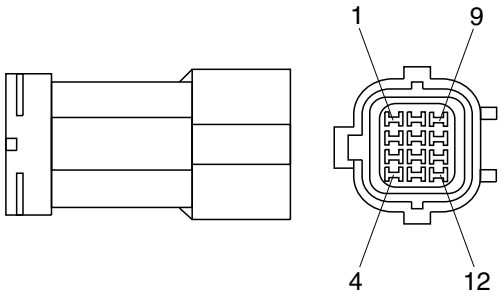
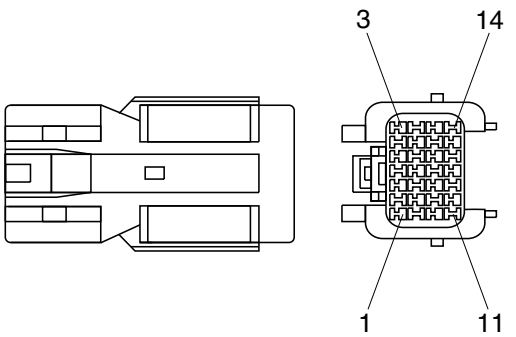
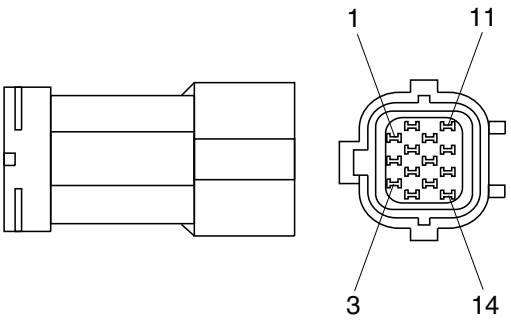
WIPER AND WASHER CIRCUIT



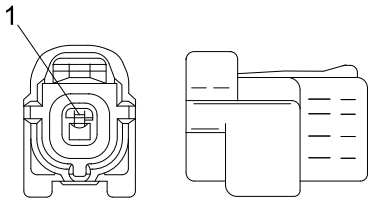
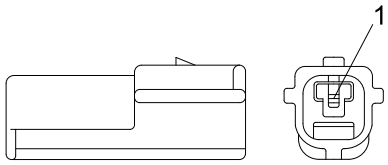
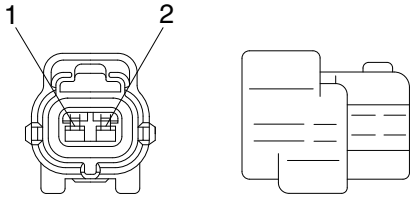
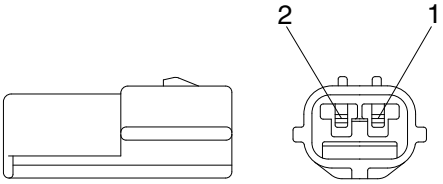
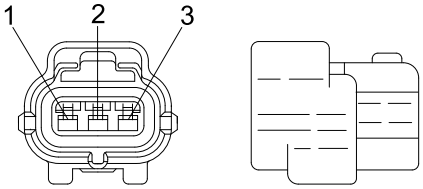
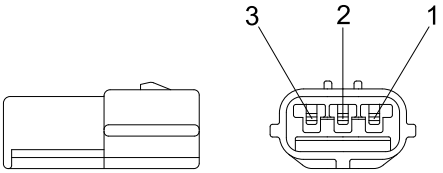
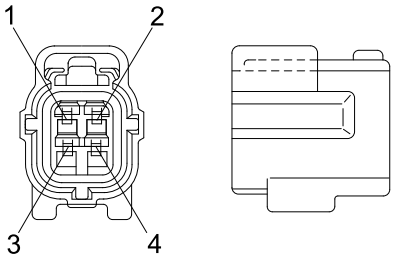
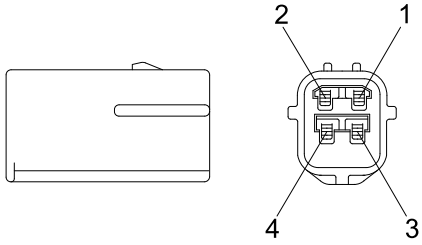
210WA4EL08

Part name	Symbol	Specifications	Check
Room lamp	 CL-1	24V 10W	※ Check disconnection Normal : 1.0Ω ON : 0Ω(For terminal 1-2) ∞Ω(For terminal 1-3) OFF : ∞Ω(For terminal 1-2) 0Ω(For terminal 1-3)
Hazard switch		24V 1.5A	※ Check contact Normal ON : 0Ω(For terminal 2-3, 5-6) OFF : ∞Ω(For terminal 2-3, 5-6)
Work lamp, Cab lamp, Number plate lamp	 CL-5 CL-6 CL-8 CL-9 CL-10 CL-21 CL-24	24V 65W (H3 Type)	※ Check disconnection Normal : 1.2Ω
Beacon lamp	 CL-7	21V 70W (H1 Type)	※ Check disconnection Normal : A few Ω
Fuel filler pump		24V 10A 35 ℓ /min	※ Check resistance Normal : 1.0Ω
Hour meter	 CN-48	16~32V	※ Check operation Supply power(24V) to terminal No.2 and connect terminal No.1 and ground

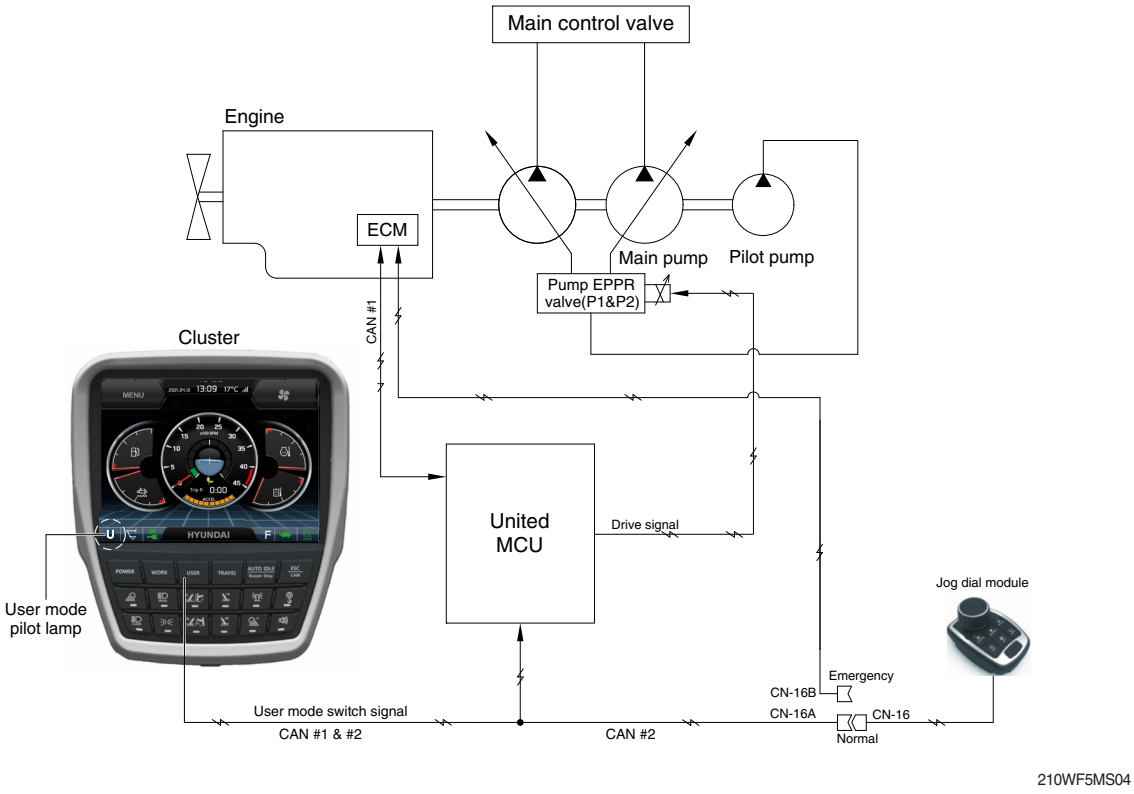
Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-54	TE	34	United MCU	4-1437290-0	-
CN-56A	AMP	12	Cluster	-	174663-2
CN-56B	AMP	8	Cluster	-	174984-2
CN-56C	AMP	8	Cluster	-	174984-2
CN-60	YAZAKI	2	Circuit breaker	-	7222-4220-30
CN-61	DEUTSCH	4	Fuel filler pump	DT06-4S-EP06	DT04-4P
CN-68	DEUTSCH	2	Safety solenoid	DT06-2S-EP06	-
CN-69	DEUTSCH	2	Ram lock solenoid	DT06-2S-EP06	-
CN-70	DEUTSCH	2	Travel high solenoid	DT06-2S-EP06	-
CN-74	RING-TERM	1	Alternator "L" terminal	MG820-105000	-
CN-74	RING-TERM	1	Alternator "B+" terminal	MG820-108000	-
CN-74	RING-TERM	1	Alternator "G" terminal	MG820-306000	-
CN-74	RING-TERM	1	Alternator "EG" terminal	MG820-312008	-
CN-80	RING-TERM	-	Glow plug	S820-406001	-
CN-81	DEUTSCH	2	Travel buzzer solenoid	DT06-2S-EP06	-
CN-88	DEUTSCH	2	Power max solenoid	DT06-2S-EP06	-
CN-93	DELPHI	96	To ECU	13964577	-
CN-95	YAZAKI	2	Circuit breaker	-	722-4220-30
CN-96	DELPHI	2	Fuel warmer	1530 0027	-
CN-100	KET	1	Battery earth	MG640994-5	-
CN-113	KET	2	Quick clamp buzzer	MG651205-5	-
CN-122	DEUTSCH	2	Forward solenoid	DT06-2S-EP06	-
CN-123	DEUTSCH	2	Reverse solenoid	DT06-2S-EP06	-
CN-125	Econoseal J	4	GPS connector	S816-004002	S816-104002
CN-125A	DEUTSCH	12	GPS	DT06-12S-P021	DT04-12PA-P021
CN-125B	DEUTSCH	8	RMS	DT06-8S	DT04-8P
CN-126	AMP	10	Service tool	S816-010002	S816-110002
CN-126A	DEUTSCH	4	RMS service tool	DT06-4S	DT04-4P
CN-131	-	6	I/conn (Stop lamp harness-Frame harness)	S816-006002	S816-106002
CN-132	DEUTSCH	2	Safety solenoid	DT06-2S-EP06	-
CN-135	DEUTSCH	2	Arm regen solenoid	DT06-2S-EP06	-
CN-138	FASTEN	3	DC/DC Converter	S810-003202	-
CN-139	FASTEN	2	12V socket	172434-2	-
CN-140	DEUTSCH	2	Quick clamp solenoid	DT06-2S-EP06	DT04-2P-E005
CN-156	DEUTSCH	60	MTCU	DRC26-40SA	-
CN-156	AMP	2	Air seat	-	S822-114002
CN-157	AMP	1	Antena power	S822-014002	-
CN-168	DEUTSCH	12	PVED-CLS	DT06-12S	-

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

18) ECONOSEAL J TYPE CONNECTORS

No. of pin	Receptacle connector (female)	Plug connector (male)
1	 S816-001002	 S816-101002
2	 S816-002002	 S816-102002
3	 S816-003002	 S816-103002
4	 S816-004002	 S816-104002

3. USER MODE SELECTION SYSTEM



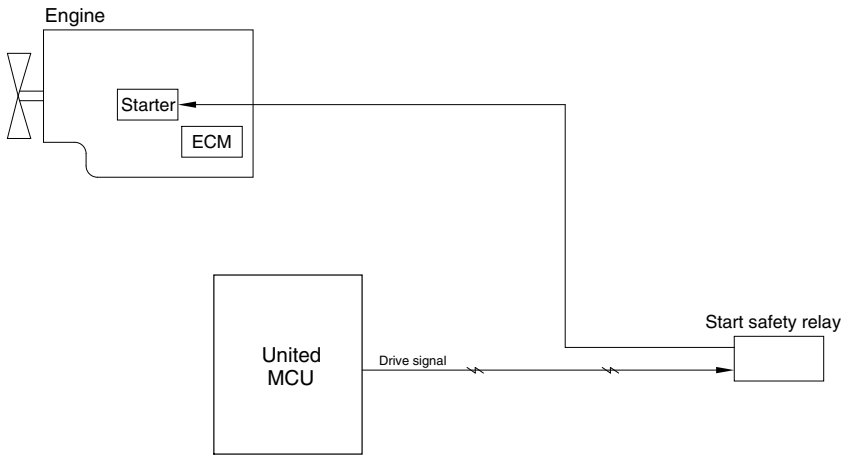
1) High idle rpm, auto idle rpm and EPPR pressure can be adjusted and memorized in the U-mode.

2) LCD segment vs parameter setting

Step (▮)	Engine speed (rpm)	Idle speed (rpm)	Power shift
1	1400	750	10%
2	1450	800	20%
3	1500	850	30%
4	1550	900	40%
5	1600	950	50%
6	1650	1000 (auto decel)	60%
7	1700	1050	70%
8	1750	1100	80%
9	1800	1150	85%
10	1900	1200	90%

※ Refer to page 5-95.

GROUP 11 ANTI-RESTART SYSTEM



210WA5MS12

1. ANTI-RESTART FUNCTION

After a few seconds from the engine starts to run, MCU turns off the start safety relay to protect the starter from inadvertent restarting.

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
167	4	(Detection) (When Travel Speed Solenoid is Off) 10 seconds continuous, Travel Speed Solenoid drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Travel Speed Solenoid is Off) 3 seconds continuous, Travel Speed Solenoid drive unit Measurement Voltage > 3.0V		●	
		(When Parking mode is not) (Detection) (When Travel High Speed Solenoid is Off) 10 seconds continuous, Travel Speed Solenoid drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Travel Speed Solenoid is Off) 3 seconds continuous, Travel Speed Solenoid drive unit Measurement Voltage > 3.0V			●
	6	(Detection) (When Travel High Speed Solenoid is On) 10 seconds continuous, Travel Speed Solenoid drive current > 4.5 A (Cancellation) (When Travel Speed Solenoid is On) 3 seconds continuous, Travel Speed Solenoid drive current ≤ 4.5 A	●		
	(Results / Symptoms) 1. Control Function – driving in 1/2 transmission operation failure (Checking list) 1. CN-70 (#1) – CN-52 (#05) Checking Open/Short 2. CN-70 (#2) – GND Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General C : Crawler Type W : Wheel Type

DTC		Diagnostic Criteria	Application		
HCESPN	FMI		G	C	W
525	4	(Detection) (When Ram Lock Solenoid is Off) 10 seconds continuous, Ram Lock Solenoid drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Ram Lock Solenoid is Off) 3 seconds continuous, Ram Lock Solenoid drive unit Measurement Voltage > 3.0V			●
	6	(Detection) (When Ram Lock Solenoid is On) 10 seconds continuous, Ram Lock Solenoid drive current > 6.5 A (Cancellation) (When Ram Lock Solenoid is On) 3 seconds continuous, Ram Lock Solenoid drive current ≤ 6.5 A			●
	(Results / Symptoms) 1. Control Function – Ram lock control operation failure (Checking list) 1. CN-69 (#1) – CN-53 (#12) Checking Open/Short 2. CN-69 (#2) – Fuse box (#33) Checking Open/Short				
527 (N.A)	4	(Detection) (When Creep Solenoid is Off) 10 seconds continuous, Creep Solenoid drive unit Measurement Voltage ≤ 3.0V (Cancellation) (When Creep Solenoid is Off) 3 seconds continuous, Creep Solenoid drive unit Measurement Voltage > 3.0V			●
	6	(Detection) (When Creep Solenoid is On) 10 seconds continuous, Creep Solenoid drive current > 6.5 A (Cancellation) (When Creep Solenoid is On) 3 seconds continuous, Creep Solenoid drive current ≤ 6.5 A			●
	(Results / Symptoms) 1. Control Function – Creep mode operation failure (Checking list) 1. CN-206 (#1) – CN-52 (#17) Checking Open/Short 2. CN-206 (#2) – Fuse box (#30) Checking Open/Short				

※ Some error codes are not applied to this machine.

G : General C : Crawler Type W : Wheel Type

Fault code J1939 SPN J1939 FMI	Item	Description
731 723 7	Engine speed / position camshaft and crankshaft misalignment	Mechanical system not responding or out of adjustment
741 1176 3	Turbocharger 1 compressor intake pressure circuit	Voltage above normal, or shorted to high source
742 1176 4	Turbocharger 1 compressor intake pressure circuit	Voltage below normal, or shorted to low source
743 1176 2	Turbocharger 1 compressor intake pressure	Data erratic, intermittent or incorrect
769 597 3	Brake switch circuit	Voltage above normal, or shorted to high source
771 597 4	Brake switch circuit	Voltage below normal, or shorted to low source
778 723 2	Engine camshaft speed / position sensor	Data erratic, intermittent or incorrect
1117 3597 2	Power supply lost with ignition on	Data erratic, intermittent or incorrect
1239 2623 3	Accelerator pedal or lever position sensor 2 circuit	Voltage above normal, or shorted to high source
1241 2623 4	Accelerator pedal or lever position sensor 2 circuit	Voltage below normal, or shorted to low source
1242 91 2	Accelerator pedal or lever position sensor 1	Data erratic, intermittent or incorrect
1358 91 3	Accelerator pedal or lever position sensor 1 circuit	Voltage above normal, or shorted to high source
1359 91 4	Accelerator pedal or lever position sensor 1 circuit	Voltage below normal, or shorted to low source
1515 91 19	SAE J1939 multiplexed accelerator pedal or lever sensor system	Received network data in error
1539 1387 3	Auxiliary pressure sensor input 1 circuit	Voltage above normal, or shorted to high source
1621 1387 4	Auxiliary pressure sensor input 1 circuit	Voltage below normal, or shorted to low source

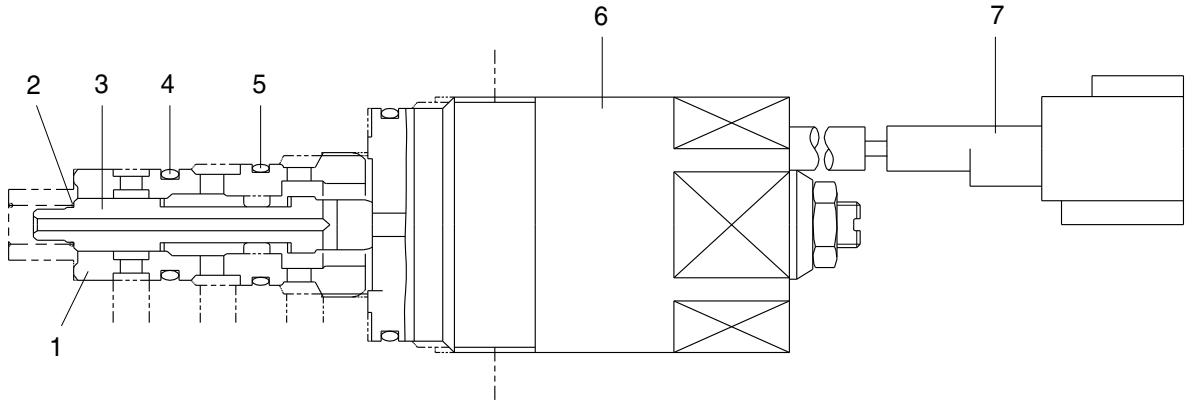
※ Some fault codes are not applied to this machine.

Fault code J1939 SPN J1939 FMI	Item	Description
4584 3936 14	Aftertreatment diesel particulate filter system	Special instructions
4585 4792 14	Aftertreatment 1 SCR catalyst system	Special instructions
4677 1761 9	SAE J1939 multiplexing pgn timeout error	Abnormal update rate
4724 702 5	Auxiliary input/output 2 circuit	Current below normal or open circuit
4725 702 6	Auxiliary input/output 2 circuit	Current above normal or grounded circuit
4731 3031 13	Aftertreatment 1 diesel exhaust fluid tank temperature sensor	Out of calibration
4734 701 14	Auxiliary input/output 1	Special instructions
4737 3031 11	Aftertreatment 1 diesel exhaust fluid tank temperature	Root cause not known
4739 1761 11	Aftertreatment 1 diesel exhaust fluid tank level sensor	Root cause not known
4747 3217 20	Aftertreatment intake oxygen sensor	Data not rational - drifted high
4748 3217 21	Aftertreatment intake oxygen sensor	Data not rational - drifted low
4749 3227 20	Aftertreatment outlet oxygen	Data not rational - drifted high
4751 3227 21	Aftertreatment outlet oxygen	Data not rational - drifted low
4768 3521 11	Aftertreatment 1 diesel exhaust fluid property	Root cause not known
4769 1761 10	Aftertreatment 1 diesel exhaust fluid tank level sensor	Abnormal rate of change
4842 3364 15	Aftertreatment diesel exhaust fluid quality	Data valid but above normal operating range - Least severe level

※ Some fault codes are not applied to this machine.

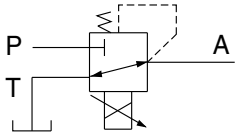
3) OPERATING PRINCIPLE (pump EPPR valve)

(1) Structure



5-22(1)

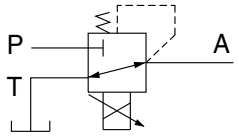
1	Sleeve	4	O-ring	6	Solenoid valve
2	Spring	5	O-ring	7	Connector
3	Spool				

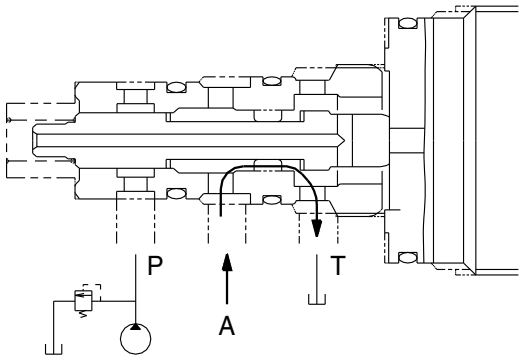


P Pilot oil supply line (pilot pressure)
T Return to tank
A Secondary pressure to flow regulator at main pump

(2) Neutral

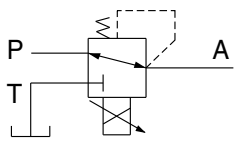
Pressure line is blocked and A oil returns to tank.

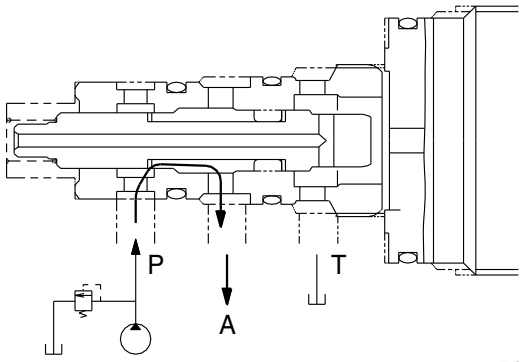




(3) Operating

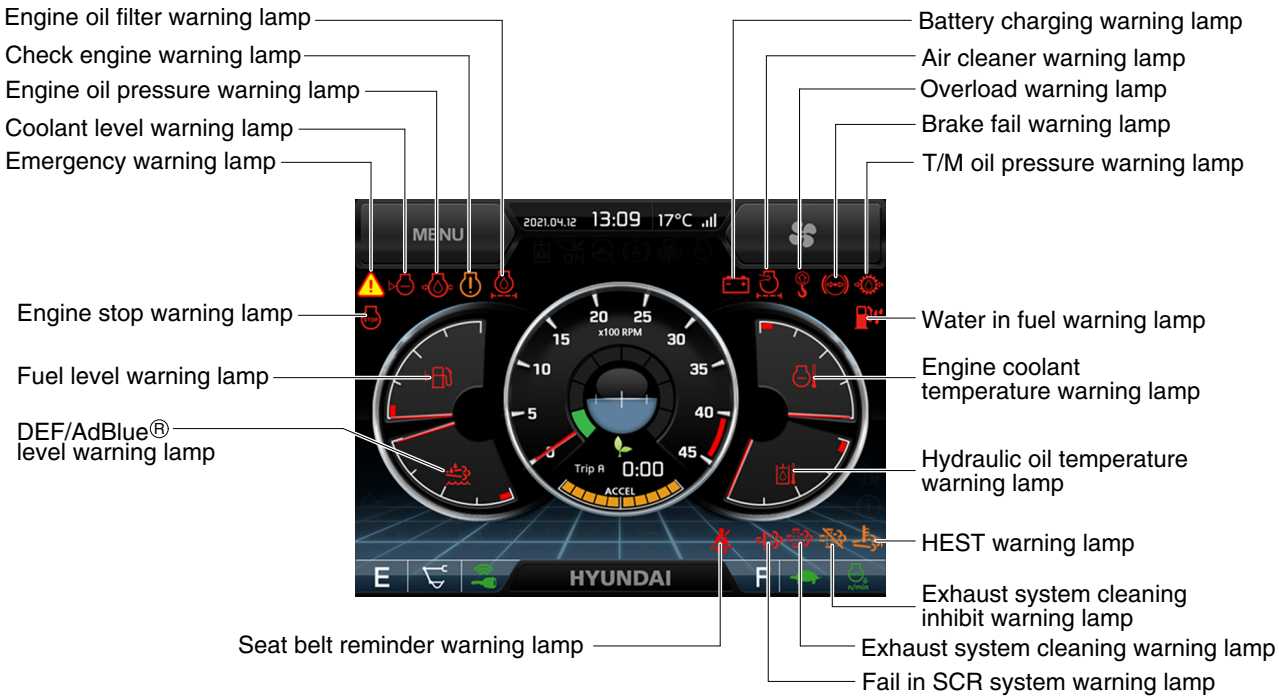
Secondary pressure enters into A.





5-22(2)

5) WARNING LAMPS



140WA3CD20

※ **Warning lamps and buzzer**

Warnings	When error happened	Lamps and buzzer
All warning lamps except below	Warning lamp pops up on the center of the LCD and the buzzer sounds	· The pop-up warning lamp moves to the original position, blinks and the buzzer stops when; - the buzzer stop switch AUTO IDLE Buzzer Stop is pushed - the knob of the jog dial module is pushed - the lamp of the LCD is touched
	Warning lamp pops up on the center of the LCD and the buzzer sounds	· The pop-up warning lamp moves to the original position, lights up or blinks and the buzzer stops when; - the buzzer stop switch AUTO IDLE Buzzer Stop is pushed - the knob of the jog dial module is pushed - the lamp of the LCD is touched **※ Refer to page 5-80 for details.**
	Warning lamp pops up on the center of the LCD and the buzzer sounds	· The pop-up warning lamp moves to the original position, lights up and the buzzer stops after 2 seconds elapses.
	Warning lamp pops up on the center of the LCD and the buzzer sounds	· The pop-up warning lamp moves to the original position, blinks and the buzzer stops after 2 seconds elapses.
	Warning lamp pops up on the center of the LCD and the buzzer sounds	· Cluster displays this pop-up when it has communication error with MCU. · If communication with MCU become normal state, it will disappear automatically.
	Warning lamp pops up on the center of the LCD and the buzzer sounds	**※ Refer to page 5-76 for details.**
	Warning lamp lights up and the buzzer sounds	**※ Refer to page 5-80 for details.**

※ **Refer to page 5-90 for the buzzer stop switch AUTO IDLE Buzzer Stop and the operator's manual page 3-77 for the jog dial module.**

(7) Maintenance pilot lamp

300A3CD35

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.

※ **Refer to page 5-102.**

(8) RMCU signal strength pilot lamp (mobile only)

220A3CD200

① This lamp indicates RMCU signal strength as below.

- : Searching
- : Bad
- : Normal
- : Good
- : Excellent

⑼ Smart key pilot lamp (opt)

300A3CD36A

① This lamp lights up when the engine is started by the start button.

② This lamp is red when the a authentication fails, it will be green when it authentication is successful.

※ **Refer to the page 5-103.**

8) MAIN MENU

※ You can select or set the menu by the jog dial module or touch screen.
On the operation screen, tap MENU to access the main menu screen.
On the sub menu screen, you can tap the menu bar to access functions or applications.

· Operation screen

140WA3CD50

※ Please refer to the jog dial module, the operator's manual page 3-77 for selection and change of menu and input value.

(1) Structure

No	Main menu	Sub menu	Description
1	 Mode 290F3CD103	Work tool U mode power Combination speed setting Auto power boost IPC mode Auto engine shutdown Initial mode Emergency mode	Breaker, Crusher, Not installed User mode only Load sensitivity, Trucking balance, Boom/Arm balance, Arm speed Enable, Disable Speed mode, Balance mode, Efficiency mode One time, Always, Disable Key on initial mode / initial work mode, Accel initial mode / step Switch function
2	 Monitoring 290F3CD104	Active fault Logged fault Delete logged fault Monitoring	MCU, Engine ECM, FATC, AAVM (option) MCU, Engine ECM, FATC, AAVM (option) All logged fault delete, Initialization canceled Machine information, Switch status, Output status,
3	 Management 290F3CD105	Fuel rate information Maintenance information Machine security Machine information Contact Service menu Clinometer Update	General record, Hourly, Daily, Mode record Replacement, Change interval oils and filters ESL mode setting, Password change Model, MCU, Monitor, jog dial module, switch controller, RMCU, Relay drive unit, FATC, AAVM (option) A/S phone number, A/S phone number change Power shift, Operating hour, Breaker mode pump acting, EPPR current level, Overload pressure, Optional piping pressure removal, Fine swing Clinometer setting Cluster, ETC device
4	 Display 290F3CD106	Display item Clock Brightness Unit setup Language selection Screen type	Engine speed, Tripmeter A, Tripmeter B, Tripmeter C Clock Manual, Auto Temperature, Pressure, Flow, Distance, Date format Korean, English, ETC A type, B type
5	 Utilities 290F3CD107	Tripmeter Camera Auto idle time setting	3 kinds (A, B, C) Camera setting, Auto mode (travel) Time setting

④ Machine security

300A3CD90A

300A3CD91A

300A3CD92A

· **ESL mode setting**

- ESL : Engine Starting Limit
- ESL mode is desingned to be a theft deterrent or will prevent the unauthorized operation of the machine.
- When you Enable the ESL mode, the password will be required when the starting switch is turned to the on position.
- **Machine security**

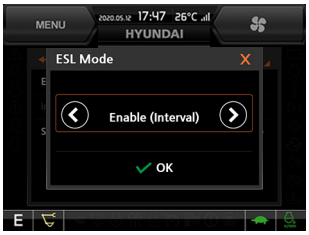
  Disable : ESL function is disabled and password is not required to start engine.

  Enable (always) : The password is required whenever the operator starts engine.
- **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 4 hours.

※ **Default password : 00000 + ✔**

※ **Password length : (5~10 digits) + ✔**

- **Smart key** (option) : Refer to next page.



300A3CD93A

300A3CD94A

· **Password change**

- The password is 5~10 digits.

300A3CD95A

300A3CD96A

300A3CD91A

Enter the current password

300A3CD99A

Enter the new password

300A3CD98A

Enter the new password again

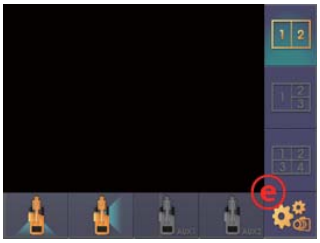
※ **Before first use, please set user password and owner password in advance for machine security.**

- **Split-view camera order setting**

· Touch ⓔ (camera setting) button to set split-view camera order.

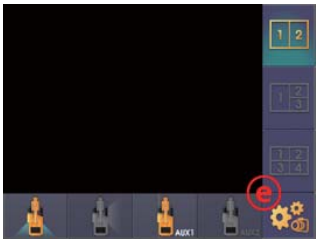
140WA3CD180K

Camera setting



140WA3CD181K

Type A. RH view option



140WA3CD182K

Type B. mirror view option

· You can change split-view camera order on display order menu.

140WA3CD183K

Type A (RH view) default setting

1st rear / 2nd right

140WA3CD184K

Type B (mirror view) default setting

1st rear / 2nd Aux1

- **With 2nd camera monitor option.**

※ You can set camera view on maun cluster.

140WA3CD185K

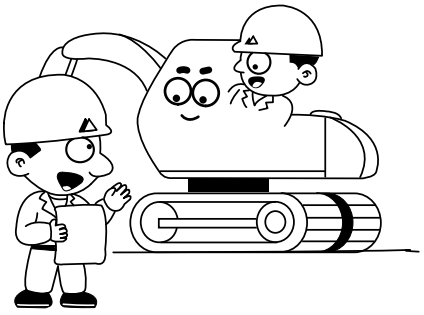
Set camera view on main cluster

→

140WA3CD186K

STEP 4. Inspect the trouble actually on the machine

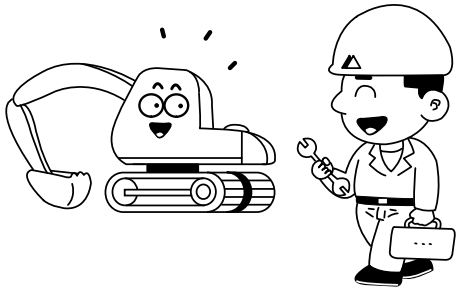
In case that some trouble cannot be confirmed, obtain the details of the malfunction from the operator.
Also, check if there are any in complete connections of the wire harnesses are or not.



(210-7) 6-3(1)

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.

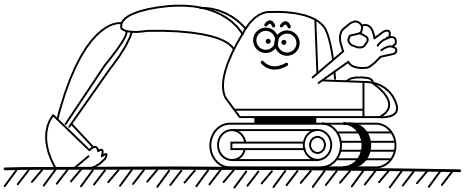


13031SH05

STEP 6. Trace a cause

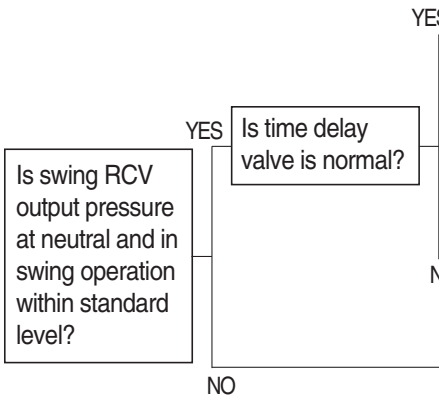
Before reaching a conclusion, check the most suspectible causes again. Try to trace what the real cause of the trouble is.

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



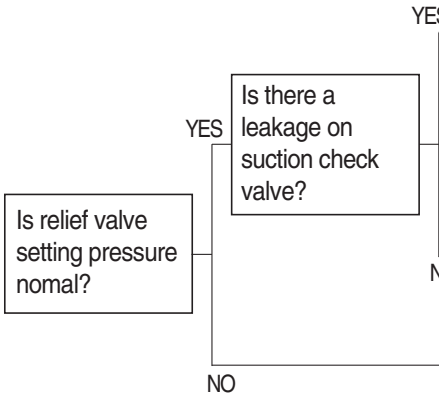
(210-7) 6-3(3)

6) LARGE SHOCK OCCURS WHEN STOP SWINGING



Cause	Remedy
Swing motor is broken.	Disassemble and repair.
Time delay valve is faulty.	Disassemble and repair or replace.
Malfunction of swing RCV	Disassemble and repair.

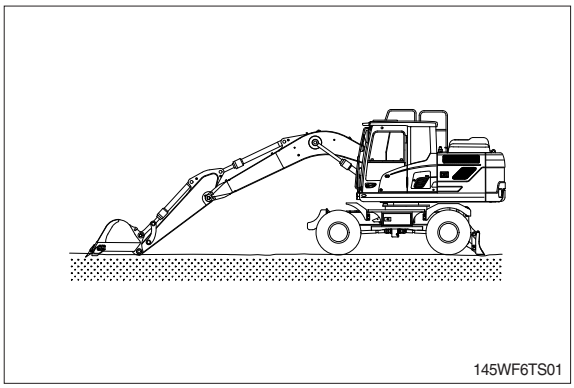
7) LARGE SOUND OCCURS WHEN STOP SWINGING



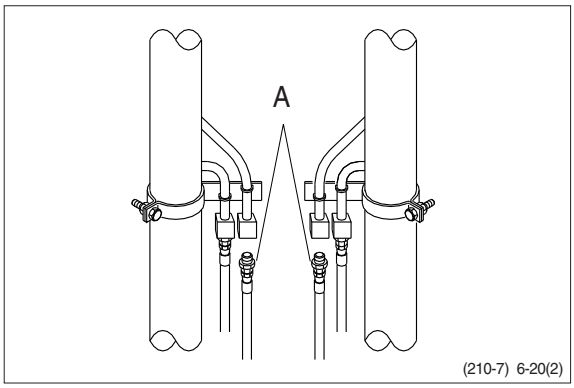
Cause	Remedy
Seal of suction valve is faulty.	Disassemble and repair.
Internal defect of swing motor.	Disassemble and repair.
Malfunction of relief valve.	Adjust swing relief valve pressure or replace swing relief valve.

※ 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.

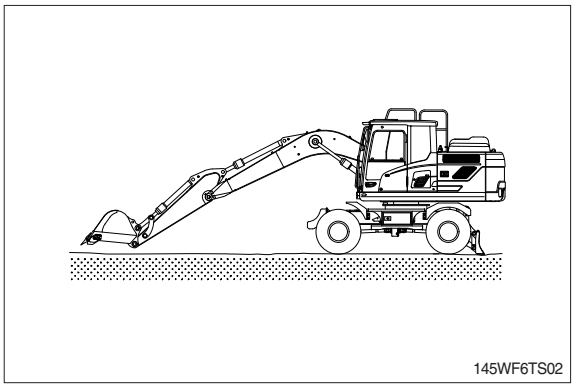


2. Disconnect hose (A) from rod side of boom cylinder and drain oil from cylinders and hose. (put cups on piping and hose ends)



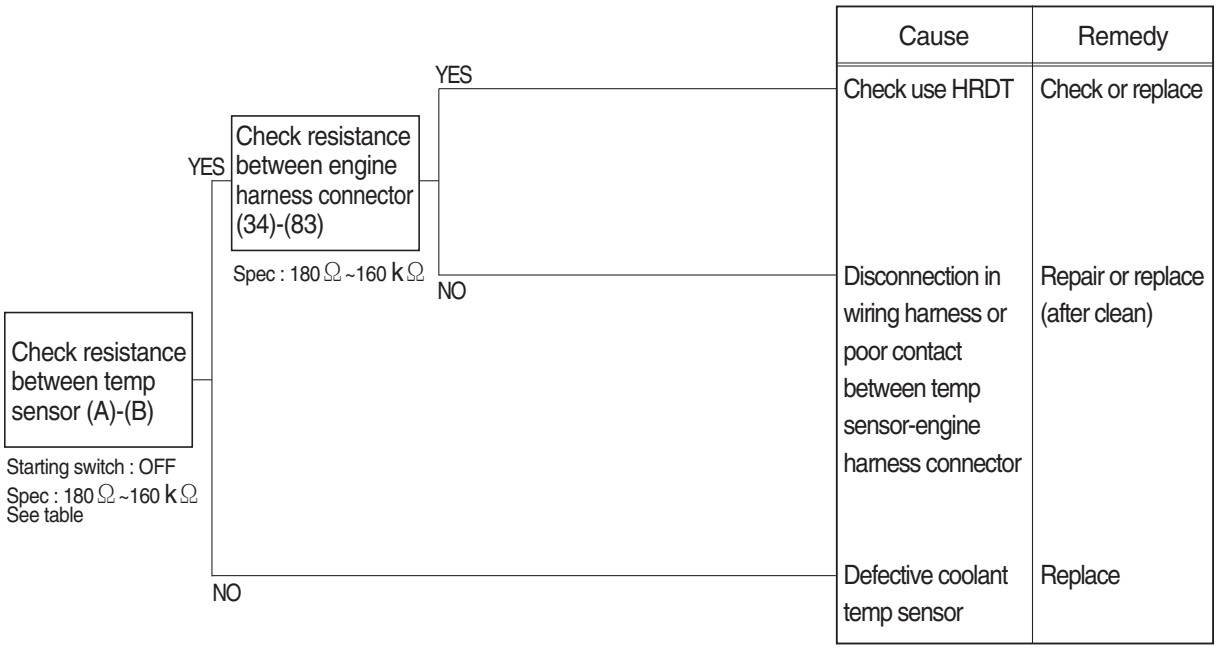
3. Raise bucket OFF the ground by retracting the arm cylinder rod.

   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.

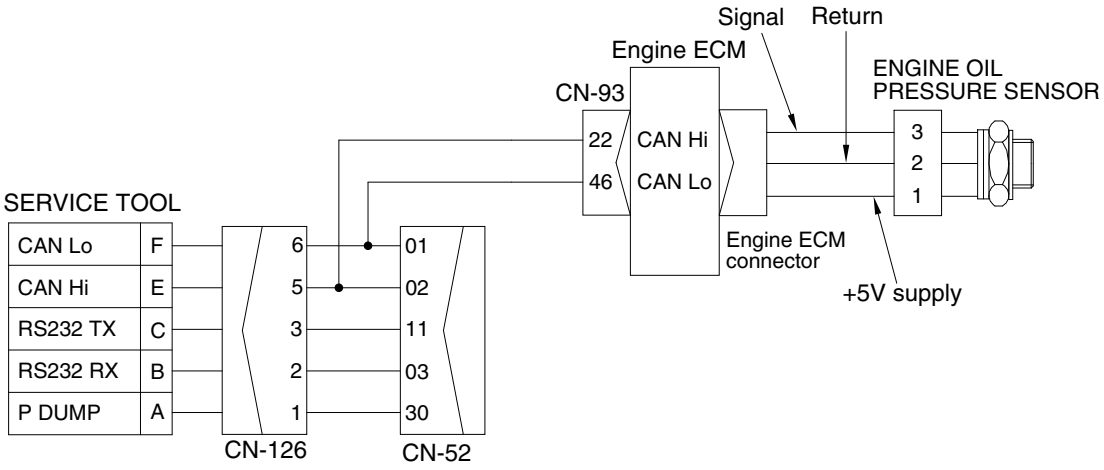


8. WHEN COOLANT TEMPERATURE GAUGE DOES NOT OPERATE (HCESPN 304, FMI 3 or 4)

· 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



210WA6ES07

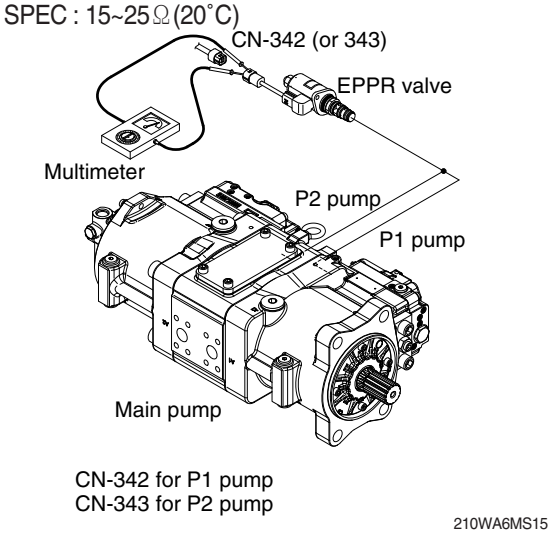
2) TEST PROCEDURE

(1) Test 1 : Check resistance at connector CN-342 (or 343).

① Starting switch OFF.

② Disconnect connector CN-342 (or 343) from EPPR valve at main hydraulic pump.

③ Check resistance between 2 lines as figure.



(2) Test 2 : Check electric current at EPPR valve.

① Disconnect connector CN-342 (or 343) from EPPR valve.

② Insert the adapter to CN-342 (or 343) and install multimeter as figure.

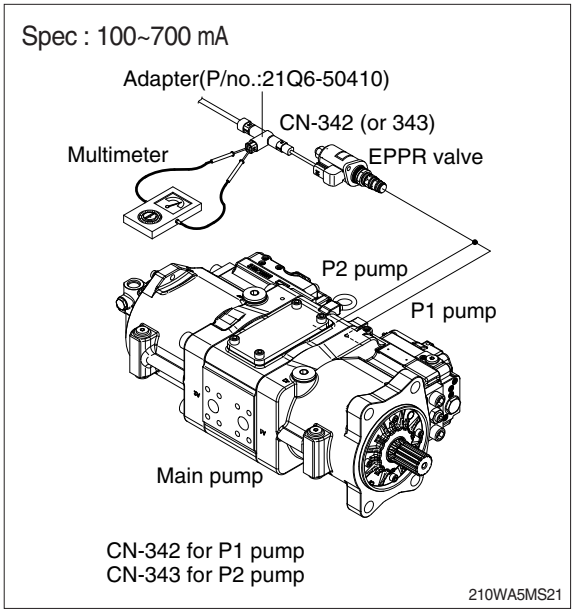
③ Start engine.

④ Set S-mode and cancel auto decel mode.

⑤ Position the multimodal dial at 10.

⑥ If tachometer show approx 1500±50 rpm disconnect one wire harness from EPPR valve.

⑦ Check electric current at bucket circuit relief position.



(3) Test 3 : Check pressure at EPPR valve.

① Remove plug and connect pressure gauge as figure.

· Gauge capacity : 0 to 50 kgf/cm² (0 to 725 psi)

② Start engine.

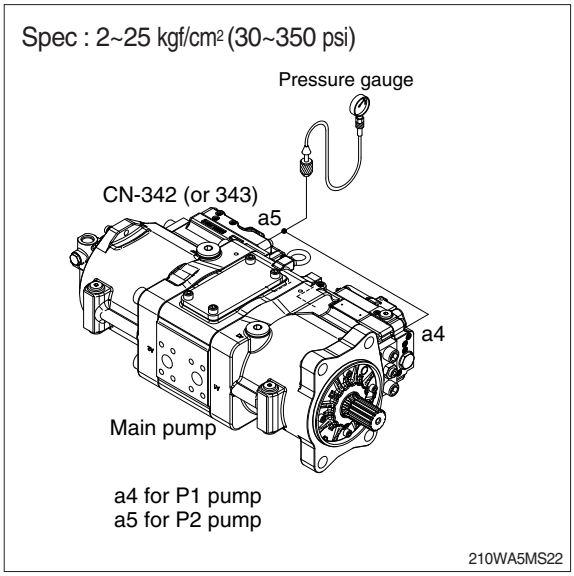
③ Set S-mode and cancel auto decel mode.

④ Position the multimodal dial at 10.

⑤ If tachometer show approx 1500±50 rpm check pressure at relief position of bucket circuit by operating bucket control lever.

⑥ If pressure is not correct, adjust it.

⑦ After adjust, test the machine.

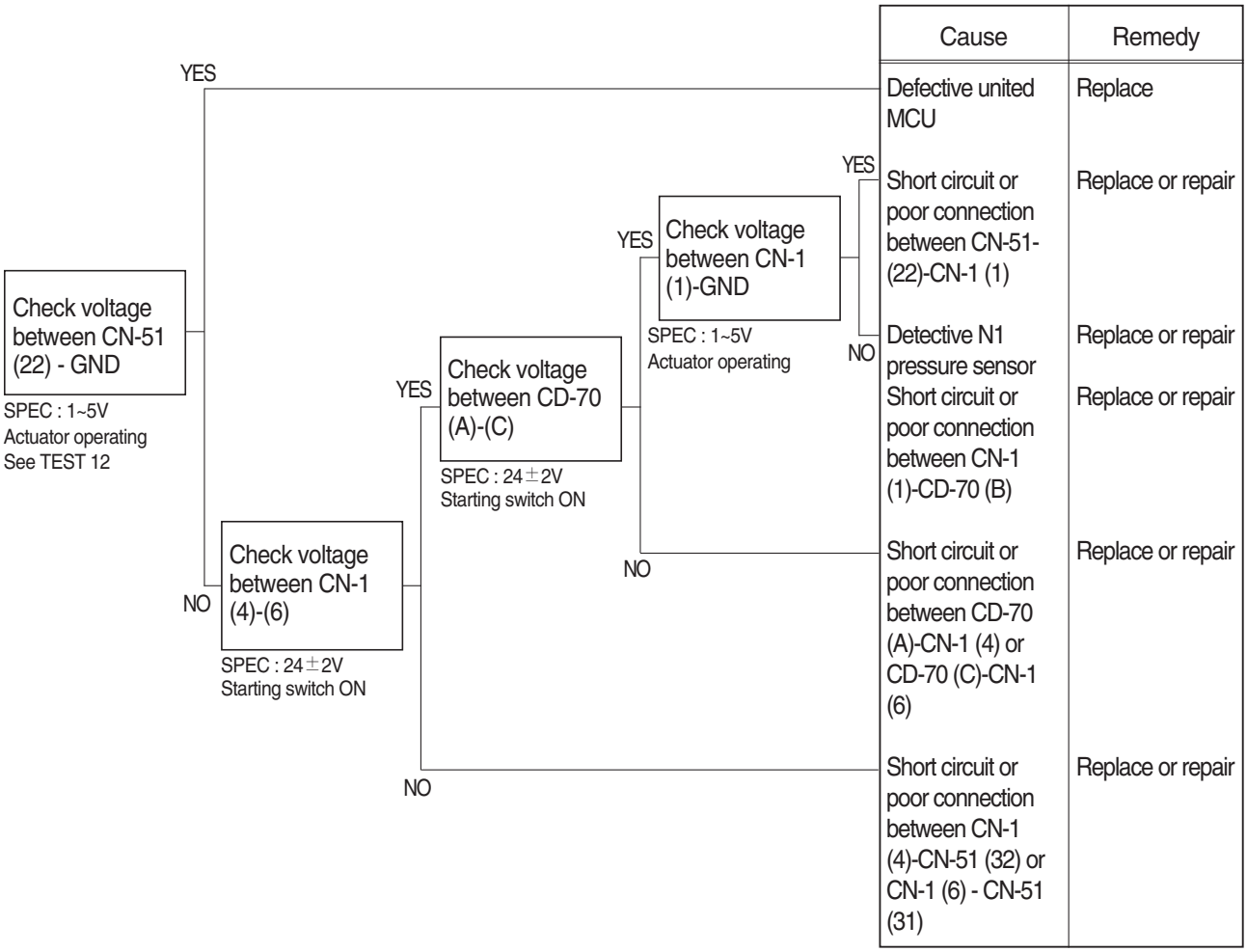


7. MALFUNCTION OF NEGATIVE 1 PRESSURE SENSOR

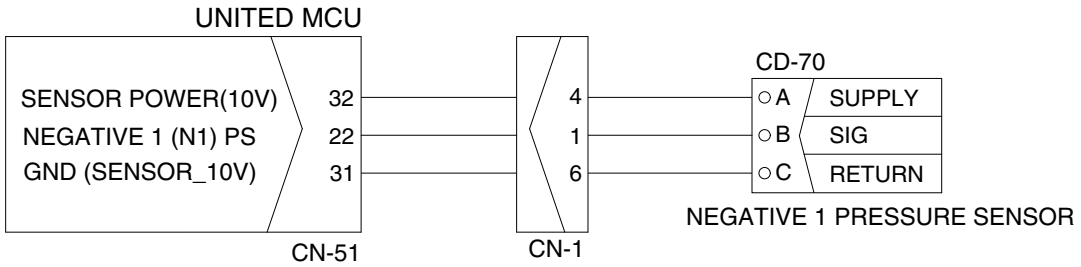
· Fault code : HCESPN 123, FMI 0~4

※ Before carrying out below procedure, check all the related connectors are properly inserted.

1) INSPECTION PROCEDURE



Wiring diagram



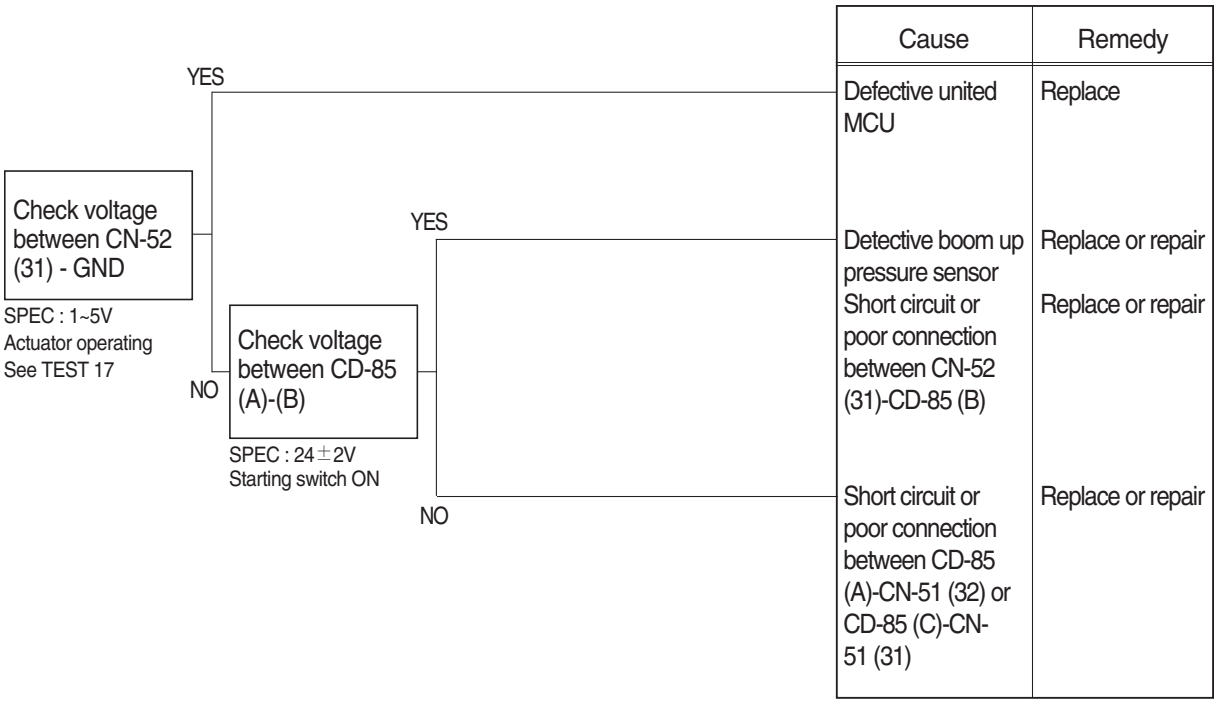
260A6MS111

12. MALFUNCTION OF BOOM DOWN PRESSURE SENSOR

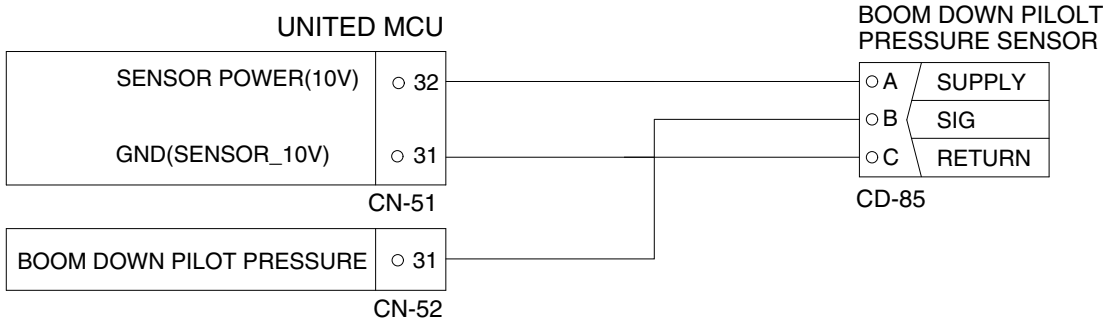
· Fault code : HCESPN 128, FMI 0~4

※ Before carrying out below procedure, check all the related connectors are properly inserted.

1) INSPECTION PROCEDURE



Wiring diagram



220A6MS121

2) TEST PROCEDURE

(1) Test 22 : Check voltage at CN-52 (29) and ground.

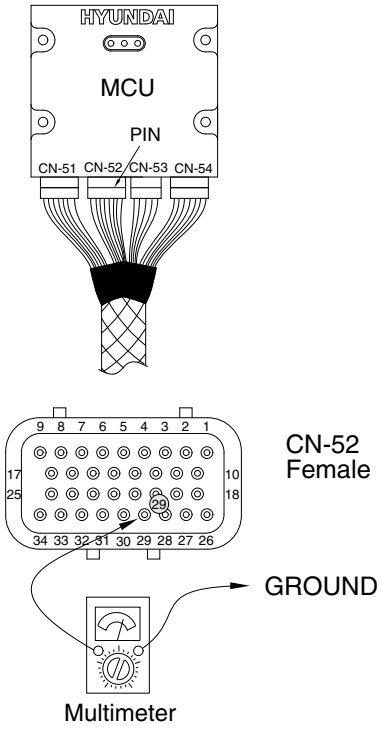
① Prepare 1 piece of thin sharp pin, steel or copper.

② Insert prepared pin to rear side of connectors : One pin to (29) of CN-52.

③ Starting switch ON.

④ Check voltage as figure.

SPEC : Actuator operating : 1~5 V

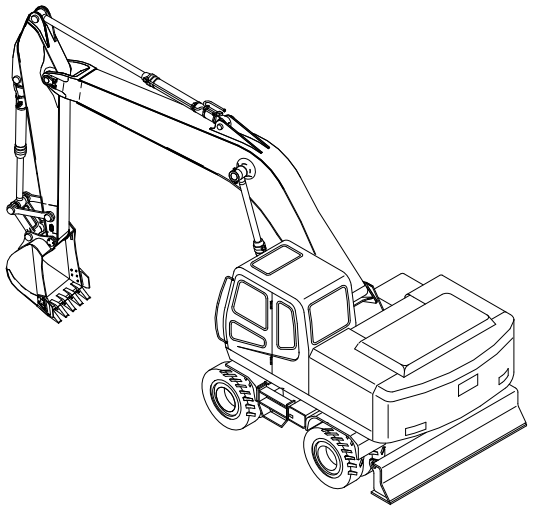


140WF6MS163

2. TERMINOLOGY

1) STANDARD

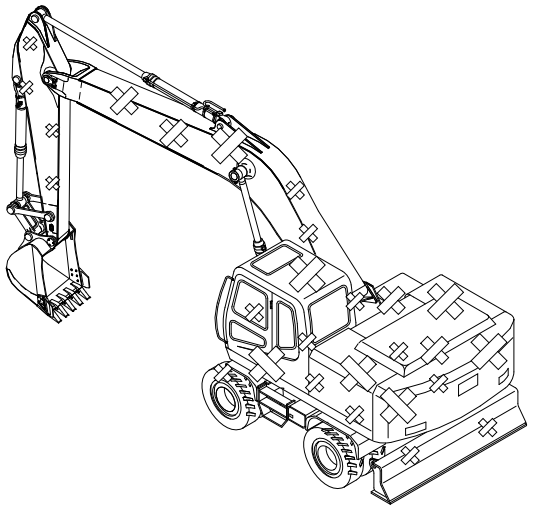
Specifications applied to the brand-new machine, components and parts.



140W77MS02

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.



140W77MS03

9) 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 Select the following switch positions.
· Power mode switch: P mode
③ Operate each boom, arm, bucket and swing lever at full stroke and measure the maximum operating force for each.
④ 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.
⑤ Repeat steps ③ and ④ three times and calculate the average values.

(4) Evaluation

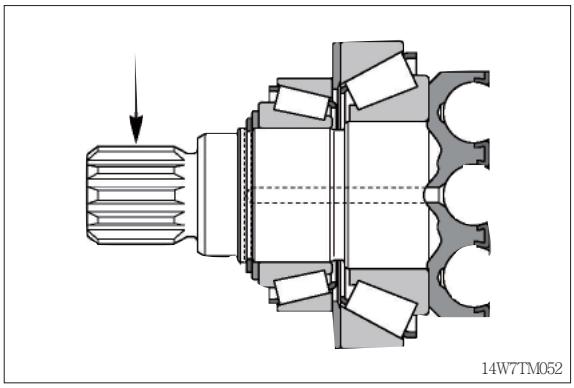
The measured operating force should be within the following specifications.

Unit : kgf

Model	Kind of lever	Standard	Maximum allowable	Remarks
HW210A	Boom lever	1.3 or below	1.7	
	Arm lever	1.3 or below	1.7	
	Bucket lever	1.3 or below	1.7	
	Swing lever	1.3 or below	1.7	

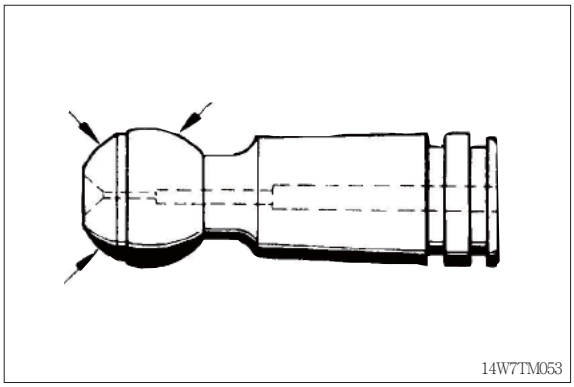
4. TRAVEL MOTOR

1) Free of corrosion, erosion or fretting; no damage to splines or keyways.



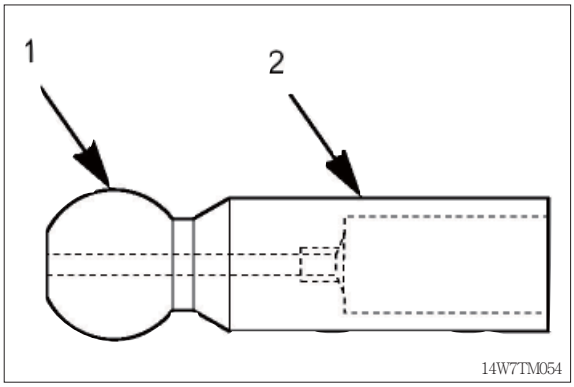
2) Pistons

No scoring and no pittings.



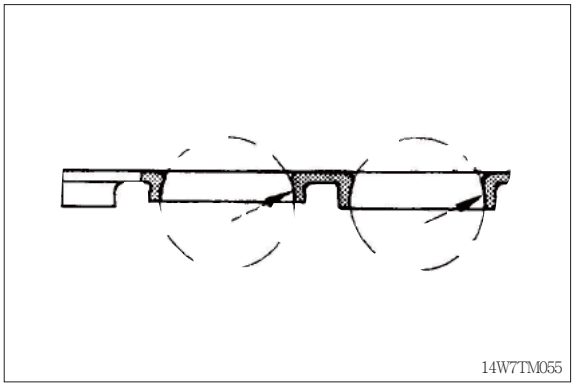
3) Center pin

No scoring and no pittings.



4) Retaining plate

No scoring and no evidence of wear.



3. COMPLETING WORK

1) If the coolant has been drained, tighten the drain valve, and add water to the specified level. Run the engine to circulate the water through the system. Then check the water level again.
2) If the hydraulic equipment has been removed and installed again, add engine oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
3) If the piping or hydraulic equipment, such as hydraulic cylinders, pumps, or motors, have been removed for repair, always bleed the air from the system after reassembling the parts.
4) Add the specified amount of grease (molybdenum disulphied grease) to the work equipment related parts.

3) DISASSEMBLY

For disassembling the pump, read this section thoughly and then disassemble it in the following sequence. The figures in parentheses after part names show the item in structure drawing.

(1) Select place suitable to disassembling.

※ Select clean place.

※ Spread rubber sheet, cloth or so on overhaul workbench top to prevent parts from being damaged.

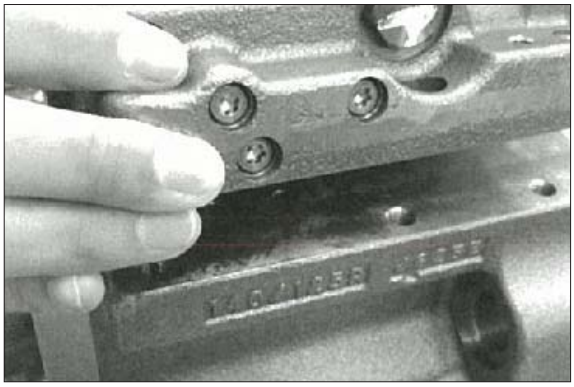
(2) Remove dust, rust, etc, from pump surfaces with cleaning oil or so on.

(3) Remove drain port plug (468) and let the oil out from pump casing (271, 272).

※ For tandem type pump, remove plugs of both front and rear pumps.

(4) Remove hexagon socket head bolts (412) and remove regulator.

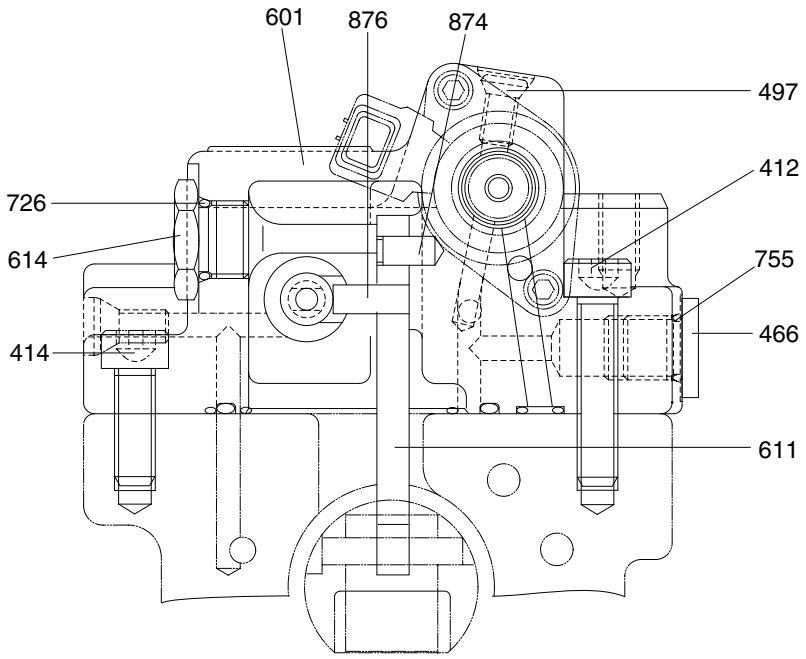
※ Refer to page 8-28 for disassemble regulator.



220F8MP11

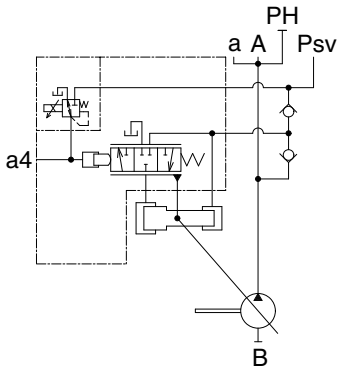
3. REGULATOR

1) STRUCTURE (1/2)



SECTION A-A

See next page



210WA2MP08

412	Hexagon socket screw	601	Regulator casing	755	O-ring
414	Hexagon socket screw	611	Feedback lever	874	Pivot pin
466	Plug	614	Adjust plug	876	Pin
497	Plug	726	O-ring		

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) Remove the wirings for the pressure sensor and so on.

(5) Remove bolts and disconnect pipe.

(6) Disconnect pilot line hoses.

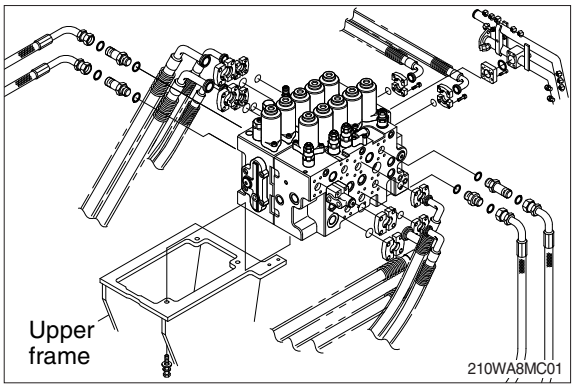
(7) Disconnect pilot piping.

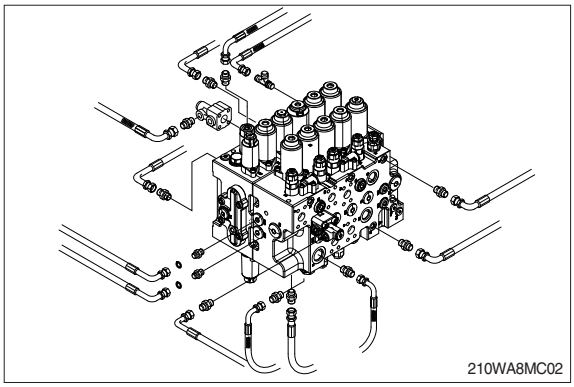
(8) Sling the control valve assembly and remove the control valve mounting bolt and bracket.

· Weight : 220 kg (485 lb)

· Tightening torque : 12.8 ± 3.0 kgf·m (92.6 ± 21.7 lbf·ft)

(9) Remove the control valve assembly.
When removing the control valve assembly, check that all the piping have been disconnected.





2) INSTALL

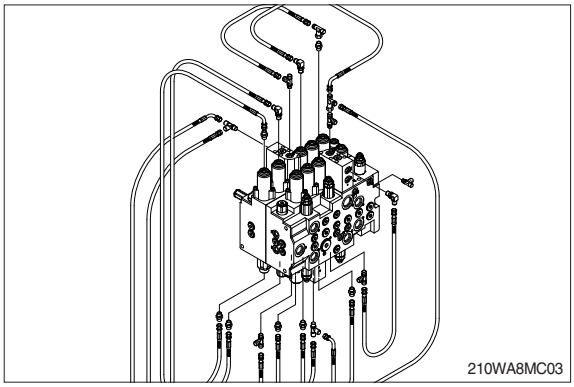
(1) Carry out installation in the reverse order to removal.

(2) Bleed the air from below items.

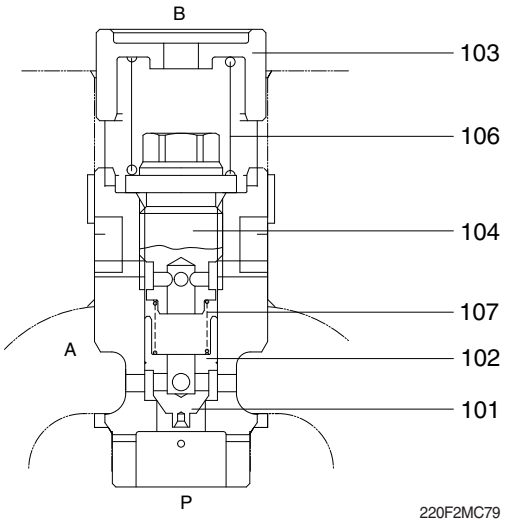
① Cylinder (boom, arm, bucket)
② Swing motor
③ Travel motor

※ See each item removal and install.

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

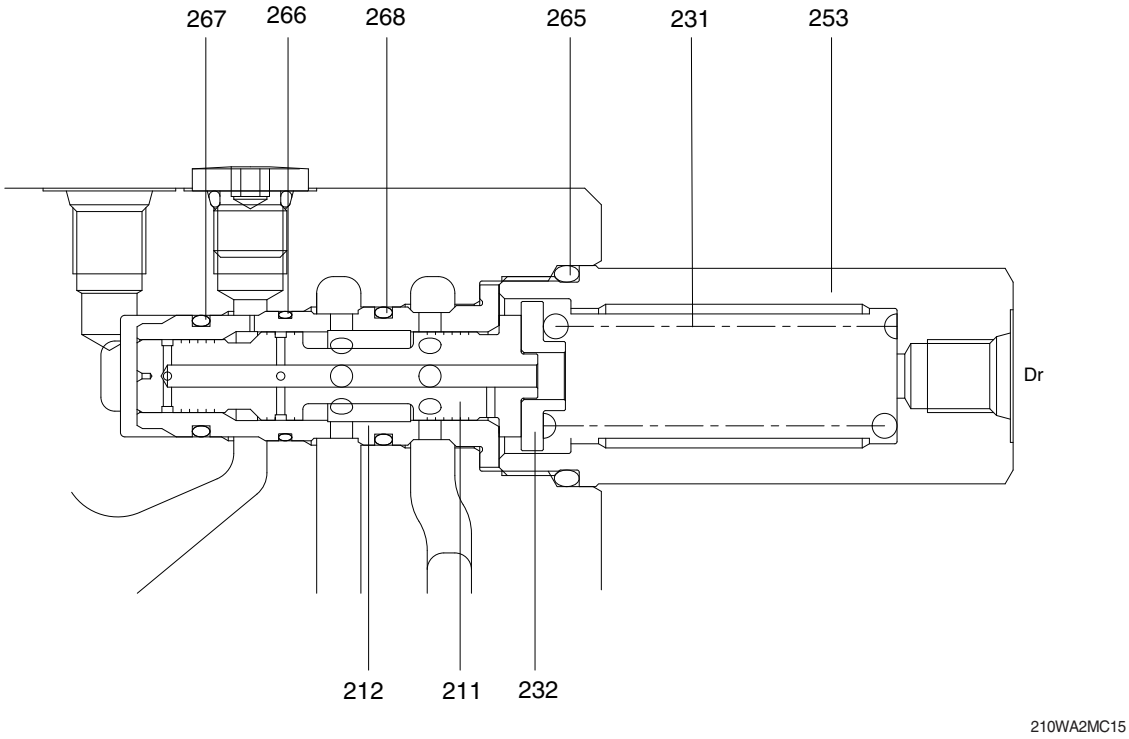


19) ARM 2 LOGIC POPPET ASSY (256)



101 Logic poppet
102 Poppet
103 Spring seat
104 Plug
106 Spring
107 Spring

20) ARM REGENERATION CUT SUB ASSY (257)



211 Spool
212 Sleeve
231 Spring
232 Spring seat
253 Plug
265 O-ring
266 O-ring
267 O-ring
268 O-ring

(16) Disassembly of casing :

① Except in special cases, do not disassemble the tie bolts (975) of the P1 housing.

② Regarding the plugs not described in above disassembling procedures, the blind plugs for sacrifice holes and for the housing sanitation, do not disassemble them, except in special cases.

21098MC58

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.

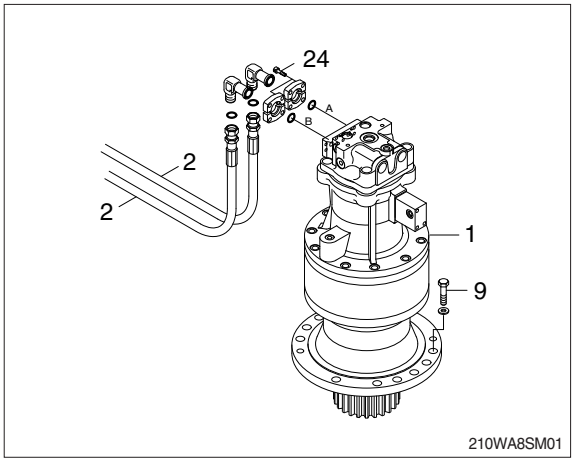
(4) Disconnect hose assembly (2).

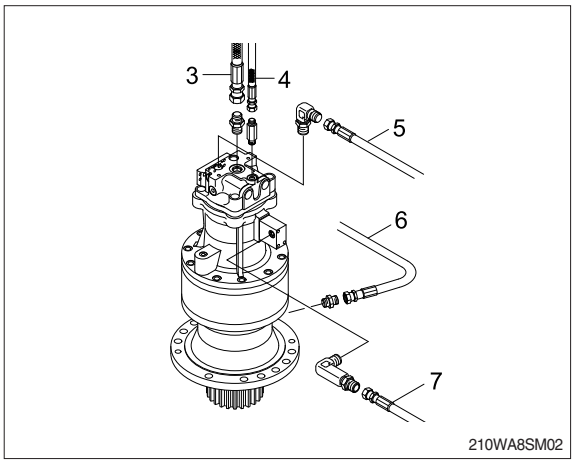
(5) Disconnect pilot line hoses (3, 4, 5, 6, 7, 8).

(6) Sling the swing motor assembly (1) and remove the swing motor mounting socket bolts (9).
- Weight : 254 kg (560 lb)
- Tightening torque : 12.8 ± 3.0 kgf·m (92.6 ± 21.7 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.

⑤ Insert O-ring (18, 19) into casing (1).
- O-ring (18)×1EA
- O-ring (19)×1EA

2209A8SM82

⑥ Assemble rotating block (8) into casing (1).

2209A8SM83

⑦ Assemble separate plate (14) and friction plate (13) 4 sets into casing (1) and fit parking piston (15) into casing (1) by a jig or a press.
- Separate plate×4EA
- Friction plate×4EA
- Parking piston×1EA

2209A8SM84

⑧ Assemble spring (parking piston, 16) into parking piston (15).
- Spring×26EA

2209A8SM85

3) ASSEMBLING NO.2 CARRIER SUB ASSY

(1) Put thrust plate in firmly No.2 carrier.

2209A8SM17

(2) After assembling No.2 needle bearing to No.2 planetary gear, put 2 pieces of No.2 thrust washer on both sides of bearing and install them to No.2 carrier.

2209A8SM18

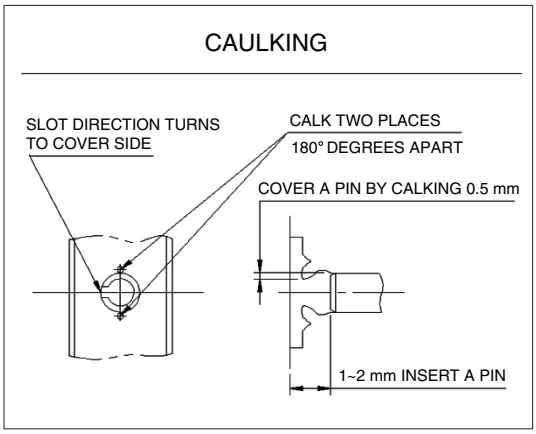
(3) Align No.2 spring pin hole and No.2 carrier spring pin hole, put No.2 spring pin into the holes.
Make No.2 spring pin cutting line face to No.2 planetary gear.

2209A8SM19

(4) Caulk carrier holes to make No.2 spring pin settle down stably.

※ Refer to “Caulking details”

Use paint marker for marking after caulking.



220SA8TM147

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 socket bolt (1) and remove the pipes (2).

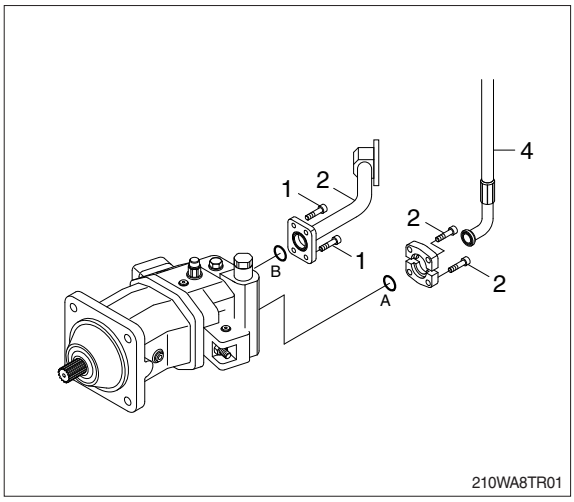
(5) Disconnect hoses (3, 4, 5, 6, 7, 8).

(6) Loosen the socket bolt (9) and remove travel motor (10).

· Weight : 77 kg (170 lb)

· Tightening torque : 35.6 ± 7.1 kgf·m (257 ± 51.4 lbf·ft)

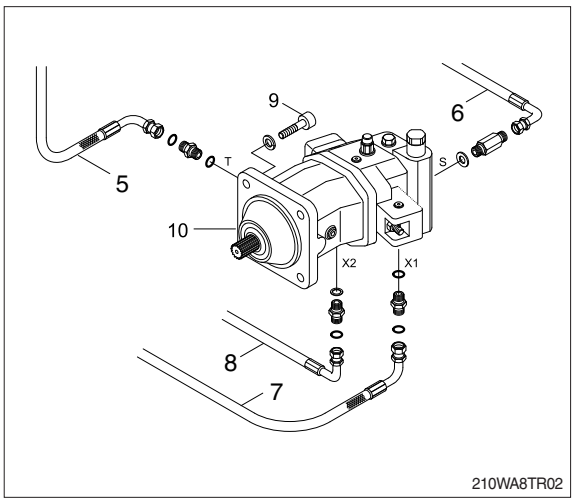
※ When removing the travel motor assembly, check that all the hoses have been disconnected.



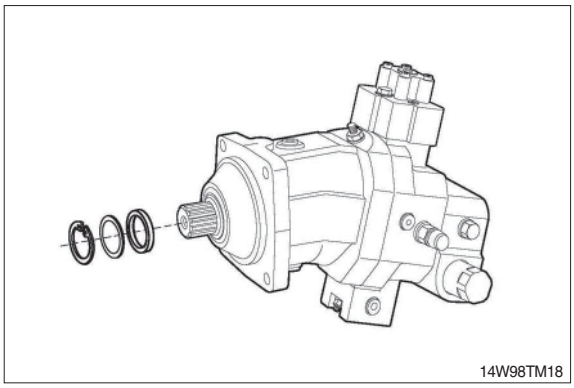
2) INSTALL

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

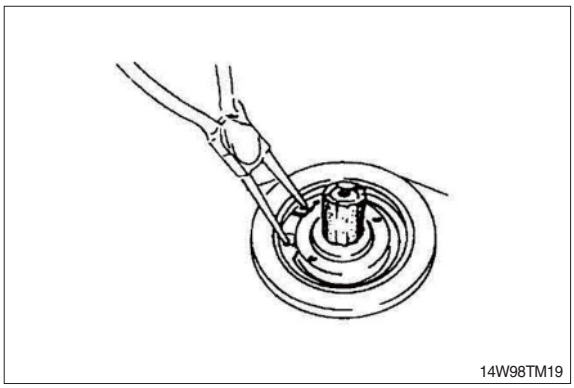
(2) Confirm the hydraulic oil level and check the hydraulic oil leak or not.



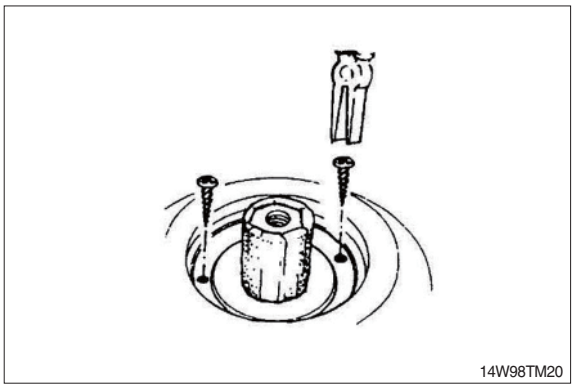
4) SEALING THE DRIVE SHAFT



(1) Protecting the drive shaft.
Remove retaining ring and shim.



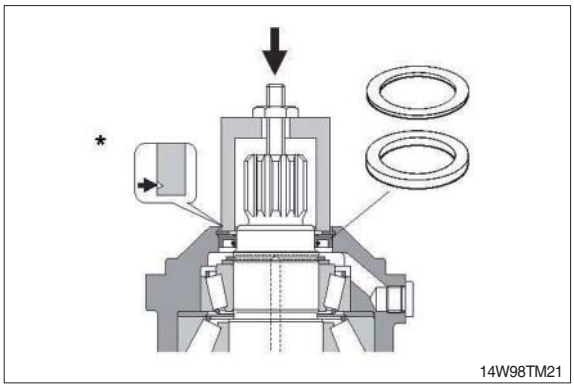
(2) Screw in sheet metal screw into the holes fitted with rubber.
Pull out seal with pliers.



(3) Press in shaft seal and shim with bush to stop.

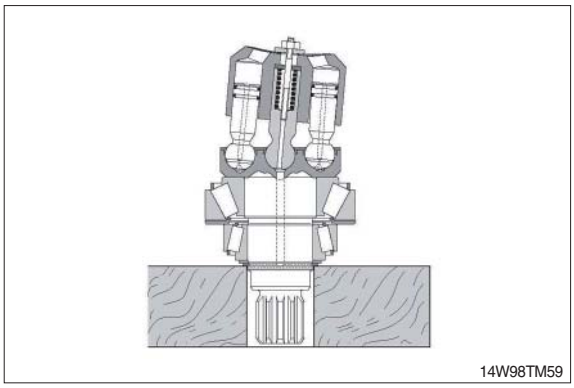
⚠ **Pay attention to pressing depth.**

* Mark for pressing depth.
Assemble retaining ring.

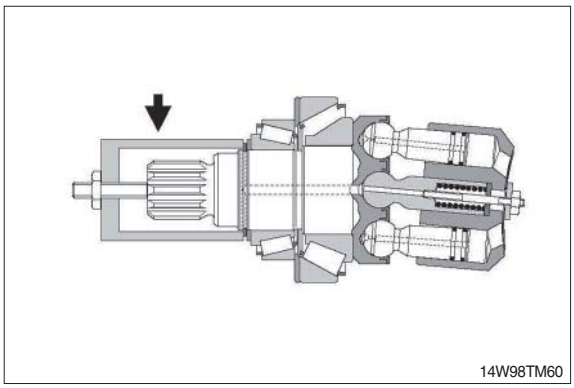


12) ROTARY GROUP ASSEMBLY

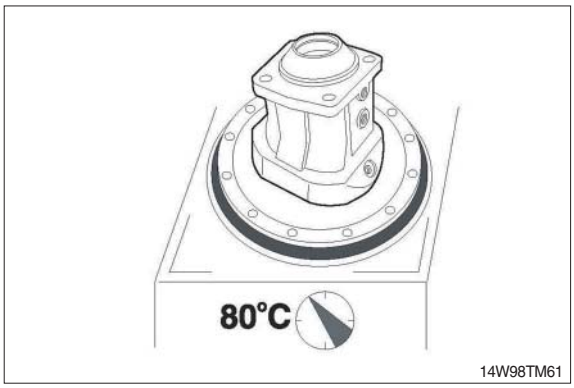
(1) Rotary group completely assembled ready for assembly.



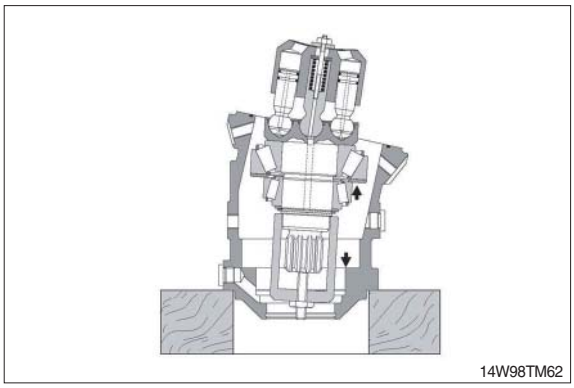
(2) Place assembly sleeve.



(3) Warm up housing to 80˚C.

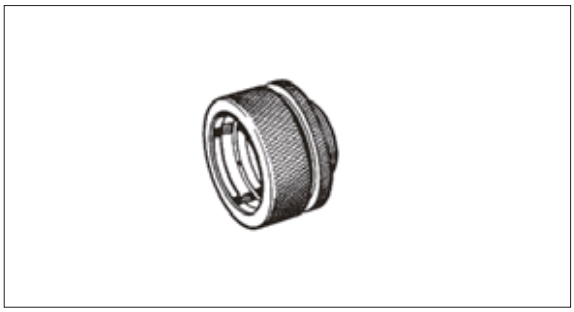


(4) Insert rotary group into housing to seat position.



16) Grab sleeve

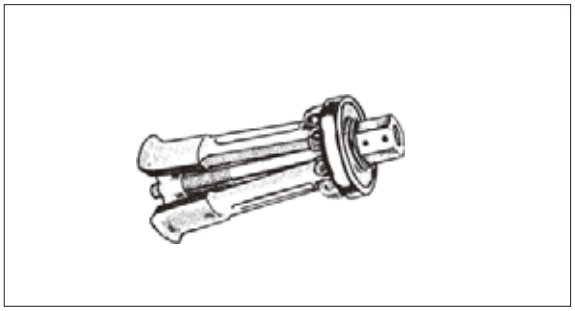
5873 001 037



14WF8TM16

17) Inner extractor

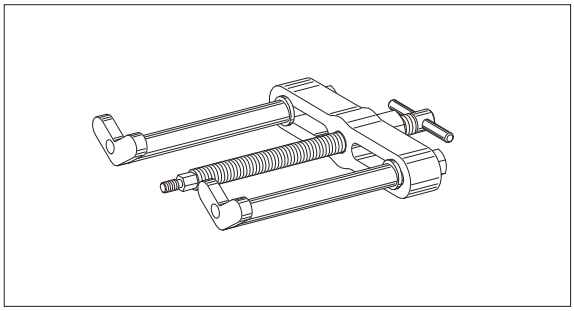
5870 300 019



14WF8TM17

18) Counter support

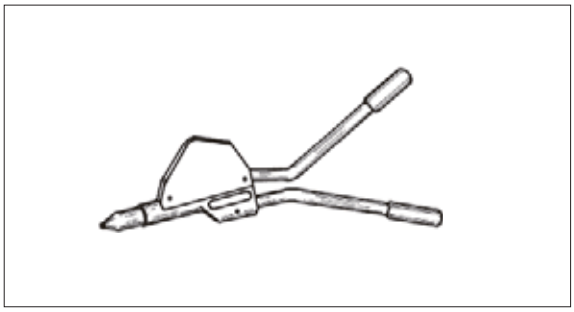
5870 300 020



14WF8TM18

19) Lever riveting tongs

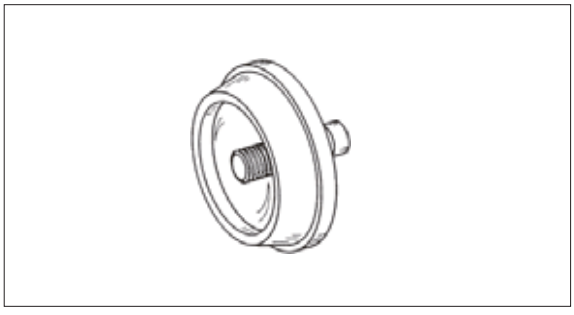
5870 320 016



14WF8TM19

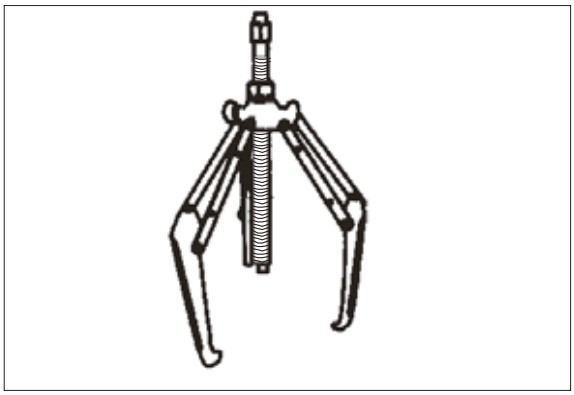
20) Driver tool

5870 058 073



14WF8TM20

18) Three armed puller



14WF8TM62

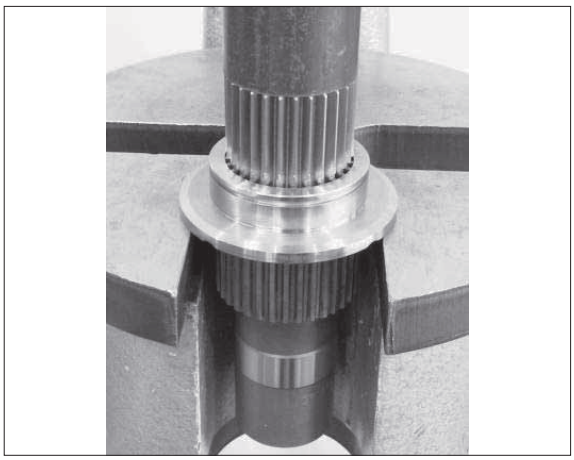
5870 971 001	
Jaw width	85 mm
Throat depth	65 mm
5870 971 002	
Jaw width	130 mm
Throat depth	105 mm
5870 971 003	
Jaw width	230 mm
Throat depth	150 mm
5870 971 004	
Jaw width	295 mm
Throat depth	235 mm
5870 971 005	
Jaw width	390 mm
Throat depth	230 mm
5870 971 006	
Jaw width	640 mm
Throat depth	290 mm

31) Unsnap retaining ring.

14WF8TM95

32) Press centering disk from input shaft.

※ In case of extreme press fit – heat centering disk.



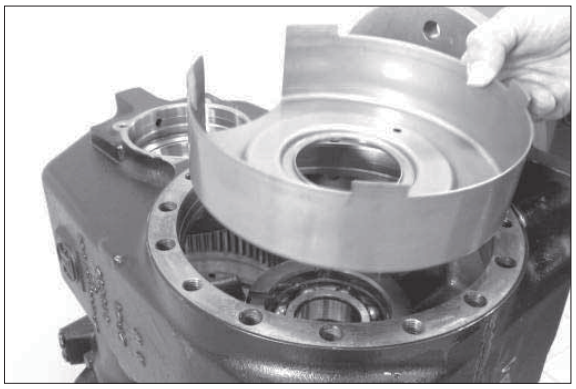
14WF8TM96

33) Unsnap retaining ring and remove ball bearing.

(S) Clamping pliers 5870 900 021

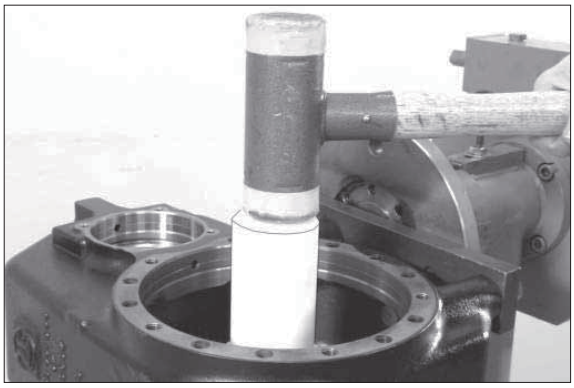
14WF8TM97

23) Remove screen sheet from transmission housing.



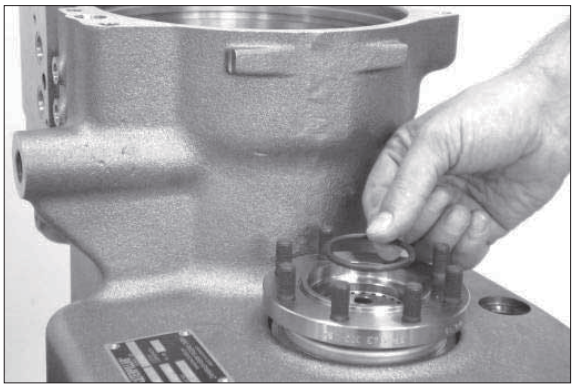
14WF8TM130

24) Disassemble ball bearing from housing hole.



14WF8TM131

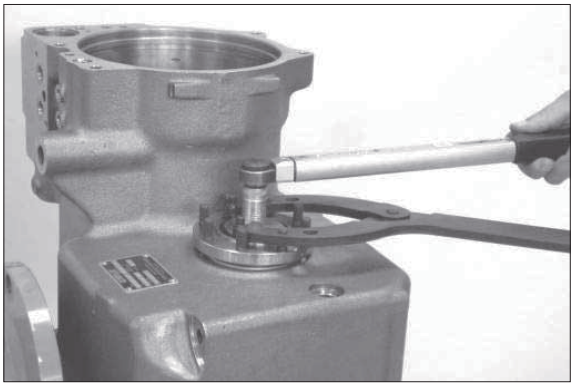
34) Mount preassembled flange and put O-ring into recess.



14WF8TM165

35) Place disk and fix it with hexagon screws.

Tightening torque (M 10/10.9)	M_A = 68 Nm
(S) Clamping fork	5870 240 025

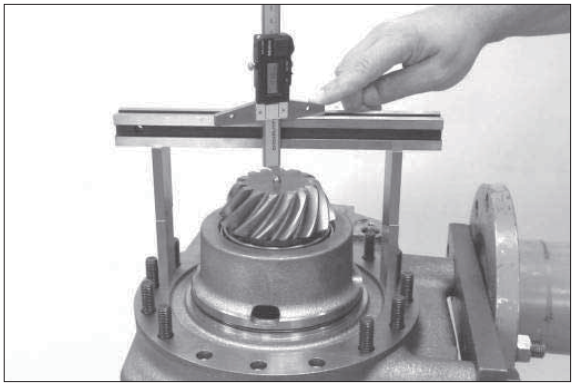


14WF8TM166

Check pinion gap

36) Position ball [use Ø = 7 mm → ball Ø like for determination of auxiliary dimension A into centering hole of the pinion and determine dim. C (see 14WF8TM140), from contact surface/bearing cover to ball.

(S) Straightedge	5870 200 108



14WF8TM167

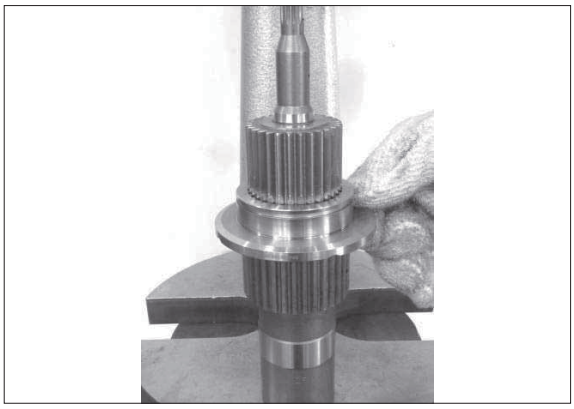
⚠ If the constant value of dimensionE = 73.00±0.05 mm

If the constant value of Dim. E = 73.00 ±0.05 mm is not achieved, correct with an adequate shim/pinion gap (see 14WF8TM145).

For a correction of the shim/pinion gap, a counter correction of adjusting ring of rolling moment/ pinion gap – Fig. 14WF8TM154 must also be considered.

Brake and clutch

16) Mount heated centering disk and press it until contact.



14WF8TM204

17) Fix centering disk by engaging retaining ring into annular groove of input shaft.

14WF8TM205

18) Insert ball bearing into ring gear and fasten it by engaging retaining ring into annular groove of ring gear.

(S) Clamping pliers 5870 900 021

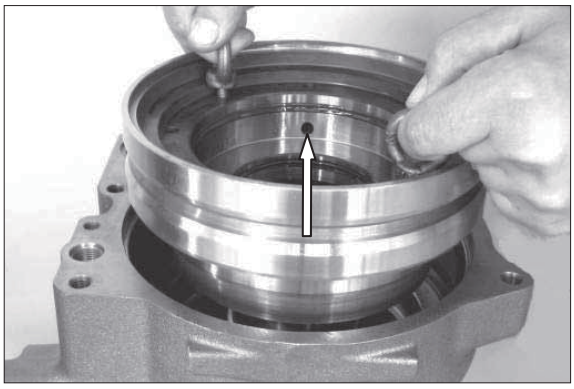
14WF8TM206

19) Heat bearing inner ring of ball bearing.

14WF8TM207

53) Insert preassembled piston/brake until contact.

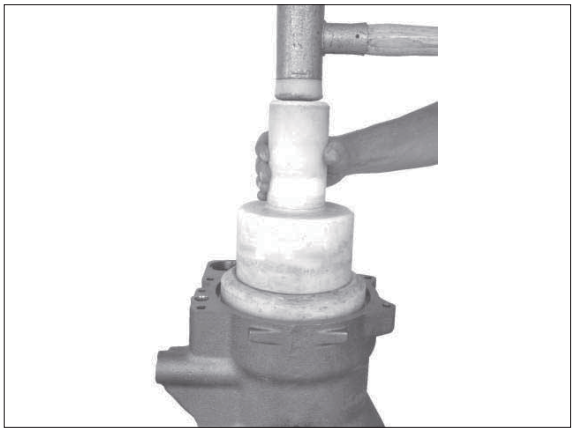
※ Position piston in such a way that oil supply hole (see arrow) is at 12.00 o'clock position. Observe version as to transmission installation position HORIZONTAL – VERTICAL.



14WF8TM244

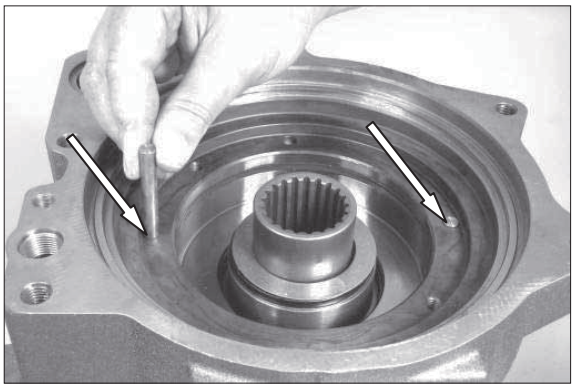
54) Use driver tool to bring piston into contact position.

(S) Driver tool 5870 506 161



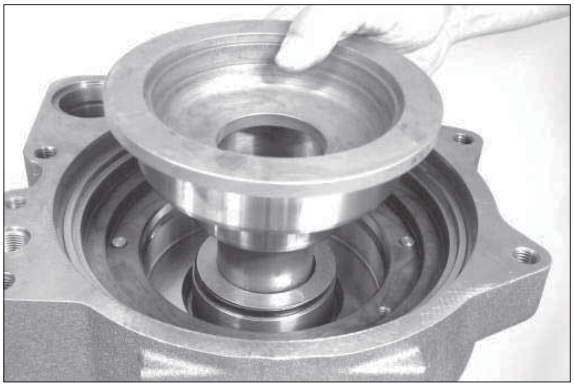
14WF8TM245

55) Insert both cyl. pins (arrow).



14WF8TM246

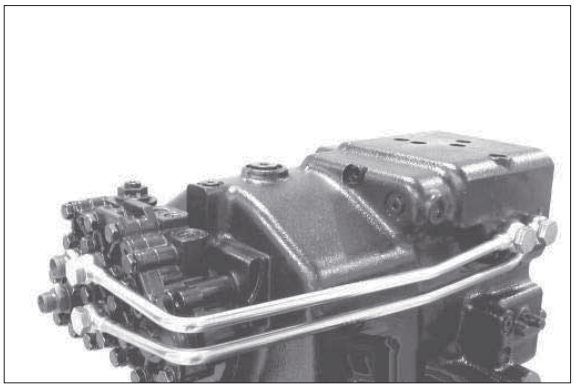
56) Insert piston/clutch until contact.



14WF8TM247

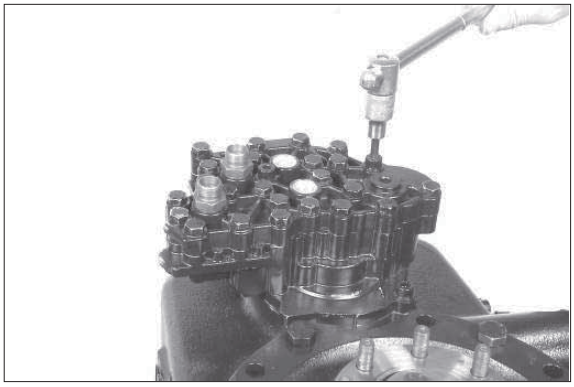
Shift interlock version

12) Disassemble both oil tubes.



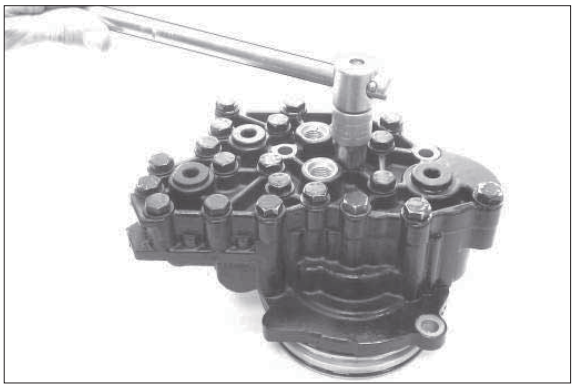
14WF8TM283

13) Loosen threaded joint of shift interlock (3 x cylindrical screws) and remove cpl. shift interlock.



14WF8TM284

14) Loosen cover screws, remove cover and gasket (see also 14WF8TM286).

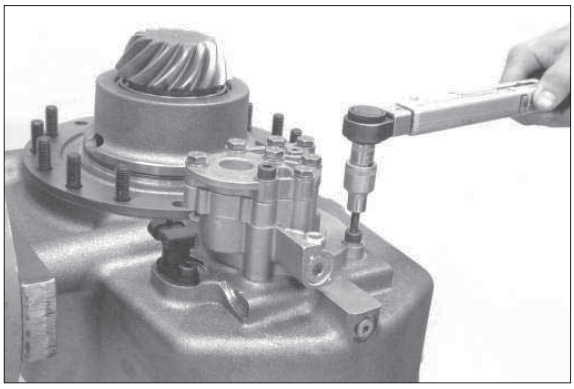


14WF8TM285

21) Mount cpl. lubrication pump and fasten it with cylindrical screws and disks.

Tightening torque (M8/10.9) M_A = 23 Nm

※ Prior to putting the unit into operation, observe the specifications and regulations.

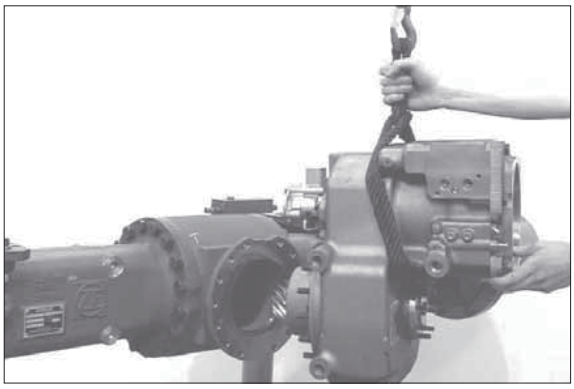


14WF8TM319

14. Mount TRANSMISSION to AXLE (only for version axle attachment)

1) Position complete transmission to axle.

(S) Lifting strap 5870 281 026

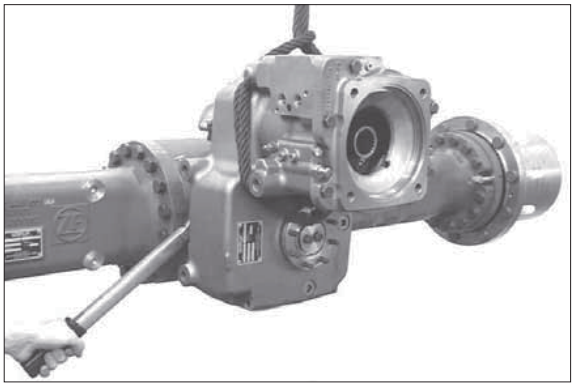


14WF8TM351

2) Fix transmission to axle with hexagon screws and nuts.

Tightening torque (M12/8.8) M_A = 79 Nm

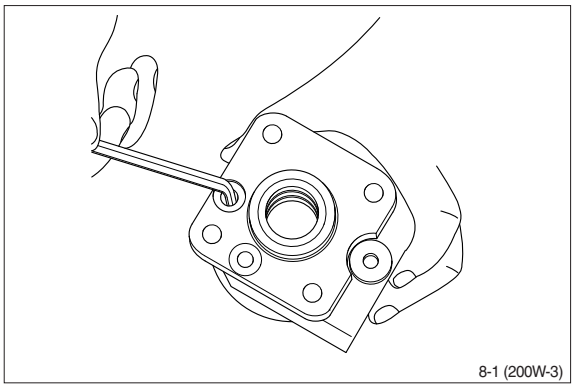
※ Prior to putting the unit into operation, observe the specifications and regulations.



14WF8TM352

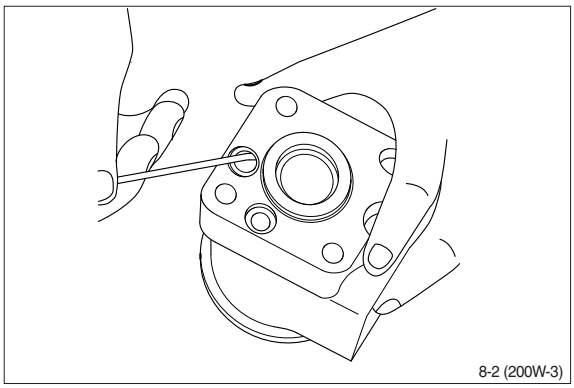
(15) Disassemble the dual shock valve

① Remove plugs from shock valves using a 6㎜ hexagon socket spanner.



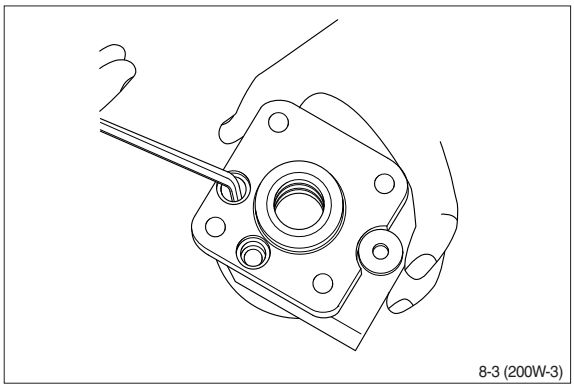
8-1 (200W-3)

② Remove seal washers (2-off).



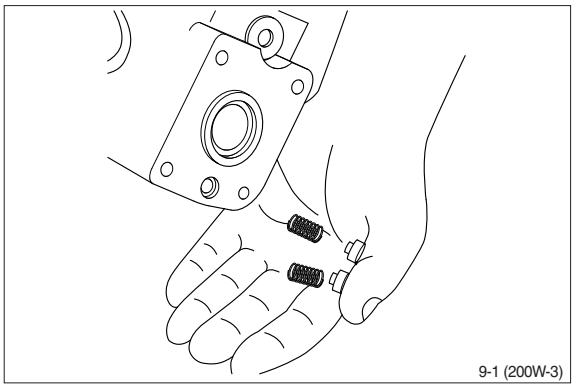
8-2 (200W-3)

③ Unscrew the setting screws using a 6 ㎜ hexagon socket spanner.



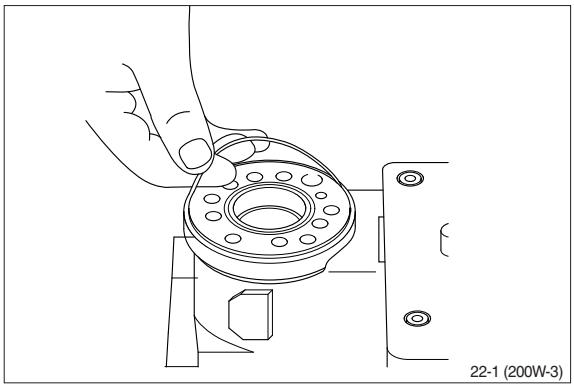
8-3 (200W-3)

④ Shake out the two springs and two valve balls into your hand. The valve seats are bonded into the housing and cannot be removed.

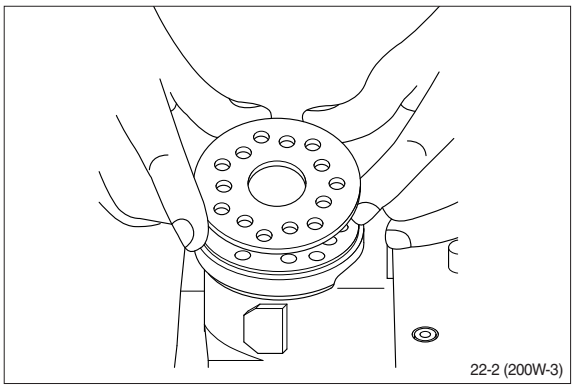


9-1 (200W-3)

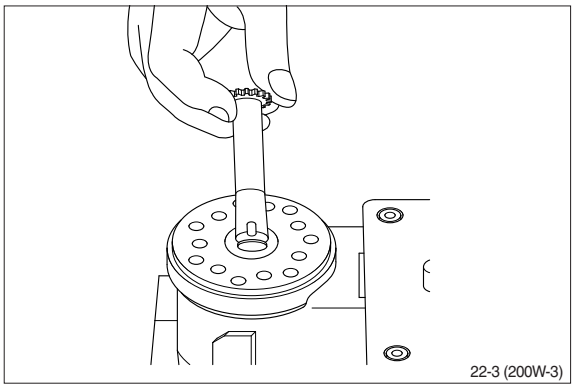
(22) Grease the O-ring with mineral oil approx viscosity 500 cST at 20˚C.


22-1 (200W-3)

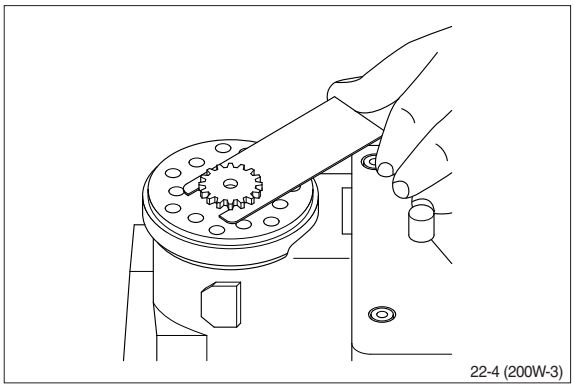
(23) Place the distributor plate so that the channel holes match the holes in the housing.


22-2 (200W-3)

(24) Guide the cardan shaft down into the bore so that the slot is parallel with the connection flange.


22-3 (200W-3)

(25) Place the cardan shaft as shown so that it is held in position by the mounting fork.

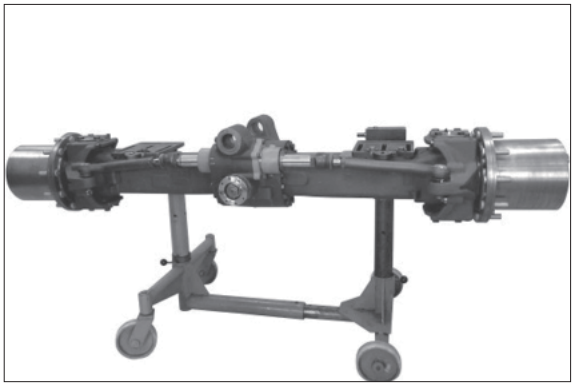

22-4 (200W-3)

3. DISASSEMBLY

1) STEERING

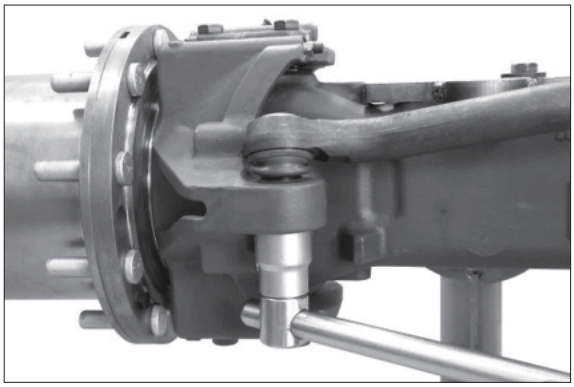
(1) Fix the axle to the assembly truck.

(S) Assembly truck 5870 350 000
(S) Support 5870 350 106



17W98FA001

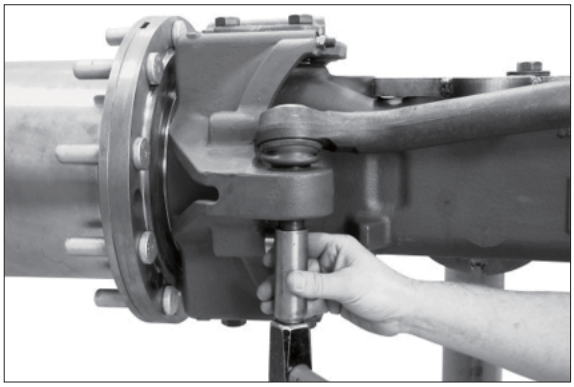
(2) Loosen locknut.



17W98FA002

(3) Force out tie rod from bevel seat.

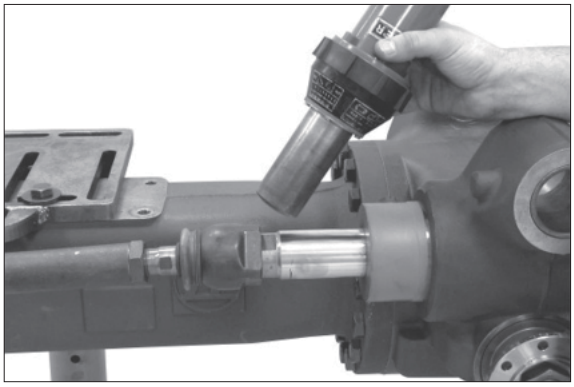
※ Use suitable mandrel (brass or aluminum).



17W98FA003

(4) Warm up piston rod by means of hot air blower.

※ Axial joint is installed with Loctite no. 243.

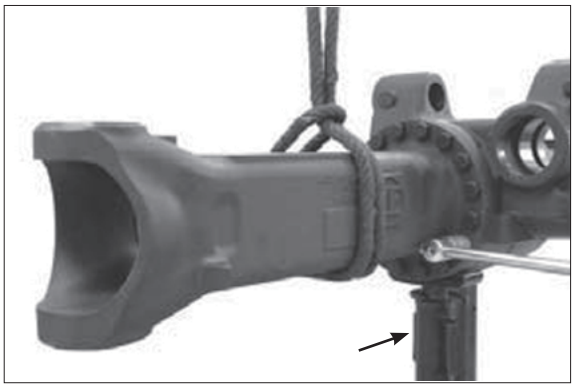


17W98FA004

3) INPUT

(1) Support axle to axle drive housing (see arrow).
Then secure axle housing (crown wheel side) by means of lifting tackle and loosen threaded joint.
Then separate axle housing from axle drive housing.

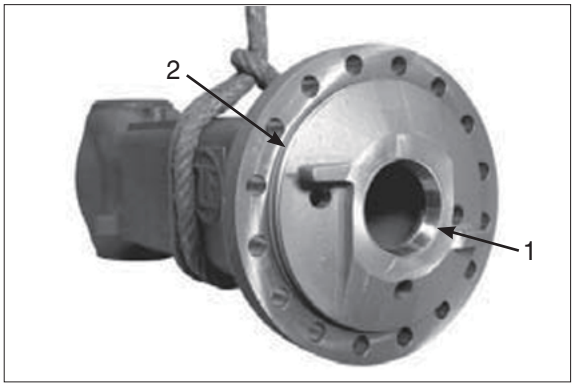
※ Pay attention to possibly releasing differential.



17W98FA041

(2) Pull bearing outer ring (arrow 1) from the bearing hole and remove releasing shim.
Then remove O-ring (arrow 2).

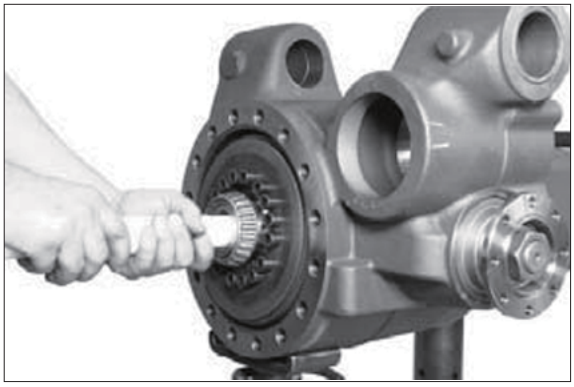
(S) Striker 5870 650 004



17W98FA042

(3) Lift differential out of the axle drive housing.

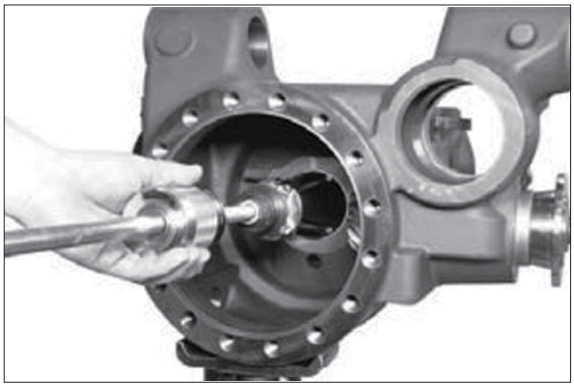
※ Disassembly of the differential is described as of page 8-259.



17W98FA043

(4) Use striker (S) to pull bearing outer ring out of the bearing hole (axle housing) and remove releasing shim.

(S) Striker 5870 650 004



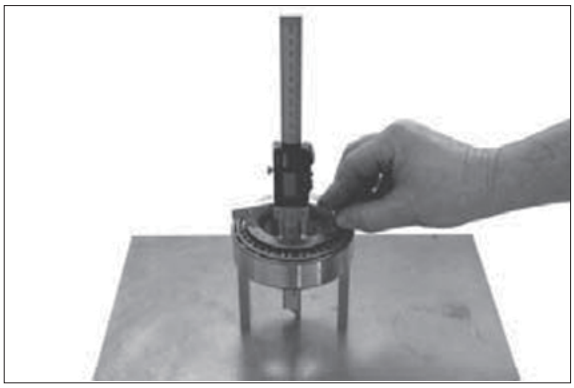
17W98FA044

(4) Determine dimension III (bearing width).

※ Make sure that the rollers are located without any play (rotate bearing g inner ring several times in both directions roller setting).

Since the installed roller bearing is subject to a pre-load in installation position, consider an experience deduction of 0.1 mm.

Dimension III, e.g. 36.60 mm – 0.1 mm . . . . . = 36.50 mm

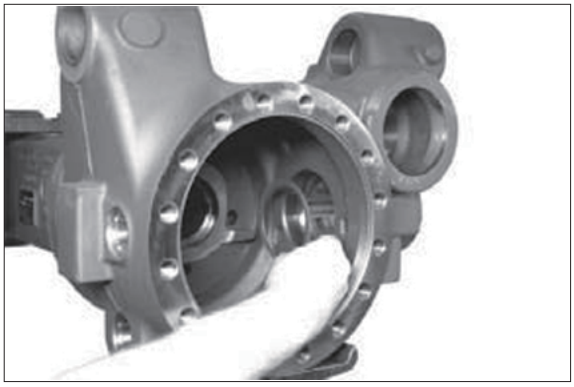


17W98FA079

(5) Calculation example "B" :

Dimension I . . . . . 154.05 mm
Dimension X . . . . . - 152.50 mm
Difference = shim s = 1.55 mm

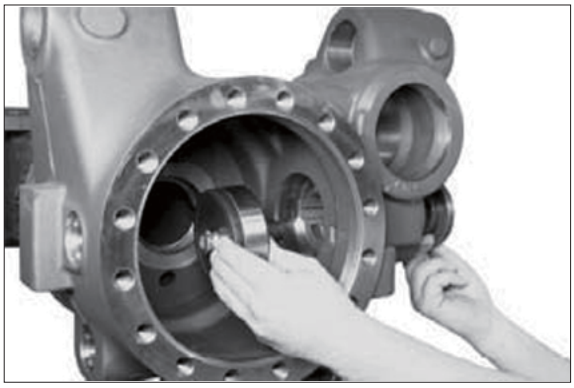
Insert the determined shim (e.g. s = 1.55 mm) into the inner bearing hole.



17W98FA080

(6) Undercool bearing outer ring (see arrow) and bring into contact position in the bearing hole by using the assembly fixture (S).

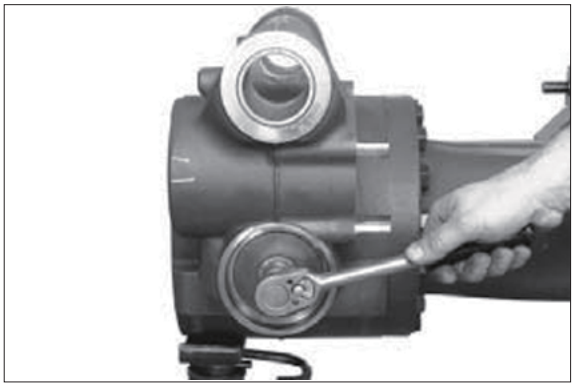
(S) Assembly fixture 5870 345 049
(S) Pressure ring 5870 345 056



17W98FA081

(7) Undercool outer bearing outer ring and insert into bearing hole until contact is obtained.

(S) Assembly fixture 5870 345 049
(S) Pressure ring 5870 345 056



17W98FA082

(11) Comment on sketch:

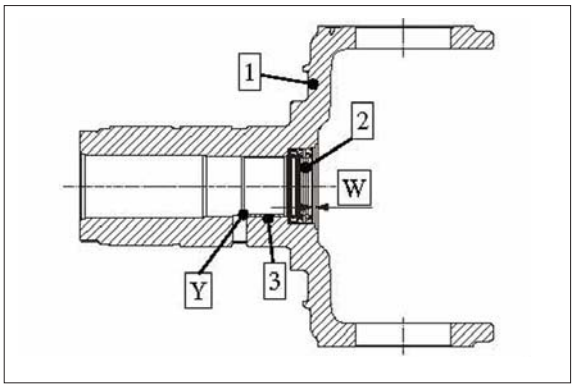
1 = Knuckle housing

2 = Shaft seal ring

3 = Bushing

W = Installation dimension – shaft seal ring ..... 3.5±0.2 mm

Y = Lubrication groove outlet (V-point) must be mounted in 6 o'clock position and showing to the oil chamber side (referred to the axle fitted into the vehicle)



17W98FA113

※ Just before fitting wet contact face shaft seal ring / knuckle housing with sealing agent.

Apply grease on seal and dust lip of the seal ring.

(12) Grease O-ring (see arrow) and insert it into the groove of the bearing pin.

17W98FA114

(13) Place sealing cap (see arrow) and mount the tapered roller bearing until contact position is obtained.

17W98FA115

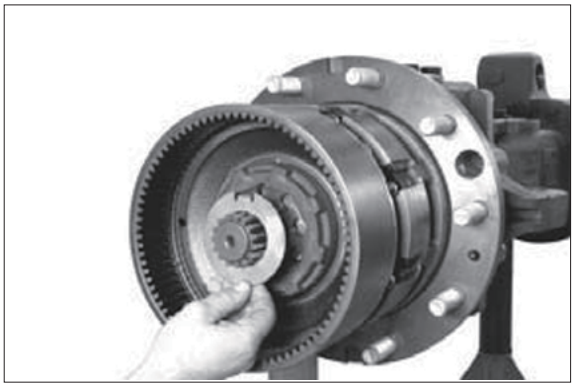
(16) Secure slotted nut with cylindrical screw (please also refer to figure FA142)

Tightening torque (M 10/8.8) . . . . . MA = 32 Nm

17W98FA147

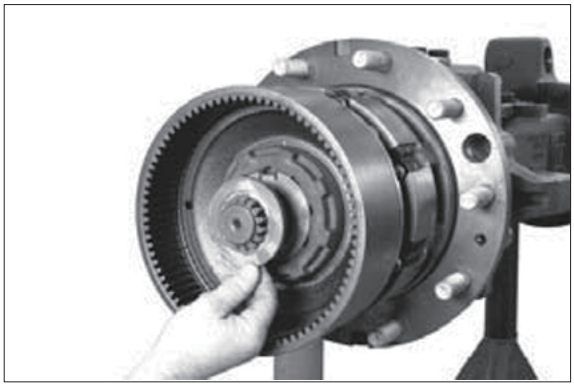
(17) Insert thrust washer.

※ Observe installation position ensure that both lugs of the thrust washer are engaged each in a spare fixing hole of the slotted nut.



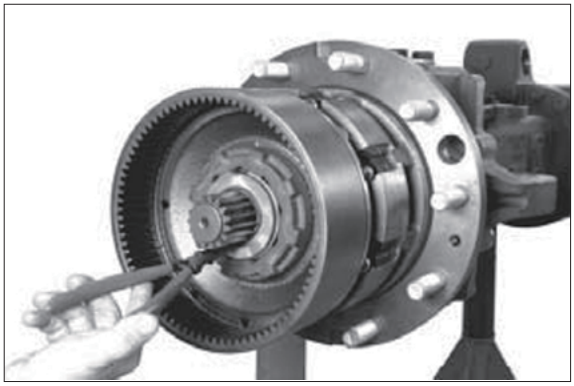
17W98FA148

(18) Mount thrust washer with shoulder showing to the retaining ring (outwards).



17W98FA149

(19) Fix thrust washers by using a retaining ring.



17W98FA150

(22) Check leakage of steering

Make leakage test of steering in both steering directions by means of HP pump.

Test pressure: 200 bar
Test medium: Engine oils SAE 10W

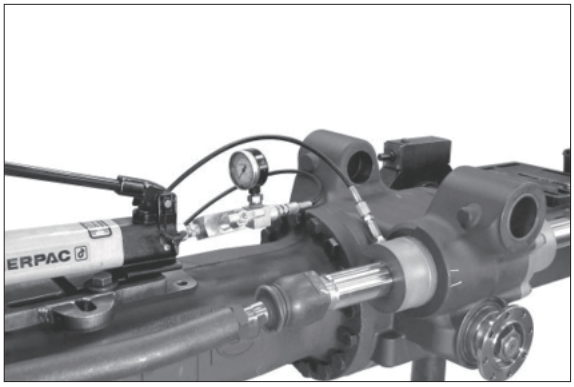
Test pressure p = Build up 200 bar (bleed pressure chamber).

Then close connection to HP pump by means of locking valve.

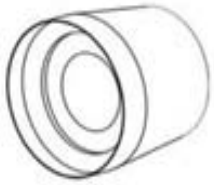
A 5 bar pressure drop is permissible during a test duration of 20 sec.

(S) HP pump	5870 287 007
(S) Reduction	5870 950 161
(S) Clutch	0501 207 939

※ Prior to putting the axle into operation fill it with oil.



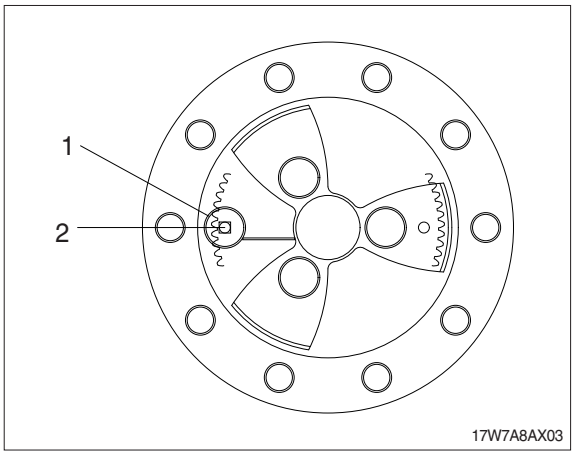
17W98FA180

No.	Figure	Designation order no.	Qty	Page
46	 180W9A8FA546	Inner installer (FR axle) 5870 651 088	1	8-287
47	 180W9A8FA547	Inner installer 5870 651 089	1	8-287
48	 180W9A8FA548	Calibration bushing 5870 651 090 (Not used)	1	8-264
49	 180W9A8FA549	Calibration bushing 5870 651 091	1	8-287
50	 180W9A8FA550	Socket wrench (FR axle) 5870 656 097	1	8-247, 278, 281 8-315, 344, 348

4) BRAKE LINING WEARING TEST

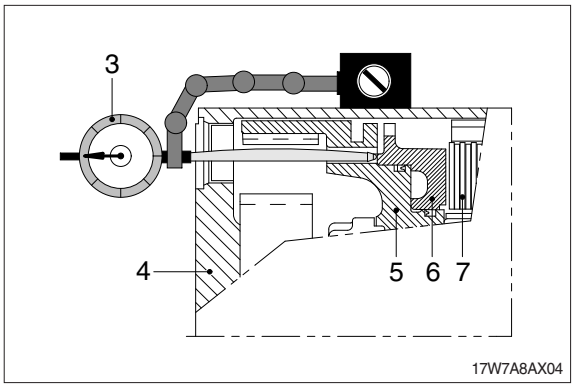
(1) The measurement of wear on the multi-disc brake only gives limited information on the total state of the plate pack without disassembling the output.
Make measurement of lining wear at least once per year, in particular, however, in case of a different braking behaviour, like :
- Braking noises
- Reduced braking power
- Different deceleration
- Different brake oil level
- Different braking pressure

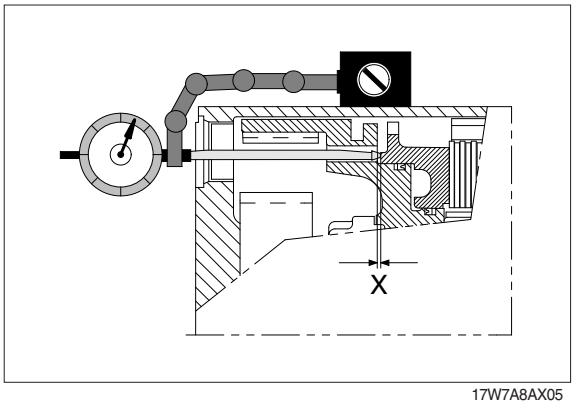
※ To avoid injury when opening the oil drain/ oil filler plug (1), due to a possible pressure build-up in the planetary carrier bring drain hole to topmost position (12 o'clock) and carefully unscrew oil drain and filler plug (1).



(2) Then turn output until oil filler / oil drain hole (2) is on 9 o'clock position.

1 = Oil filler-/oil drain hole
2 = Gauge hole (∅=10 ㎜) in ring gear
9 o'clock position
3 = Dial indicator with solenoid support
4 = Planetary carrier
5 = Ring gear
6 = Piston
7 = Plate pack
X = Piston stroke

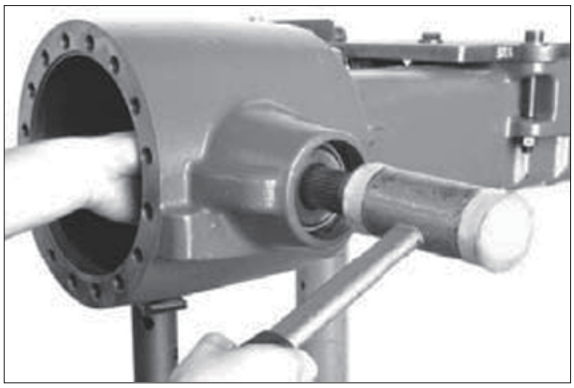




(15) Force out input pinon and remove the releasing roller bearing.

※ Use a plastic hammer.

※ If the tapered roller bearings are not replaced, pay attention that all the rollers of the outer bearing inner ring are always in contact with the bearing outer ring when forcing out the input pinion.



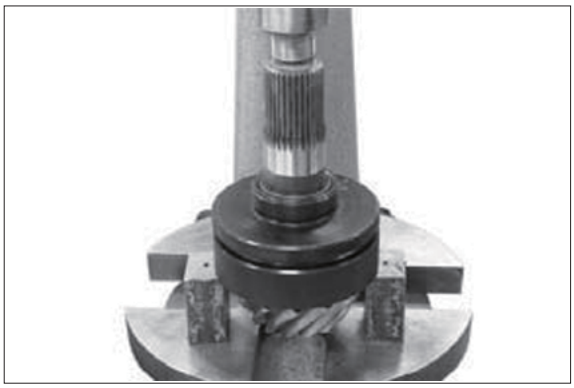
17W98RA037

(16) Remove spacer ring.

17W98RA038

(17) Press roller bearing off the input pinion.

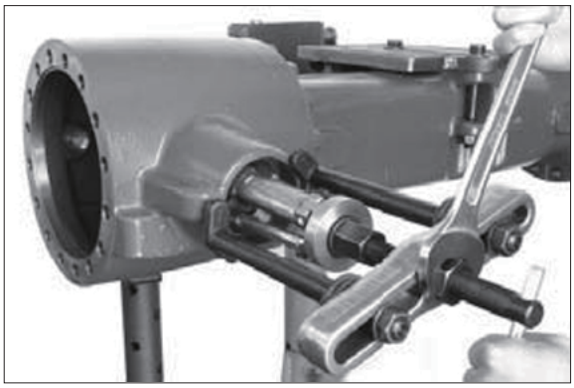
(S) Grab sleeve 5873 001 037



17W98RA039

(18) Pull external bearing outer ring out of the bearing hole.

(S) Internal extractor 5870 300 019
(S) Counter support 5870 300 020



17W98RA040

(7) Use lifting tackle to mount the axle housing (crown wheel side) and preliminarily fix it with hexagon screws.

Tightening torque (M18/12.9) . . . . . MA = 440 Nm

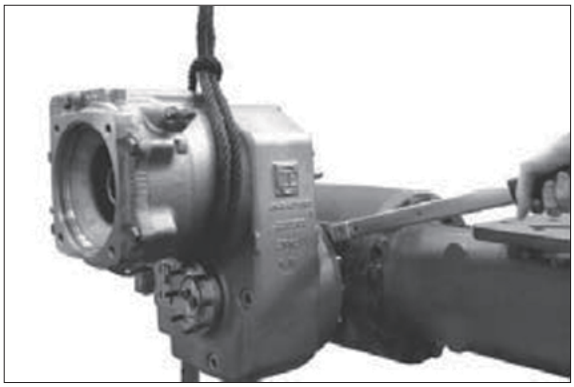
※ Preliminarily fix axle housing without O-ring.

17W98RA071

(8) Rotate axle by 90˚ and support it.

Use lifting tackle to bring HL transmission into contact position with the axle housing and fix it.

Tightening torque . . . . . MA = 79 Nm



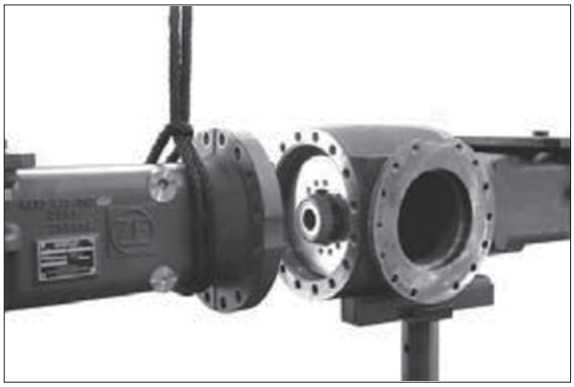
17W98RA072

(9) By rotating the input flange, roll crown wheel over the input pinion in both directions several times.

Then remove transmission and axle housing and lift differential out of the axle drive housing.

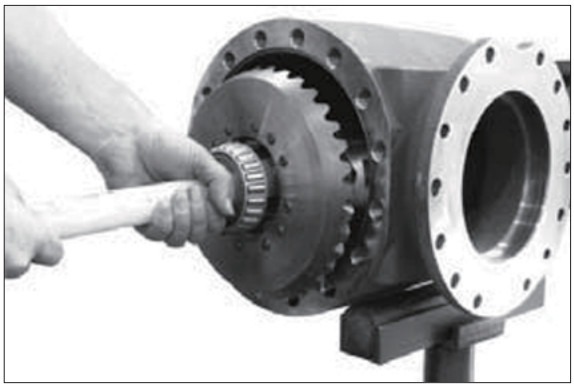
Compare the obtained contact pattern.

※ In case of a contact pattern deviation, check the pinion shimming of the transmission.



17W98RA073

(10) After contact pattern check, place differential into the axle drive housing.

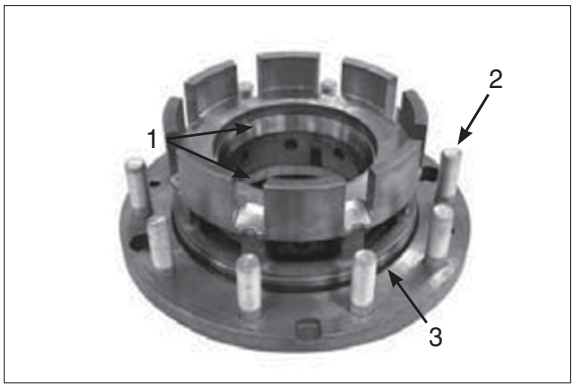


17W98RA074

(5) Insert both bearing outer rings (1) of the hub bearing until contact position is obtained.

Press wheel bolts (2) into the hub until contact position is obtained.

Grease O-ring (3) and place it into the annular groove of the hub.



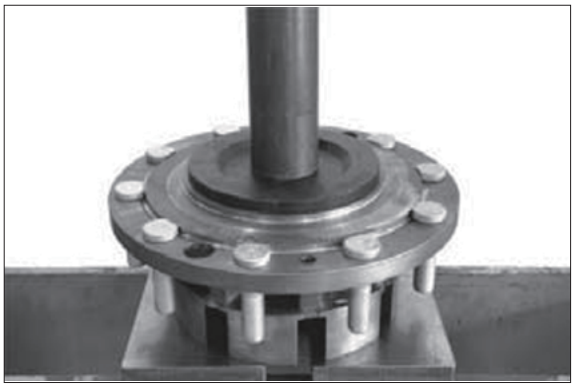
17W98RA107

(6) Press shaft seal ring into the hub, with the marking "OUT SIDE" showing outwards (facing up):

(S) Driver tool 5870 051 068

※ Use of the specified driver tool (S) ensures the exact installation position of the shaft seal ring.

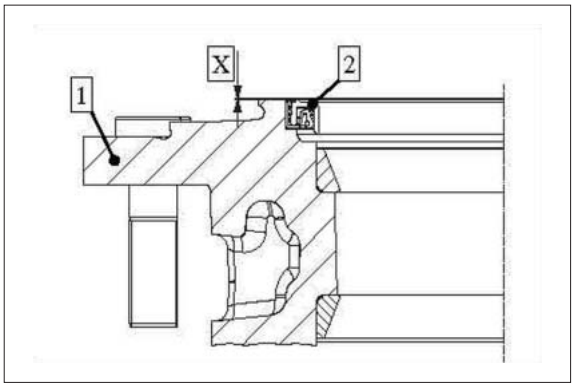
※ Wet outer diameter of the shaft seal ring with Loctite no. 574.



17W98RA108

(7) Legend to sketch:

1 = Hub
2 = Shaft seal ring
X = Installation dimension – shaft seal ring
..... $2.5^{+0.5}$ mm

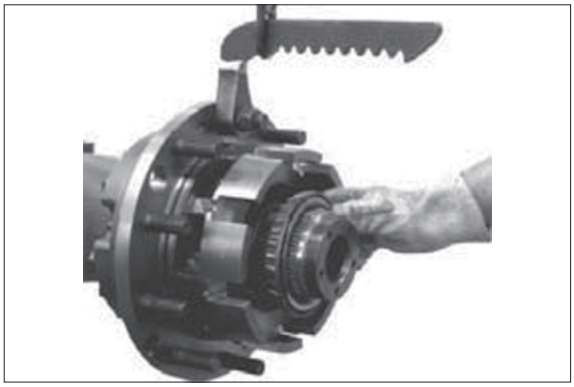


17W98RA109

(8) Mount preassembled hub until contact is obtained and fix it with heated tapered roller bearing.

(S) Lifting bracket 5870 281 043

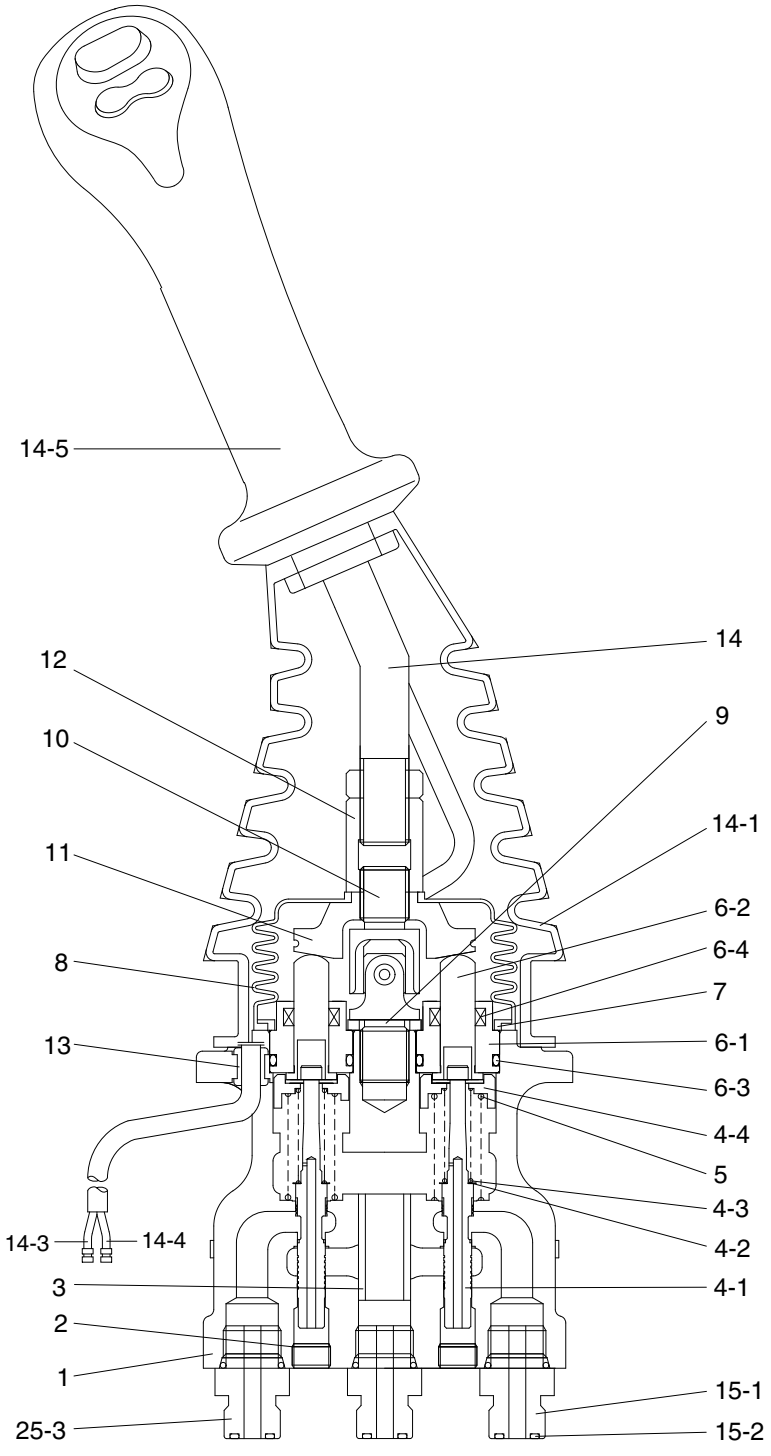
※ Just before fitting, wet sealing lips of shaft seal ring with lubricant.



17W98RA110

2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE



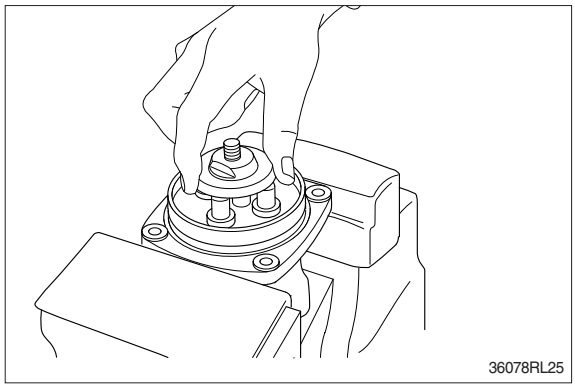
140WA2RL06

1	Case	5	Spring	9	Spacer	14-3	Housing
2	Plug	6-1	Plug	10	Joint Assy	14-4	Housing
3	Bushing	6-2	Push rod	11	Swash plate	14-5	Handle
4-1	Spool	6-3	O-ring	12	Adjusting nut	14-6	Lock nut
4-2	Shim	6-4	Rod seal	13	Bushing	15-1	Filter
4-3	Spring	7	Spacer	14-1	Boot	15-2	Connector
4-4	Spring seat	8	Boot	14-2	Spring pin	15-3	Connector

(10) Assemble swash plate (11) to joint (10).

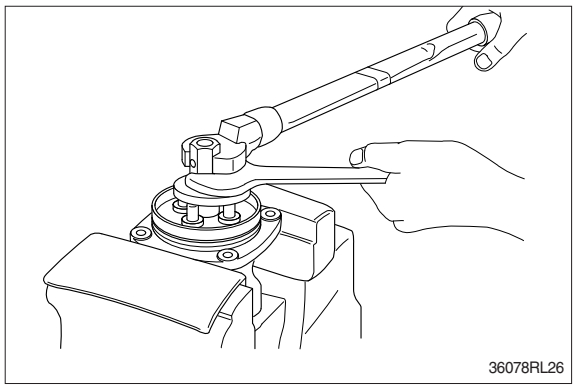
※ Screw it to position that it contacts with 4 push rods evenly.

※ Do not screw it over.

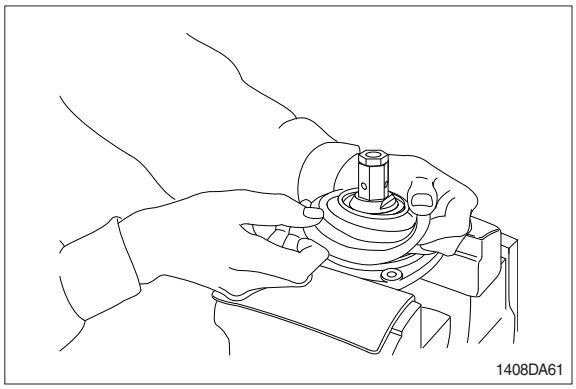


(11) Assemble adjusting nut (12), apply spanner to width across flat of plate (11) to fix it, and tighten adjusting nut to the specified torque.

※ During tightening, do not change position of disk.



(12) Fit boot (8) to plate.

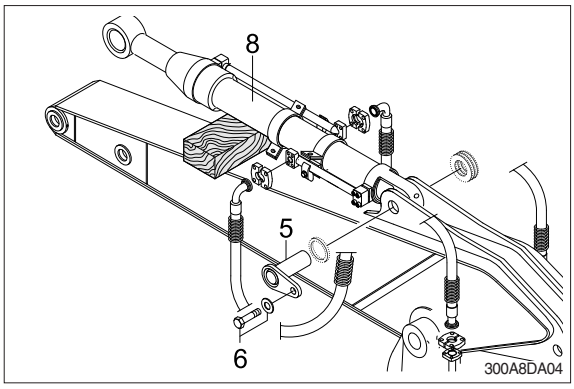


④ Sling bucket cylinder assembly (8) and remove bolt (6) then pull out pin (5).

· Tightening torque (6) : 29.7±4.5 kgf · m (215±32.5 lbf · ft)

⑤ Remove bucket cylinder assembly (8).

· Weight : 171 kg (380 lb)



(2) Install

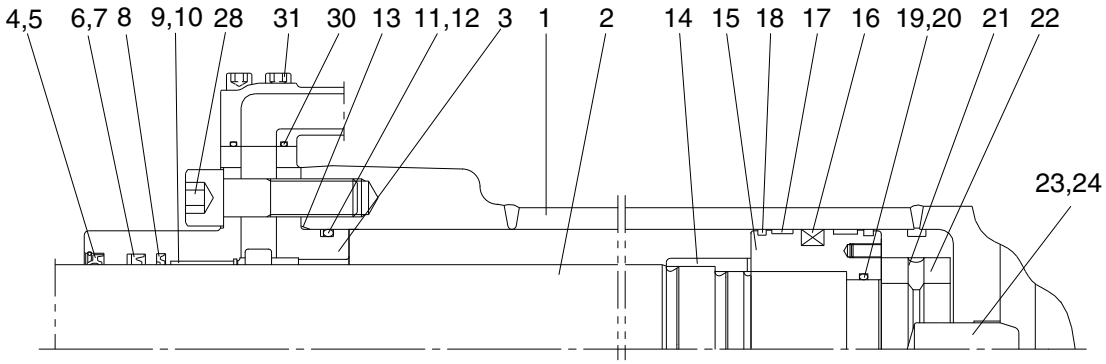
① Carry out installation in the reverse order to removal.

⚠ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.

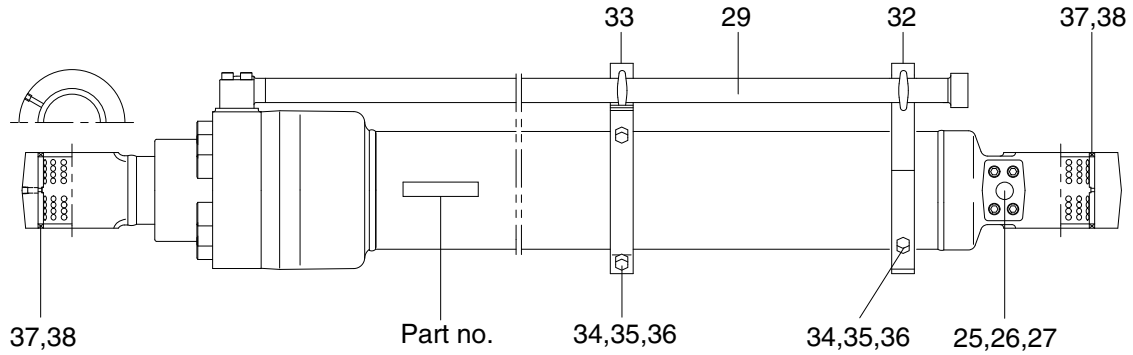
※ Bleed the air from the bucket cylinder.

※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

Standard (SHPAC)



Internal detail



31Q6-50132EGG

1	Tube assembly	14	Cushion ring	27	Plug
2	Rod assembly	15	Piston	28	Hexagon socket head bolt
3	Gland	16	Piston seal	29	Pipe assembly-R
4	Dust wiper	17	Wear ring	30	O-ring
5	Retaining ring	18	Dust ring	31	Hexagon socket head bolt
6	Rod seal	19	O-ring	32	Band assembly-B
7	Back up ring	20	Back up ring	33	Band assembly-R
8	Buffer ring	21	Lock nut	34	U-bolt
9	Dry bearing	22	Hex socket headless set screw	35	Hexagon nut
10	Retaining ring	23	Cushion plunger	36	Spring washer
11	O-ring	24	Stop ring	37	Dimple bushing
12	Back up ring	25	Check valve	38	Dust seal
13	O-ring	26	Coil spring		

Part name		Item	Size	Torque	
				kgf · m	lbf · ft
Socket head bolt	Adjust cylinder	22★1★3	M20	150±15.0	1085±108
		24★1★7	M20	58.0±4.0	420±28.9
		30★3	M10	5.4±0.5	39.1±3.6
		32★3	M10	5.4±0.5	39.1±3.6
		32★7	M10	5.5~6.0	39.8~43.4
		35★7	M10	5.5~6.0	39.8~43.4
Lock nut	Bucket cylinder	20★3	-	100±10.0	723±72.3
		21★4	M62	100±10.0	723±72.3
		20★6	M56	100±10.0	723±72.3
		21★4★5	M56	100±10.0	723±72.3
	Boom cylinder	20★3	-	100±10.0	723±72.3
		21★4	M56	100±10.0	723±72.3
	Arm cylinder	20★3	-	150±15.0	1085±108
		21★4	M70	150±15.0	1085±108
	Adjust cylinder	13★3	M85	100±10.0	723±72.3
		22★7	M82	190±19.0	1374±137
Piston	Bucket cylinder	14★3	-	150±15.0	1085±108
		15★4	M75	150±15.0	1085±108
	Boom cylinder	14★3	-	150±15.0	1085±108
		15★4	M75	150±15.0	1085±108
		14★6	M75	150±15.0	1085±108
		15★4★5	M56	150±15.0	1085±108
	Arm cylinder	14★3	-	200±20.0	1447±145
		15★4	M90	200±20.0	1447±145
	Dozer cylinder	12★4	M56	140±14.0	1013±101
	Outtrigger cylinder	12★4	M56	140±14.0	1013±101
	Adjust cylinder	13★3	M100	150±15.0	1085±108
		16★7	M95	100±10.0	723±72.3
Set screw	Bucket cylinder	21★3	M8	2.7±0.3	19.5±2.2
		22★4	M8	1.7±0.2	12.3±1.4
	Boom cylinder	21★3	M8	2.7±0.3	19.5±2.2
		22★4	M8	1.7±0.2	12.3±1.4
		21★6	M8	2.7±0.3	19.5±2.2
		22★4★5	M8	1.7±0.2	12.3±1.4
	Arm cylinder	21★3	M10	5.4±0.5	39.1±3.6
		22★4	M10	2.5±0.3	18.1±2.2
	Dozer cylinder	19★4	M8	1.7±0.2	12.3±1.4
	Outtrigger cylinder	19★4	M8	1.7±0.2	12.3±1.4
	Adjust cylinder	23★7	M8	5.0	36.2

★1 : Apply loctite #243 on the thread of bolt.
★3 : CHANGZHOU, type 1
★4 : SHPAC
★5 : 2-piece boom
★6 : CHANGZHOU, type 2
★7 : DY POWER