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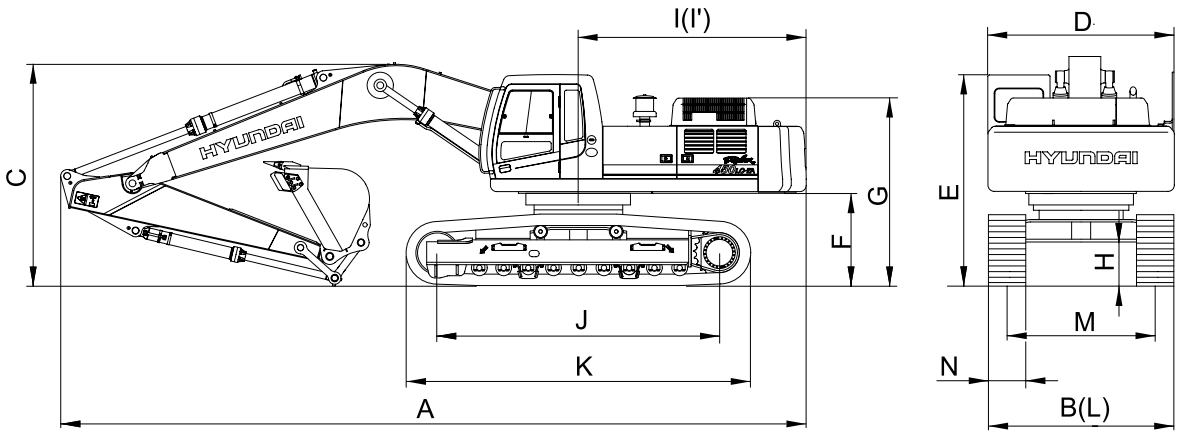
SECTION 1 GENERAL

2. SPECIFICATIONS

1) ROBEX 450LC-7A

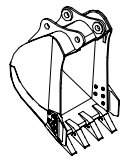
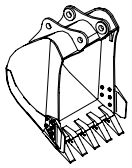
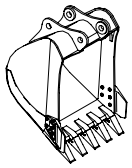
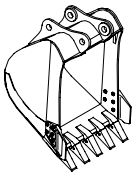
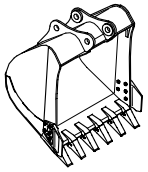
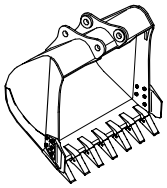
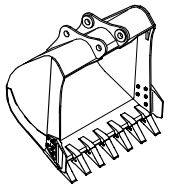


4507A2SP02

Description		Unit	Specification
Operating weight		kg(lb)	45200(99650)
Bucket capacity(SAE heaped), standard		$m^3(yd^3)$	2.15(2.81)
Overall length	A	mm(ft-in)	12000(39' 4")
Overall width, with 600mm shoe	B		3340(10'11")
Overall height	C		3600(11'10")
Superstructure width	D		2980(9' 9")
Overall height of cab	E		3250(10' 8")
Ground clearance of counterweight	F		1340(4' 5")
Engine cover height	G		2792(9' 2")
Minimum ground clearance	H		555(1'10")
Rear-end distance	I		3665(12' 0")
Rear-end swing radius	I'		3720(12' 2")
Distance between tumblers	J		4470(14' 8")
Undercarriage length	K		5462(17'11")
Undercarriage width	L		3340(10'11")
Track gauge	M		2740(8'12")
Track shoe width, standard	N		600(24")
Travel speed(Low/high)		km/hr(mph)	3.2/5.0(2.0/3.1)
Swing speed		rpm	9.0
Gradeability		Degree(%)	35(70)
Ground pressure(600mm shoe)		$kgf/cm^2(psi)$	0.78(11.09)

6. BUCKET SELECTION GUIDE

1) GENERAL BUCKET

						
1.38m³ SAE heaped bucket	1.65m³ SAE heaped bucket	1.84m³ SAE heaped bucket	※2.15m³ SAE heaped bucket	2.56m³ SAE heaped bucket	2.79m³ SAE heaped bucket	3.03m³ SAE heaped bucket

Capacity		Width		Weight	Recommendation						
					7.06m (23' 2") boom					6.55m(21' 5") boom	9.00m(29' 6") boom
SAE heaped	CECE heaped	Without side cutter	With side cutter		2.4m arm (7' 10")	2.9m arm (9' 6")	3.38m arm (11' 1")	4.0m arm (13' 1")	4.5m arm (14' 9")	2.4m arm (7' 10")	5.85m arm (19' 2")
1.38m³ (1.80yd³)	1.20m³ (1.57yd³)	1100mm (43.3")	1250mm (49.2")	1360kg (3000lb)							
1.65m³ (2.16yd³)	1.44m³ (1.88yd³)	1350mm (53.1")	1500mm (59.1")	1550kg (3420lb)							
1.84m³ (2.41yd³)	1.60m³ (2.09yd³)	1420mm (55.9")	1570mm (61.8")	1590kg (3510lb)							
※2.15m³ (2.81yd³)	1.85m³ (2.40yd³)	1610mm (63.4")	1760mm (69.3")	1740kg (3840lb)							
2.56m³ (3.35yd³)	2.20m³ (2.90yd³)	1870mm (73.6")	2020mm (79.5")	1970kg (4340lb)							
2.79m³ (3.65yd³)	2.40m³ (3.14yd³)	2020mm (79.5")	2170mm (85.4")	2100kg (4630lb)							
3.03m³ (3.96yd³)	2.60m³ (3.40yd³)	2170mm (85.4")	2320mm (91.3")	2140kg (4720lb)							

※ : Standard bucket

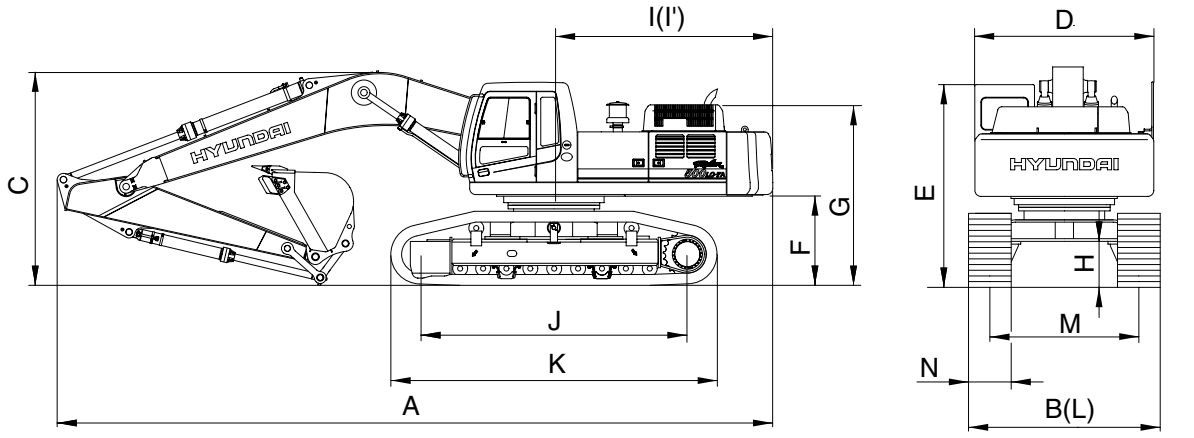
Applicable for materials with density of 2000kgf/m³ (3370lbf/yd³) or less

Applicable for materials with density of 1600kgf/m³ (2700lbf/yd³) or less

Applicable for materials with density of 1100kgf/m³ (1850lbf/yd³) or less

2. SPECIFICATIONS

· 7.06m(23' 2") BOOM, 3.38m(11' 1")ARM



5007A2SP02

Description		Unit	Specification
Operating weight		kg(lb)	48800(107580)
Bucket capacity(SAE heaped), standard		$m^3(yd^3)$	2.15(2.81)
Overall length	A	mm(ft-in)	12030(39' 6")
Overall width, with 600mm shoe (Transport position/Working position)	B		2990/3540(9'10"/11'7")
Overall height	C		3850(12' 8")
Superstructure width	D		2980(9' 9")
Overall height of cab	E		3390(11' 2")
Ground clearance of counterweight	F		1500(4'11")
Engine cover height	G		3015(9'11")
Minimum ground clearance	H		770(2' 6")
Rear-end distance	I		3665(12' 0")
Rear-end swing radius	I'		3720(12' 2")
Distance between tumblers	J		4470(14' 8")
Undercarriage length	K		5460(17'11")
Undercarriage width (Transport position/Working position)	L		2980/3540(9' 9"/11' 7")
Track gauge (Transport position/Working position)	M		2380/2940(7'10"/ 9' 8')
Track shoe width, standard	N		600(24")
Travel speed(Low/high)		km/hr(mph)	3.2/5.0(2.0/3.1)
Swing speed		rpm	9.0
Gradeability		Degree(%)	35(70)
Ground pressure(600mm shoe)		$kgf/cm^2(psi)$	0.84(11.94)

6) 7.06m(23' 2") boom, 4.50m(14' 9") arm equipped with 2.15m³(SAE heaped) bucket, 600mm (24") triple grouser shoe and 10,200kg(22,490lb) counterweight.

Load point height		Load radius												At max. reach		
		3.0m(10.0ft)		4.5m(15.0ft)		6.0m(20.0ft)		7.5m(25.0ft)		9.0m(30.0ft)		10.5m(35.0ft)		Capacity		Reach
																m(ft)
7.5m (25.0ft)	kg									*6730	*6730			*6590	4990	11.18
	lb									*14840	*14840			*14530	11000	(36.7)
6.0m (20.0ft)	kg									*7500	*7500	*4930	*4930	*6620	4370	11.76
	lb									*16530	*16530	*10870	*10870	*14590	9630	(38.6)
4.5m (15.0ft)	kg							*9110	*9110	*8110	7320	*6660	5390	*6690	3990	12.11
	lb							*20080	*20080	*17880	16140	*14680	11880	*14750	8800	(39.7)
3.0m (10.0ft)	kg			*17640	*17640	*12870	*12870	*10360	9600	*8840	6980	*7820	5200	6490	3790	12.25
	lb			*38890	*38890	*28370	*28370	*22840	21160	*19490	15390	*17240	11460	14310	8360	(40.2)
1.5m (5.0ft)	kg			*21200	20380	*14860	12910	*11540	9040	*9530	6640	*8180	5000	6450	3740	12.18
	lb			*46740	44930	*32760	28460	*25440	19930	*21010	14640	*18030	11020	14220	8250	(40.0)
Ground Line	kg	*14310	*14310	*22980	19250	*16190	12200	*12400	8580	*10040	6360	8190	4840	6640	3840	11.91
	lb	*31550	*31550	*50660	42440	*35690	26900	*27340	18920	*22130	14020	18060	10670	14640	8470	(39.1)
-1.5m (-5.0ft)	kg	*17750	*17750	*23160	18780	*16670	11780	*12770	8290	*10210	6170	*7850	4740	7110	4140	11.41
	lb	*39130	*39130	*51060	41400	*36750	25970	*28150	18280	*22510	13600	*17310	10450	15670	9130	(37.4)
-3.0m (-10.0ft)	kg	*22170	*22170	*22090	18710	*16250	11640	*12510	8160	*9840	6100			*7120	4710	10.65
	lb	*48880	*48880	*48700	41250	*35830	25660	*27580	17990	*21690	13450			*15700	10380	(34.9)
-4.5m (-15.0ft)	kg	*27780	*27780	*19780	18920	*14820	11710	*11360	8210	*8500	6190			*6890	5790	9.56
	lb	*61240	*61240	*43610	41710	*32670	25820	*25040	18100	*18740	13650			*15190	12760	(31.4)
-6.0m (-20.0ft)	kg	*21610	*21610	*15870	*15870	*11960	*11960	*8670	8500					*6000	*6000	7.98
	lb	*47640	*47640	*34990	*34990	*26370	*26370	*19110	18740					*13230	*13230	(26.2)

7) 9.00m(29' 6") boom, 5.85m(19' 2") arm equipped with 1.65m³(SAE heaped) bucket, 600mm (24") triple grouser shoe and 10,700kg(23,590lb) counterweight.

Load point height		Load radius												At max. reach		
		3.0m(10.0ft)		5.0m(15.0ft)		7.0m(25.0ft)		9.0m(30.0ft)		11.0m(35.0ft)		13.0m(45.0ft)		Capacity		Reach
																m(ft)
10.0m (35.0ft)	kg													*4350	3530	13.66
	lb													*9590	7780	(44.8)
8.0m (25.0ft)	kg									*4910	*4910	*2810	*2810	*4290	2860	14.63
	lb									*10820	*10820	*6190	*6190	*9460	6310	(48.0)
6.0m (20.0ft)	kg									*5320	*5320	*4370	3650	*4290	2450	15.25
	lb									*11730	*11730	*9630	8050	*9460	5400	(50.0)
4.0m (15.0ft)	kg					*9040	*9040	*7050	*7050	*5880	4990	*5110	3450	4200	2200	15.57
	lb					*19930	*19930	*15540	*15540	*12960	11000	*11270	7610	9260	4850	(51.1)
2.0m (-5.0ft)	kg			*16870	16620	*10900	9970	*8070	6630	*6460	4600	*5410	3230	4080	2100	15.60
	lb			*37190	36640	*24030	21980	*17790	14620	14240	10140	*11930	7120	8990	4630	(51.2)
Ground Line	kg			*17270	15020	*12210	9020	*8880	6060	*6930	4250	5550	3030	4140	2110	15.35
	lb			*38070	33110	*26920	19890	*19580	13360	*15280	9370	12240	6680	9130	4650	(50.4)
-2.0m (-5.0ft)	kg	*11700	*11700	*18210	14440	*12720	8480	*9290	5680	*7160	4010	5400	2890	4390	2270	14.80
	lb	*25790	*25790	*40150	31830	*28040	18700	*20480	12520	*15790	8840	11900	6370	9680	5000	(48.6)
-4.0m (-15.0ft)	kg	*15000	*15000	*17860	14390	*12450	8290	*9180	5500	*7000	3890	*4190	2870	*4530	2620	13.91
	lb	*33070	*33070	*39370	31720	*27450	18280	*20240	12130	*15430	8580	*9240	6330	*9990	5780	(45.6)
-6.0m (-20.0ft)	kg	*18860	*18860	*15810	14660	*11330	8360	*8400	5530	*6190	3940			*4380	3290	12.61
	lb	*41580	*41580	*34860	32320	*24980	18430	*18520	12190	*13650	8690			*9660	7250	(41.4)
-8.0m (-25.0ft)	kg	*17900	*17900	*12440	*12440	*9090	8680	*6540	5780					*3820	*3820	10.72
	lb	*39460	*39460	*27430	*27430	*20040	19140	*14420	12740					*8420	*8420	(35.2)

SECTION 2 STRUCTURE AND FUNCTION

2) REGULATOR

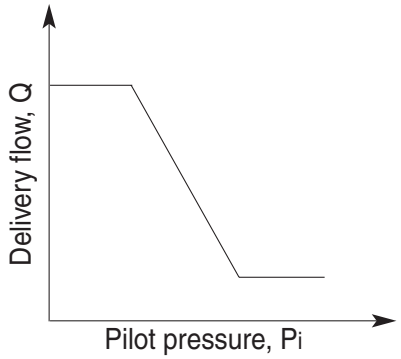
Regulator consists of the negative flow control, total horse power control and power shift control function.

(1) Negative flow control

By changing the pilot pressure Pi, the pump tilting angle(delivery flow) is regulated arbitrarily, as shown in the figure.

This regulator is of the negative flow control in which the delivery flow Q decreases as the pilot pressure Pi rises.

With this mechanism, when the pilot pressure corresponding to the flow required for the work is commanded, the pump discharges the required flow only, and so it does not consume the power uselessly.



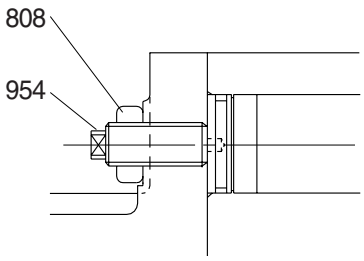
(4) Adjustment of maximum and minimum flows

① Adjustment of maximum flow

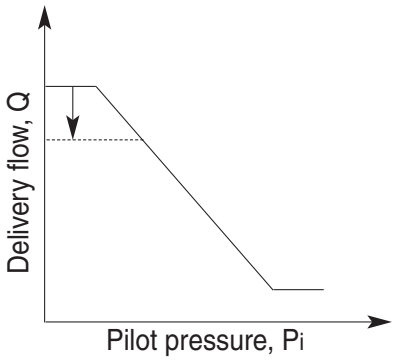
Adjust it by loosening the hexagon nut(808) and by tightening(or loosening) the set screw(954).

The maximum flow only is adjusted without changing other control characteristics.

Speed	Adjustment of max flow	
	Tightening amount of adjusting screw (954)	Flow change amount
(min^{-1})	(Turn)	(ℓ /min)
1900	+1/4	-7.6



2-19(1)

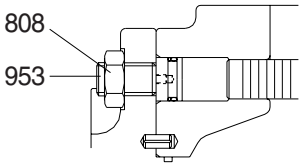


② Adjustment of minimum flow

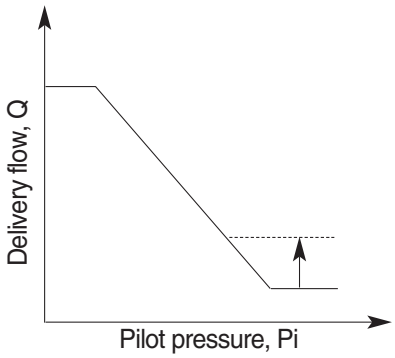
Adjust it by loosening the hexagon nut(808) and by tightening(or loosening) the hexagonal socket head set screw (953). Similarly to the adjustment of the maximum flow, other characteristics are not changed.

However, remember that, if tightened too much, the required horsepower during the maximum delivery pressure(or during relieving) may increase.

Speed	Adjustment of min flow	
	Tightening amount of adjusting screw (953)	Flow change amount
(min^{-1})	(Turn)	(ℓ /min)
1900	+1/4	+7.6



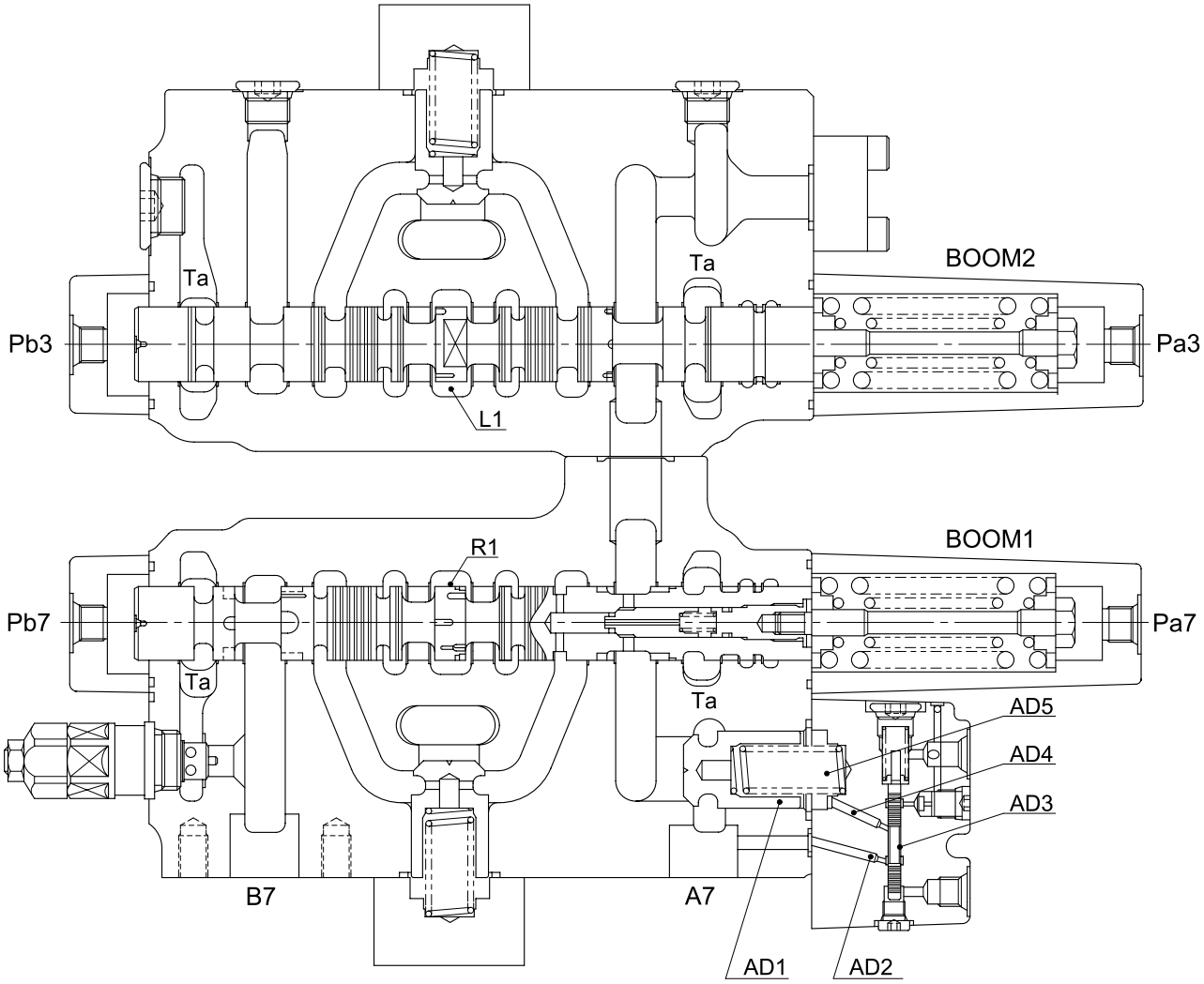
2-19(2)



3) BOOM SPOOL

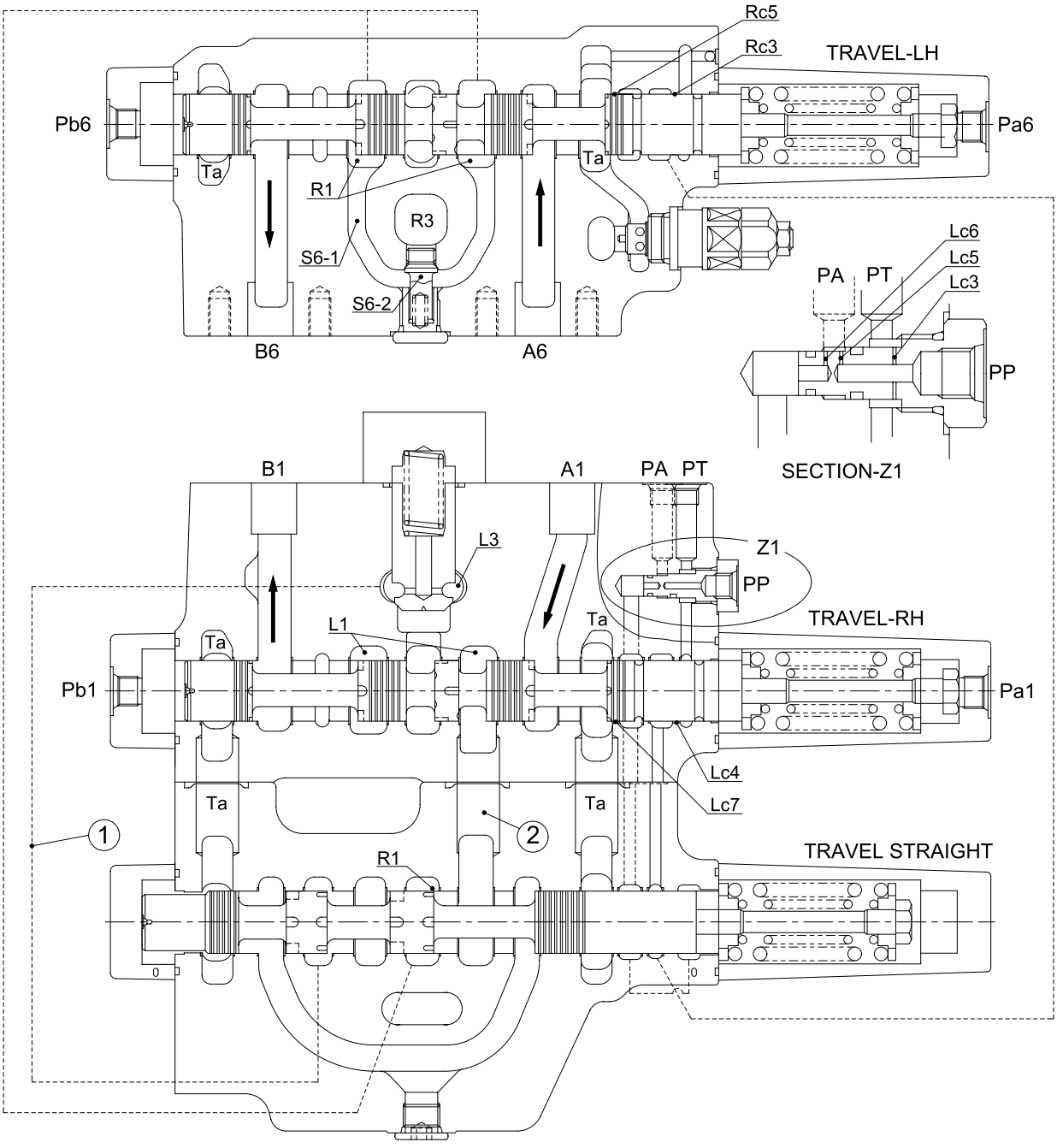
(1) Neutral

This valve is providing the anti-drift valve on the cylinder bottom side of boom 1 section. In neutral, the poppet(AD1) is seated by the pressure of spring chamber(AD5) because the oil from the port A7 is connection with spring chamber(AD5) via passage(AD2), spool(AD3) and passage(AD4).



② When the straight travel spool is operated, the oil discharged from port P1 flows into RH travel section through the neutral passage(L1) and also flows into LH travel section via the neutral passage(R1) and passage(②). The oil discharged from port P2 flows into the parallel passage(L3) via passage(①).

③ In case the load pressure of the section except travel is higher than that of the RH travel section, the partial oil of discharged from port P2 pushes open the poppet(S6-2) and flows together into the passage(S6-1) through the orifice at the edge of poppet. The travel(LH, RH) is operated by the discharged oil from port P1 and the other actuators are operated by the discharged oil from port P2. Thus, when travel and front attachment functions are operated simultaneously, keeps the straight travel.



45071MC14

2. FUNCTION

1) ROTARY PART

When high pressurized oil enters a cylinder through port(a), which is the inlet of balance plate(1), hydraulic pressure acting on the piston causes axial force F. The pressure force F works via the piston(2) upon the return plate(3) which acts upon the swash plate(4) via an hydrostatic bearing. Force F1 perpendicular to swash plate(4) and force F2 perpendicular to cylinder center.

Being transferred to the cylinder block(5) through piston, force F2 causes rotational moment at surroundings of cylinder.

Since cylinder block has 9 equidistantly arrayed pistons, rotational torque is transmitted to cylinder shaft in order by several pistons connected to the inlet port of high pressurized oil. When the direction of oil flow is reversed, rotational direction of cylinder is also reversed. Output torque is given by the equation.

$$T = \frac{p \times q}{2\pi}, \quad q = Z \cdot A \cdot PCD \cdot \tan\theta, \quad F1 = \frac{F}{\cos\theta}, \quad F_2 = F \tan\theta, \quad S = PCD \times \tan\theta$$

Where p : Effective difference of pressure(kgf/cm^2)

q : Displacement(cc/rev)

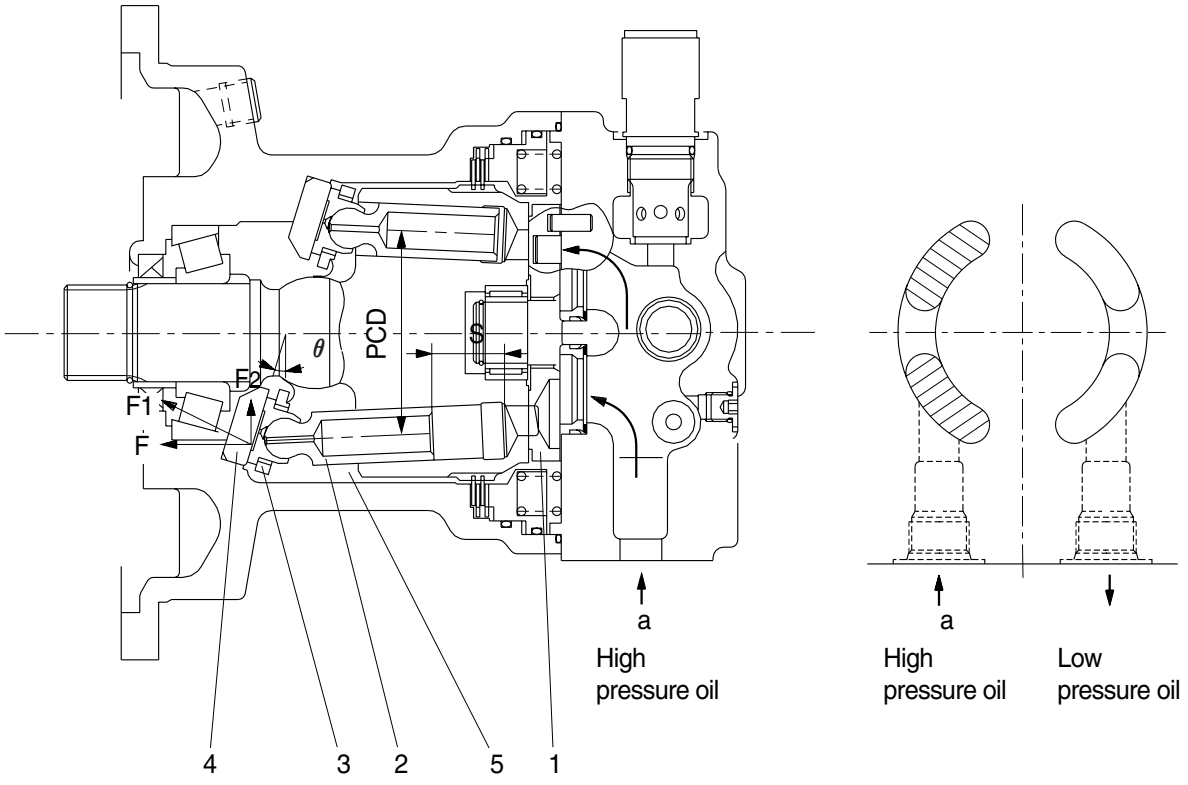
T : Output torque(kgf · cm)

Z : Piston number(9EA)

A : Piston area(cm^2)

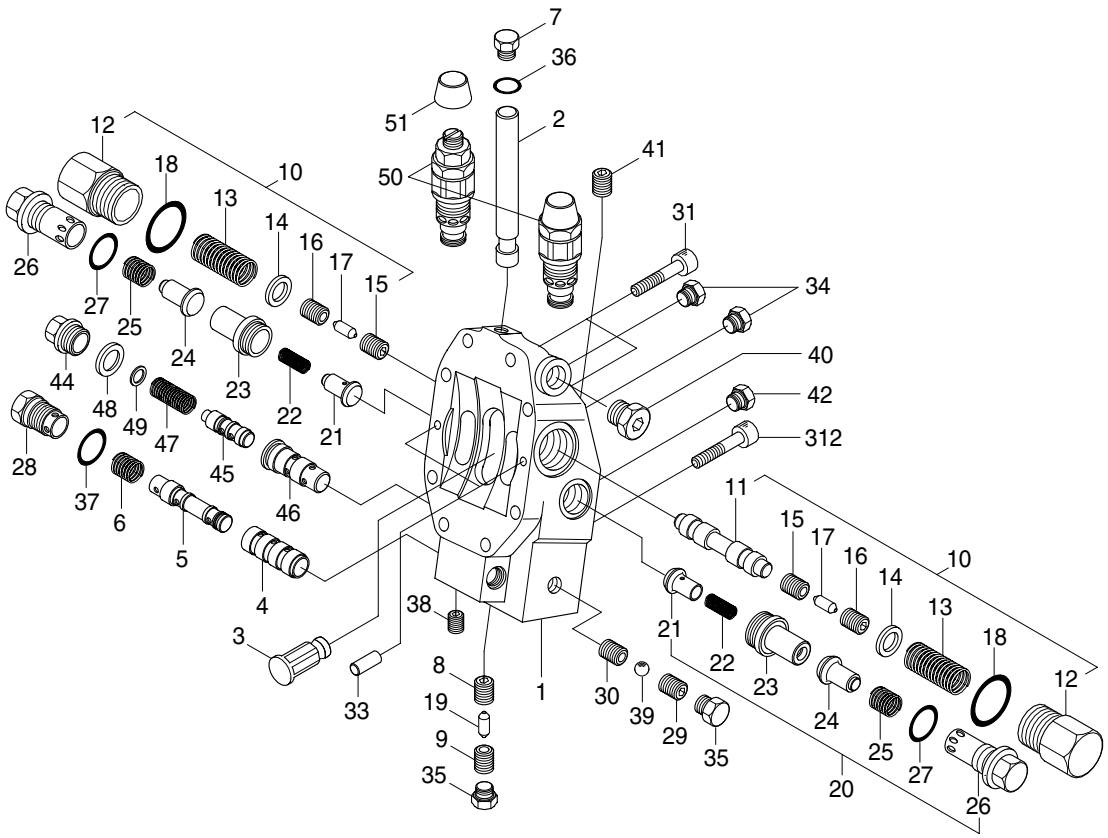
θ : Tilting angle of swash plate(degree)

S : Piston stroke(cm)



TRAVEL MOTOR(2/2)

· Control part



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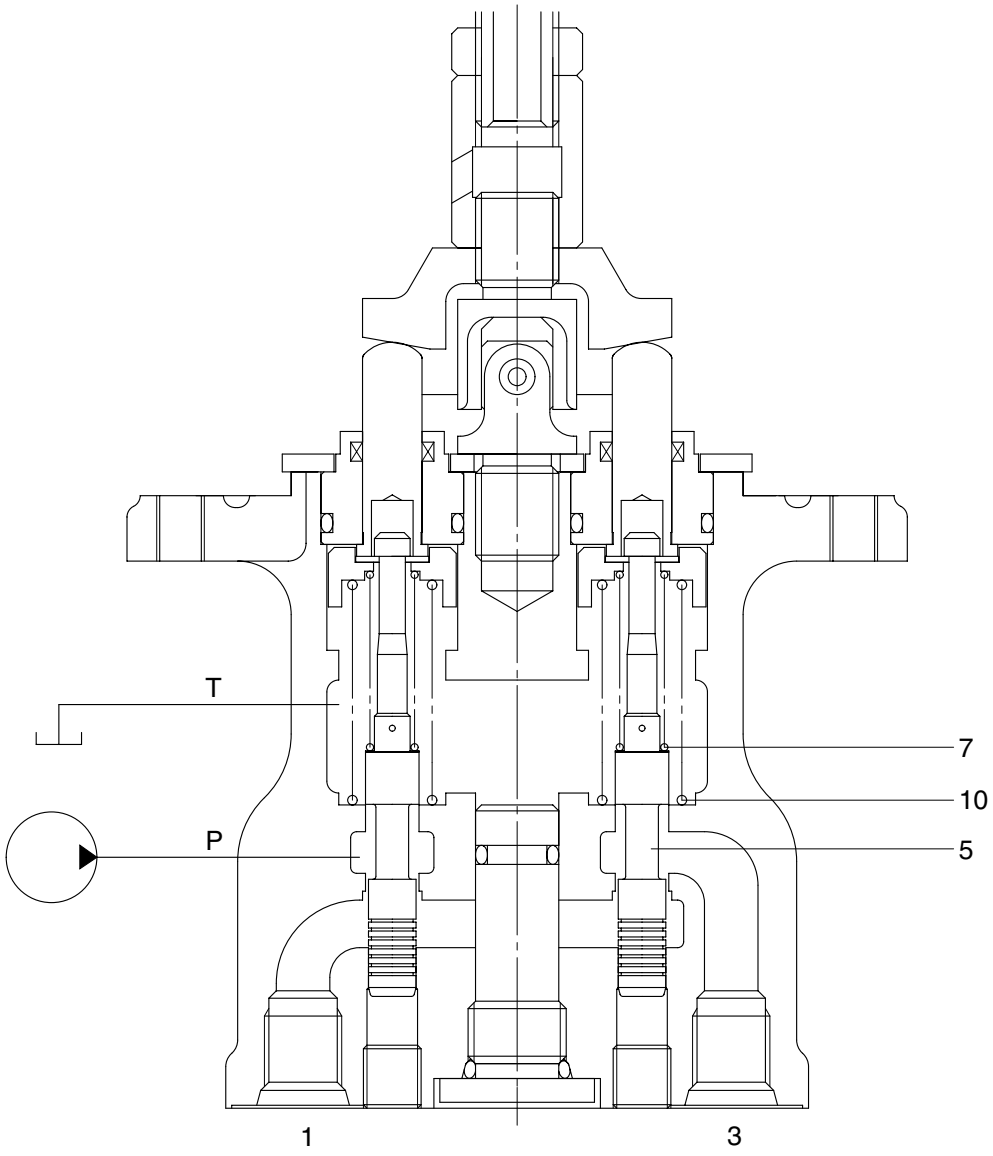
1	Port plate	18	O-ring	35	Locking screw
2	Position piston	19	Throttle pin	36	O-ring
3	Position turnnion	20	Valve	37	O-ring
4	Control bushing	21	Poppet valve	38	Brake off pin
5	Control piston	22	Pressure spring	39	Ball
6	Pressure spring	23	Seat poppet	40	Locking screw
7	Locking screw	24	Poppet valve	41	Brake off pin
8	Throttle screw	25	Pressure spring	42	Locking screw
9	Throttle screw	26	Locking screw	43	Pressure control valve
10	Brake valve	27	O-ring	44	Locking screw
11	Brake piston	28	Locking screw	45	Control piston
12	Locking screw	29	Valve screw	46	Control bushing
13	Pressure spring	30	Bushing	47	Pressure spring
14	Washer	31	Socket screw	48	O-ring
15	Throttle screw	32	Socket screw	49	Shim
16	Throttle screw	33	Cylinder pin	50	Relief pressure valve
17	Throttle pin	34	Locking screw	51	Cap

(1) Case where handle is in neutral position



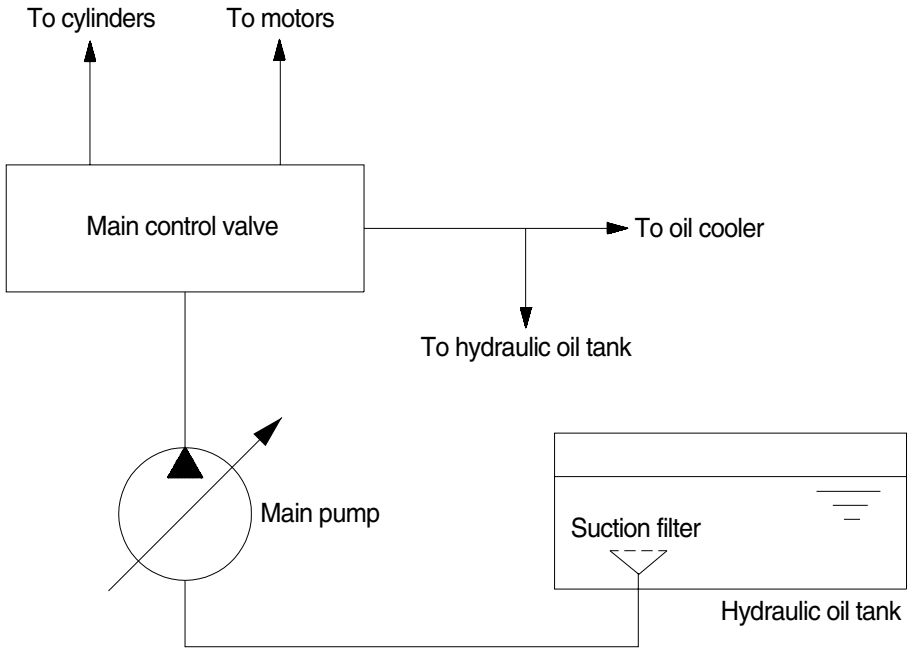
25032RL03

The force of the spring(7) that determines the output pressure of the pilot valve is not applied to the spool(5). Therefore, the spool is pushed up by the spring(10) to the position of port(1, 3) in the operation explanation drawing. Then, since the output port is connected to tank port T only, the output port pressure becomes equal to tank pressure.

GROUP 2 MAIN CIRCUIT

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

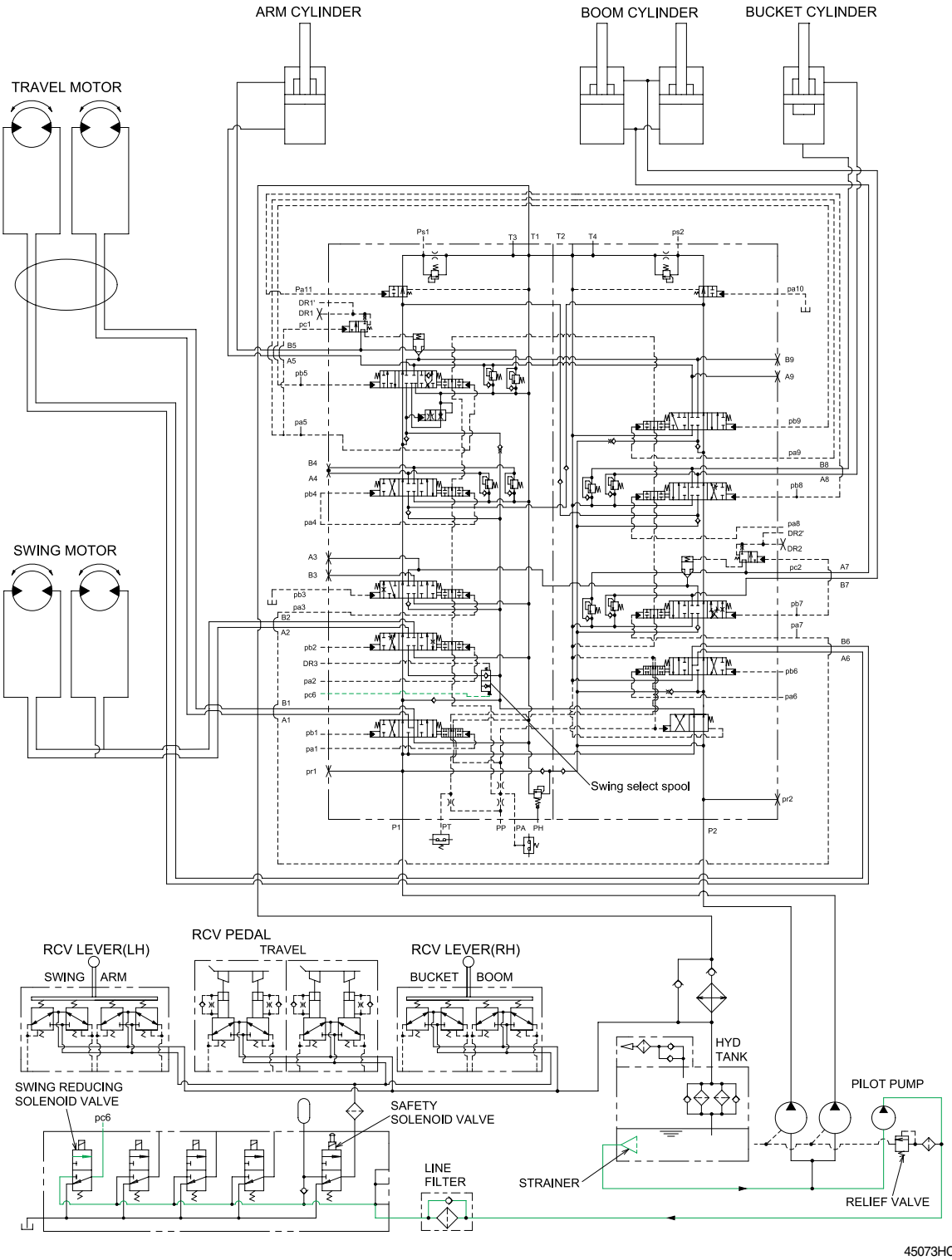
1. SUCTION AND DELIVERY CIRCUIT



3-02 (210-7)

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

7. BOOM PRIORITY SYSTEM



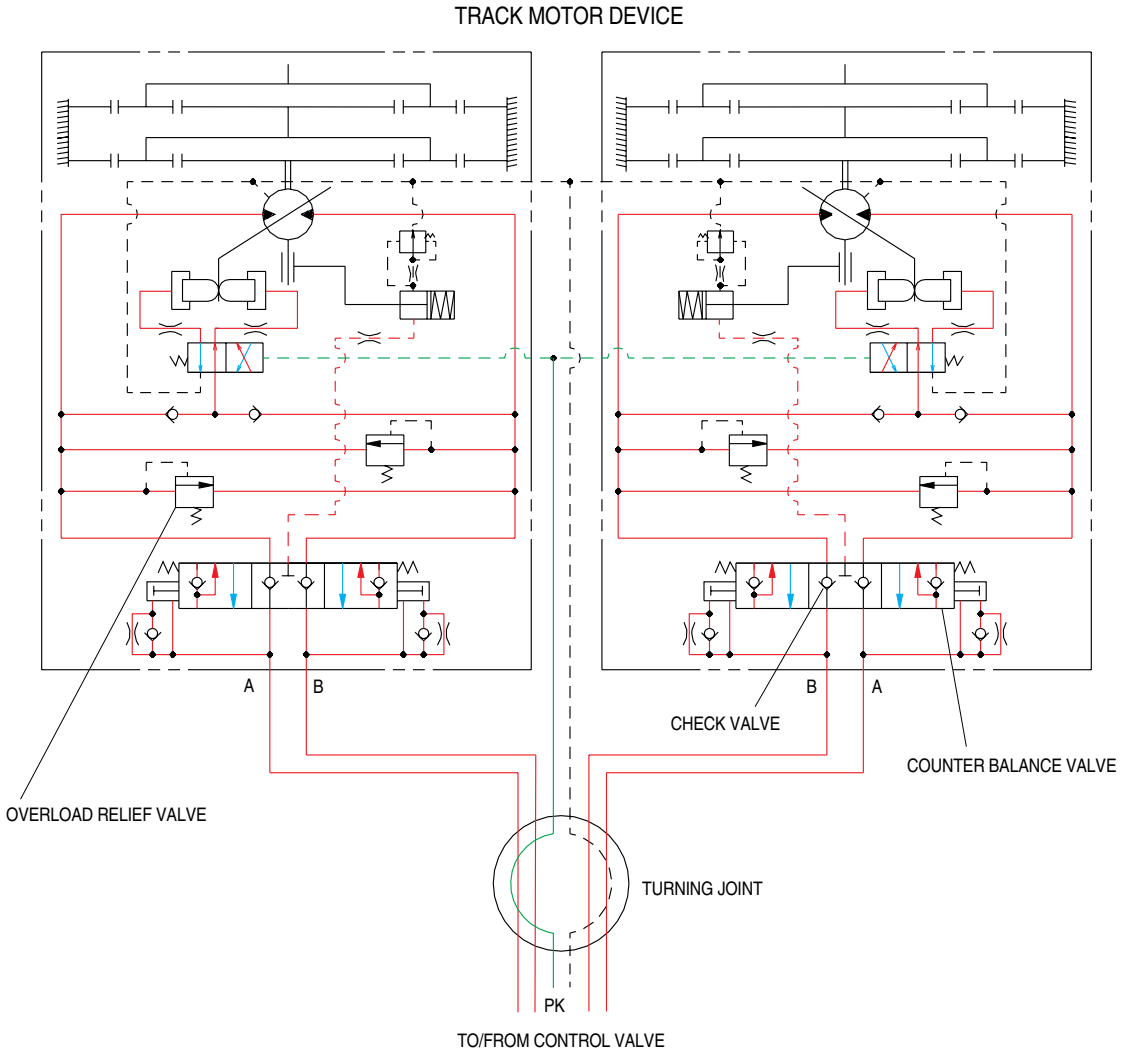
When carrying out the combined operation of swing and boom or arm, the boom or arm speed can be lowered than operating speed of swing. When the heary duty working mode in work mode is selected on the cluster, swing reducing solenoid valve actuates automatically.

The oil from pilot pump flows into the solenoid valve through the line filter.

6pcb pressure from solenoid valve change the swing select spool and decreases the oil flow rate to the swing section by orifice.

This is called the boom priority system.

TRAVEL CIRCUIT OPERATION



3-20 (210-7)

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

1) CHECK VALVE

Stopping the motor, this valve sucks the oil from lower pressure passage for prevention the negative pressure and the cavitation of the motor.

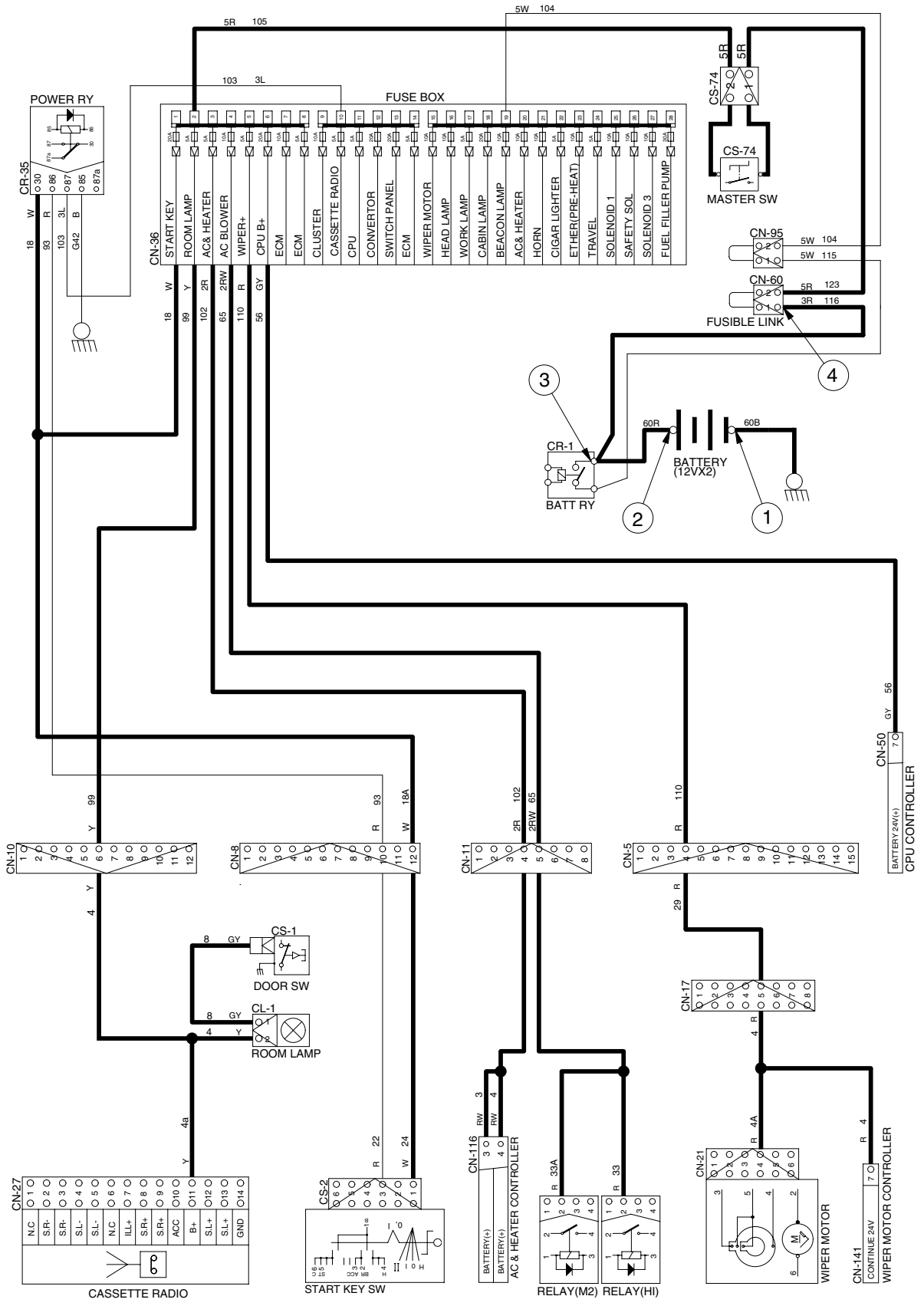
2) COUNTER BALANCE VALVE

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

3) OVERLOAD RELIEF VALVE

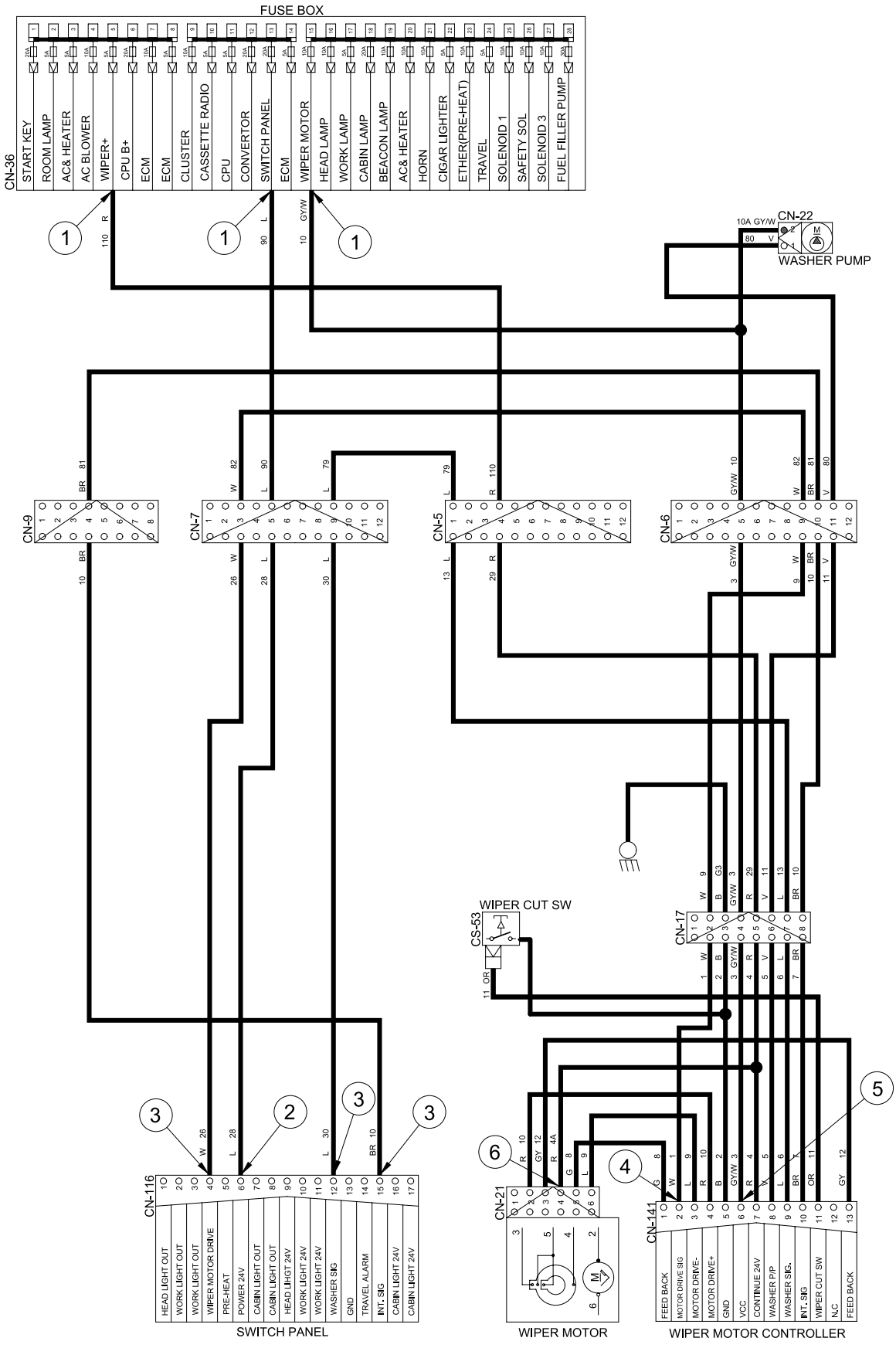
Relief valve limit the circuit pressure below 345kgf/cm^2 to prevent high pressure generated at a time of stopping the machine. Stopping the motor, this valve sucks the oil from lower pressure passage for preventing the negative pressure and the cavitation of the motor.

POWER CIRCUIT

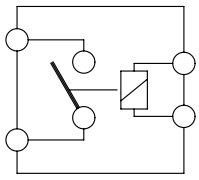
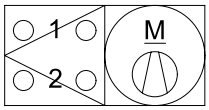
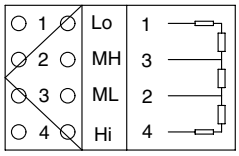
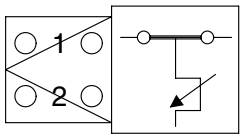
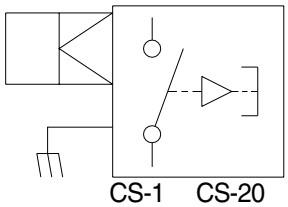
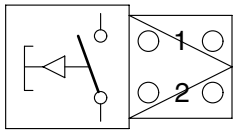


4507A4EL05

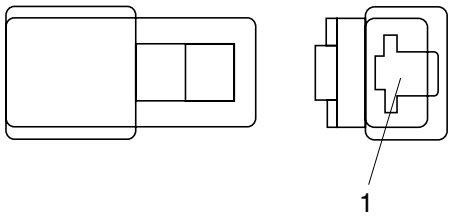
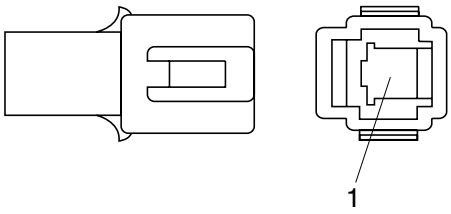
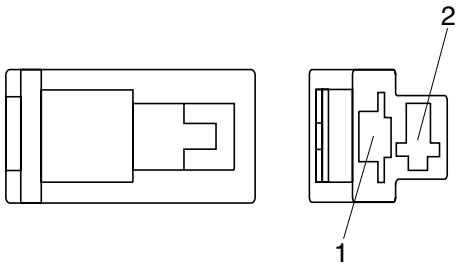
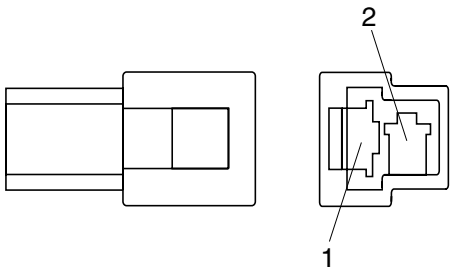
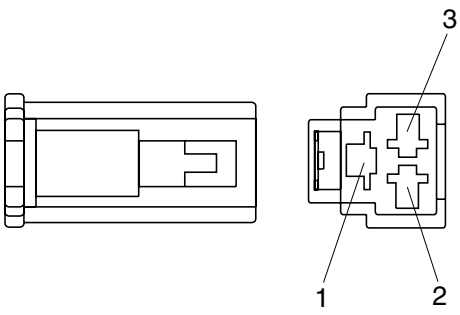
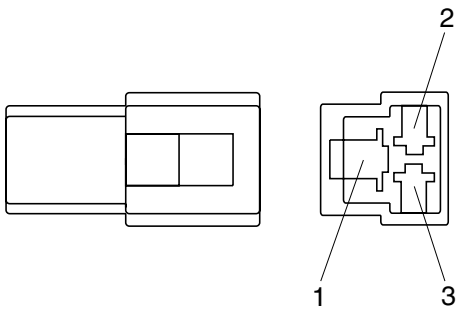
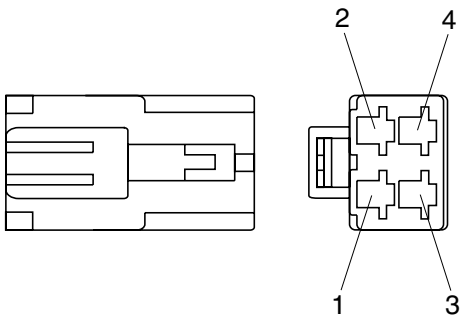
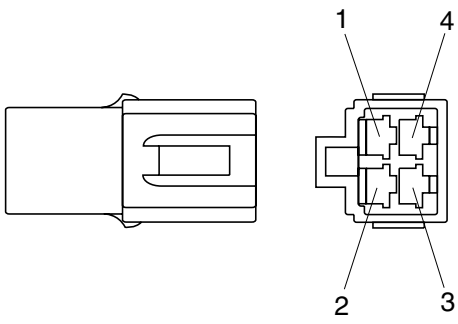
WIPER AND WASHER CIRCUIT

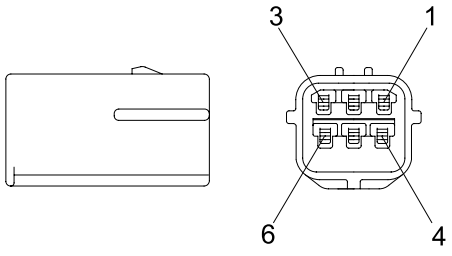
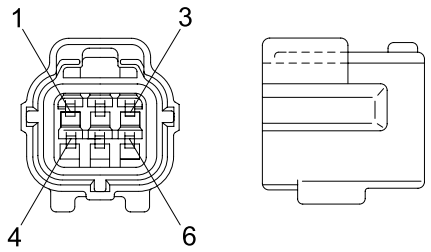
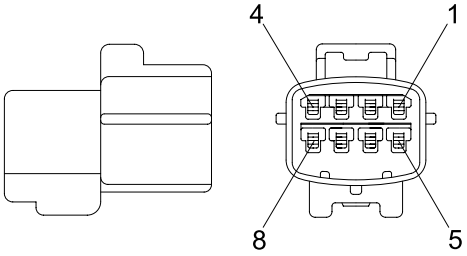
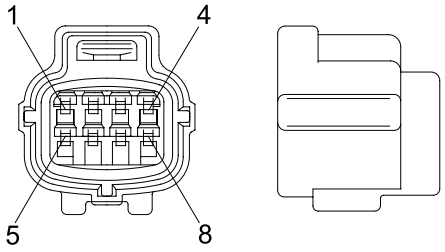
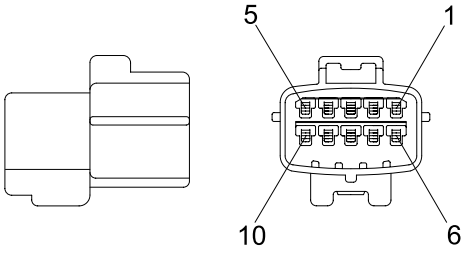
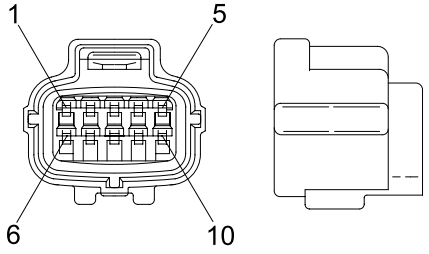
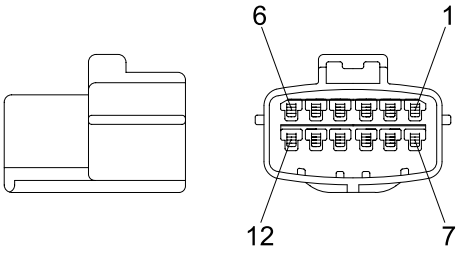
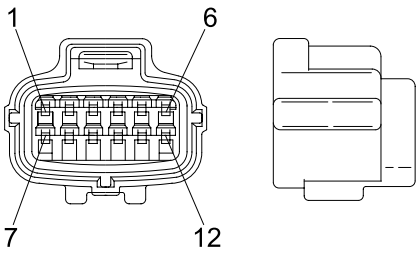


4507A4EL10

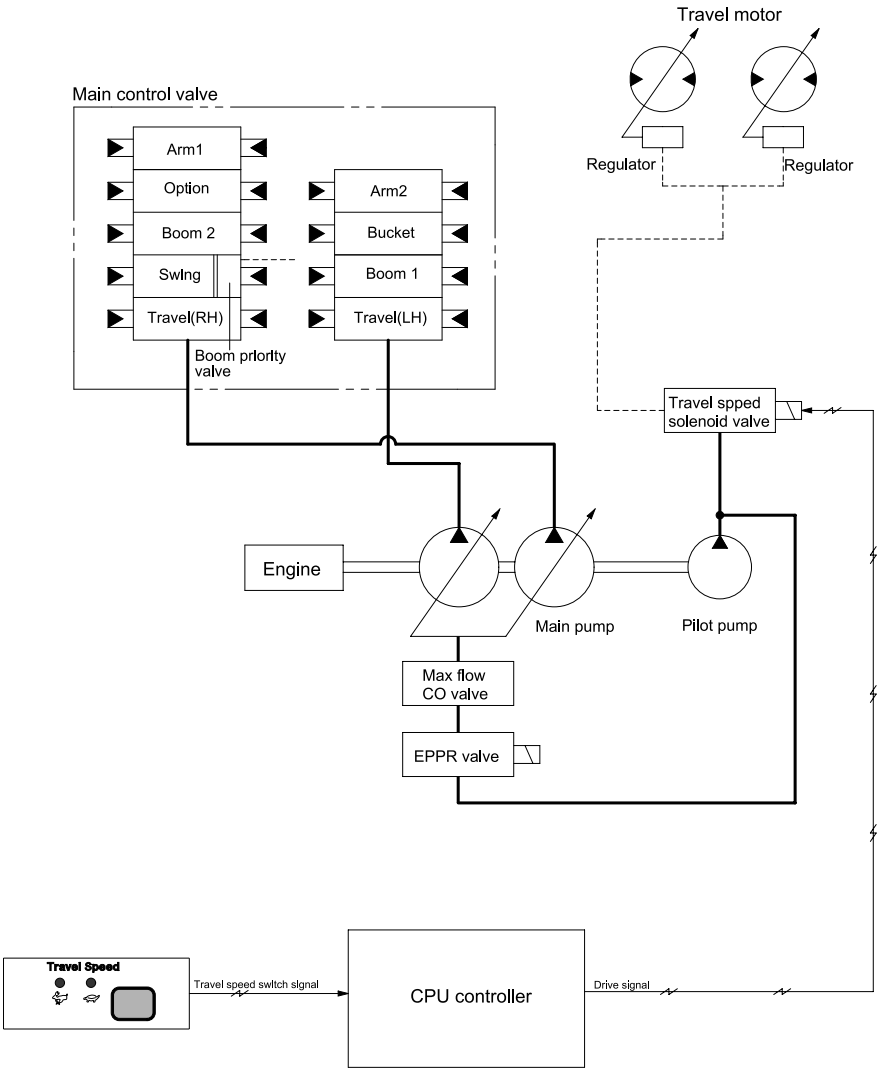
Part name	Symbol	Specifications	Check
Start relay	 CR-23	24V 300A	※Check contact Normal : 0.94 Ω (For terminal 1-2)
Blower motor		24V 9.5A	※Check resistance Normal : 2.5 Ω (For terminal 1-2)
Aircon resistor		-	※Check resistance Normal : 1.12 Ω (For terminal 4-2) 2.07 Ω (For terminal 2-3) 3.17 Ω (For terminal 3-1)
Duct sensor		1℃ OFF 4℃ ON	※Check resistance Normal : 0 Ω (For terminal 1-2), the atmosphere temp : Over 4℃
Door switch	 CS-1 CS-20 CS-53	24V 2W	※Check resistance Normal : About 5M Ω
Switch (Power max, one touch decal, horn, breaker)	 CS-5 CS-19 CS-26 CS-29	24V 6A	※Check resistance Normal : ∞ Ω

4) CN TYPE CONNECTOR

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

No. of pin	Receptacle connector(Female)	Plug connector(Male)
6	 S816-006002	 S816-106002
8	 S816-008002	 S816-108002
10	 S816-010002	 S816-110002
12	 S816-012002	 S816-112002

GROUP 5 TRAVEL SPEED CONTROL SYSTEM



45075MS07

Travel speed can be switched manually by pressing the travel speed switch on the cluster.

Speed	Travel speed solenoid valve	Lamp on cluster	Operation
Lo	OFF	Turtle	Low speed, high driving torque in the travel motor
Hi	ON	Rabbit	High speed, low driving torque in the travel motor

※ Default : Turtle(Lo)

Fault code No.	Reason	Effect(only when fault code is active)
288	The machine vehicle electronic control unit (VECU) detected a fault with its remote throttle.	The engine will not respond to the remote throttle.
293	High voltage detected at the machine temperature sensor signal pin of the 31-pin machine connector.	No engine protection for machine temperature.
294	Low voltage detected at the machine temperature sensor signal pin of the 31-pin machine connector.	No engine protection for machine temperature.
295	An error in the ambient air pressure sensor signal was detected by the ECM.	Engine is derated to no air setting.
297	High voltage detected at the machine pressure sensor signal pin of the 31-pin machine connector.	No engine protection for machine pressure.
298	Low voltage detected at the machine pressure sensor signal pin of the 31-pin machine connector.	No engine protection for machine pressure.
299	Engine shutdown by device other than key switch before proper engine cool down resulting in filtered load factor above maximum shutdown threshold.	No action taken by the ECM.
311	Current detected at No.1 injector when voltage is turned off.	Current to injector is shut off.
312	Current detected at No.5 injector when voltage is turned off.	Current to injector is shut off.
313	Current detected at No.3 injector when the voltage is turned off	Current to injector is shut off.
314	Current detected at No 6 injector when the voltage is turned off.	Current to injector is shut off.
315	Current detected at No.2 injector when the voltage is turned off.	Current to injector is shut off.
319	Real time clock lost power.	None on performance. Data in the ECM will not have accurate time and date information.
321	Current detected at No.4 injector when the voltage is turned on.	Current to injector is shut off.
322	No current detected at No.1 injector when the voltage is turned on.	Current to injector is shut off.
323	No current detected at No.5 injector when the voltage is turned on.	Current to injector is shut off.
324	No current detected at No.3 injector when the voltage is turned on.	Current to injector is shut off.
325	No current detected at No.6 injector when the voltage is turned on.	Current to injector is shut off.
331	No current detected at No.2 injector when the voltage is turned on.	Current to injector is shut off.
332	No current detected at No.4 injector when the voltage is turned on.	Current to injector is shut off.
341	Severe loss of data from the ECM.	Possible no noticeable performance effects OR engine dying OR hard starting. Fault information, trip information and maintenance monitor data may be inaccurate.
343	Internal ECM error.	Possible none on performance or severe derate.
349	A frequency greater than calibrated threshold was detected at the tail shaft governor signal pin of the 31-pin machine connector.	Calibration dependent power and speed derate.
352	Low voltage detected on the ECM voltage supply line to some sensors (VSEN 1 supply).	Engine is derated to no air setting.

2) CLUSTER CHECK PROCEDURE

(1) Start key : ON

① Check monitor initial 5 seconds

a. All lamps light up.
b. Buzzer sound.

② Check monitor after 5 seconds : Indicate cluster version and machine condition

a. Cluster program version : CL : 2.0 Indicates program version 2.0 for 2 seconds.
b. Tachometer : 0rpm
c. Fuel gauge : All light up below appropriate level
d. Hydraulic temperature : All light up below appropriate level
e. Engine coolant temperature gauge : All light up below appropriate level
f. Warning lamp

※ During start key **ON** the engine oil pressure lamp and battery charging lamp go on, but it is not abnormal.
※ When engine coolant temperature below 30°C, the warming up lamp lights up.

③ Indicating lamp state

a. Work mode selection : General work
b. Power mode selection : S mode
c. User mode selection : No LED ON
d. Auto decel LED : ON
e. Travel speed pilot lamp : Low(Turtle)

(2) Start of engine

① Check machine condition

a. Tachometer indicates at present rpm
b. Gauge and warning lamp : Indicate at present condition.
※ When normal condition : All warning lamp OFF
c. Work mode selection : General work
d. Power mode selection : S mode
e. User mode selection : No LED ON
f. Auto decel LED : ON
g. Travel speed pilot lamp : Low(Turtle)

② When warming up operation

a. Warming up lamp : ON
b. 10 seconds after engine started, engine speed increases to1000 rpm(Auto decel LED : ON)
※ Others same as above ①.

③ When abnormal condition

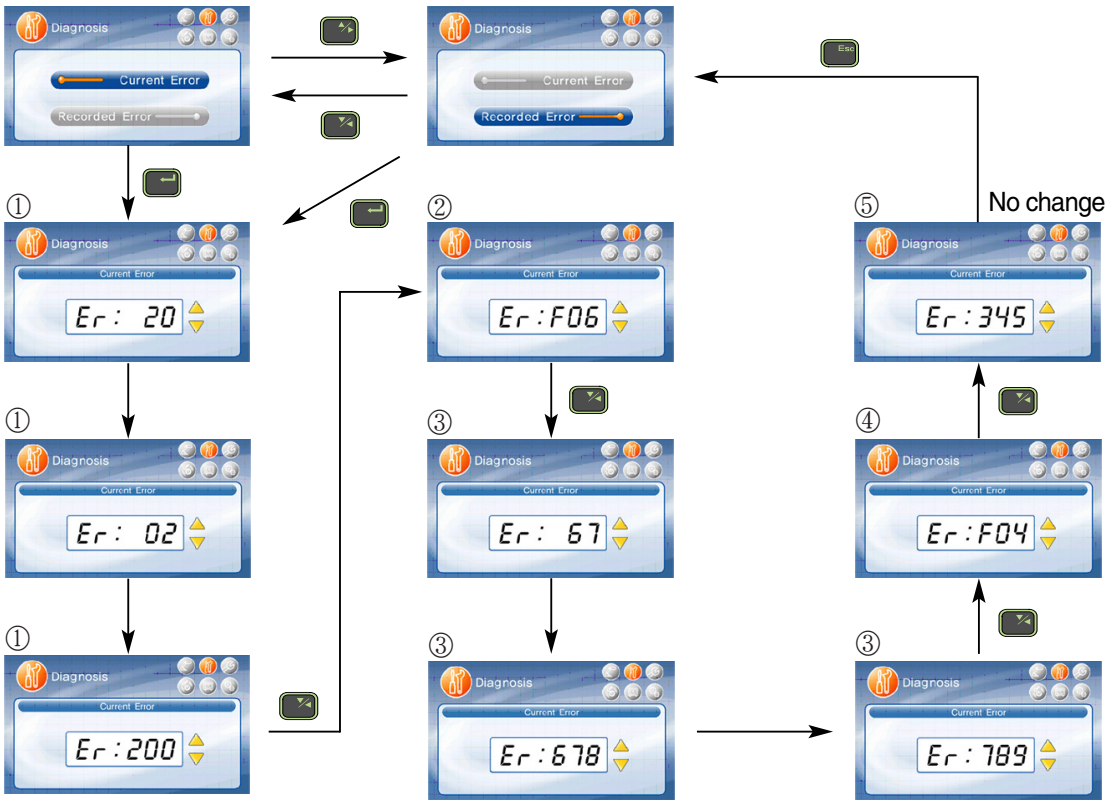
a. The lamp lights up and the buzzer sounds.
b. If **BUZZER STOP** switch is pressed, buzzer sound is canceled but the lamp light up until normal condition.

2) DESCRIPTION OF MONITORING DISPLAY

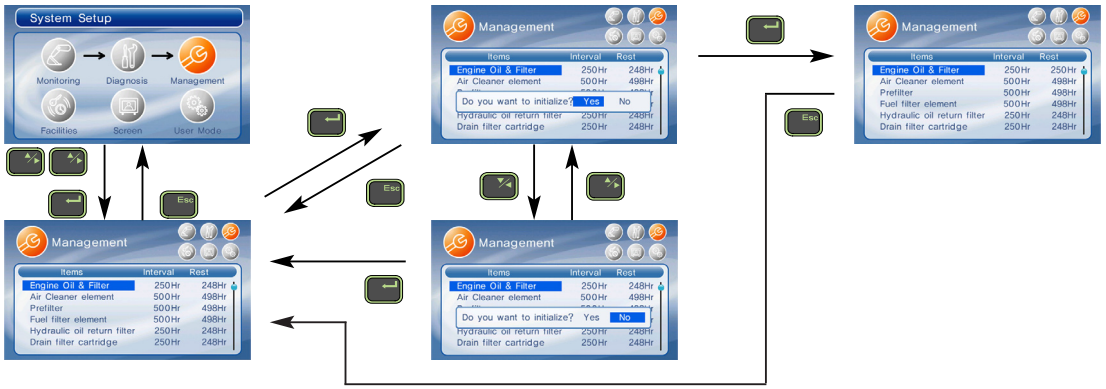
Group	Display	Name	Description
Group 0	1850 rpm	Engine speed	It displays current engine speed detected by engine speed sensor from 500 to 3000rpm. Range : 500~3000rpm by 10rpm
	TIME 12 : 30	Time	It displays current time(12 is hour and 30 is minute) Range : Hour(1~12), minute(00~59)
	EP : 10bar	Power shift pressure of EPPR valve	It shows that pump power shift pressure of EPPR valve being controlled by the CPU controller is 10bar. Range : 00~50bar by 1bar
	45 : C5.1	Model and CPU program version	It shows that machine model(R450/500LC-7A) and the program version of the CPU controller is 5.1. Version display range : 0.0~9.9 by 0.1
	P1 : 100bar (Option)	Front pump pressure	It displays front pump pressure of 100bar which is detected by pressure sensor. Range : 000~500bar by 10bar
	P2 : 200bar (Option)	Rear pump pressure	It displays rear pump pressure of 200bar which is detected by pressure sensor. Range : 000~500bar by 10bar
	P3 : 30bar (Option)	Pilot pump pressure	It displays pilot pump pressure of 30bar which is detected by pressure sensor. Range : 00~50bar by 1bar
Group 1	b: 24.8V	Battery voltage	It shows that battery power of 24.8V is supplied into CPU controller. Range : 00.0~48.0V by 0.1V
	Po : 2.5V	Potentiometer voltage	It shows that throttle command signal voltage is 2.5V. Range : 0.0~5.0V by 0.1V
	dL : 3.8V	Accel dial voltage	It shows that accel dial signal voltage is 3.8V. Range : 0.0~5.0V by 0.1V
	Hd : 50°C	Hydraulic oil temperature	It shows that hydraulic oil temperature detected by temperature sensor is 50℃. Range : 0~150℃ by 1℃
	Ct : 85°C	Coolant temperature	It shows that coolant oil temperature received from ECM is 50℃. Range : 0~150℃ by 1℃
	AP : 100	Ambient pressure	It shows that ambient pressure recived from ECM is 120kpa Range : 0~125kpa by 1kpa

b. Protocol type 2

- If there are more than 2 error codes, each one can be displayed by pressing or switch respectively.
- 3 error codes (①SPN200200, ②FMI06, ③SPN6789, ④FMI04, ⑤345) display.



③ Maintenance

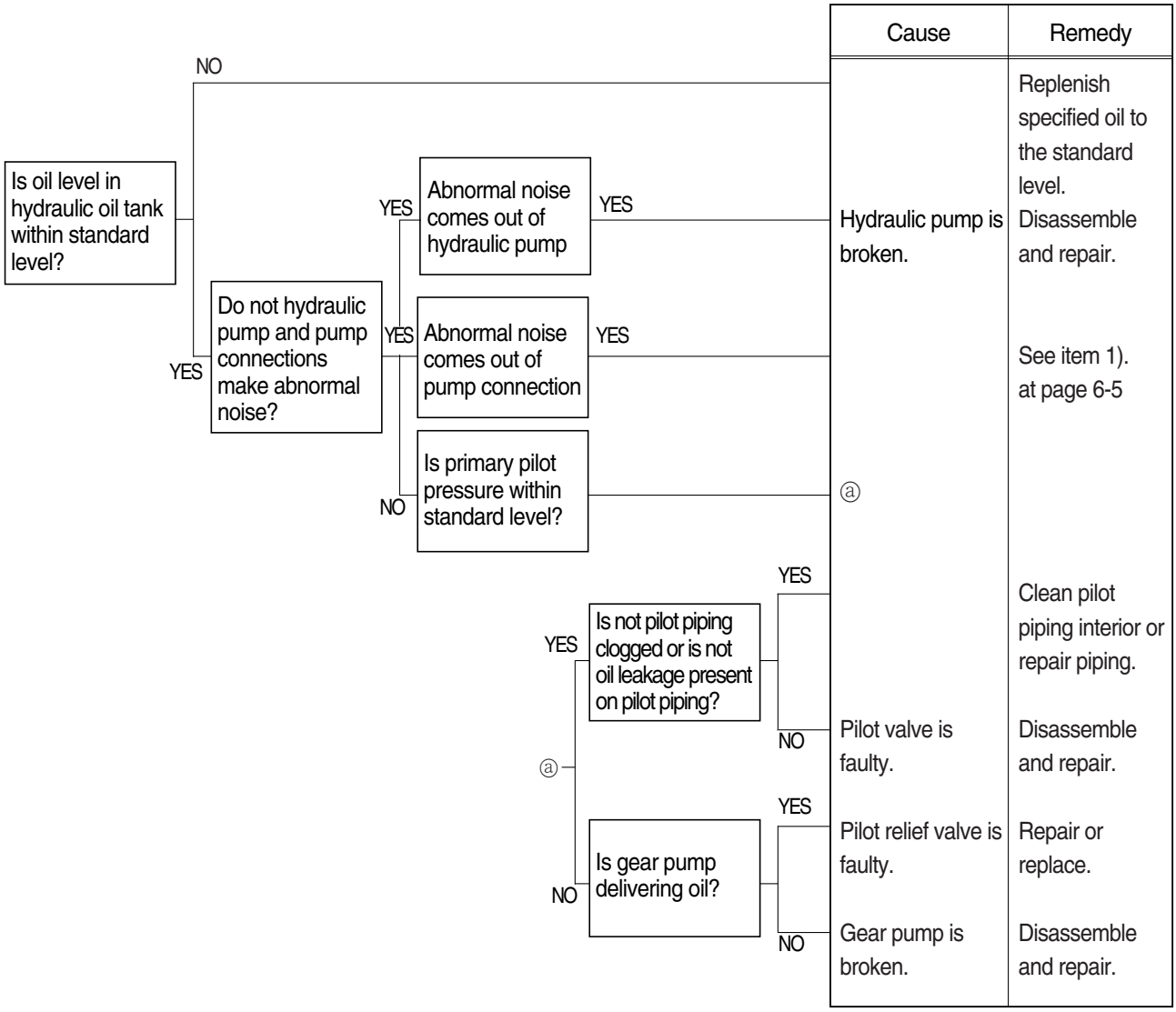


④ Setting

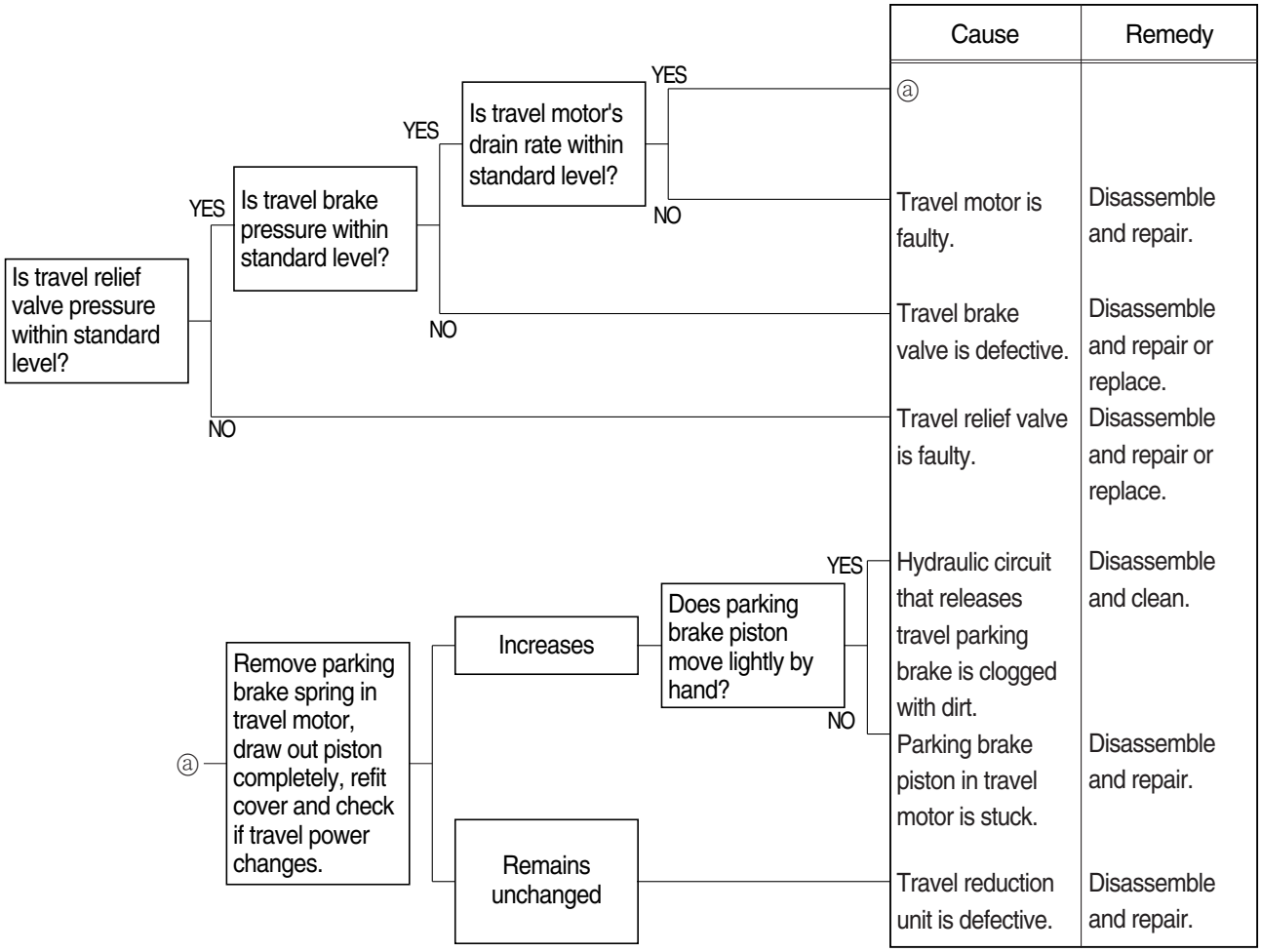
a. Time set

b. System lock - Reserved

2) ENGINE STARTS BUT MACHINE DOES NOT OPERATE AT ALL



5) TRAVEL ACTION IS POWERLESS(Travel only)



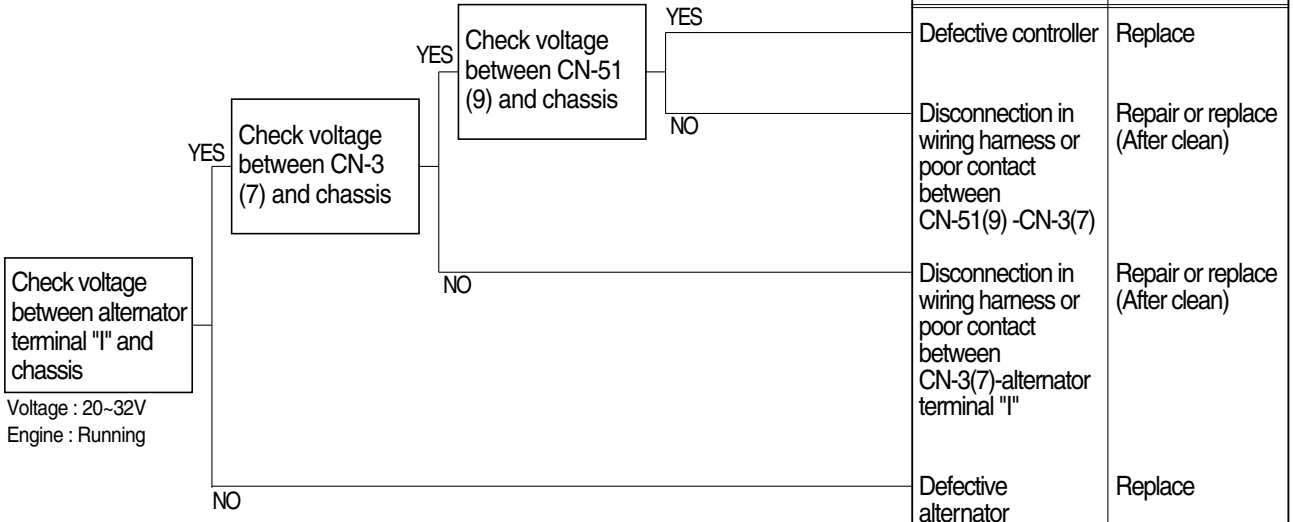
Cause	Remedy
ⓐ	
Travel motor is faulty.	Disassemble and repair.
Travel brake valve is defective.	Disassemble and repair or replace.
Travel relief valve is faulty.	Disassemble and repair or replace.
Hydraulic circuit that releases travel parking brake is clogged with dirt.	Disassemble and clean.
Parking brake piston in travel motor is stuck.	Disassemble and repair.
Travel reduction unit is defective.	Disassemble and repair.

6) MACHINE RUNS RECKLESSLY ON A SLOPE

Cause	Remedy
	Disassemble and repair or replace.

3. BATTERY CHARGING WARNING LAMP LIGHTS UP(Starting switch : ON)

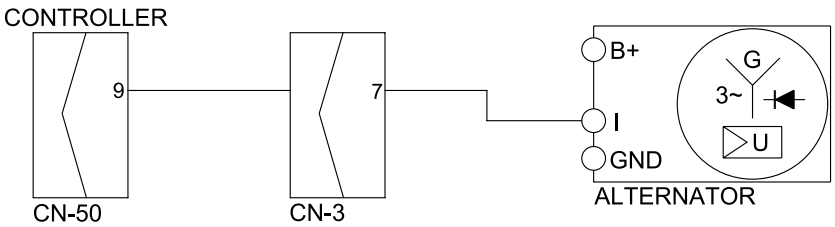
- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.



Cause	Remedy
Defective controller	Replace
Disconnection in wiring harness or poor contact between CN-51(9) -CN-3(7)	Repair or replace (After clean)
Disconnection in wiring harness or poor contact between CN-3(7)-alternator terminal "I"	Repair or replace (After clean)
Defective alternator	Replace

Check voltage

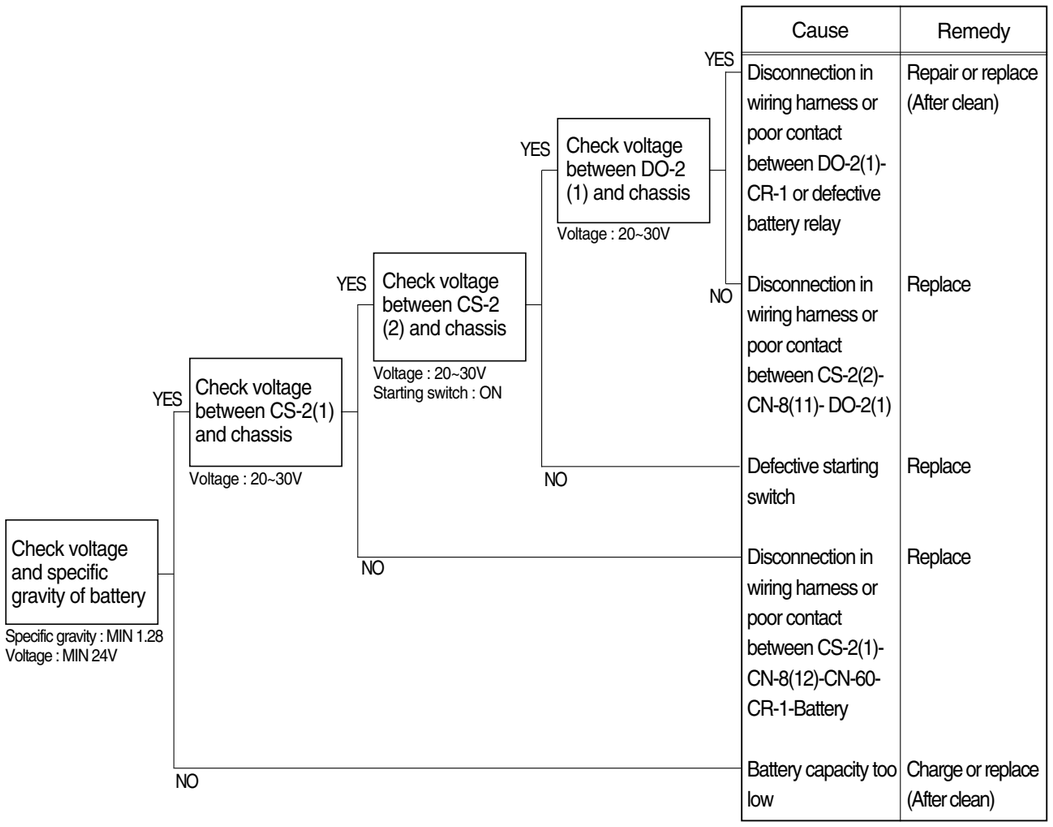
YES	20 ~ 32V
NO	0V

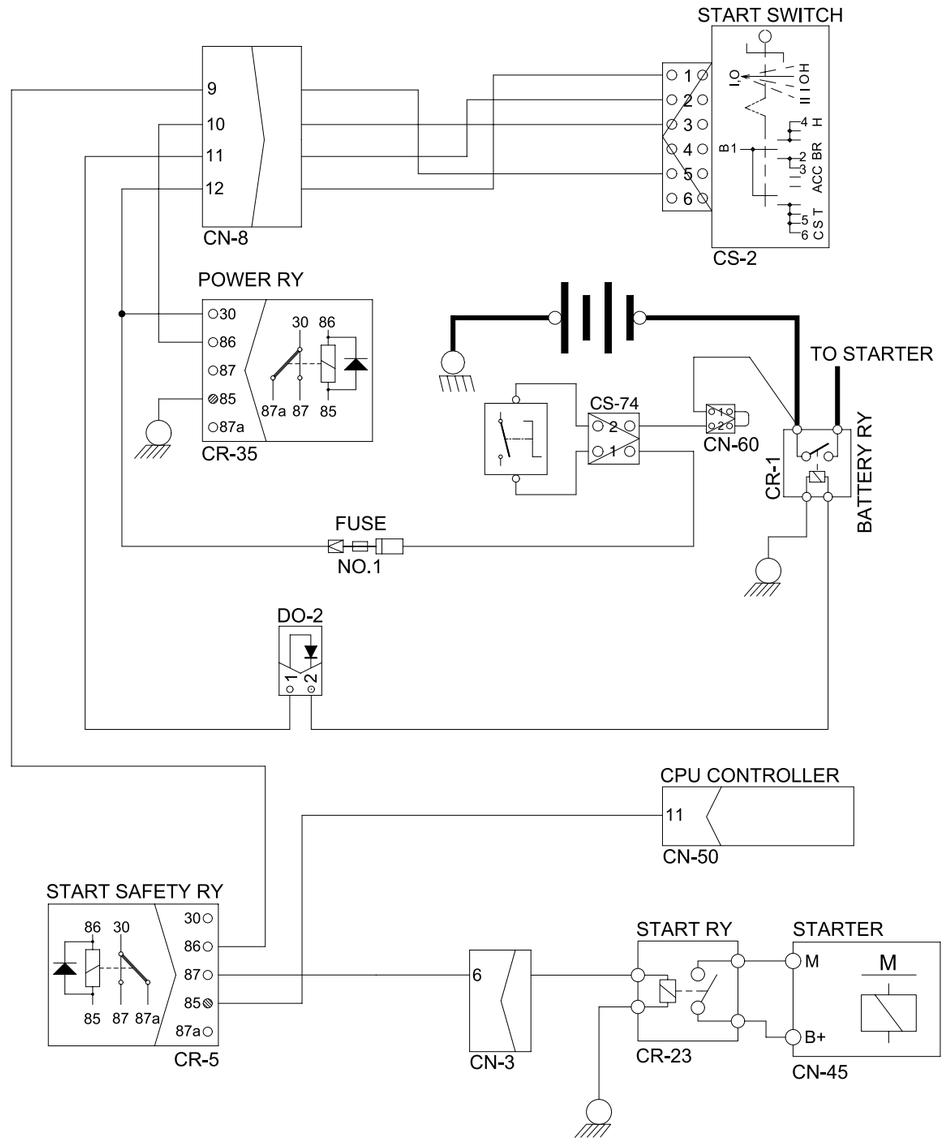


45076ES01

13. WHEN STARTING SWITCH ON DOES NOT OPERATE

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





50076ES08

2) TEST PROCEDURE

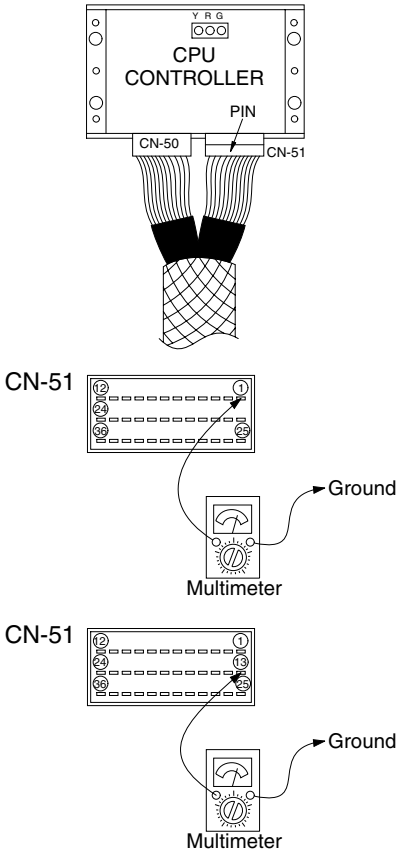
(1) Test 6 : Check voltage at CN-51(1) and ground.

① Prepare 1 piece of thin sharp pin, steel or copper.
② Starting key ON.
③ Insert prepared pin to rear side of connectors : One pin to (1) of CN-51.
④ Check voltage as figure.

(2) Test 7 : Check voltage at CN-51(13) and ground.

① Prepare 1 piece of thin sharp pin, steel or copper
② Starting key ON.
③ Insert prepared pin to rear side of connectors : One pin to (13) of CN-51
④ Check voltage as figure.

SPEC : Actuator stop : 4~5V
Actuator operating : 0~1V



4) TRACK REVOLUTION SPEED

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

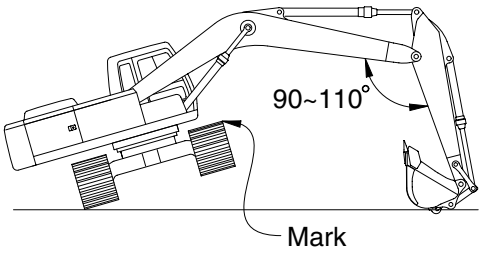
(2) Preparation

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

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

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

④ Keep the hydraulic oil temperature at 50±5℃.



21077MS06

(3) Measurement

① Select the following switch positions.

- Travel mode switch : 1 or 2 speed
- Mode selector : H mode
- Auto decel switch : OFF

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

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

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

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

(4) Evaluation

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

Unit : Seconds / 3 revolutions

Model	Travel speed	Standard	Maximum allowable
R450LC-7A	1 Speed	39.9±2.0	49.9
	2 Speed	24.8±2.0	31
R500LC-7A	1 Speed	38.5±2.0	48
	2 Speed	24.0±2.0	30

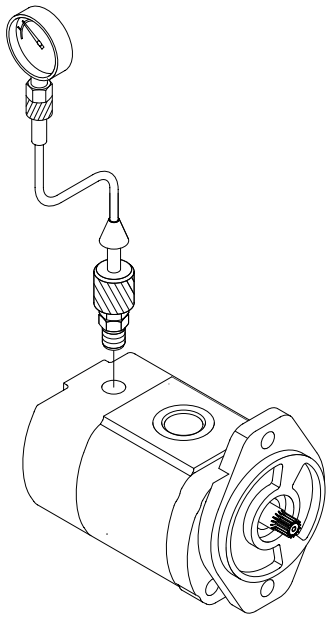
13) PILOT PRIMARY PRESSURE

(1) Preparation

① Stop the engine.
② Remove the top cover of the hydraulic tank oil supply port with a wrench.
③ Loosen and remove plug on the pilot pump delivery port and connect pressure gauge.
④ Start the engine and check for oil leakage from the port.
⑤ Keep the hydraulic oil temperature at 50±5℃.

(2) Measurement

① Select the following switch positions.
· Engine speed : Decel rpm(1000)



50077MS01

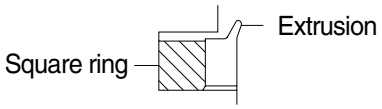
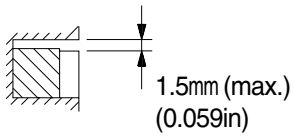
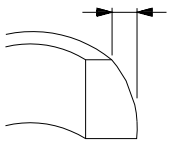
(3) Evaluation

The average measured pressure should meet the following specifications:

Unit : kgf / cm^2

Model	Engine speed	Standard	Allowable limits	Remarks
R450LC-7A R500LC-7A	Decel rpm(1000)	35±5	-	

6. TURNING JOINT

Part name		Maintenance standards	Remedy
Body, Stem	Sliding surface with sealing sections.	Plating worn or peeled due to seizure or contamination.	Replace
	Sliding surface between body and stem other than sealing section.	· Worn abnormality or damaged more than 0.1mm (0.0039in) in depth due to seizure contamination.	Replace
		· Damaged more than 0.1mm(0.0039in) in depth.	Smooth with oilstone.
	Sliding surface with thrust plate.	· Worn more than 0.5mm(0.02in) or abnormality.	Replace
		· Worn less than 0.5mm(0.02in).	Smooth
		· Damage due to seizure or contamination remediable within wear limit (0.5mm)(0.02in).	Smooth
Cover	Sliding surface with thrust plate.	· Worn more than 0.5mm(0.02in) or abnormality.	Replace
		· Worn less than 0.5mm(0.02in).	Smooth
		· Damage due to seizure or contamination remediable within wear limit (0.5mm)(0.02in).	Replace
Seal set	-	· Extruded excessively from seal groove square ring. 	Replace
	-	· Slipper ring 1.5mm(0.059in) narrower than seal groove, or narrower than back ring. 	Replace
	-	· Worn more than 0.5mm(0.02in) ~ 1.5mm(MAX.) (0.059in) 	Replace

2. INSTALL WORK

1) Tighten all bolts and nuts(Sleeve nuts) to the specified torque.

2) Install the hoses without twisting or interference.

3) Replace all gaskets, O-rings, cotter pins, and lock plates with new parts.

4) Bend the cotter pin or lock plate securely.

5) When coating with adhesive, clean the part and remove all oil and grease, then coat the threaded portion with 2-3 drops of adhesive.

6) When coating with gasket sealant, clean the surface and remove all oil and grease, check that there is no dirt or damage, then coat uniformly with gasket sealant.

7) Clean all parts, and correct any damage, dents, burrs, or rust.

8) Coat rotating parts and sliding parts with engine oil.

9) When press fitting parts, coat the surface with antifriction compound(LM-P).

10) After installing snap rings, check that the snap ring is fitted securely in the ring groove(Check that the snap ring moves in the direction of rotation).

11) When connecting wiring connectors, clean the connector to remove all oil, dirt, or water, then connect securely.

12) When using eyebolts, check that there is no deformation or deterioration, and screw them in fully.

13) When tightening split flanges, tighten uniformly in turn to prevent excessive tightening on one side.

14) When operating the hydraulic cylinders for the first time after repairing and reassembling the hydraulic cylinders, pumps, or other hydraulic equipment or piping, always bleed the air from the hydraulic cylinders as follows:

(1) Start the engine and run at low idling.

(2) Operate the control lever and actuate the hydraulic cylinder 4-5 times, stopping 100㎜ before the end of the stroke.

(3) Next, operate the piston rod to the end of its stroke to relieve the circuit. (The air bleed valve is actuated to bleed the air.)

(4) After completing this operation, raise the engine speed to the normal operating condition.

※ If the hydraulic cylinder has been replaced, carry out this procedure before assembling the rod to the work equipment.

※ Carry out the same operation on machines that have been in storage for a long time after completion of repairs.

3) DISASSEMBLY

(1) Select place suitable to disassembling.

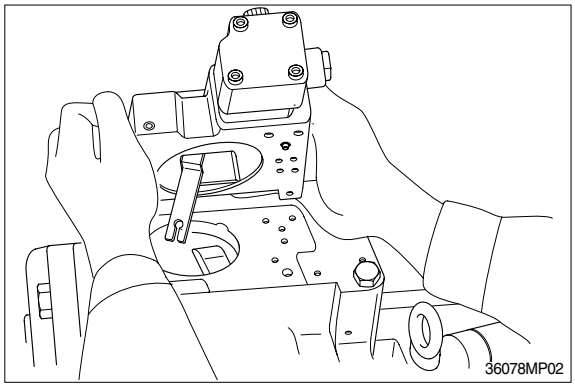
※ Select clean place.

※ Spread rubber sheet, cloth or so on 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 oil out of pump casing(Front and rear pump).

(4) Remove hexagon socket head bolts(412, 413) and remove regulator.



(5) Loosen hexagon socket head bolts(401) which tighten swash plate support(251), pump casing(271) and valve cover(F, 311).

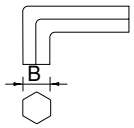
※ If gear pump and so on are fitted to rear face of pump, remove them before starting this work.

(6) Loosen hexagon socket head bolts(402) which tighten swash plate support(251), pump casing(271) and valve cover(R, 312).

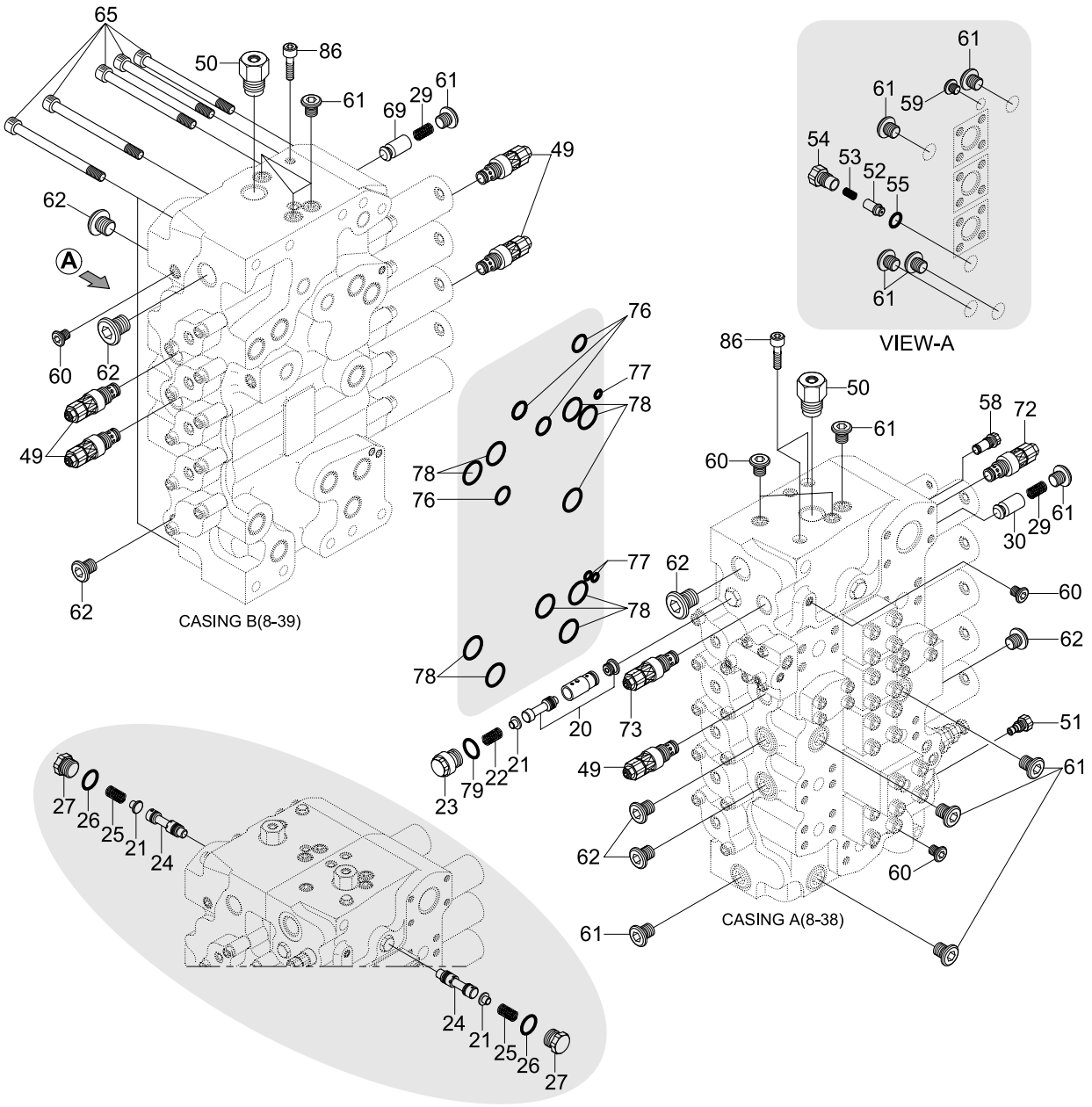
6) TOOLS AND TIGHTENING TORQUE

(1) Tools

The tools necessary to disassemble/reassemble the pump are shown in the follow list.

<table>
<tr><td colspan="2">Tool name & size</td><td colspan="4">Part name</td></tr>
<tr><td>Name</td><td>B</td><td>Hexagon socket head bolt</td><td>PT plug (PT thread)</td><td>PO plug (PF thread)</td><td>Hexagon socket head setscrew</td></tr>
<tr><td rowspan="3">Allen wrench  </td><td>4</td><td>M 5</td><td>BP-1/16</td><td>-</td><td>M 8</td></tr>
<tr><td>5</td><td>M 6</td><td>BP-1/8</td><td>-</td><td>M10</td></tr>
<tr><td>6</td><td>M 8</td><td>BP-1/4</td><td>PO-1/4</td><td>M12, M14</td></tr>
<tr><td rowspan="2">Double ring spanner, socket wrench, double(Single) open end spanner  </td><td>-</td><td colspan="2">Hexagon head bolt</td><td>Hexagon nut</td><td>VP plug (PF thread)</td></tr>
<tr><td>6</td><td colspan="2">M 8</td><td>M 8</td><td>-</td></tr>
<tr><td colspan="2">Adjustable angle wrench</td><td colspan="4">Small size, Max 36㎜</td></tr>
<tr><td colspan="2">Screw driver</td><td colspan="4">Minus type screw driver, Medium size, 2 sets</td></tr>
<tr><td colspan="2">Hammer</td><td colspan="4">Plastic hammer, 1 set</td></tr>
<tr><td colspan="2">Pliers</td><td colspan="4">For snap ring, TSR-160</td></tr>
<tr><td colspan="2">Steel bar</td><td colspan="4">4×100㎜</td></tr>
<tr><td colspan="2">Torque wrench</td><td colspan="4">Capable of tightening with the specified torques</td></tr>
<tr><td colspan="2">Pincers</td><td colspan="4">-</td></tr>
<tr><td colspan="2">Bolt</td><td colspan="4">M4, Length : 50㎜</td></tr>
</table>

2. STRUCTURE(1/3)



20	Spool assy	50	Relief valve assy	62	Plug assy
21	Spring seat	51	Plug assy	65	Bolt
22	Spring	52	Poppet	69	Poppet
23	Plug	53	Spring	72	Relief valve kit
24	Spool assy	54	Plug	73	Relief valve kit
25	Spring	55	O-ring	76	O-ring
26	O-ring	58	Plug assy	77	O-ring
27	Plug	59	Plug assy	78	O-ring
29	Spring	60	Plug assy	79	O-ring
30	Poppet	61	Plug assy	86	Socket head bolt
49	Relief valve kit				

3) ASSEMBLY

(1) General comments

① In this assembly section, explanation only is shown.
For further understanding, please refer to the figures and photographs shown in the previous disassembly section.

② Figure in ( ) shown after the part name in the explanation refers to the reference identity number shown on the construction figure shown in the spares section.

③ Cautions in assembling seal

a. Pay close attention to keeping all seals free from handling damage and inspect carefully for damage before using them.

b. Apply clean grease or hydraulic oil to the seal so as to ensure it is fully lubricated before assembly.

c. Do not stretch seals so much as to deform them permanently.

d. In fitting O-rings, pay close attention not to roll them into their final position in addition, a twisted O-ring cannot easily untwist itself naturally and could thereby cause inadequate sealing and thereby both internal and external oil leakage.

e. Tighten fitting bolts for all sections with a torque wrench adjusted to the respective tightening torque as shown on the corss section drawings of the spares section.

(2) Main spool

① Apply loctite to thread of spools(3, 4, 6, 7, 9, 10, 11) and assemble spring seat, spring and spool end. Assemble spool end to spool after fixing spool with a vise attached wood.

※ Be careful not to applying loctite too much.

· Tightening torque : 2.4 ~ 2.6 kgf · m(17.4 ~ 18.8lbf · ft)

Fit O-ring into housing and assemble spools(3, 4, 6, 7, 9, 10, 11) into housing.

Assemble lock cap on housing and tighten hex socket bolt.

· Tightening torque : 11±0.5 kgf · m(79.7±3.7lbf · ft)

② Insert poppet, spring into spool(5) and then apply loctite to thread of spool.

Fit O-ring and backup ring on the plug and then tighten plug.

Assemble spring seat, spring, and spool end and then assemble spool end sub assy to spool after fixing spool with a vise attached wood.

· Tightening torque : 2.4 ~ 2.6 kgf · m(17.4 ~ 18.8lbf · ft)

Fit O-ring into housing and assemble spool(5) into housing.

Assemble lock cap on housing and tighten hex socket bolt.

· Tightening torque : 11±0.5 kgf · m(79.7±3.7lbf · ft)

③ Insert poppet, spring into spool(8) and then apply loctite to thread for spool.

Fit O-ring and backup ring on the plug and then tighten plug.

Assemble spring seat, spring, and spool end and then assemble spool end sub assy to spool after fixing spool with a vise attached wood.

· Tightening torque : 2.4 ~ 2.6 kgf · m(17.4 ~ 18.8lbf · ft)

Fit O-ring into housing and assemble spool(8) into housing.

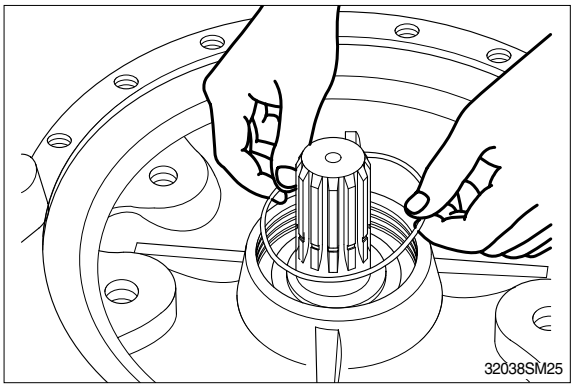
Assemble lock cap on housing and tighten hex socket bolt.

· Tightening torque : 11±0.5 kgf · m(79.7±3.7lbf · ft)

④ Assemble short cap on housing and tighten hex socket bolt.

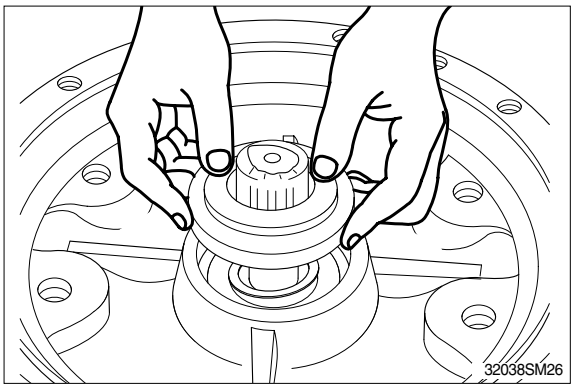
· Tightening torque : 11±0.5 kgf · m(79.7±3.7lbf · ft)

(4) Tack O-ring(471) to the casing(301).

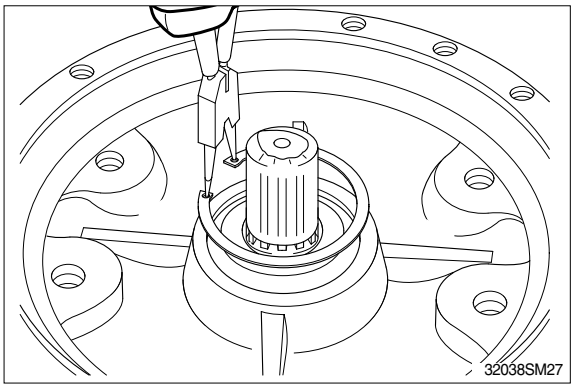


(5) Reassemble the front cover(304) to the casing(301).

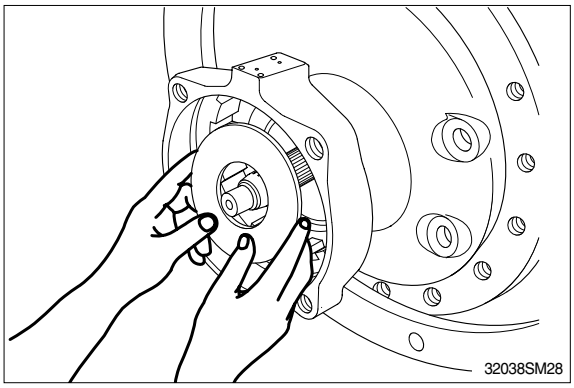
※ Apply grease to the rib of oil seal to avoid damage to the rib.



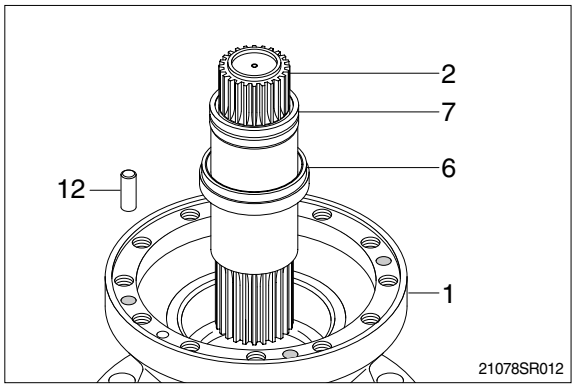
(6) Install the snap ring(437) to the casing (301).



(7) Insert the shoe plate(124) with the casing (301) position horizontally.

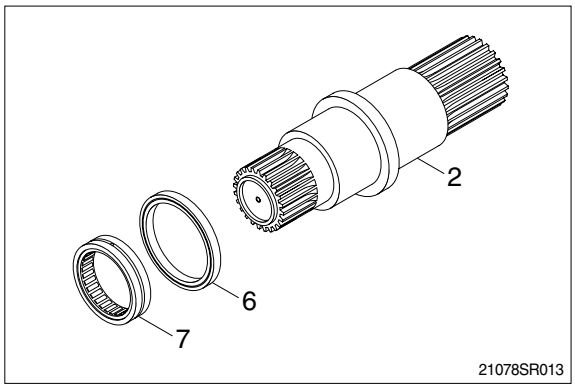


(12) Remove drive shaft(2) with roller bearing(7) and oil seal(6) assembled.
Remove knock pin(12) from the casing(1).

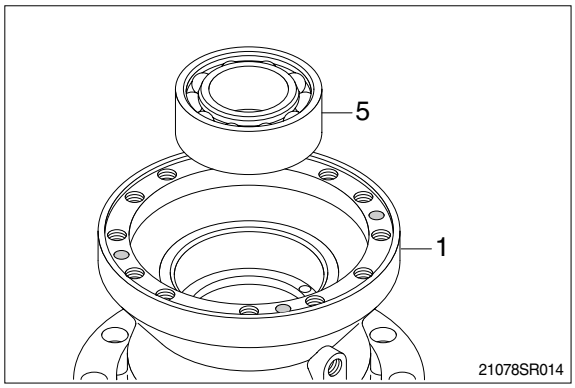


(13) Remove roller bearing(7) and oil seal(6) from the drive shaft(2).

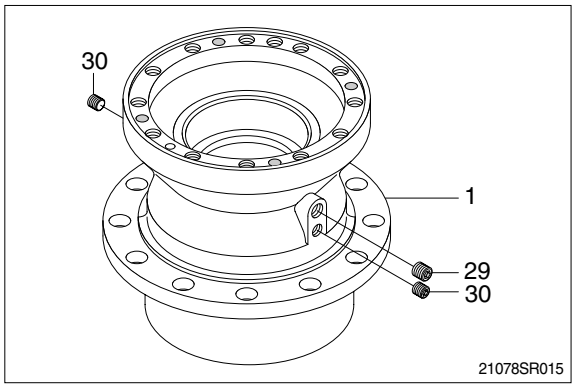
※ Do not reuse oil seal(6) once removed.



(14) Using the bearing disassembly tool, remove roller bearing(5).

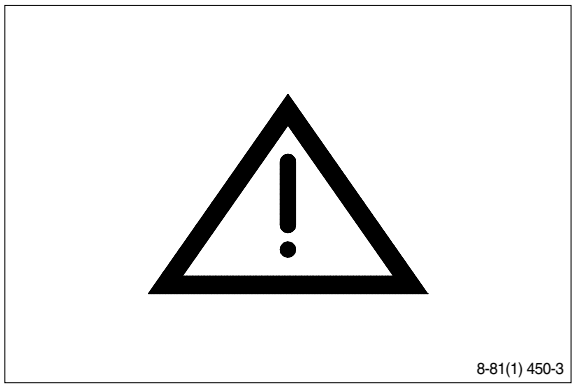


(15) Remove plugs(29, 30) from the casing(1).

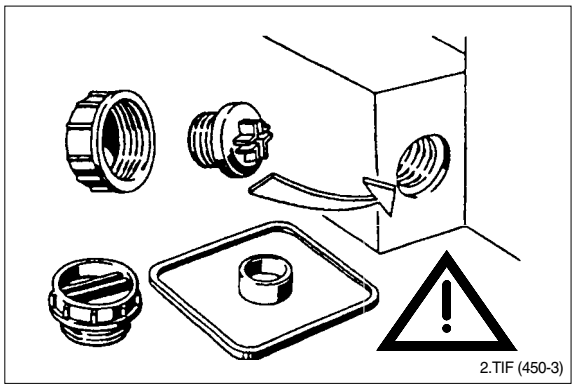


(2) Seal kit and component groups

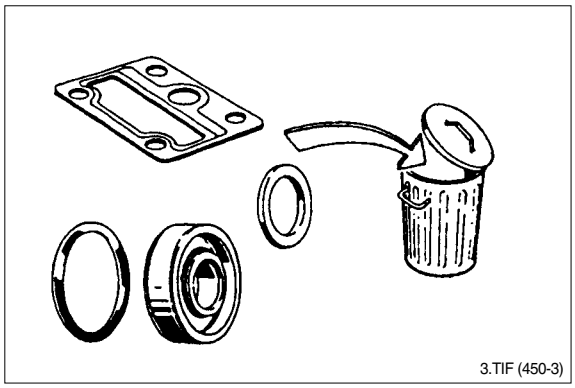
① Attention
Observe the following notices when carrying out repair work at hydraulic aggregates!



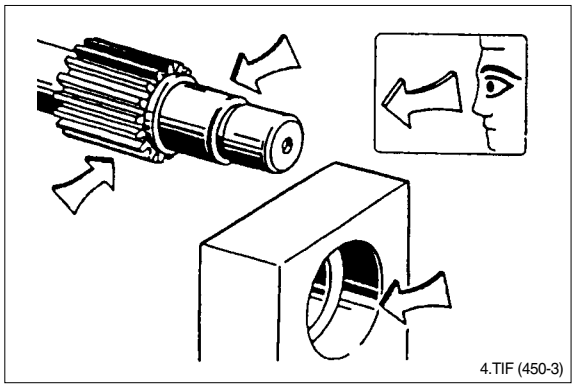
② Close all ports of the hydraulic aggregates.



③ Replace all seals.
Use only original spare parts.



④ Check all seal and sliding surfaces for wear.
Rework of sealing area for example with abrasive paper can damage surface.

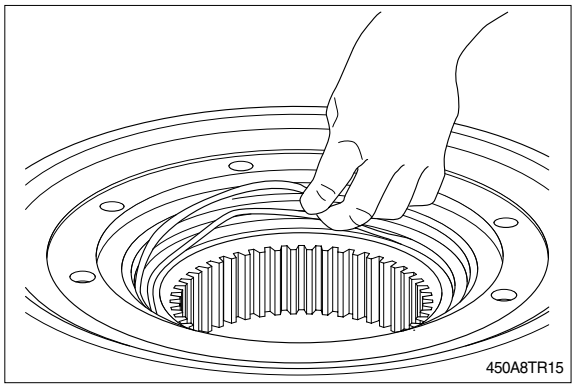


4) ASSEMBLY

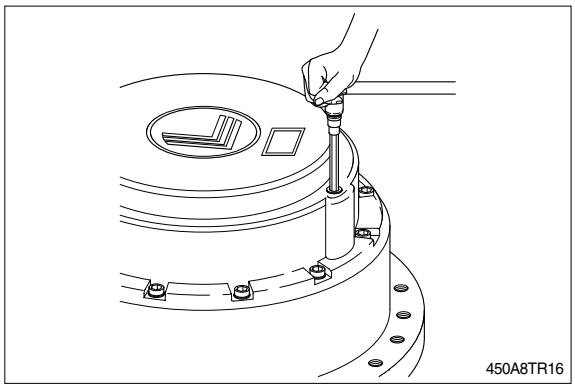
(1) General precautions

① Reassemble in a work area that is clean and free from dust and grit.
② Handle parts with bare hands to keep them free of linty contaminates.
③ Repair or replace the damaged parts.
Each parts must be free of burrs its corners.
④ Do not reuse O-rings, oil seal and floating seal that were removed in disassembly.
Provide the new parts.
⑤ Wash all parts thoroughly in a suitable solvent.
Dry thoroughly with compressed air.
Do not use the cloths.
⑥ When reassembling oil motor components of motor, be sure to coat the sliding parts of the motor and valve with fresh hydraulic oil. (NAS class 9 or above)
⑦ Use a torque wrench to tighten bolts and plugs, to the torque specified as follows.

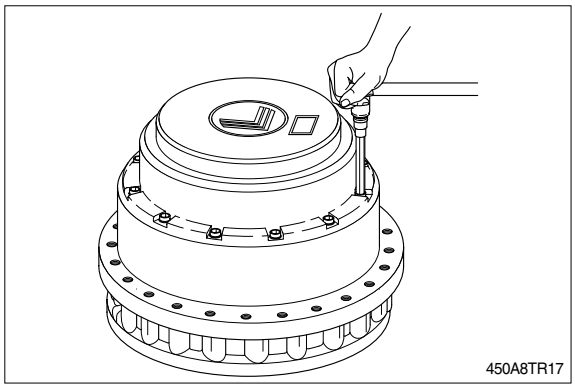
(12) Remove the O-rings(24,25) and the backup rings(23, 26) from their groves in the flanged hub(17).



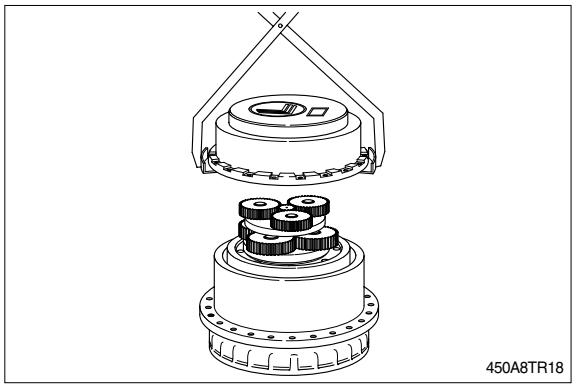
(13) Turn the gearbox around, unscrew and remove the 2 plugs(2) and the 2 washers (1) from the end cover(4).



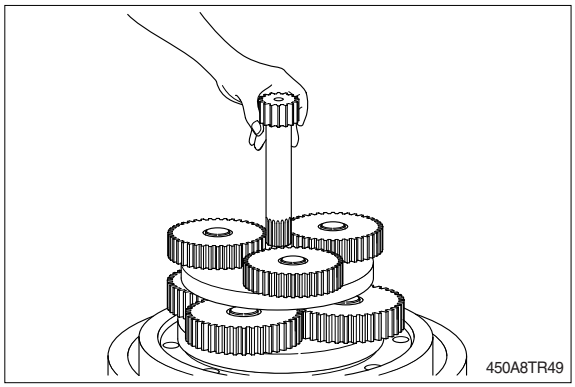
(14) Unscrew and remove the 16 socket head screws(3).



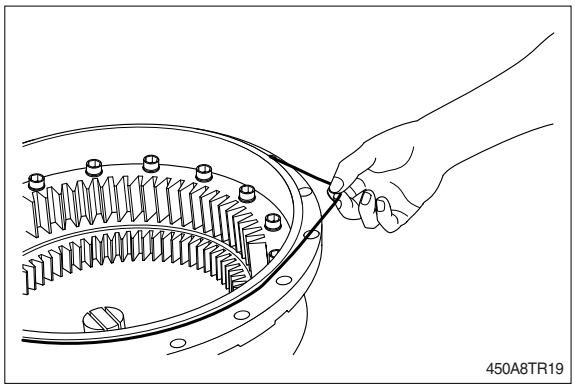
(15) By means of a puller remove the end cover(4).



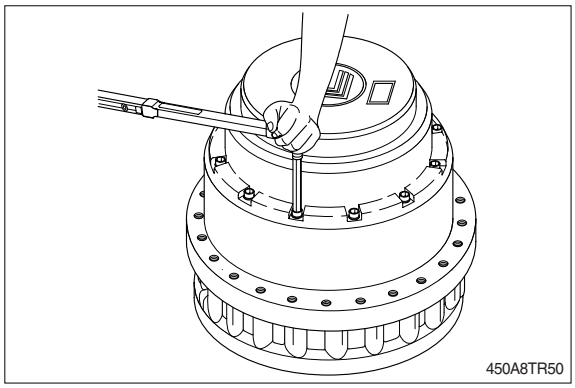
(21) Insert the 1st stage sun gear(7).



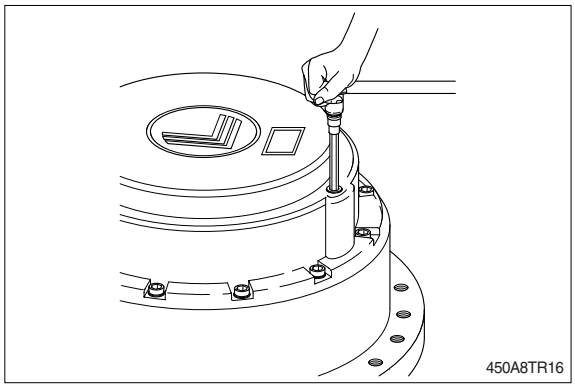
(22) Fit the O-ring(5) into its grove in the end cover(4).



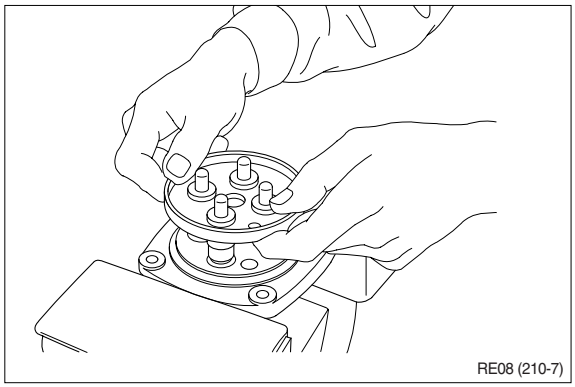
(23) Place the end cover(4) on the gearbox housing(15).
Apply LOCTITE type 243 on the 16 socket head screws(3), and tighten them by a torque wrench at a torque of 19.4kgf · m (140lbf · ft).



(24) Place the 2 washer(1) in their groves and tighten the 2 plugs at a torque of 6.1~8.2kgf · m(44.1~59.3lbf · ft).



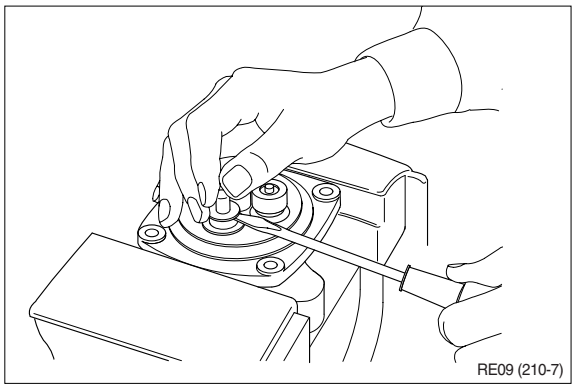
(7) Remove plate(15).


RE08 (210-7)

(8) When return spring(10) is weak in force, plug(11) stays in casing because of sliding resistance of O-ring.

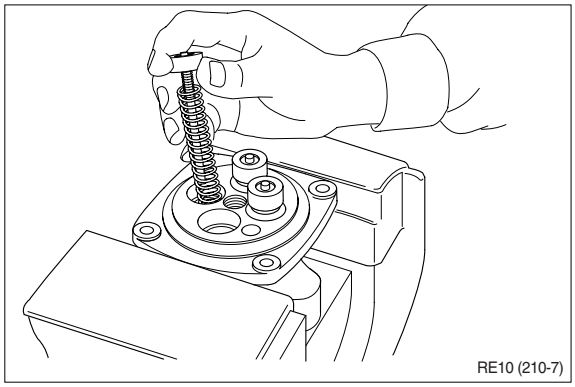
※ Take it out with minus screwdriver.
Take it out, utilizing external periphery groove of plug and paying attention not to damage it by partial loading.

※ During taking out, plug may jump up due to return spring(10) force.
Pay attention to this.

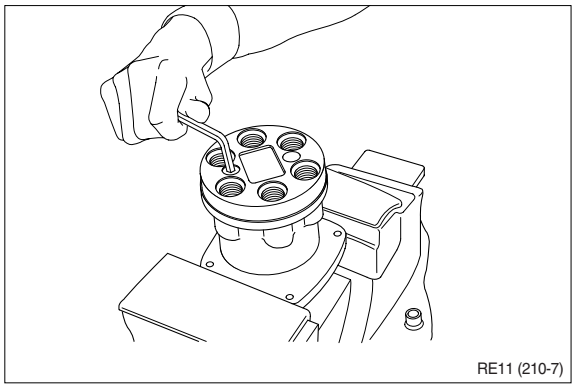

RE09 (210-7)

(9) Remove reducing valve subassembly and return spring(10) out of casing.

※ Record relative position of reducing valve subassembly and return springs.

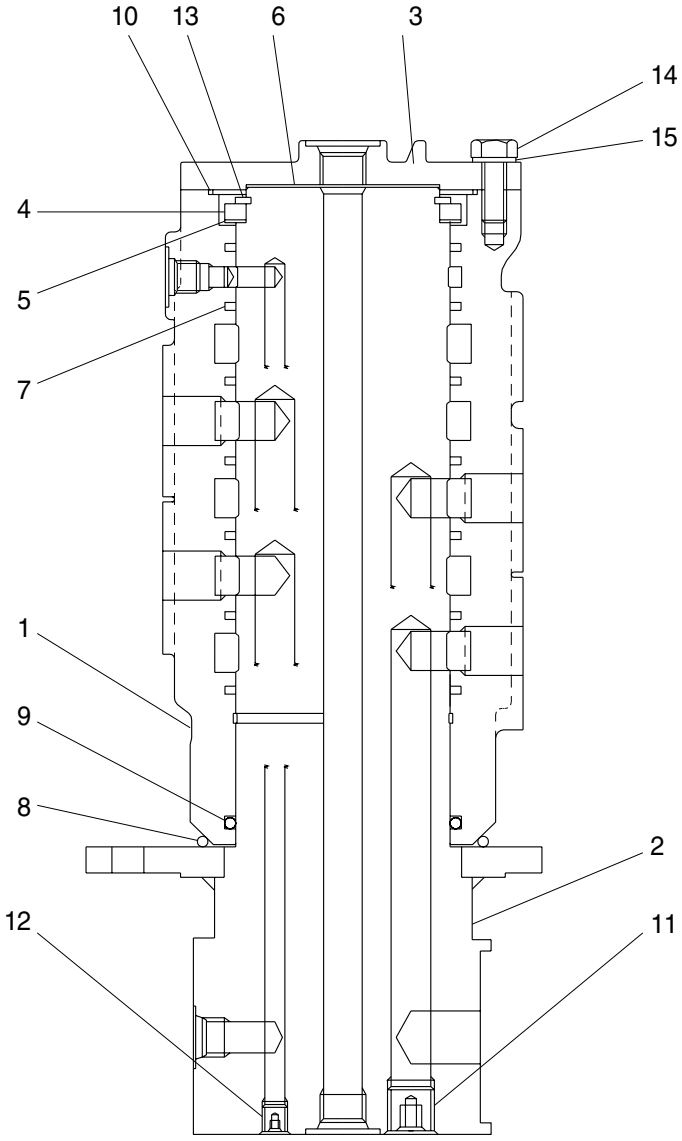

RE10 (210-7)

(10) Loosen hexagon socket head plug(2) with hexagon socket screw key.


RE11 (210-7)

2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE



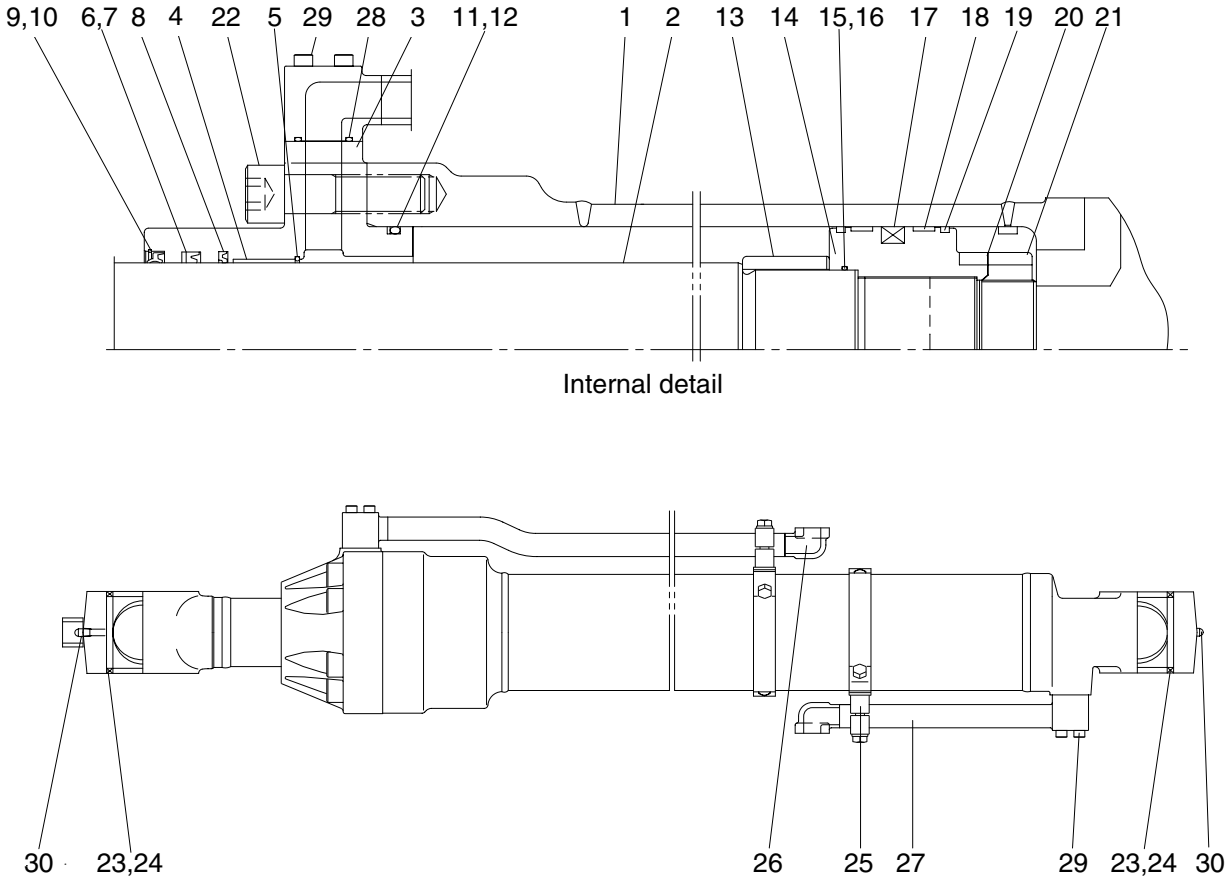
R210TJT2

1	Hub	6	Shim	11	Plug
2	Shaft assembly	7	Slipper seal	12	Plug
3	Cover	8	O-ring	13	Retaining ring
4	Spacer	9	O-ring	14	Hexagon bolt
5	Shim	10	O-ring	15	Spring washer

2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

(1) Bucket cylinder(R450LC-7A)



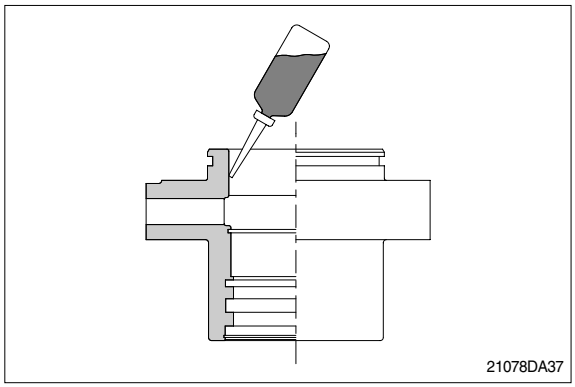
1	Tube assembly	11	O-ring	21	Lock nut
2	Rod assembly	12	Back up ring	22	Hexagon socket head bolt
3	Gland	13	Cushion ring	23	Pin bushing
4	DD2 bushing	14	Piston	24	Dust seal
5	Snap ring	15	O-ring	25	Band assembly
6	Rod seal	16	Back up ring	26	Pipe assembly
7	Back up ring	17	Piston seal	27	Pipe assembly
8	Buffer ring	18	Wear ring	28	O-ring
9	Dust wiper	19	Dust ring	29	Hexagon socket head bolt
10	Snap ring	20	Lock washer	30	Grease nipple

3) ASSEMBLY

(1) Assemble cylinder head assembly

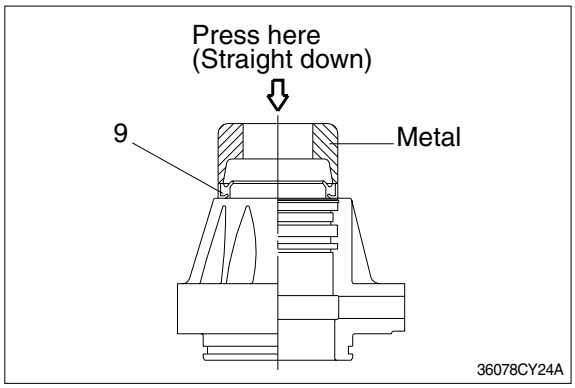
※ Check for scratches or rough surfaces if found smooth with an oil stone.

① Coat the inner face of gland(3) with hydraulic oil.



② Coat dust wiper(9) with grease and fit dust wiper(9) to the bottom of the hole of dust seal.
At this time, press a pad metal to the metal ring of dust seal.

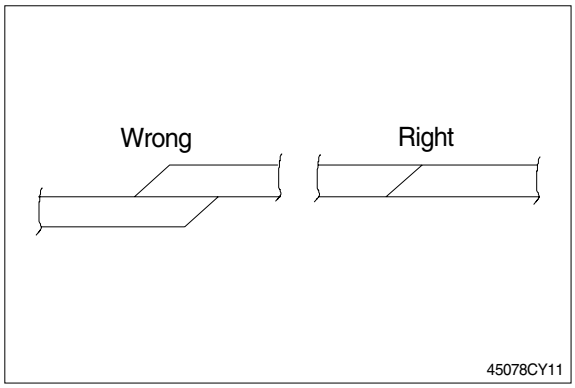
③ Fit snap ring(10) to the stop face.



④ Fit back up ring(7), rod seal(6) and buffer ring(8) to corresponding grooves, in that order.

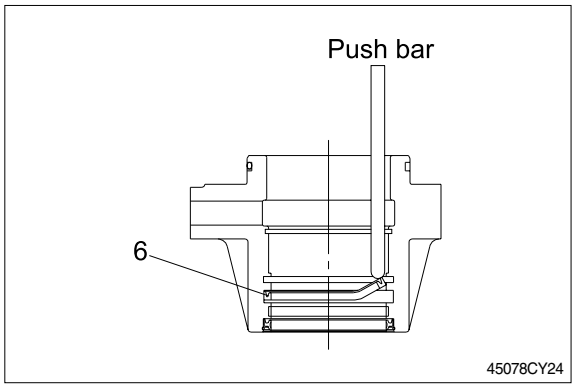
※ Coat each packing with hydraulic oil before fitting it.

※ Insert the backup ring until one side of it is inserted into groove.



※ Rod seal(6) has its own fitting direction. Therefore, confirm it before fitting them.

※ Fitting rod seal(6) upside down may damage its lip. Therefore check the correct direction that is shown in fig.

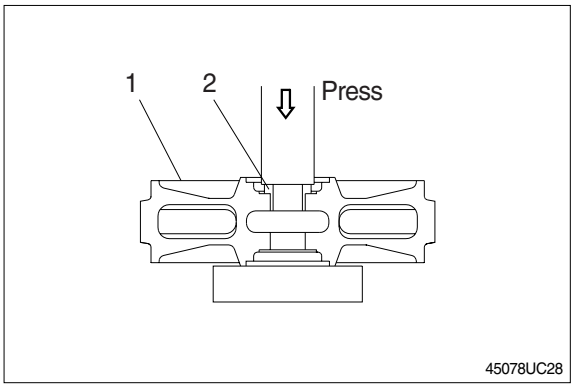


(3) Assembly

※ Before assembly, clean the parts.

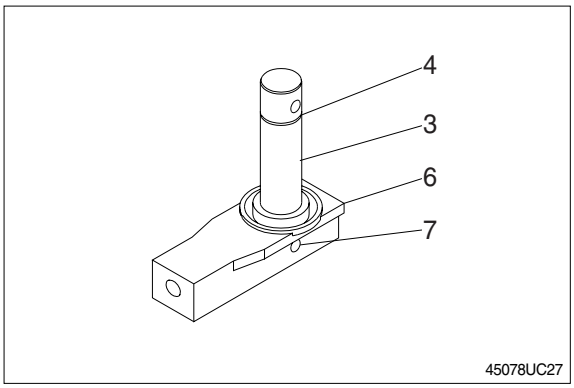
※ Coat the sliding surfaces of all parts with oil.

① Cool up bushing(2) fully by some dry ice and press it into shell(1).
Do not press it at the normal temperature, or not knock in with a hammer even after the cooling.

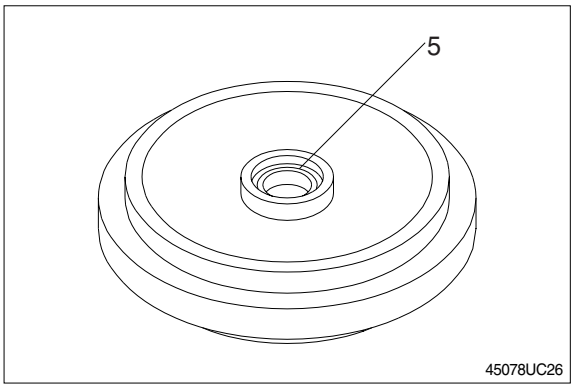


② Coat O-ring(4) with grease thinly, and install it to shaft(3).

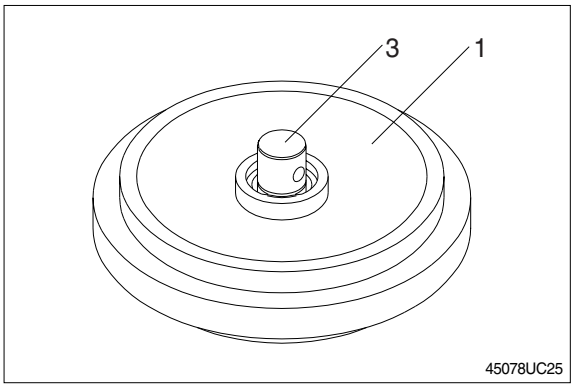
③ Insert shaft(3) into bracket(6) and drive in the spring pin(7).



④ Install seal(5) to shell(1) and bracket(6).



⑤ Install shaft(3) to shell(1).



SECTION 9 COMPONENT MOUNTING TORQUE