SPECIFICATIONS

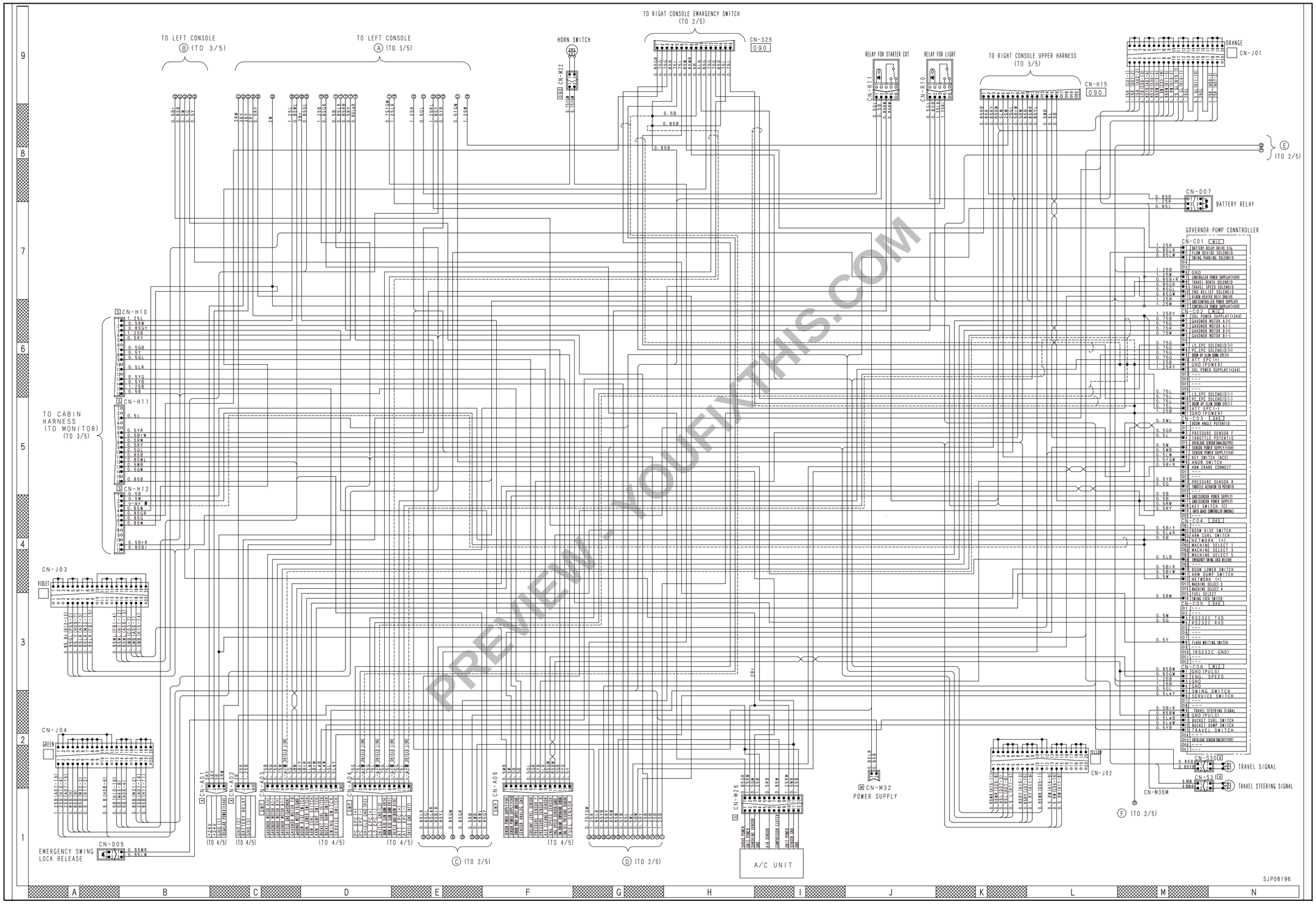
Machine model				PC228US-3
Serial Number				20001 and up
Bucket capacity			m^3	0.8
Operating weight			kg	21,800
Performance	Working ranges	Max. digging depth	mm	6,620
		Max. vertical wall depth	mm	5,980
		Max. digging reach	mm	9,875
		Max. reach at ground level	mm	9,670
		Max. digging height	mm	10,700
		Max. dumping height	mm	7,825
	Max. digging force (using power max. function)		kN {kg}	137 {14,000} (147 {15,000})
	Swing speed		rpm	11.0
	Swing max. slope angle		deg.	20
	Travel speed		km/h	Lo: 3.0 Hi: 5.5
	Gradeability		deg.	35
	Ground pressure (triple grouser shoe width: 600 mm		kPa {kg/cm^2}	50 {0.51}
Dimensions	Overall length (for transport)		mm	8,700
	Overall width		mm	2,980
	Overall width of track		mm	2,800
	Overall height (for transport)		mm	3,010
	Overall height to chassis		mm	3,035
	Ground clearance to bottom of upper structure		mm	1,058
	Min. ground clearance		mm	440
	Tail swing radius		mm	1,680
	Min. swing radius of work equipment		mm	2,310
	Height of work equipment at min. swing radius		mm	8,250
	Length of track on ground		mm	3,270
	Track gauge		mm	2,200
	Height of machine cab		mm	2,287

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ELECTRICAL CIRCUIT DIAGRAM (1/5)

STD machine

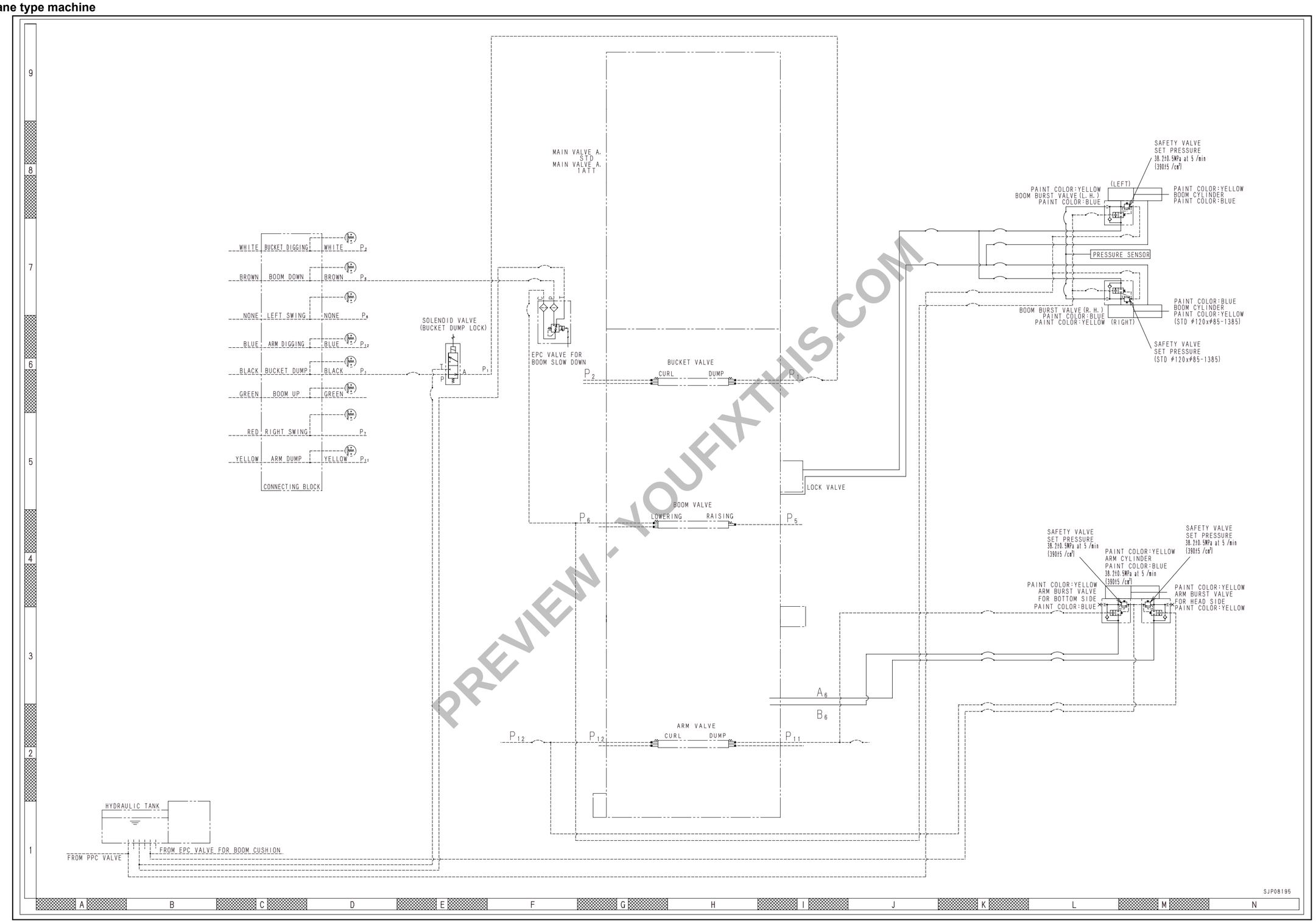


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HYDRAULIC CIRCUIT DIAGRAM

Arm crane type machine



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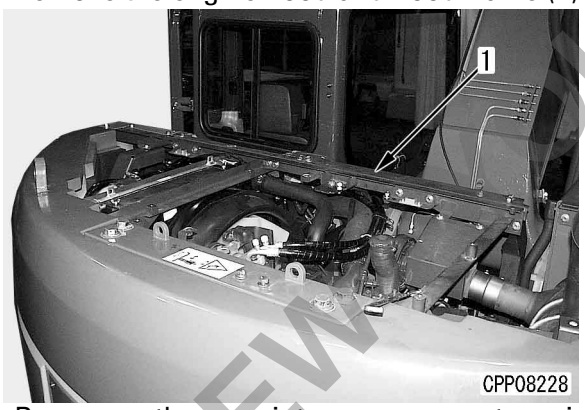
REMOVAL OF ENGINE ASSEMBLY

⚠ Lower the work equipment to the ground and release the residual pressure from the hydraulic circuit. Refer to TESTING AND ADJUSTING, Releasing residual pressure from hydraulic circuit.

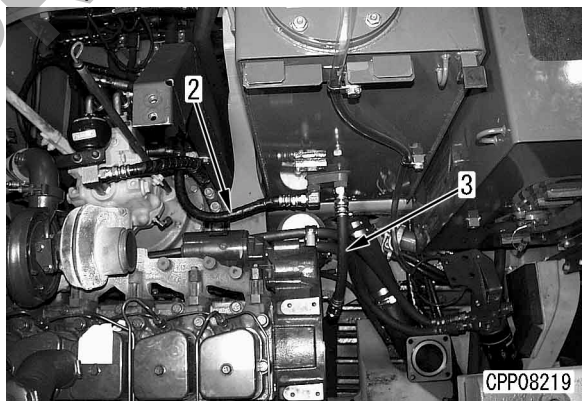
⚠ Disconnect the cable from the negative (-) terminal of the battery.

1. Release the air conditioner refrigerant. ※1
2. Remove the hydraulic pump assembly. For details, see REMOVAL OF HYDRAULIC PUMP ASSEMBLY.
   ★ Before lifting off the engine assembly, bind the engine oil filter and hose together to the engine assembly, so that they will not be damaged.
3. Drain the cooling water.

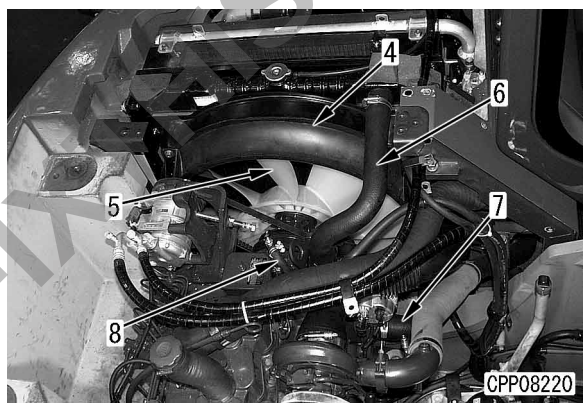
   Quantity of cooling water: 21.5 L
4. Remove the engine hood and hood frame (1).

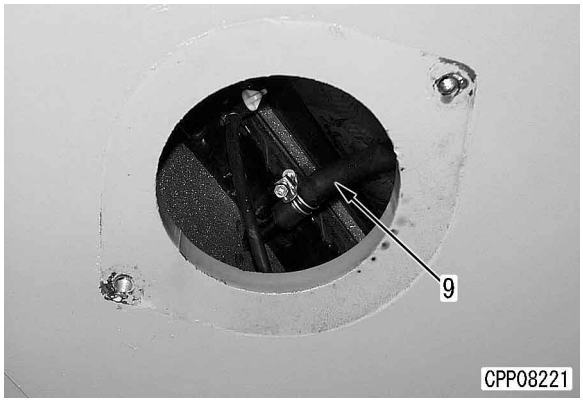


5. Remove the maintenance counterweight assembly (central one at the rear of the engine). For details, see REMOVAL OF COUNTERWEIGHT ASSEMBLY.
6. Remove hydraulic tank return hoses (2) and (3).
   ★ Remove the nipples and elbows on the hydraulic tank side.



7. Remove bellmouth shroud (4) (only the upper one) and fan (5). ※2
8. Disconnect radiator inlet hose (6) and outlet hose (7) on the engine side.
   ★ Since outlet hose (7) is secured with a clamp to the lower part (on the radiator side), disconnect the clamp from the frame.
9. Disconnect heater hoses (8) and (9).
   ★ When disconnecting the heat hoses, take sufficient care not to bend the radiator tubes.





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STANDARD TIGHTENING TORQUE

STANDARD TIGHTENING TORQUE TABLE (WHEN USING TORQUE WRENCH)

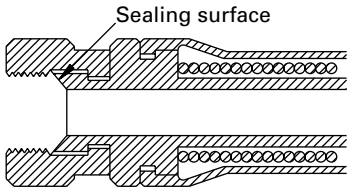
★ In the case of metric nuts and bolts for which there is no special instruction, tighten to the torque given in the table below.

Thread diameter of bolt	Width across flats	Tightening torque	
		 CDL00372	
mm	mm	Nm	kgm
6	10	11.8 – 14.7	1.2 – 1.5
8	13	27 – 34	2.8 – 3.5
10	17	59 – 74	6 – 7.5
12	19	98 – 123	10 – 12.5
14	22	153 – 190	15.5 – 19.5
16	24	235 – 285	23.5 – 29.5
18	27	320 – 400	33 – 41
20	30	455 – 565	46.5 – 58
22	32	610 – 765	62.5 – 78
24	36	785 – 980	80 – 100
27	41	1150 – 1440	118 – 147
30	46	1520 – 1910	155 – 195
33	50	1960 – 2450	200 – 250
36	55	2450 – 3040	250 – 310
39	60	2890 – 3630	295 – 370

Thread diameter of bolt	Width across flats	Tightening torque	
		 CDL00373	
mm	mm	Nm	kgm
6	10	5.9 – 9.8	0.6 – 1.0
8	13	13.7 – 23.5	1.4 – 2.4
10	14	34.3 – 46.1	3.5 – 4.7
12	27	74.5 – 90.2	7.6 – 9.2

TABLE OF TIGHTENING TORQUES FOR FLARED NUTS

★ In the case of flared nuts for which there is no special instruction, tighten to the torque given in the table below.



SAD00483

Thread diameter	Width across flat	Tightening torque	
mm	mm	Nm	kgm
14	19	24.5 ± 4.9	2.5 ± 0.5
18	24	49 ± 19.6	5 ± 2
22	27	78.5 ± 19.6	8 ± 2
24	32	137.3 ± 29.4	14 ± 3
30	36	176.5 ± 29.4	18 ± 3
33	41	196.1 ± 49	20 ± 5
36	46	245.2 ± 49	25 ± 5
42	55	294.2 ± 49	30 ± 5

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Example 3: When no service code is recorded, all digits on digital meter display (1) and service meter display (2) show [-].

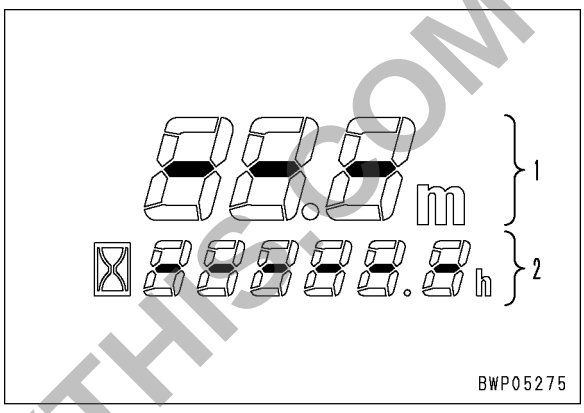
ii) To go on to the next service code display, press [Buzzer cancel switch (8)] + [Working mode selector (UP) switch (3)].

iii) To go back to the previous service code display, press [Buzzer cancel switch (8)] + [Working mode selector (DOWN) switch (4)].

iv) To finish using the service code display mode, press [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)].

v) To delete the service codes from memory, keep [Buzzer cancel switch (8)] pressed and turn the starting switch OFF. Then turn the starting switch ON again and keep [Buzzer cancel switch (8)] pressed for 5 seconds.

★ If the number of service codes in memory exceeds 20, the oldest service codes are deleted in turn.



2) Table of service codes

Service code	Abnormal system	User code
E101	Abnormality in data	—
E104	Abnormality in air cleaner clogging sensor detected	—
E108	Engine water temperature over 105° C detected	—
E112	Short circuit in wiper drive normal rotation system	—
E113	Short circuit in wiper drive reverse rotation system	—
E114	Short circuit in window washer drive system	—
E115	Wipe failure continues for 10 seconds	—
E206	Stow failure continues for 10 seconds	—
E201	Short circuit in travel junction solenoid system	—
E203	Short circuit in swing holding brake solenoid system	E03
E204	Short circuit in pump merge/divider solenoid system	—
E205	Short circuit in 2-stage relief solenoid system	—
E206	Short circuit in travel speed Hi/Lo selector solenoid system	—
E211	Disconnection in travel junction solenoid system	—

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METHOD OF USING JUDGEMENT TABLE

This judgement table is a tool to determine if the problem with the machine is caused by an abnormality in the electrical system or by an abnormality in the hydraulic or mechanical system. The symptoms are then used to decide which troubleshooting table (E-OO, S-OO, N-OO, C-OO, F-OO, H-OO, M-OO) matches the symptoms.
The judgement table is designed so that it is easy to determine from the user code and service code which troubleshooting table to go to.

★ The abnormality display (warning) given by the monitor panel leads directly to troubleshooting of the machine monitor (M-OO). (See troubleshooting of the machine monitor system).

1. When using judgement table for governor, pump controller (governor control system) and engine related parts.

- If a service code is displayed on the monitor panel, go to the troubleshooting code at the bottom of the judgement table (E-OO).
  (A ● mark is put at the places where the failure mode and service code match).
- If a problem has appeared but no service code is displayed on the monitor panel, go to the point where the failure mode matches the troubleshooting code on the right of the judgement table (E-OO or S-OO).

<Example> Failure mode "Engine does not start".

Procedure: Check if the service code is being displayed on the monitor panel.

Failure mode			Abnormality in engine throttle and pump controller power source system	Engine throttle and pump controller, engine related parts (E3: system)					
				Self-diagnostic display					
				Abnormality in fuel control dial input value	Abnormality (disconnection) in motor (4-pole system)	Abnormality (short circuit) in motor drive system	Abnormality in feedback potentiometer system	Abnormality (short circuit) in battery relay output	Abnormality (step-out) in motor
		User code		E05					
		Service code		308	317	318	306	315	316
1	Engine does not start easily								
2	Engine does not start								
3	Engine speed stays at low idling, and does not follow accelerator; or engine pickup is poor		●	●	●	●			
4	Engine stops during operation								
5	Engine rotation is irregular	When idling speed is irregular							
		When there is hunting		●	●	●	●		●
6	Lack of output (engine high idling speed is too low)			●			●		
7	Auto-deceleration does not work								
8	Engine does not stop		●		●	●	●	●	
9	Warming-up operation is defective								
10	Exhaust gas is black								
11	Oil consumption is excessive, or exhaust gas is blue								
12	Oil becomes dirty prematurely								
13	Fuel consumption is excessive, or exhaust gas is blue								
14	Oil is mixed in coolant								
15	Engine oil pressure caution lamp lights up								
16	Oil level rises								
17	Coolant temperature rises too high (overheating)								
18	Abnormal noise is generated								
19	There is excessive vibration								
20	Engine speed does not change even when working mode is switched								
Troubleshooting code when service code is displayed			E-1	E-2	E-3	E-4	E-5	E-6	E-7
Troubleshooting code when there is abnormality in monitoring or machine monitor check			–	–	–	–	–	–	–

Checking monitoring, check items							Machine monitor check item			Troubleshooting code if no service code display is given
Battery relay drive signal	No. 2 throttle command value	Fuel control dial command value	Governor motor potentiometer	Governor motor A phase current	Governor motor B phase current	Coolant temperature voltage	Is red range displayed? 102° C or above	Is red range displayed? 105° C or above	Does starting motor turn?	
Monitoring code										
35	16	30	31	33	34	41		108		
										S-1
									O	S-2
		※	※	※	※			O		S-3
										S-4
										E-9A), S-5
			※							E-9A), S-5
	※	※				O				E-10, S-6
										E-3 and E-4
O				※	※					E-11
						O		O		E-3 and E-4
										See ENGINE SHOP MANUAL
										See ENGINE SHOP MANUAL
										See ENGINE SHOP MANUAL
										See ENGINE SHOP MANUAL
										See ENGINE SHOP MANUAL
										See ENGINE SHOP MANUAL
										See ENGINE SHOP MANUAL
						O	O			See ENGINE SHOP MANUAL
										See ENGINE SHOP MANUAL
										See ENGINE SHOP MANUAL
	※									E-3 and E-4
–	–	–	–	–	–	–	–	–	–	
E-12	–	–	–	–	–		M-13	M-13	E-8	

O: This shows item to check with monitoring or machine monitor

[Judgement]

1) If a service code is being displayed on the monitor panel.....go to troubleshooting [E3:OO] for the governor, pump controller (governor control system).
2) If no service code is displayed on the monitor panel, and the engine does not start:

- Check that starting motor rotates
  - Starting motor rotates..... Go to troubleshooting S-2 of mechanical system
  - Starting motor does not rotate..... Go to troubleshooting E-8 of electrical system

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20 TESTING AND ADJUSTING 20-1

30 DISASSEMBLY AND ASSEMBLY 30-1

90 OTHERS 90-1

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SAFETY
SAFETY NOTICE

IMPORTANT SAFETY NOTICE

Proper service and repair is extremely important for safe machine operation. The service and repair techniques recommended by Komatsu and described in this manual are both effective and safe. Some of these techniques require the use of tools specially designed by Komatsu for the specific purpose.

To prevent injury to workers, the symbol ⚠ is used to mark safety precautions in this manual. The cautions accompanying these symbols should always be followed carefully. If any dangerous situation arises or may possibly arise, first consider safety, and take the necessary actions to deal with the situation.

GENERAL PRECAUTIONS

Mistakes in operation are extremely dangerous. Read the Operation and Maintenance Manual carefully BEFORE operating the machine.

1. Before carrying out any greasing or repairs, read all the precautions given on the decals which are fixed to the machine.
2. When carrying out any operation, always wear safety shoes and helmet. Do not wear loose work clothes, or clothes with buttons missing.
   - Always wear safety glasses when hitting parts with a hammer.
   - Always wear safety glasses when grinding parts with a grinder, etc.
3. If welding repairs are needed, always have a trained, experienced welder carry out the work. When carrying out welding work, always wear welding gloves, apron, hand shield, cap and other clothes suited for welding work.
4. When carrying out any operation with two or more workers, always agree on the operating procedure before starting. Always inform your fellow workers before starting any step of the operation. Before starting work, hang UNDER REPAIR signs on the controls in the operator's compartment.
5. Keep all tools in good condition and learn the correct way to use them.
6. Decide a place in the repair workshop to keep tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.

PREPARATIONS FOR WORK

7. Before adding oil or making any repairs, park the machine on hard, level ground, and block the wheels or tracks to prevent the machine from moving.
8. Before starting work, lower blade, ripper, bucket or any other work equipment to the ground. If this is not possible, insert the safety pin or use blocks to prevent the work equipment from falling. In addition, be sure to lock all the control levers and hang warning signs on them.
9. When disassembling or assembling, support the machine with blocks, jacks or stands before starting work.
10. Remove all mud and oil from the steps or other places used to get on and off the machine. Always use the handrails, ladders or steps when getting on or off the machine. Never jump on or off the machine. If it is impossible to use the handrails, ladders or steps, use a stand to provide safe footing.

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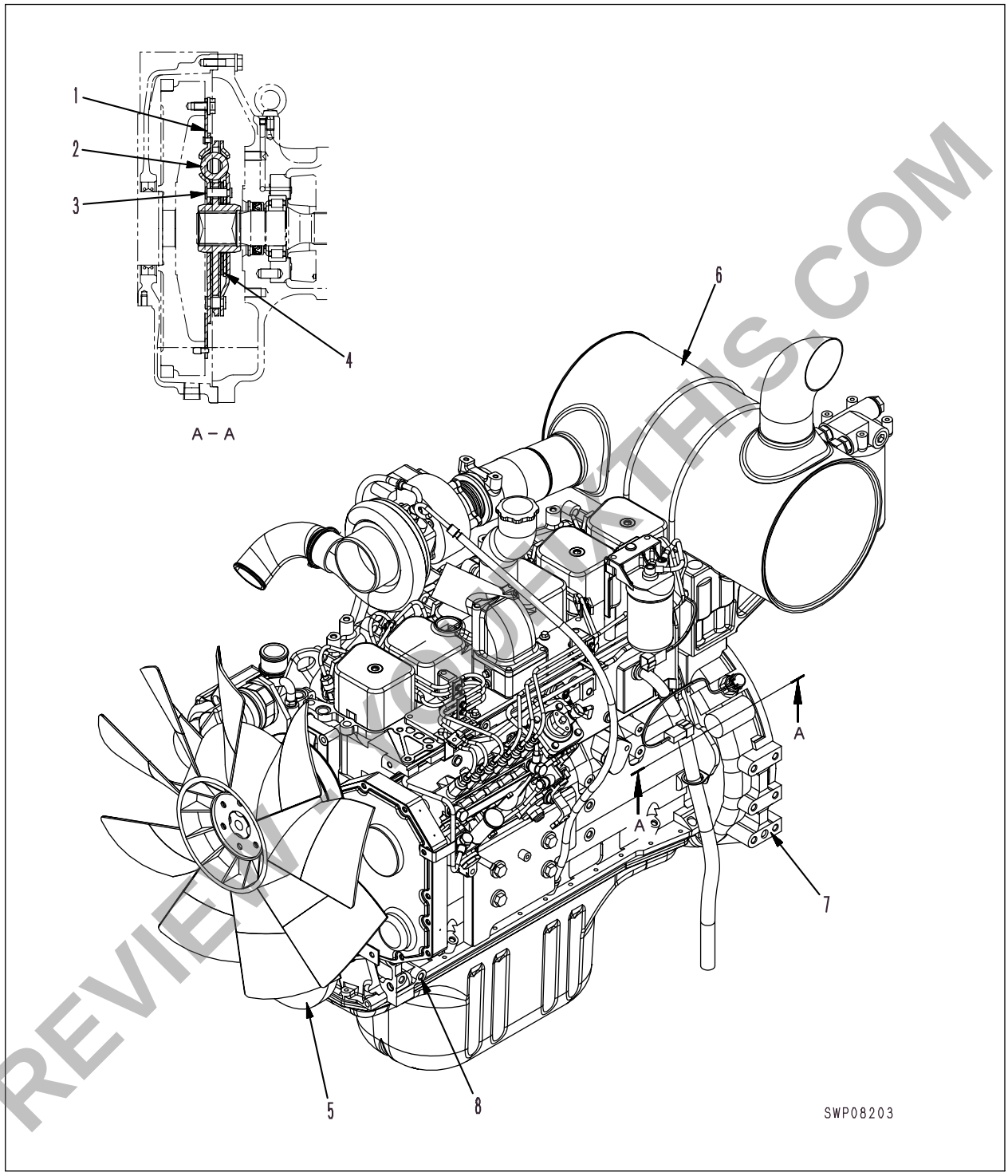
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Mark	Pages	Revision number	Mark	Pages	Revision number	Mark	Pages	Revision number	Mark	Pages	Revision number	Mark	Pages	Revision number
	10-96			10-135			20-1			20-120	(1)		20-224	(1)
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	10-109			10-148			20-14			20-133	(1)		20-237	(1)
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	10-111			10-150			20-16			20-135	(1)		20-239	(1)
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	10-113			10-152			20-18			20-202	(1)		20-241	(1)
	10-114			10-153			20-19			20-203	(1)		20-242	(1)
	10-115			10-154			20-20			20-204	(1)		20-243	(1)
	10-116			10-155			20-101	(1)		20-205	(1)		20-244	(1)
	10-117			10-156		●	20-102	(4)		20-206	(1)		20-245	(1)
	10-118			10-157			20-103	(1)		20-207	(1)		20-246	(1)
	10-119			10-158		●	20-104	(4)		20-208	(1)		20-247	(1)
	10-120			10-159			20-105	(1)		20-209	(1)	●	20-248	(4)
	10-121			10-160			20-106	(1)		20-210	(1)	●	20-249	(4)
	10-122			10-161			20-107	(1)		20-211	(1)	●	20-250	(4)
	10-123			10-162			20-108	(1)		20-212	(1)		(20-251)	
	10-124			10-163			20-109	(1)		20-213	(1)		20-252	(1)
	10-125			10-164			20-110	(1)		20-214	(1)		20-253	(1)
	10-126			10-165			20-111	(1)		20-215	(1)	●	20-254	(4)
	10-127			10-166		●	20-112	(4)		20-216	(1)		20-255	(1)
	10-128			10-167			20-113	(1)		20-217	(1)		20-256	(1)
	10-129			10-168			20-114	(1)		20-218	(1)		20-257	(1)
	10-130			10-169			20-115	(1)		20-219	(1)		20-258	(1)
	10-131			10-170		●	20-116	(4)		20-220	(1)		20-259	(1)
	10-132			10-171			20-117	(1)		20-221	(1)		20-260	(1)
	10-133			10-172			20-118	(1)		20-222	(1)		20-301	(1)
	10-134						20-119	(1)		20-223	(1)		20-302	(1)

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ENGINE RELATED PARTS



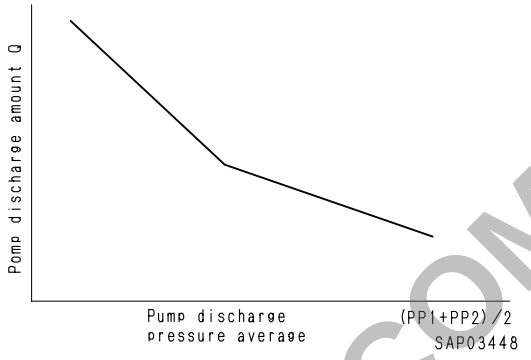
1. Drive plate
2. Torsion spring
3. Stopper pin
4. Friction plate
5. Damper assembly
6. Muffler
7. Rear engine mount
8. Front engine mount

OUTLINE

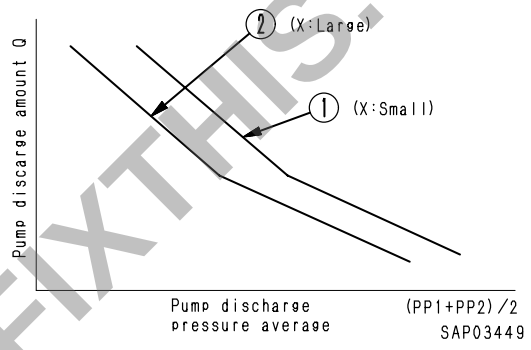
- The damper assembly is a wet type. Oil capacity: 0.75 ℓ

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- The relation of average pump pressure **(PP1 + PP2)/2** and the position of servo piston (9) forms a bent line because of the double-spring effect of springs (4) and (6). The relationship between average pump pressure **(PP1 + PP2)/2** and pump discharge amount **Q** is shown in the figure at the right.



- If command voltage **X** sent to PC-EPC valve solenoid (1) increases further, the relationship between average pump pressure **(PP1 + PP2)/2**, and pump discharge amount **Q** is proportional to the pushing force of the PC-EPC valve solenoid and moves in parallel. In other words, the pushing force of PC-EPC solenoid (1) is added to the force pushing to the left because of the pump pressure applied to the spool (3), so the relationship between the average pump pressure **(PP1 + PP2)/2** and **Q** moves from ① to ② in accordance with the increase in **X**.



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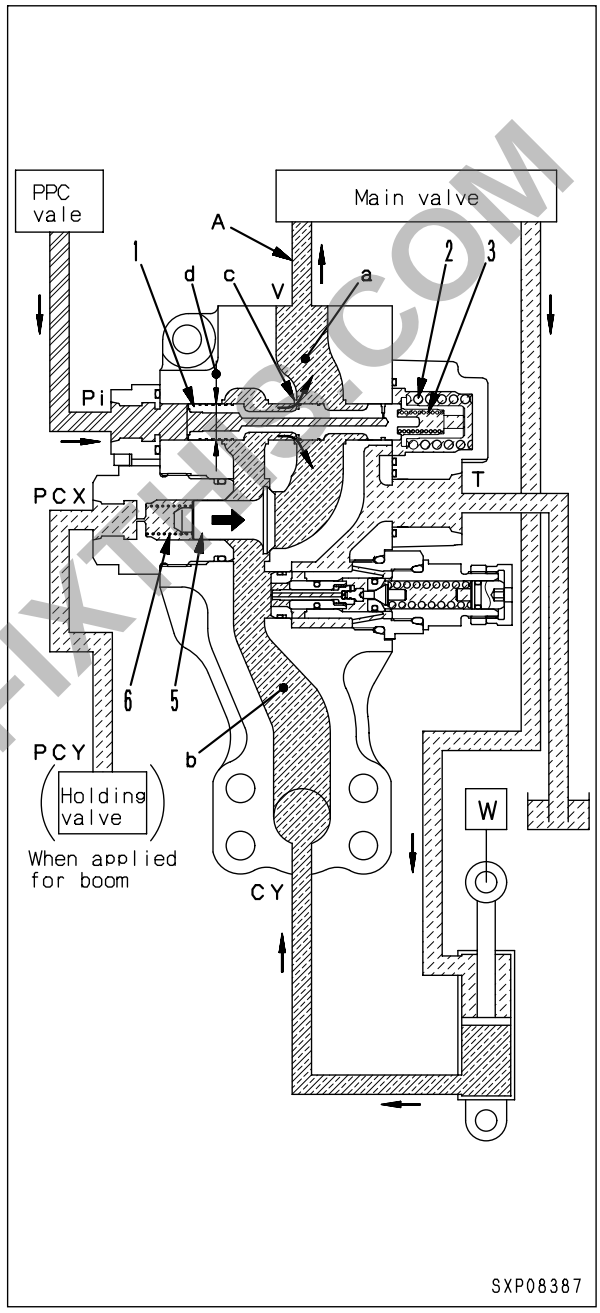
3. When oil is returned from work equipment cylinder to main valve

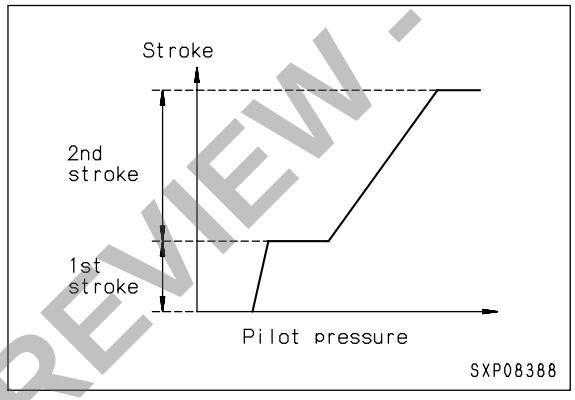
[When piping is normal]

- The work equipment cylinder holding pressure is applied to chamber "b" and check valve (5) closes.
- The pilot pressure from the PPC valve is applied to port Pi. If it is higher than the force of spring (2) (area of ⌀d), spool (1) moves to the right standby position (1st-stage stroke).
- At this time, chambers "a" and "b" are not connected to each other.
- If the pilot pressure rises higher than the force of spring (3) (area of ⌀d), spool (1) moves further to the right and chambers "a" and "b" are connected to each other (2nd-stage stroke).
- Accordingly, the oil is returned from the work equipment cylinder to the main valve.

[When piping bursts]

- If piping A between the main valve and work equipment cylinder bursts, the oil in chamber "a" flows out through the burst part. Since the oil supplied from chamber "b" to chamber "a" flows through opening "c" of spool (1), however, the cylinder does not fall suddenly.

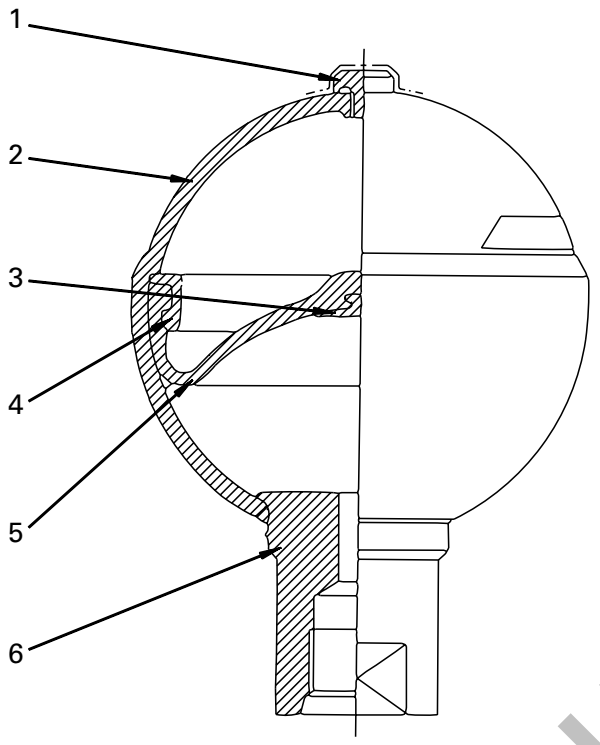




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PPC ACCUMULATOR



SBP00290

1. Gas plug
2. Shell
3. Poppet
4. Holder
5. Bladder
6. Oil port

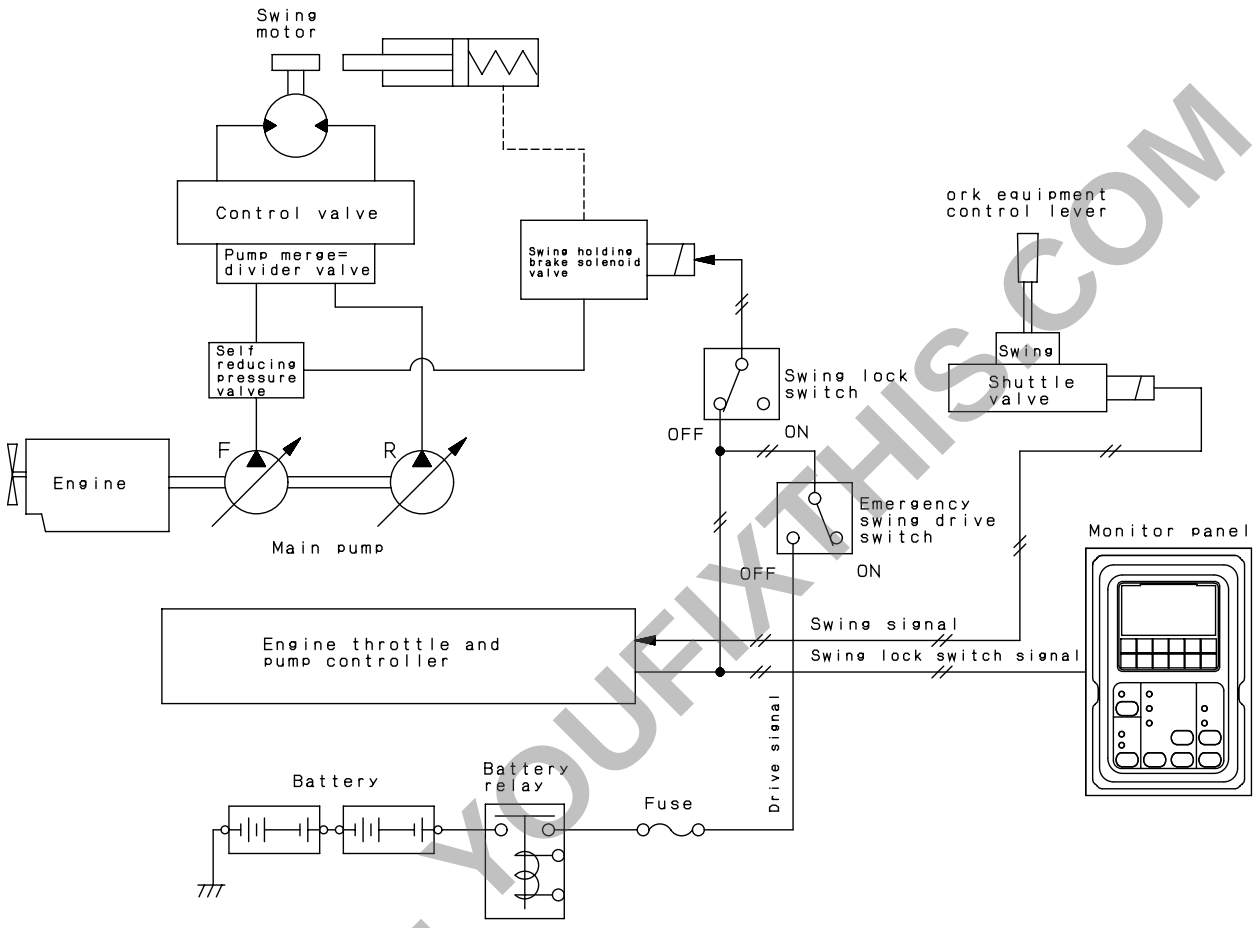
SPECIFICATIONS

Gas capacity: 300 cc (for PPC)
500 cc (for port S)

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6. Swing control function



SXP08406

Function

The swing lock and swing holding brake functions are installed.

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System	Name of component	Connector No.	Inspection method	Judgement table	Measurement conditions
Controller	Attachment (breaker) pressure switch signal	C06	Measure voltage	If the condition is as shown in the table below, it is normal When attachment (breaker) is operated (pressure switch ON): Between (6) - (3),(4): Max. 1 V At HOLD: Between (6) - (3),(4): 20 - 30 V	1) Turn starting switch OFF. 2) Insert T-adapter. 3) Turn starting switch ON.
	Swing holding brake solenoid	C01	Measure voltage	If the condition is as shown in the table below, it is normal When one of swing or work equipment control levers is operated (solenoid ON: Swing holding brake canceled): Between (3) - (6),(12): 20 - 30 V 5 seconds after all of swing or work equipment control levers are returned to HOLD (solenoid OFF: Swing holding brake applied): Between (3) - (6),(12): 0 - 3 V	1) Start engine. 2) Turn swing lock switch OFF. 3) Swing holding brake cancel switch: Normal 4) Insert T-adapter. ※ It is possible to operate the lever slightly (do not make the machine move).
	2-stage relief solenoid	C01	Measure voltage	If the condition is as shown in the table below, it is normal Swing lock switch ON (Solenoid ON: High pressure): Between (10) - (6),(12): 20 - 30 V Swing lock switch OFF (Solenoid OFF: Low pressure): Between (10) - (6),(12): 0 - 3 V	1) Turn starting switch ON. 2) Insert T-adapter.
	Governor potentiometer	C03	Measure voltage	If the condition is as shown in the table below, it is norma Between (14) - (17) (low idling): 2.3 - 3.3 V Between (14) - (17) (high idling): 0.5 - 0.9 V Between (7) - (17) (power source): 4.75 - 5.25 V	1) Turn starting switch ON. 2) Insert T-adapter.
	Governor motor	C02	Measure voltage	If the condition is as shown in the table below, it is normal Between (2) - (3): 1.8 - 4.6 V Between (4) - (5): 1.8 - 4.6 V	1) Turn starting switch ON. 2) Insert T-adapter.
	Battery relay	C01	Measure voltage	If the condition is as shown in the table below, it is normal Between (1) - (6): 20 - 30 V ★ Only for 2.5 sec. after starting switch is operated (ON→OFF); all other times: 0 V.	1) Turn starting switch ON. 2) Insert T-adapter.

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BLEEDING AIR

Order for operation and procedure for bleeding air

Air bleeding item / Nature of work	Air bleeding procedure						
	1	2	3	4	5	6	7
	Bleeding air from pump	Start engine	Bleeding air from cylinder	Bleeding air from swing motor	Bleeding air from travel motor	Start operations	Between EPC solenoid - control valve
• Replace hydraulic oil • Clean strainer	O →	O →	O →	O (Note 1) →	O (Note 1) →	O	
• Replace return filter element		O →	→	→	→	O	
• Replace, repair pump • Remove suction piping	O →	O →	O →	→	→	O	
• Replace, repair control valve		O →	O →	→	→	O	
• Replace cylinder • Remove cylinder piping		O →	O →	→	→	O	
• Replace swing motor • Remove swing motor piping		O →	→	O →	→	O	
• Replace travel motor, swivel • Remove travel motor, swivel piping		O →	→	→	O →	O	

Note 1: Bleed the air from the swing and travel motors only when the oil inside the motor case has been drained.

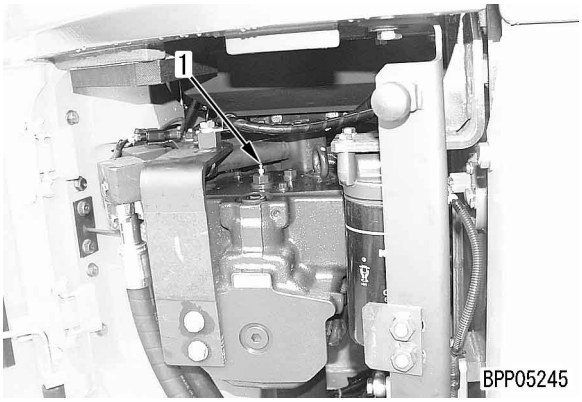
1. Bleeding air from pump

1) Loosen air bleed plug (1), and check that oil oozes out from the plug.
2) When the oil oozes out, tighten plug (1).

N·m Plug: 7.8 ~ 9.8 Nm {0.8 ~ 1.0 kgm}

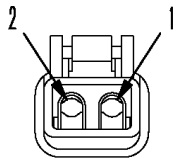
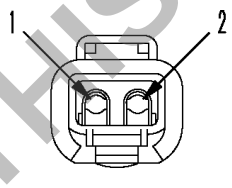
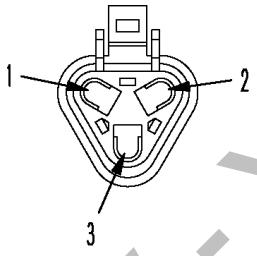
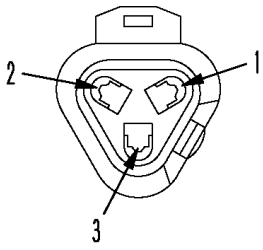
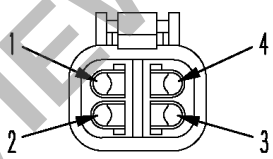
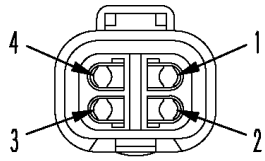
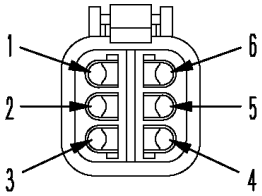
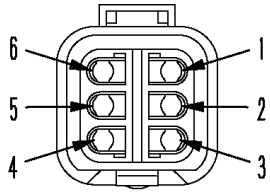
★ Precautions when starting the engine
After completing the above procedure and starting the engine, run the engine at low idling for 10 minutes.

★ If the coolant temperature is low and automatic warming-up is carried out, cancel it by using the fuel control dial after starting the engine.



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No. of Pins	DT Series connector	
	Body (plug)	Body (receptacle)
2	 BWP05037	 BWP05038
3	 BWP05039	 BWP05040
4	 BWP05041	 BWP05042
6	 BWP05043	 BWP05044

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JUDGEMENT TABLE FOR ENGINE THROTTLE AND PUMP CONTROLLER (GOVERNOR CONTROL SYSTEM) AND ENGINE RELATED PARTS

Failure mode			Abnormality in engine throttle and pump controller power source system	Engine throttle and pump controller, engine related parts (E3: system)					
				Self-diagnostic display					
				Abnormality in fuel control dial input value	Abnormality (disconnection) in motor drive system	Abnormality (short circuit) in motor drive system	Abnormality in feedback potentiometer system	Abnormality (short circuit) in battery relay output	Abnormality (step-out) in motor
		User code		E05					
		Service code		308	317	318	306	315	316
1	Engine does not start easily								
2	Engine does not start								
3	Engine speed stays at low idling, and does not follow accelerator; or engine pickup is poor		●	●	●	●	●		
4	Engine stops during operation								
5	Engine rotation is irregular	When idling speed is irregular							
		When there is hunting		●	●	●	●		●
6	Lack of output (engine high idling speed is too low)			●			●		
7	Auto-deceleration does not work								
8	Engine does not stop		●		●	●	●	●	
9	Warming-up operation is defective								
10	Exhaust gas is black								
11	Oil consumption is excessive, or exhaust gas is blue								
12	Oil becomes dirty prematurely								
13	Fuel consumption is excessive, or exhaust gas is blue								
14	Oil is mixed in coolant								
15	Engine oil pressure caution lamp lights up								
16	Oil level rises								
17	Coolant temperature rises too high (overheating)								
18	Abnormal noise is generated								
19	There is excessive vibration								
20	Engine speed does not change even when working mode is switched								
Troubleshooting code when service code is displayed			E-1	E-2	E-3	E-4	E-5	E-6	E-7
Troubleshooting code when there is abnormality in monitoring or machine monitor check			—	—	—	—	—	—	—

● : This shows applicable item service

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<table>
<tr><th>Condition when normal (voltage, current, resistance)</th><th>Action by controller when abnormality is detected</th><th>Problem that appears on machine when there is abnormality</th></tr>
<tr><td>• Between C03 (13) and (16): 0.5 - 4.5 V
• Between C03 (6) and (16): 18 - 28 V
• Between C03 (female) (13) and (16), (13) and chassis
• Resistance: Min. 1 MΩ (Disconnect connectors C03 and A52</td><td>1. Takes rear pump pressure as 0 MPa {0 kg/cm²} when actuating.
★ If the abnormality is restored by the vibration of the machine, it resets the power source to restore to the proper condition. (However, the service code display does not go out.)</td><td>1. The travel speed does not automatically shift (it does not change from Hi to Lo).
★ If the button is operated manually, the panel display is switched.
2. During high load travel, the work equipment speed drops.
3. The steering becomes difficult to turn immediately after it is turned.</td></tr>
<tr><td>• Voltage between C03 (6) and (16): 18 - 28 V</td><td>1. Takes front pump and rear pump pressure as 0 MPa {0 kg/cm²} when actuating.</td><td>1. The travel speed does not automatically shift (it does not change from Hi to Lo).
★ If the button is operated manually, the panel display is switched.
2. During high load travel, the work equipment speed drops.
3. The steering becomes difficult to turn immediately after it is turned.</td></tr>
<tr><td>• Resistance: 500 - 1000 Ω
Voltage (AC range): 0.5 - 3.0 V (engine started)</td><td>1. It functions in the equivalent of the digging mode (the speed rises).</td><td>It operates about the same as digging mode (prolix) (the power is slightly lower)</td></tr>
<tr><td><table><tr><th>C03 (female)</th><th>A53 (male)</th><th>Resistance value</th></tr><tr><td>(7) - (4)</td><td>(1) - (2)</td><td>0.25 - 5 kΩ</td></tr><tr><td>(4) - (17)</td><td>(2) - (3)</td><td>0.25 - 5 kΩ</td></tr><tr><td>—</td><td>(1) - (3)</td><td>4 - 6 kΩ</td></tr><tr><td>Between each pin and chassis</td><td>—</td><td>Min. 1 MΩ</td></tr></table></td><td>Takes boom angle as end of boom RAISE stroke.</td><td>1. Boom RAISE does not work.</td></tr>
<tr><td>—</td><td>1. Sets compensation value for end of boom RAISE stroke to 0 (theoretical value).</td><td>Effect of cushion at end of boom RAISE stroke becomes poor or weak (end of boom RAISE stroke recognized by engine throttle, pump controller is different from actual end of stroke).</td></tr>
<tr><td>—</td><td>Takes no particular action.</td><td>Same problem as with [E255] may appear.</td></tr>
<tr><td>—</td><td>Takes no particular action. (Buzzer sounds.)</td><td>Auto-greasing is not carried out.</td></tr>
</table>

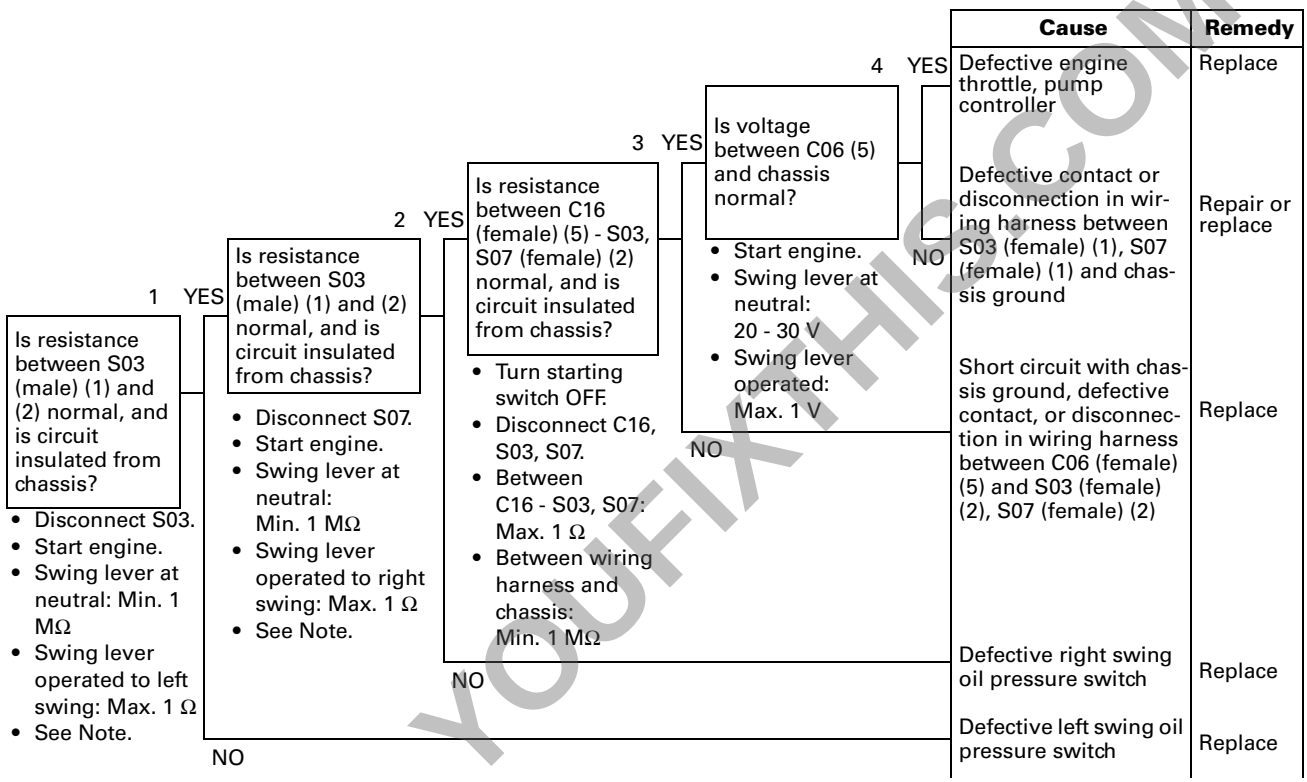
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F-1 Bit pattern 20-(1) Swing oil pressure switch ON display does not light up

⚠ Turn the swing lock switch ON before operating the swing lever. (It is enough to operate only slightly.)

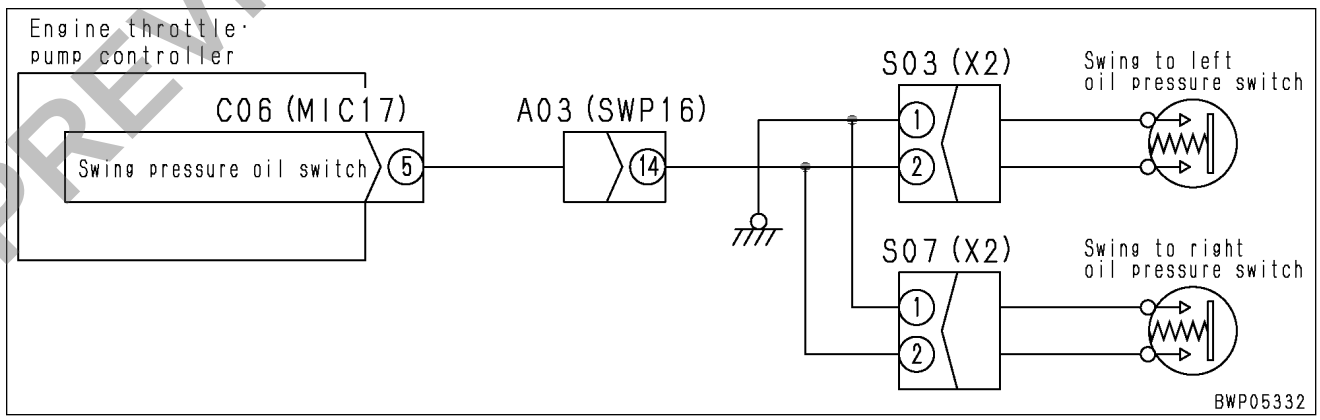
★ When measuring with the engine stopped, charge the accumulator first.



Note: It is also possible to fit a short connector and judge the condition. In this case, check the voltage between C06 (5) and the chassis.

- If it is 20 - 30 V: Go to YES
- If it is less than 1 V: Go to NO

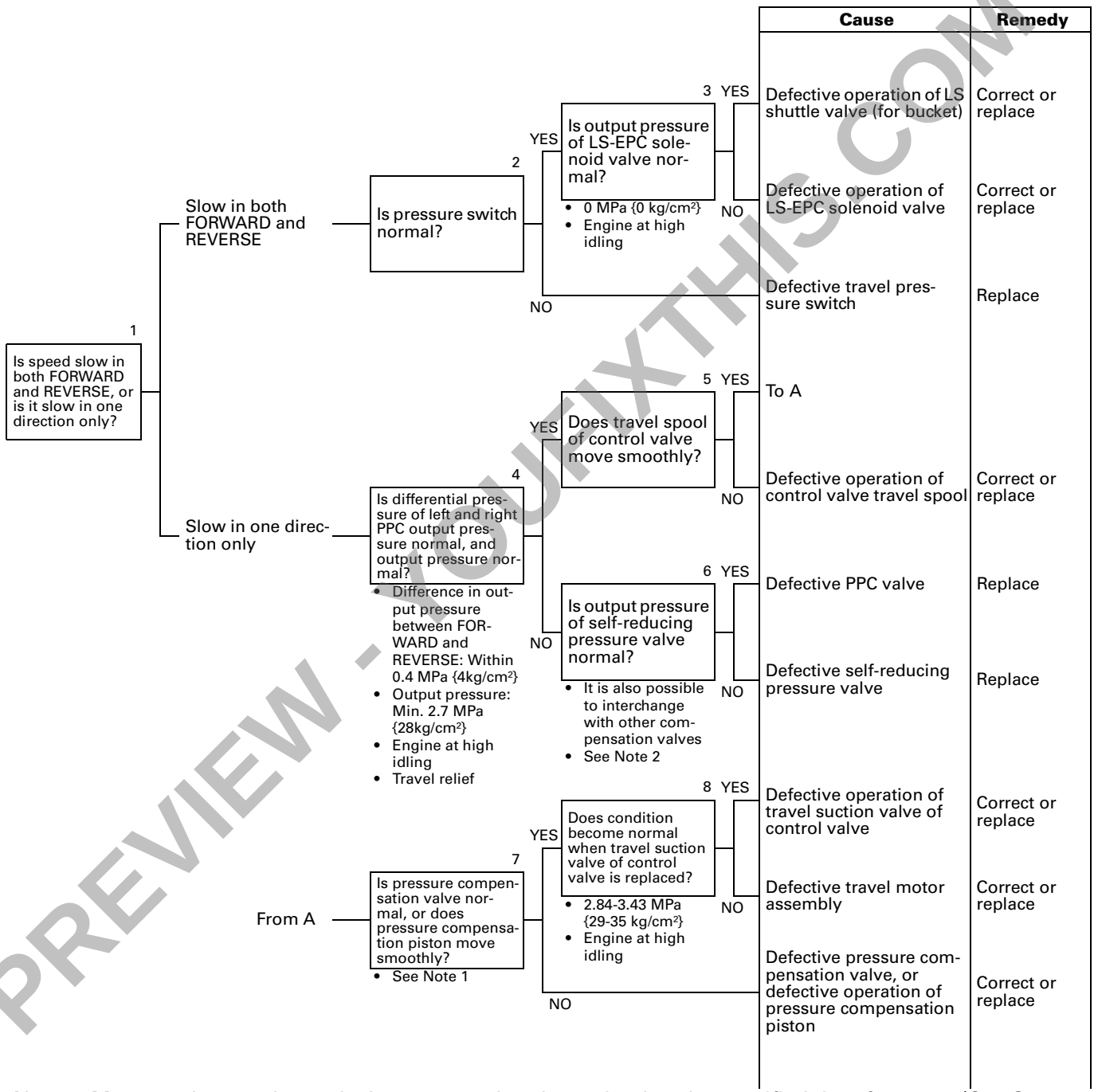
F-1 Related electrical circuit diagram



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H-19 Travel speed is slow

★ Check that the spool of the travel PPC valve is moving the full stroke before carrying out troubleshooting.
★ Carry out troubleshooting in the A mode.
★ When the swing and work equipment speeds are normal.



Note 1: Measure the travel speed when operated under no load or the specified time for 20 m. (See Standard Value Table for Engine related parts.)
- Measurement of travel motor speed when rotated under no load ➪ Remove the connector of the LS-EPC solenoid, then measure the travel speed in Hi and Lo.

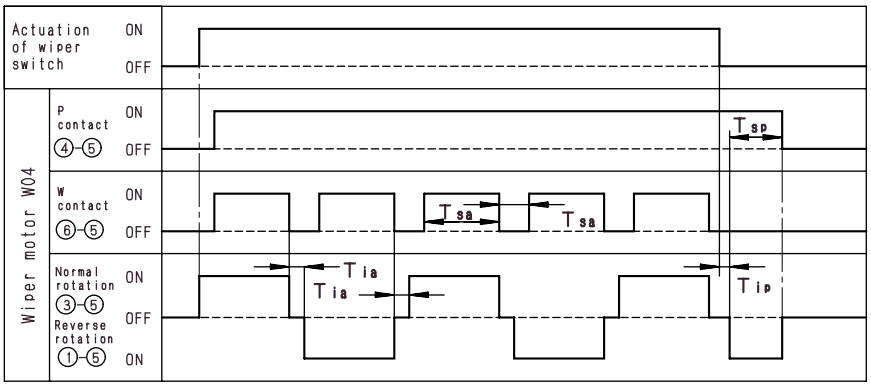
Note 2: After inspection, do not forget to return the interchanged valves to the original position.

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Table 1

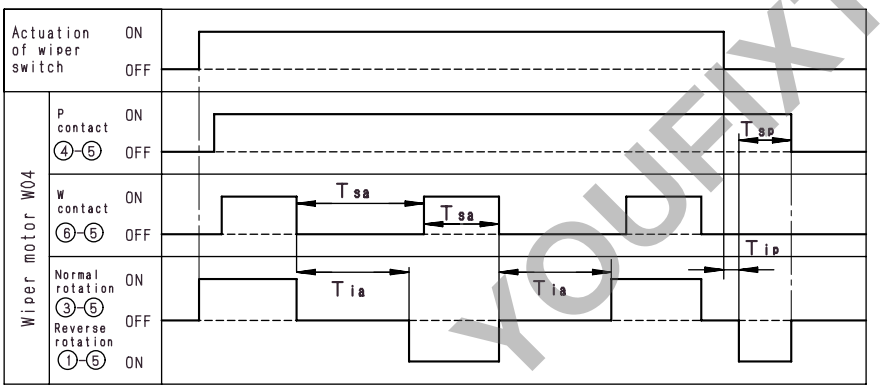
Timing chart when wiper switch is at ON



TKP00827

Item	Symbol	Set time
Length of pause until next actuation	Tla	0.13sec
Safety circuit during operation of wiper [safety function (1)]	Tsa	10sec
Length of pause when stowing wiper blade	Tlp	1.5sec
Safety circuit during stowing of wiper [safety function (2)]	Tsp	10sec

Timing chart when wiper switch is at INT



TKP00828

Item	Symbol	Set time
Length of pause until next actuation	Tla	4sec
Safety circuit during operation of wiper [safety function (1)]	Tsa	10sec
Length of pause when stowing wiper blade	Tlp	1.5sec
Safety circuit during stowing of wiper [safety function (2)]	Tsp	10sec

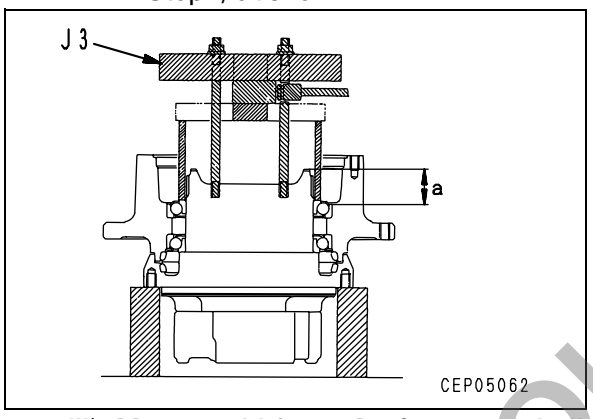
Table 2

Troubleshooting No. 4	Resistance
Between P01 (female) ⑩ and W04 (female)①	Max. 1Ω
Between P01 (female) ⑨ and W04 (female)③	
Between P01 (female) ⑫ and W04 (female)④	
Between P01 (female) ⑥,⑦ and W04 (female)⑤	
Between P01 (female) ⑤ and W04 (female)⑥	
Between W04 (female) ①,③,④,⑤,⑥ and GND	Min. 1MΩ

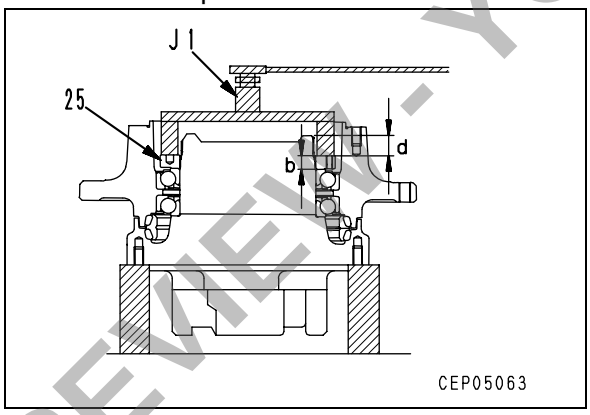
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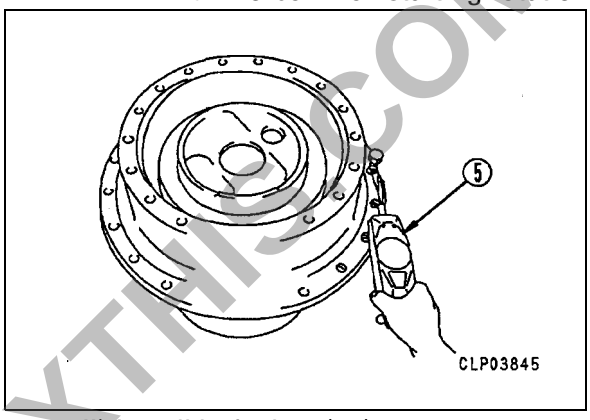
2. Nut
   1) Install nut as follows
      i) Using tool **J3**, push inner race portion of bearing.
         ★ Do not heat the bearing with a burner, or hit or push the plastic holder directly.
         ★ Pushing force: 0.9 - 1.3 tons
         ★ Rotate the hub 2 - 3 times before applying the pushing force to the bearing inner race.
      ii) Measure dimension **a** in the condition in Step i) above.



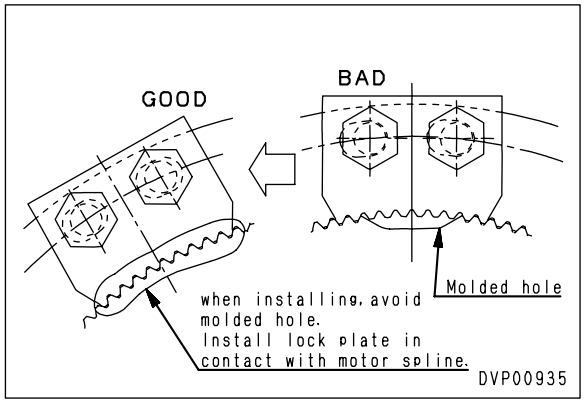
      iii) Measure thickness **b** of nut as an individual part.



      iv) Calculate **a - b = c.**
      v) Using tool **J1**, tighten nut (25) until dimension **d** is **c** $^{0}_{-0.1}$ mm.
      vi) Using push-pull scale ⑤, measure tangential force in direction of rotation of hub in relation to motor case.
         ★ Tangential force:
            Max. 297.0 N {Max. 30.0 kg}
         ★ The tangential force is the maximum force when starting rotation.

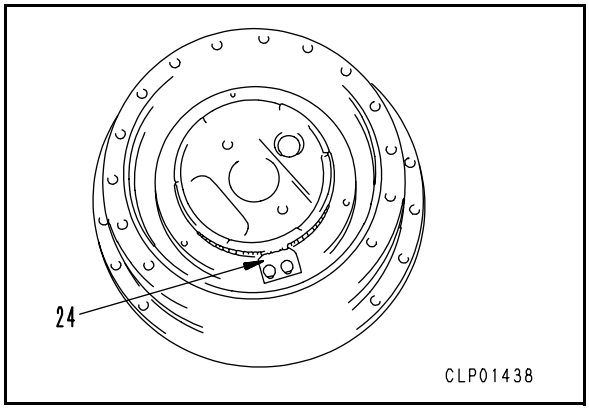


      vii) Install lock plate (24).
         ★ Install the lock plate as shown in the diagram below.





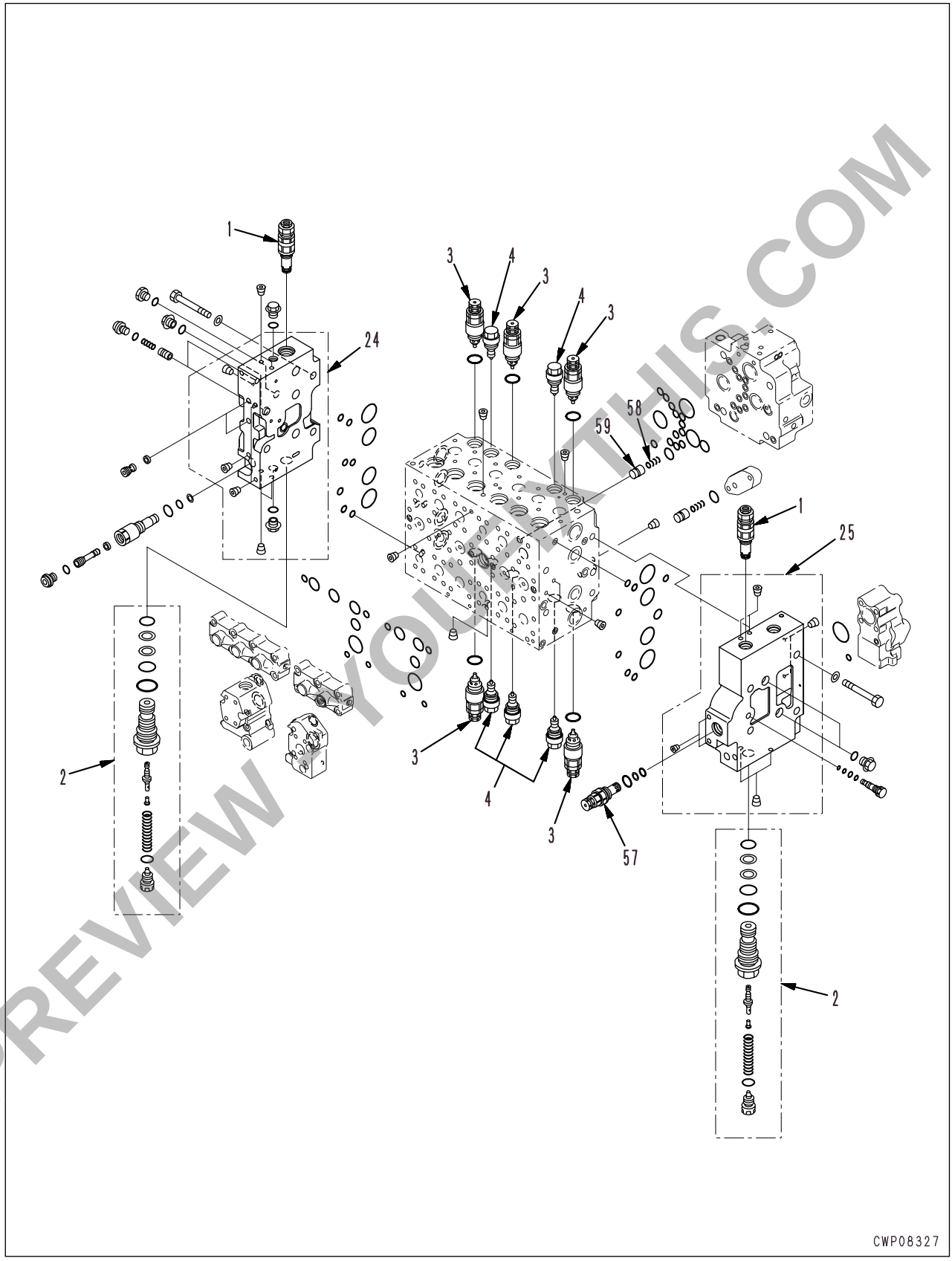
Thread of mounting bolt:
Thread tightener (LT-2)



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ASSEMBLY OF CONTROL VALVE ASSEMBLY



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