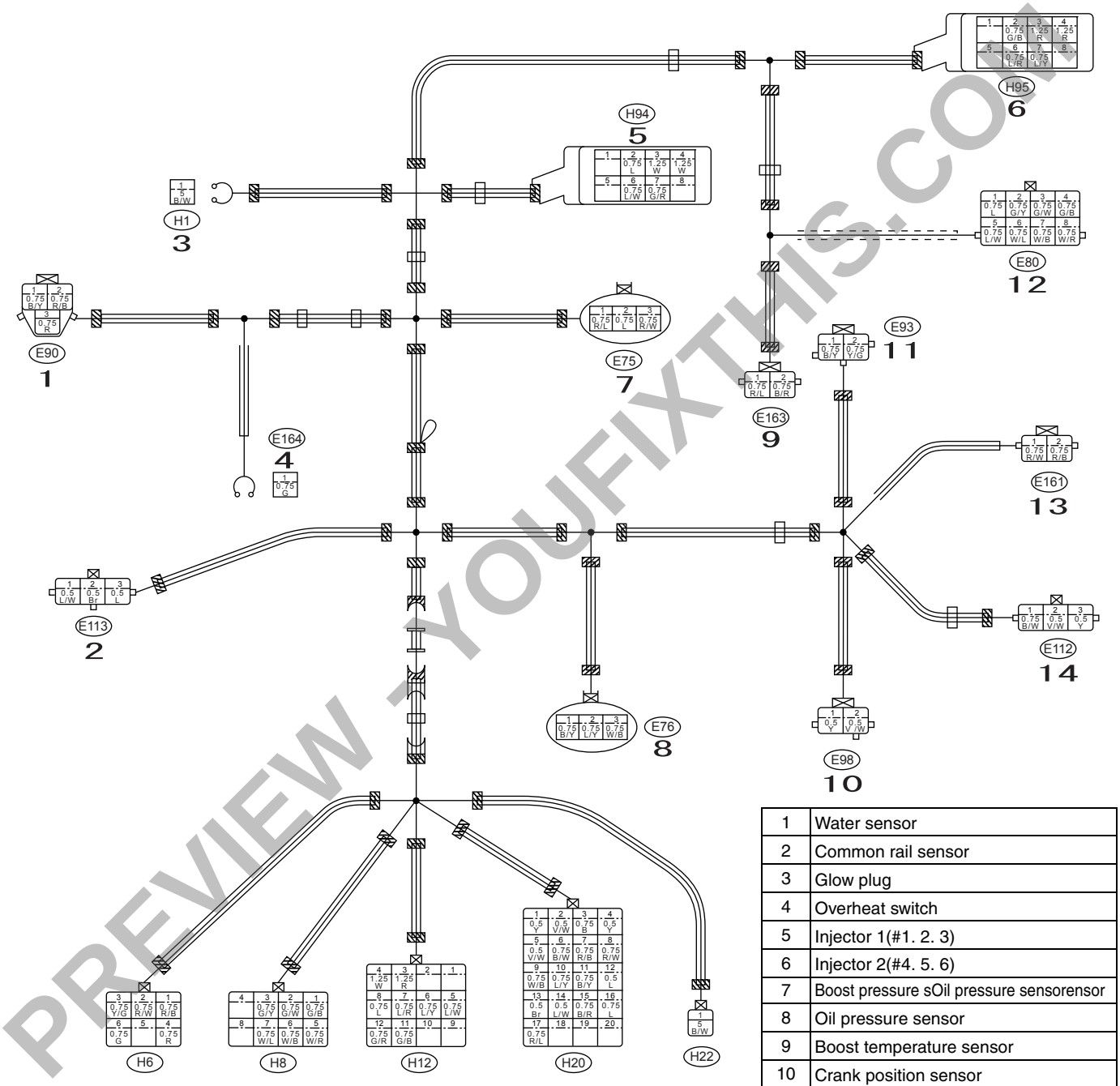
4. Engine Harness



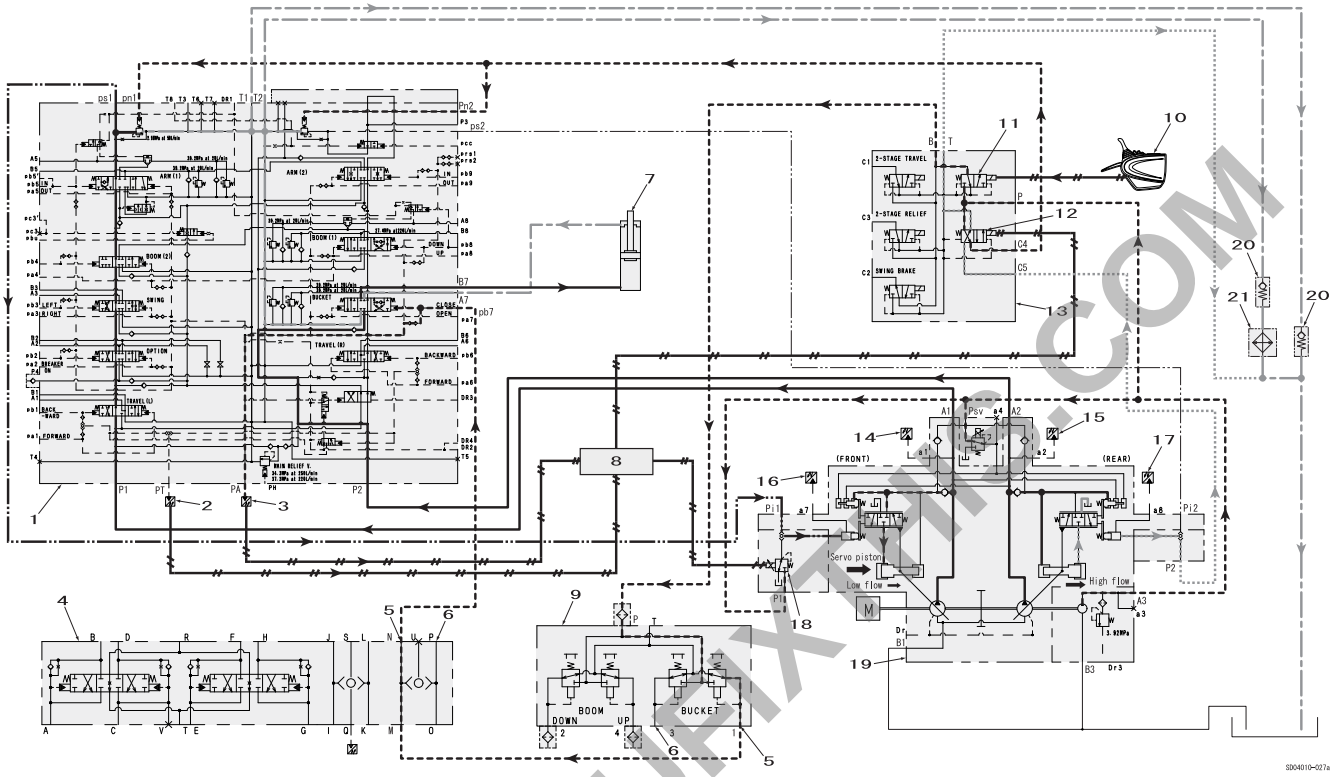
1	Water sensor
2	Common rail sensor
3	Glow plug
4	Overheat switch
5	Injector 1(#1. 2. 3)
6	Injector 2(#4. 5. 6)
7	Boost pressure sOil pressure sensorensor
8	Oil pressure sensor
9	Boost temperature sensor
10	Crank position sensor
11	Fuel temperature sensor
12	EGR valve
13	SCV
14	Cam angle sensor (G)

SE04012-002

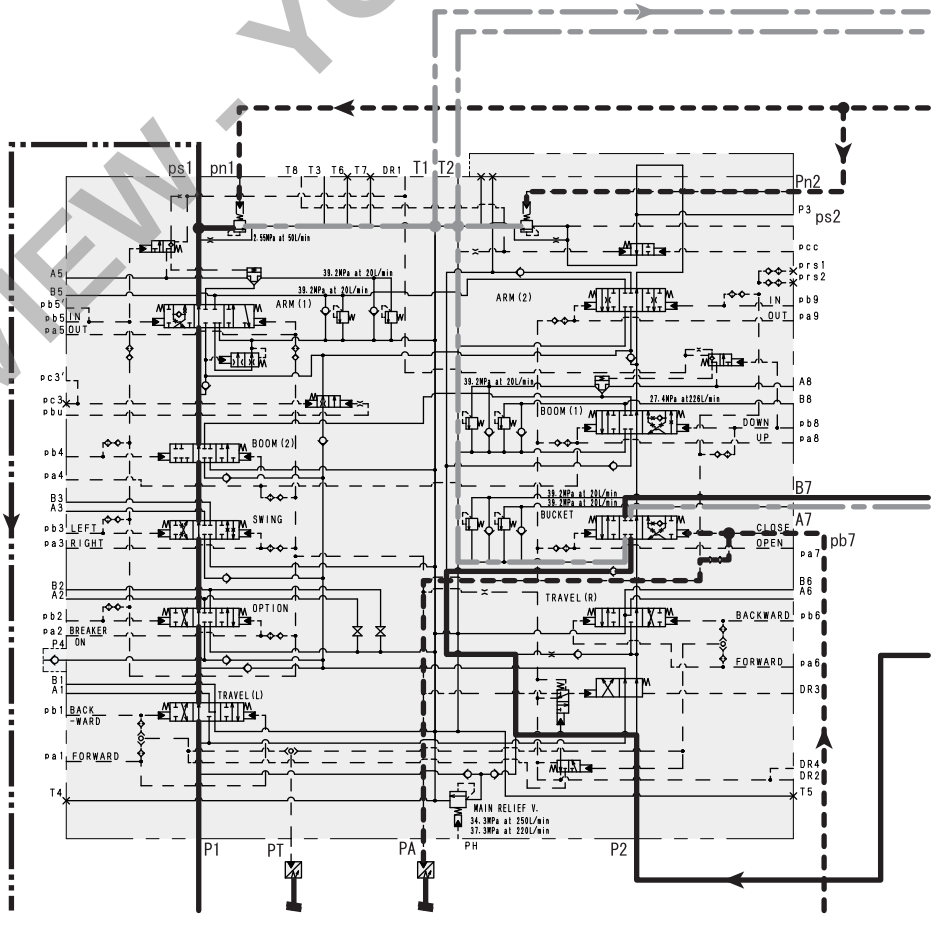
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Overall View



Enlarged View



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Caution	Always bleed off any air in the hydraulic circuits after replacing the hydraulic oil, repairing or replacing hydraulic equipment, or removing hydraulic pipes.

	Air bleed procedure mode (when bleeding, follow the procedure below.)				
	Hydraulic pump air bleeding	Cylinder air bleeding	Swing motor air bleeding	Travel motor air bleeding	Check
Hydraulic oil or hydraulic pump replacement	○ →	○ →	○	→	○
Cylinder replacement		○	→	→	○
Travel motor replacement			○	→	○
Swing motor replacement				○ →	○

RST-09-04-001a

* Failure to completely bleed off all the air can reduce the service life of hydraulic equipment and lead to damage.

Hydraulic Pump

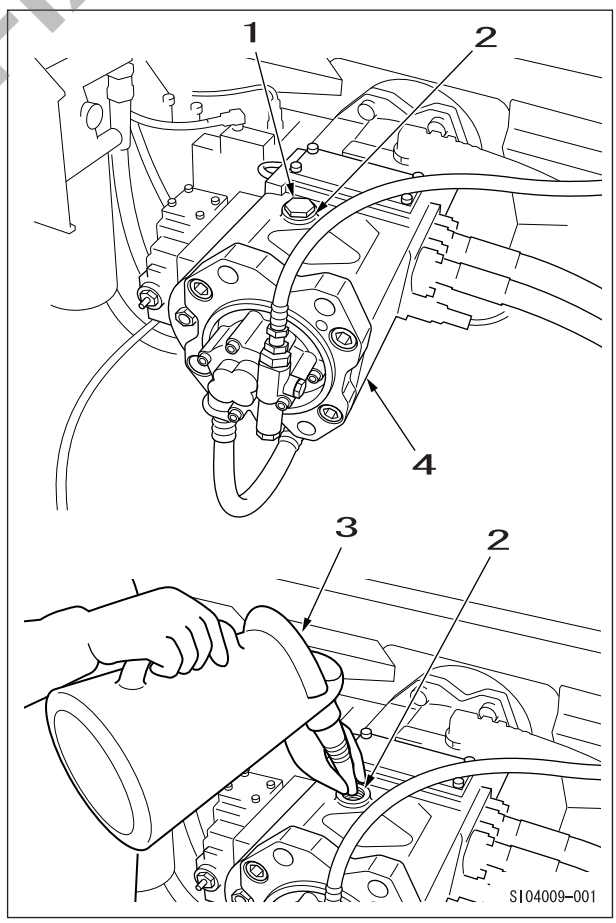
[1] Loosen the air bleed plug (1) and check that oil oozes from the air bleed port (2).

[2] If oil does not ooze out, remove the air bleed plug (1), and fill hydraulic oil(3) from the air bleed port (2) into the pump case.

[3] Temporarily tighten the air bleed plug (1).

[4] Run the engine at low idle, slightly loosen the air bleed port, and run until oil oozes from the air bleed port (2) section.

[5] Completely tighten the air bleed plug (1).



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2. Main Unit Diagnostic Trouble Code List

(1) Electrical troubles (input) [7000-7199]

Trouble location	Trouble mode	Diagnostic trouble code		Judgment timing	Prerequisites	Occurrence judgment	Recovery judgment
		DTC	Dis-play			Conditions	Conditions
Sensor; Pressure (P1)	Ground short/dis-connection	7000	○	Immediately after key switched ON	None	Voltage ≦ 0.25 V	0.25 V < Voltage < 4.75 V
	Power supply short					Voltage ≧ 4.75 V	
Sensor; Pressure (P2)	Ground short/dis-connection	7001	○	Immediately after key switched ON	None	Voltage ≦ 0.25 V	0.25 V < Voltage < 4.75 V
	Power supply short					Voltage ≧ 4.75 V	
Sensor; Pressure (N1)	Ground short/dis-connection	7002	○	Immediately after key switched ON	None	Voltage ≦ 0.25 V	0.25 V < Voltage < 4.75 V
	Power supply short					Voltage ≧ 4.75 V	
Sensor; Pressure (N2)	Ground short/dis-connection	7003	○	Immediately after key switched ON	None	Voltage ≦ 0.25 V	0.25 V < Voltage < 4.75 V
	Power supply short					Voltage ≧ 4.75 V	
Sensor; Pressure (Overload)	Ground short/dis-connection	7004	○	Immediately after key switched ON	EU selected as destination	Voltage ≦ 0.25 V	0.25 V < Voltage < 4.75 V
	Power supply short					Voltage ≧ 4.75 V	
Sensor; Pressure (Bottom)	Ground short/dis-connection	7005	○	Immediately after key switched ON	Liftcrane selected	Voltage ≦ 0.25 V	0.25 V < Voltage < 4.75 V
	Power supply short					Voltage ≧ 4.75 V	
Sensor; Pressure (Rod)	Ground short/dis-connection	7006	○	Immediately after key switched ON	Liftcrane selected	Voltage ≦ 0.25 V	0.25 V < Voltage < 4.75 V
	Power supply short					Voltage ≧ 4.75 V	
Sensor; Pressure (Upper)	Ground short/dis-connection	7020	○	Immediately after key switched ON	None	Voltage ≦ 0.25 V	0.25 V < Voltage < 4.75 V
	Power supply short					Voltage ≧ 4.75 V	
Sensor; Pressure (Swing)	Ground short/dis-connection	7021	○	Immediately after key switched ON	None	Voltage ≦ 0.25 V	0.25 V < Voltage < 4.75 V
	Power supply short					Voltage ≧ 4.75 V	
Sensor; Pressure (Travel)	Ground short/dis-connection	7022	○	Immediately after key switched ON	None	Voltage ≦ 0.25 V	0.25 V < Voltage < 4.75 V
	Power supply short					Voltage ≧ 4.75 V	
Sensor; Fuel level	Disconnection	7040	○	Immediately after key switched ON	None	Resistance ≧ 100 Ω	2 Ω < Resistance < 100 Ω
	Short					Resistance ≦ 2 Ω	
Sensor; Oil temperature	Disconnection	7041	○	3 min. after engine start	None	Resistance ≧ 67200 Ω (Voltage ≧ 4.93 V)	111 Ω < Resistance < 67200 Ω (0.5 V < Voltage < 4.93 V)
	Short			Immediately after key switched ON		Resistance ≦ 111 Ω (Voltage ≦ 0.5 V)	
Monitor; Thermistor (*1)	Disconnection	7045	×	Immediately after key switched ON	None	Trouble bit received from monitor	No trouble bit received from monitor
	Short						
Sensor; Angle (Boom)	Ground short/dis-connection	7060	○	Immediately after key switched ON	Liftcrane or inter-ference prevention selected	Voltage ≦ 0.2 V	0.2 V < Voltage < 4.8 V
	Power supply short					Voltage ≧ 4.8 V	
Sensor; Angle (Arm)	Ground short/dis-connection	7061	○	Immediately after key switched ON	Liftcrane or inter-ference prevention selected	Voltage ≦ 0.2 V	0.2 V < Voltage < 4.8 V
	Power supply short					Voltage ≧ 4.8 V	
Sensor; Angle (Offset)	Ground short/dis-connection	7062	○	Immediately after key switched ON	Liftcrane or inter-ference prevention selected	Voltage ≦ 0.2 V	0.2 V < Voltage < 4.8 V
	Power supply short					Voltage ≧ 4.8 V	
Pressure switch; Return filter clog	Disconnection	7063	○	From immediately after key switched ON until engine starts	None	Pressure switch = OFF	Pressure switch = ON

(*1) Even if trouble occurs, the "ELEC. PROBLEM" message is not displayed.
For items for which × is displayed, the "ELEC. PROBLEM" message is not displayed. Also, there is no DTC display on the user screen.
However, the DTC is recorded on the service (DIAG) screen.

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Bolt Size and Torque Table

Retightening Torque Table

Code	Retightening location		Bolt nominal diameter	Wrench	Tightening torque [N•m]
①	Travel motor		M24	36 mm	900 - 1051
②	Drive sprocket		M20	30 mm	521 - 608
③	Take-up roller		M16	24 mm	267 - 312
④	Upper roller		M20	30 mm	521 - 608
⑤	Lower roller		M24	36 mm	902 - 1049
⑥	Track guard		M24	36 mm	902 - 1049
7	Shoe		M24	32 mm	1236 - 1510
8	Counterweight		M33	50 mm	1685 - 1960
⑨	Turntable bearing		M24	36 mm	900 - 1050
⑩	Swing unit		M24	36 mm	900 - 1050
⑪	Engine	Mount	M20	30 mm	289 - 337
⑫		Front bracket	M10	17 mm	64 - 73
⑬		Rear bracket	M12	19 mm	109 - 127
⑭	Radiator		M16	24 mm	147 - 176
⑮	Hydraulic pump	Flange	M10	17 mm	64 - 73
⑯		Pump	M20	17 mm hexagon socket head	367 - 496
⑰	Hydraulic oil tank		M16	24 mm	233 - 276
⑱	Fuel tank		M16	24 mm	233 - 276
⑲	Control valve		M16	24 mm	267 - 312
⑳	Center joint	Lock bar	M16	24 mm	267 - 312
㉑		Joint	M12	19 mm	54 - 64
22	Cab		M16	24 mm	78 - 80
			M10	17 mm	35 - 42
23	Battery		M10	17 mm	20 - 29

Caution: For items marked with ○ , always apply Loctite #262 or the equivalent and tighten to the specified torque.
The tightening torque in kgf•m is determined with N•m ÷ 9.8.

The tightening for bolts and nuts not otherwise specified in the table above is as follows.

Bolt nominal diameter (size)			M6	M8	M10	M12	M14	M16	M18	M20
Hexagon bolt	Wrench	[mm]	10	13	17	19	22	24	27	30
	Tightening torque	[N•m]	6.9	19.6	39.2	58.8	98.1	156.9	196.1	294.2
Hexagon socket head bolt	Wrench	[mm]	5	6	8	10	12	14	14	17
	Tightening torque	[N•m]	8.8	21.6	42.1	78.5	117.7	176.5	245.2	343.2

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Overall

1. Main Data

Model name	SH330-5	SH330LC-5	SH350HD-5	SH350LHD-5
Operating weight	33400 kg	34000 kg	35600 kg	36100 kg
Engine output	202 kW/2000 min^{-1}			
Bucket capacity	Heaped 1.40 m^3			
	Leveled 1.04 m^3			

2. Performance

	SH330-5	SH330LC-5	SH350HD-5	SH350LHD-5
Standard weight	18.0 kN			
Swing speed	9.8 min^{-1}			
Travel speed	Low speed 3.5 km/h			
	High speed 5.5 km/h			
Maximum pulling force	265 kN			264 kN
Grade ability	70 % (35°)			
Ground pressure	67 kPa (600 mm grouser shoe)	64 kPa (600 mm grouser shoe)	72 kPa (600 mm grouser shoe)	67 kPa (600 mm grouser shoe)
	52 kPa (800 mm grouser shoe)	49 kPa (800 mm grouser shoe)	55 kPa (800 mm grouser shoe)	51 kPa (800 mm grouser shoe)

3. Main Unit Dimensions

	SH330-5/SH350HD-5	SH330LC-5	SH350LHD-5
Main unit length	5750 mm	5910 mm	
Main unit width	3200 mm		
Upper swing body width	3020 mm		3120 mm
Cab width	1000 mm		
Main unit height	3130 mm		
Swing radius (rear end)	3450 mm		
Swing body rear end distance	3420 mm		
Swing body rear section bottom height	1210 mm		
Distance between tumblers	3720 mm	4040 mm	
Overall track length	4650 mm	4980 mm	
Overall track width	3200 mm		
Distance between tracks	2600 mm		
Track shoe width	600 mm (option 800 mm)		
Minimum ground clearance	480 mm (to bottom of lower frame)		

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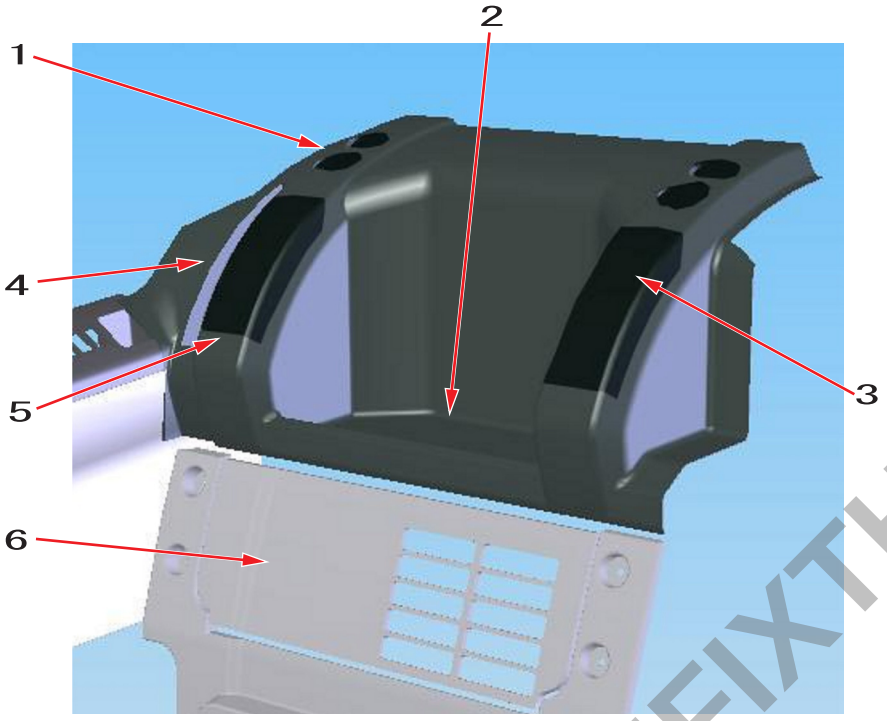
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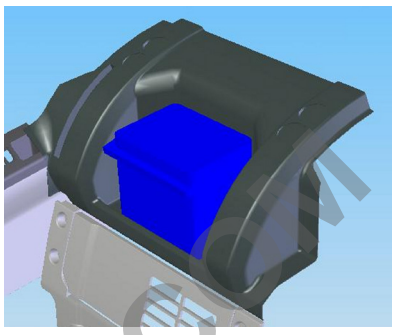
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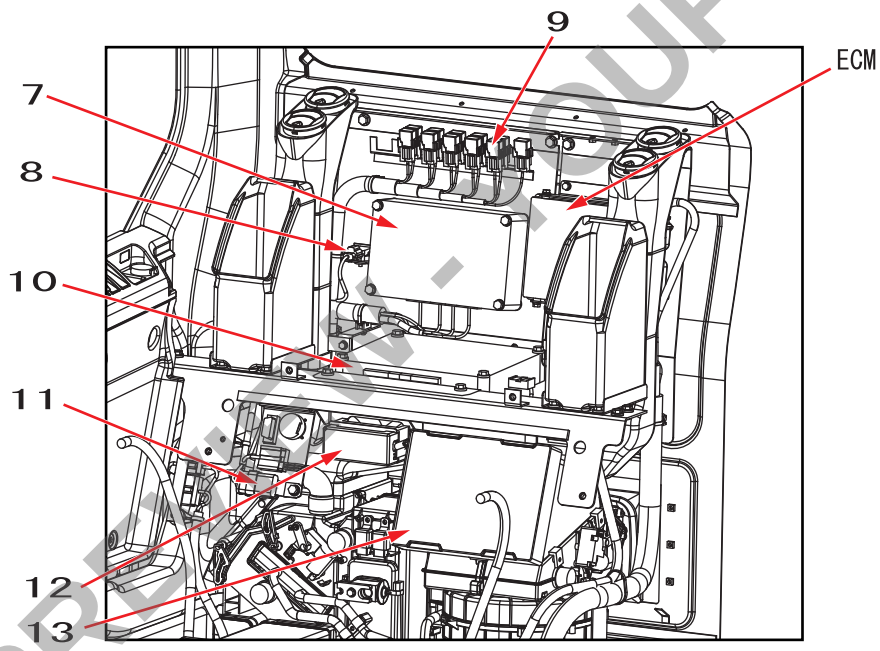
Changes from Model 3B

Rear section

Can hold large lunch box







SB00010-016

1	AC rear vent grille
2	Large tray
3	Utility box
4	Magazine rack
5	Hot and cool box
6	Maintenance space
7	Computer A
8	Atmospheric pressure sensor
9	Relay
10	Computer B
11	Computer A rewriting connector
12	Fuse box
13	Air conditioner inside air filter

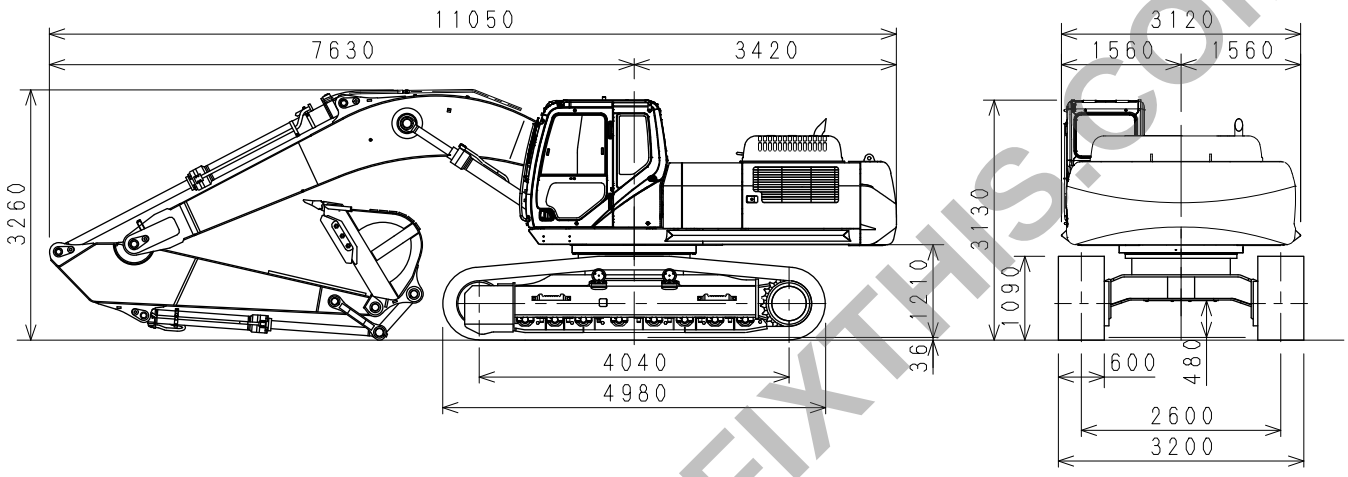
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Overall View (SH350LHD-5)

1. Standard Arm (3.25 m)

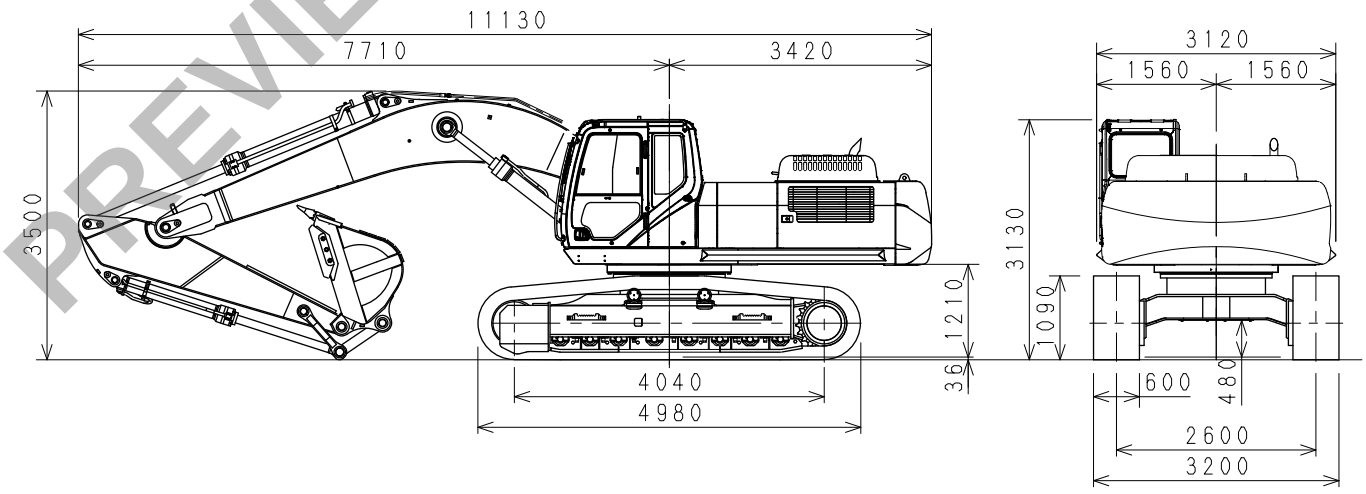
Note: 1. Numbers are subject to change without notice due to design change or other reason.
Note: 2. The diagrams give values that include the shoe lug height (36 mm).



SB03012-009_EN

2. Short Arm (2.63 m)

Note: 1. Numbers are subject to change without notice due to design change or other reason.
Note: 2. The diagrams give values that include the shoe lug height (36 mm).

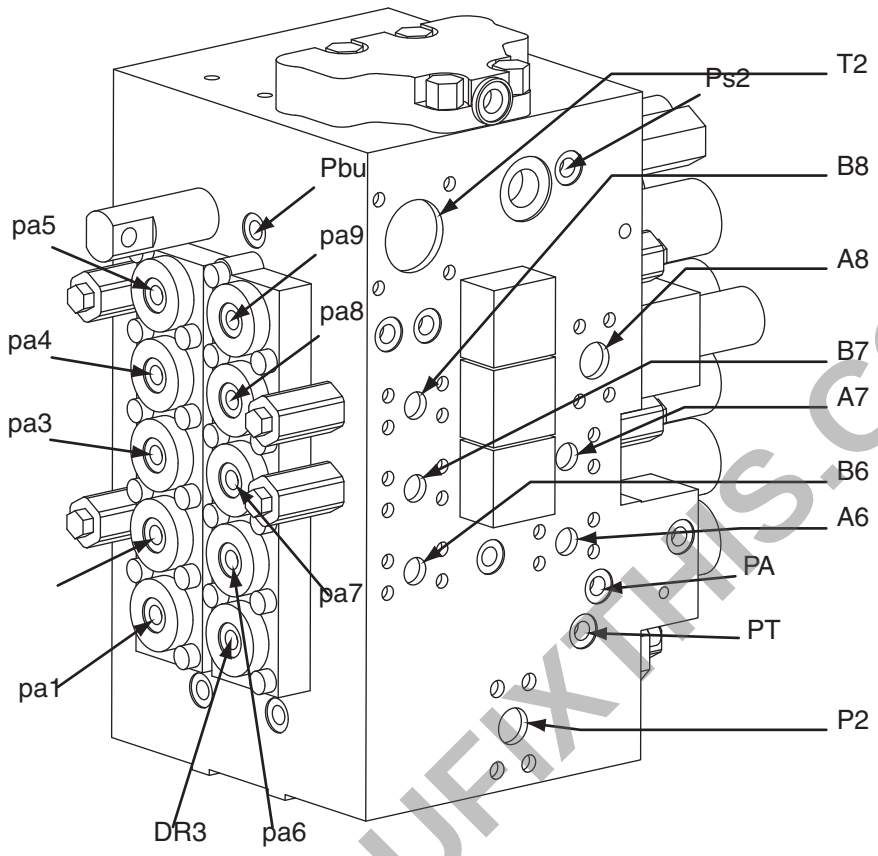


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Port Diagram



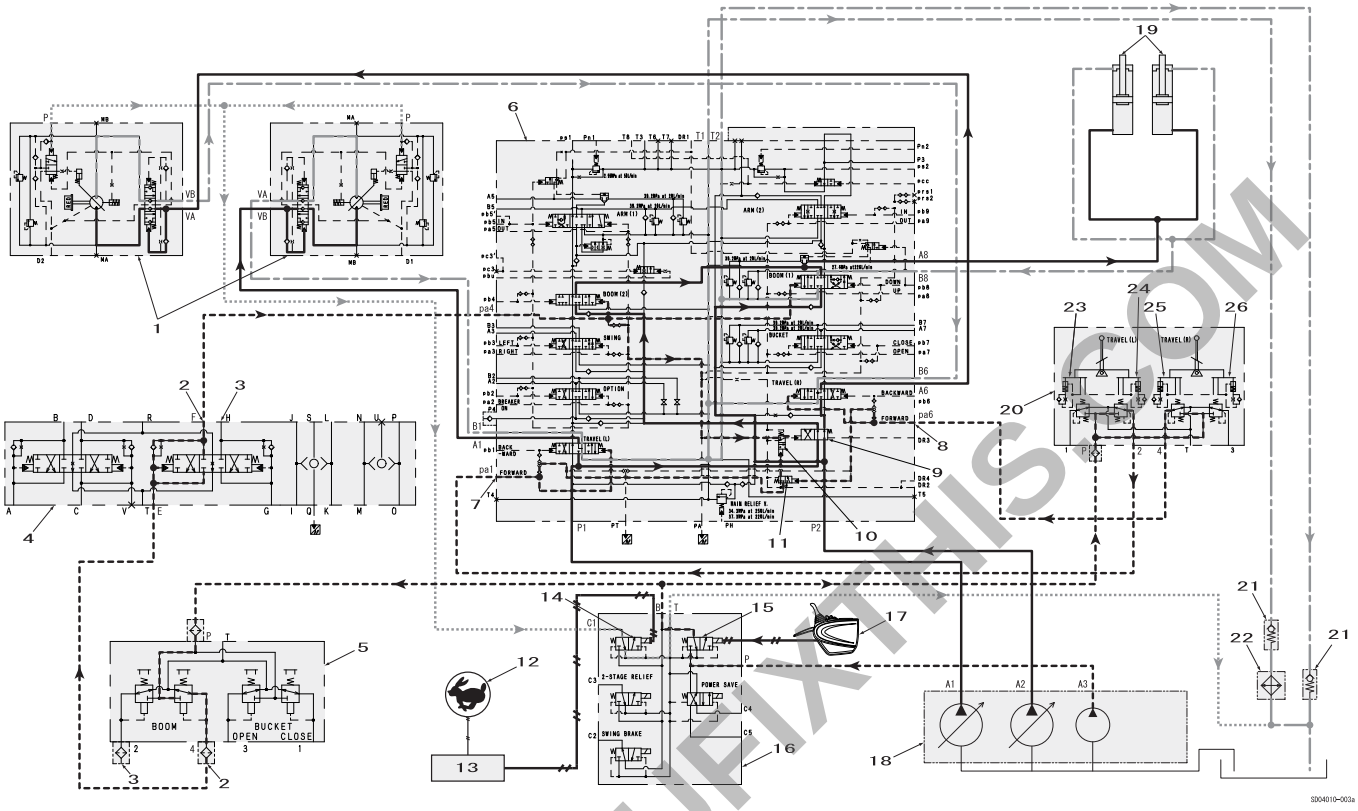
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Port	Port size	Port name	Port	Port size	Port name
P2	SAE 6000psi 1	Pressure line	pa7	G1/4	Bucket-open pilot line
A6	SAE 5000psi 1	Right travel (forward) line	pa3	G1/4	Right swing pilot line
B6	SAE 5000psi 1	Right travel (backward) line	pa8	G1/4	Boom 1-up pilot line
A7	SAE 5000psi 1	Bucket-open line	pa4	G1/4	Boom 2-up pilot line
B7	SAE 5000psi 1	Bucket-close line	pa9	G1/4	Arm 2-out pilot line
A8	SAE 5000psi 1	Boom-up line	pa5	G1/4	Arm 1-out pilot line
B8	SAE 5000psi 1	Boom-down line	PA	G1/4	Upper signal
T2		Return line	PT	G1/4	Travel signal
pa1	G1/4	Left travel forward pilot line	Ps2	G1/4	Negative control line
pa6	G1/4	Right travel forward pilot line	Pbu	G1/4	Swing priority variable orifice switch signal
DR3	G1/4	Straight travel drain line	Pa2	G1/4	Option line

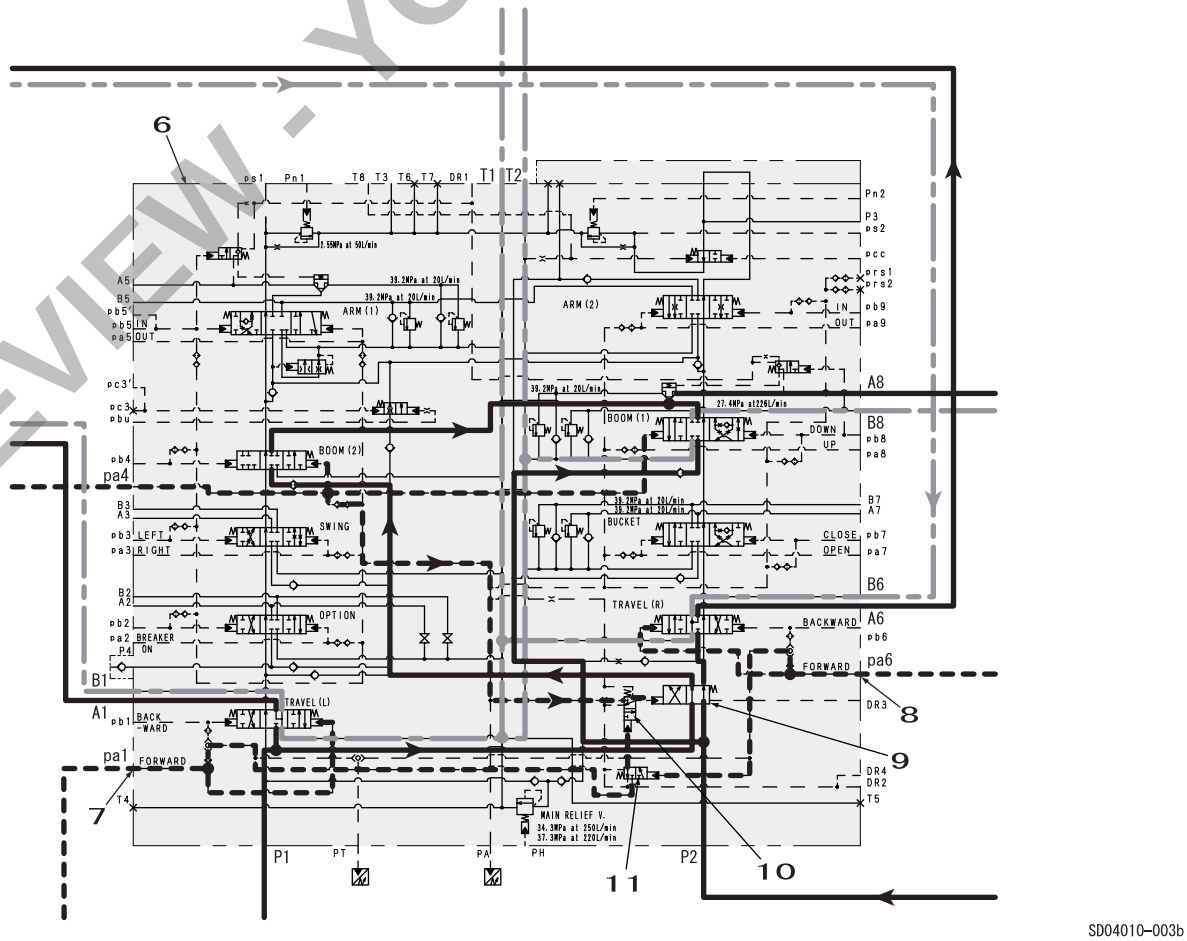
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Overall View



Enlarged View



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Negative Control Circuit

Negative control circuit (power save solenoid OFF)

When the remote control valve operation lever is set to neutral, the discharge oil from hydraulic pumps A1 and A2 goes from the control valve P1 and P2 ports through the center bypass oil path, and through the downstream negative control variable relief, and returns to the hydraulic oil tank.
The discharged oil from pilot pump A3 enters the 5 stack solenoid valve P port, flows through the power save solenoid valve, is fed to the control valve Pn1 and Pn2 ports, and holds the P1 and P2 negative control relief at the set pressure of 2.55 MPa.
The negative control pressure oil separated from the center bypass oil path is fed from the Ps1 and Ps2 ports to the hydraulic pump Pi1 and Pi2 ports, moves the pump tilting to the minimum flow side, and the pump discharge flow is reduced.

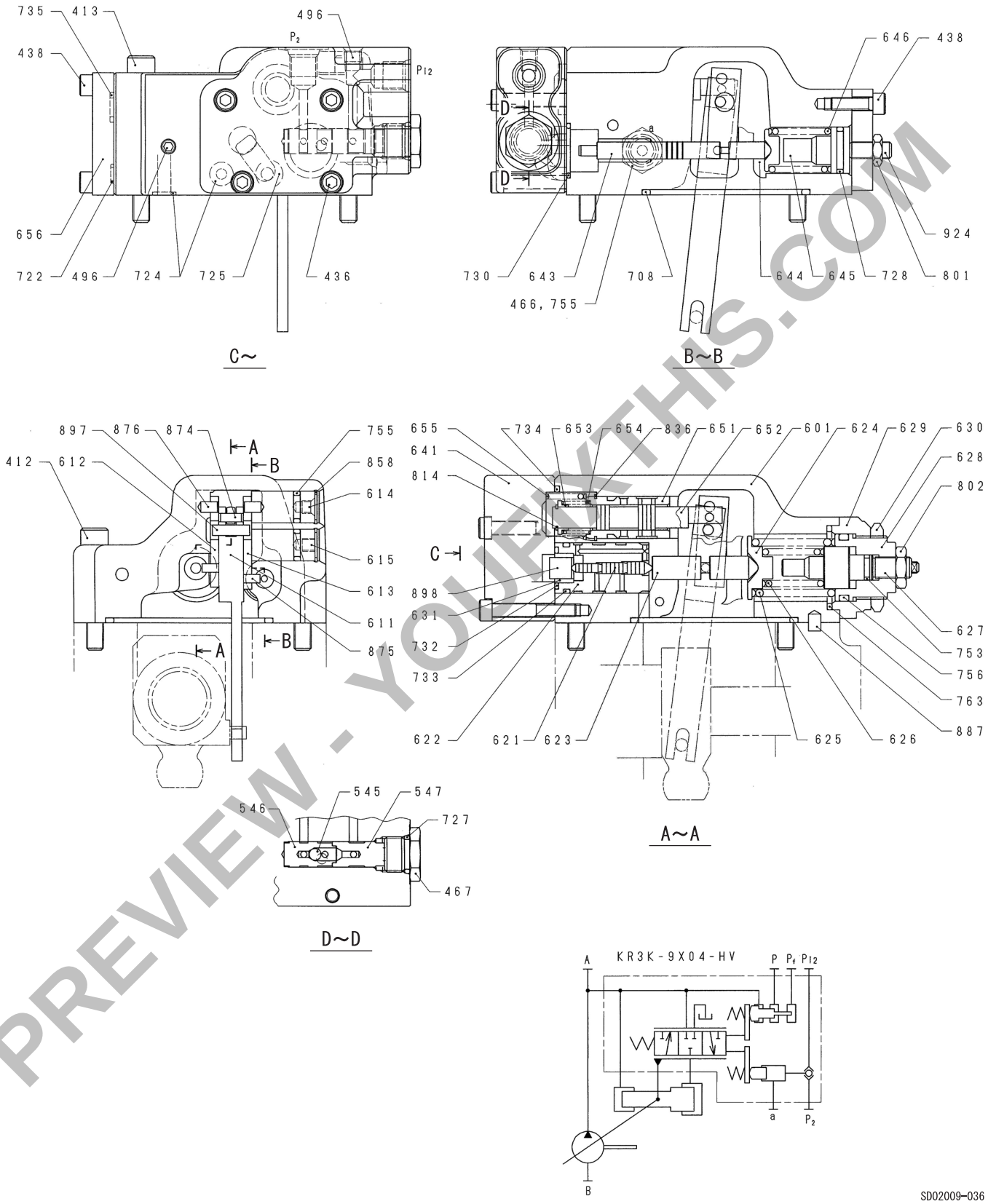
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Pressure line
Tank line
Pilot pressure line
Pilot tank line
Electric line

1	P1 negative control relief	11	N1 negative control pressure sensor
2	P2 negative control relief	12	P1 pressure sensor
3	Control valve	13	P2 pressure sensor
4	Travel pilot pressure sensor	14	N2 negative control pressure sensor
5	Upper pilot pressure sensor	15	Horsepower control proportional valve
6	Computer A	16	P1 flow control proportional valve
7	Console lever lock switch	17	Hydraulic pump
8	Lever lock	18	Check valve
9	Power save	19	Oil cooler
10	5 stack solenoid valve		

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(4) Rear side regulator internal structure diagram



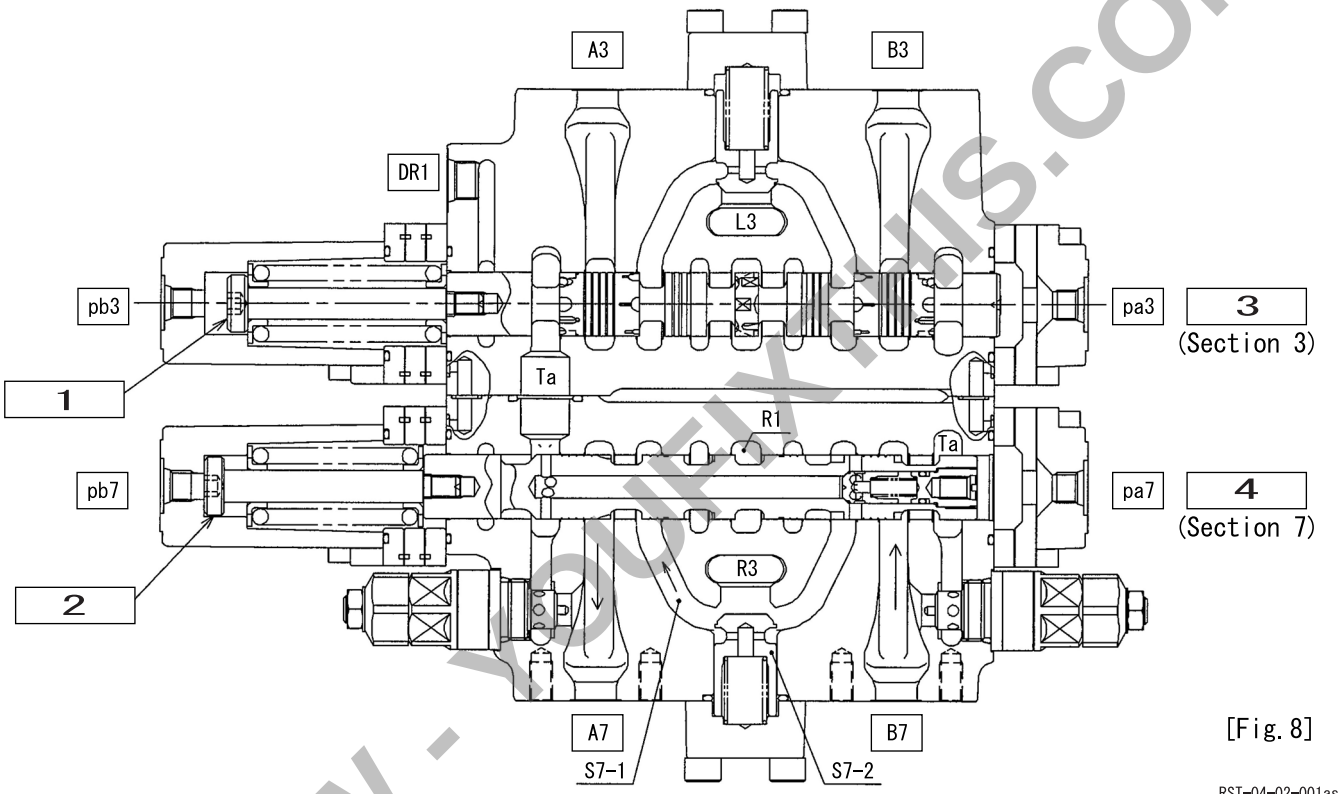
Hydraulic circuit

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2. Open [Fig. 8]
   When the bucket spool is switched by pressurizing from the bucket (section 7) pilot port Pa7, the neutral path (R1) is closed. The oil fed from the P2 port flows through the parallel path (R3),
   the load check valve (S7-2), path (S7-1), and the spool neck section, and into the A7 port.
   The return oil returns to the tank path (Ta) from the B7 port through the spool neck section.

Bucket open



[Fig. 8]

RST-04-02-001as

1	Neutral state	3	Swing
2	Switching state	4	Bucket

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3) Reverse operation
When the pressurized oil fed from the pilot operation valve to the A port (or C, E, or G port) is switched to the C port (or A, E, or G port), the pressurized oil that has operated on the control valve spool is pushed back to the B port. Because the pushed back oil flows out to the T port without passing through the check plunger metering orifice, it does not hold down the control valve spool speed, so the cushion function does not work.

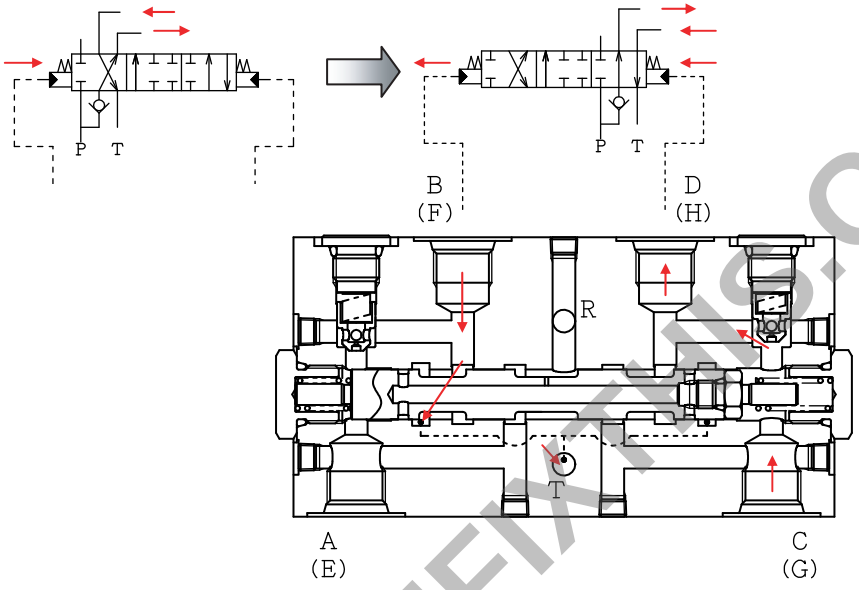


Diagram 5

4) Heat circuit
When the pilot operation valve is in the neutral position, the oil fed to the R port passes through the inside of the reverse operation spool, flows out to the T port, and heats up the inside of the valve.
When pressurized oil is being fed from the pilot operation valve to the A port (or C, E, or G port), the oil fed to the R port flows out to the C port (or A, E, or G port) and heats up the circuit to the pilot operation valve and inside the valve.

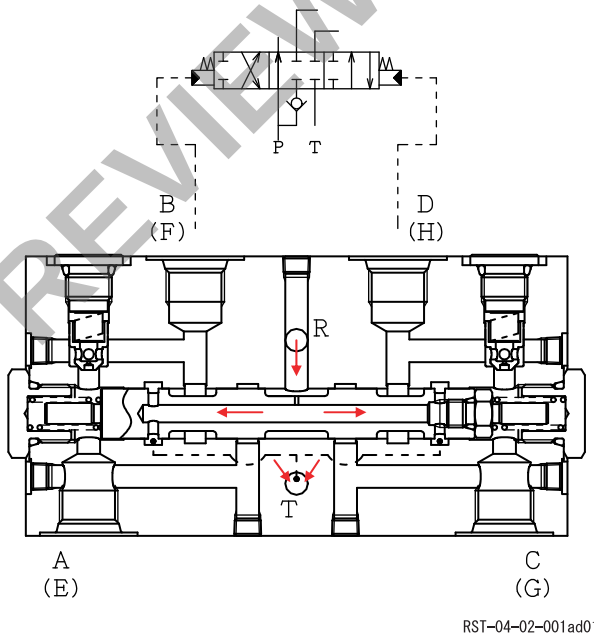


Diagram 6

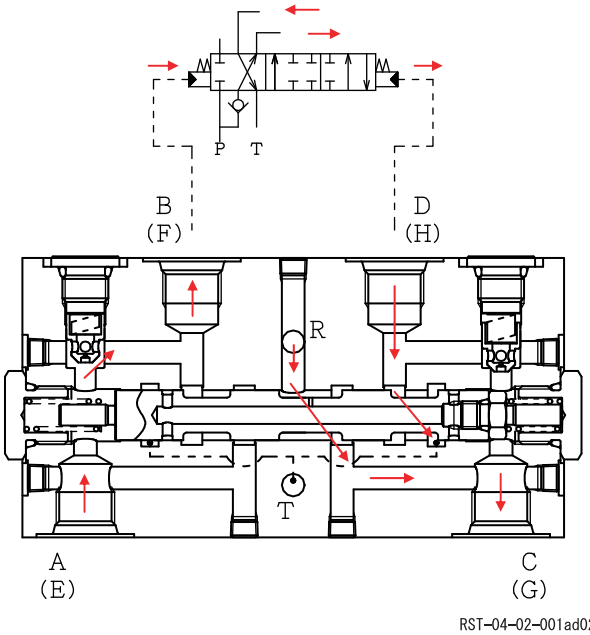
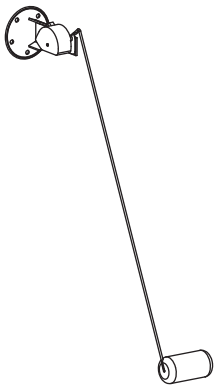
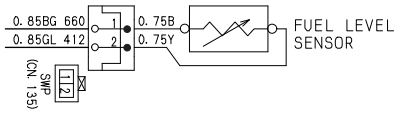
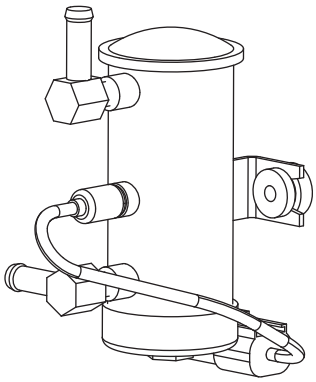
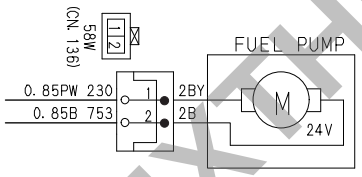
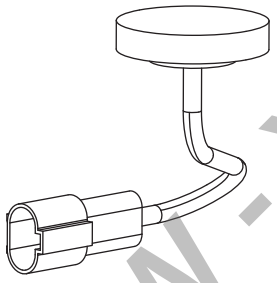
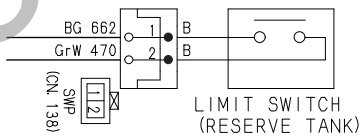
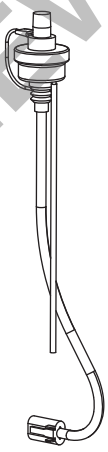
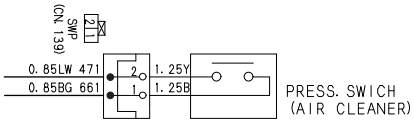


Diagram 7

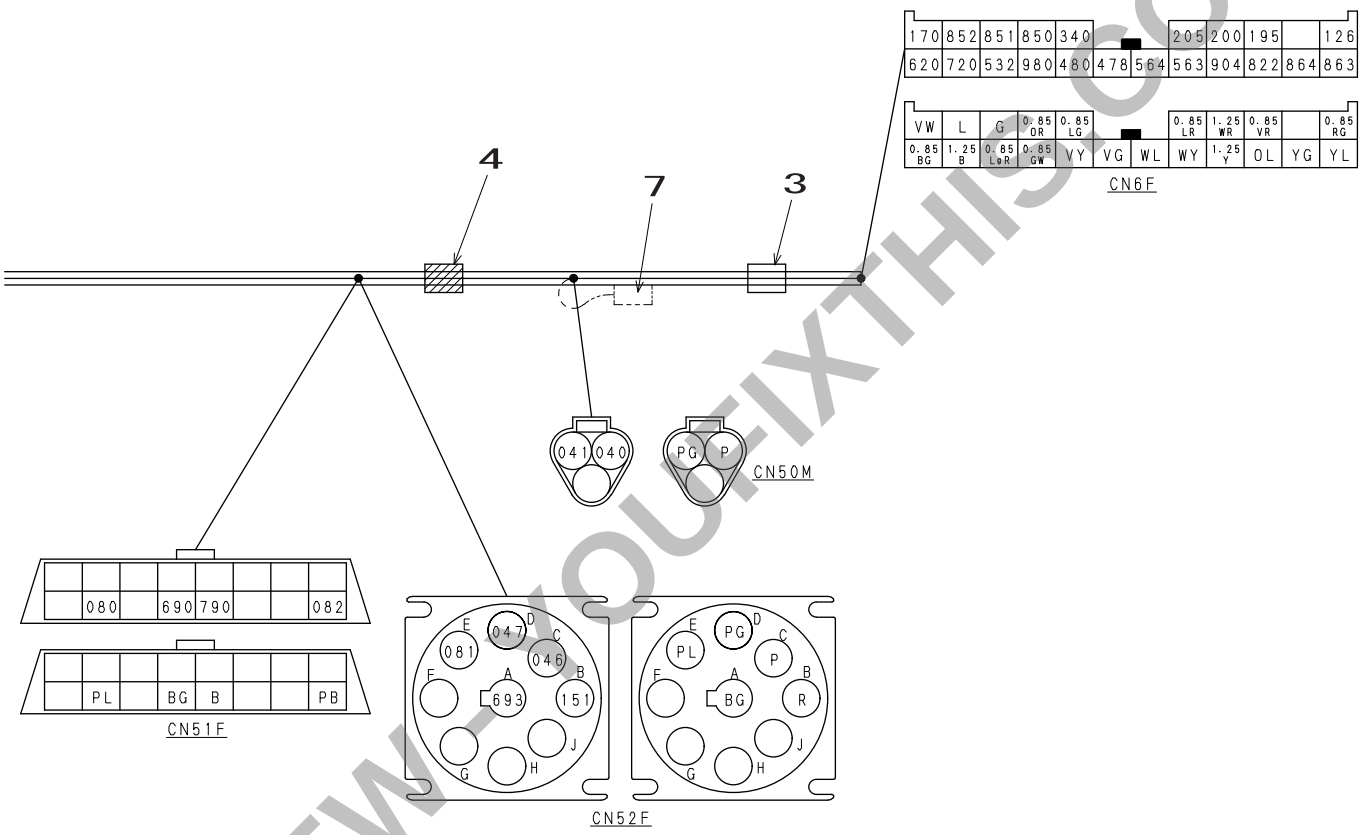
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Name	Shape	Circuit	Remarks
Fuel level sensor			Part No. ; KHR10670
Charge fuel pump			Model ; DC24 V Part No. ; KHH10460
Reserve tank limit switch			Part No. ; KHH0221
Vacuum sensor			Part No. ; KHH10330

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KHR15992-D01

1	Blue tape
2	White tape
3	Red tape
4	Position of label
5	Diag. switch
6	Memory clear
7	Fix connector (CN.50M) with red tape.

CN2F	Cab harness: B
CN4F	Cab main harness: A
CN5F	Cab main harness: B
CN6F	Console (L) harness
CN50M	J1939Connector

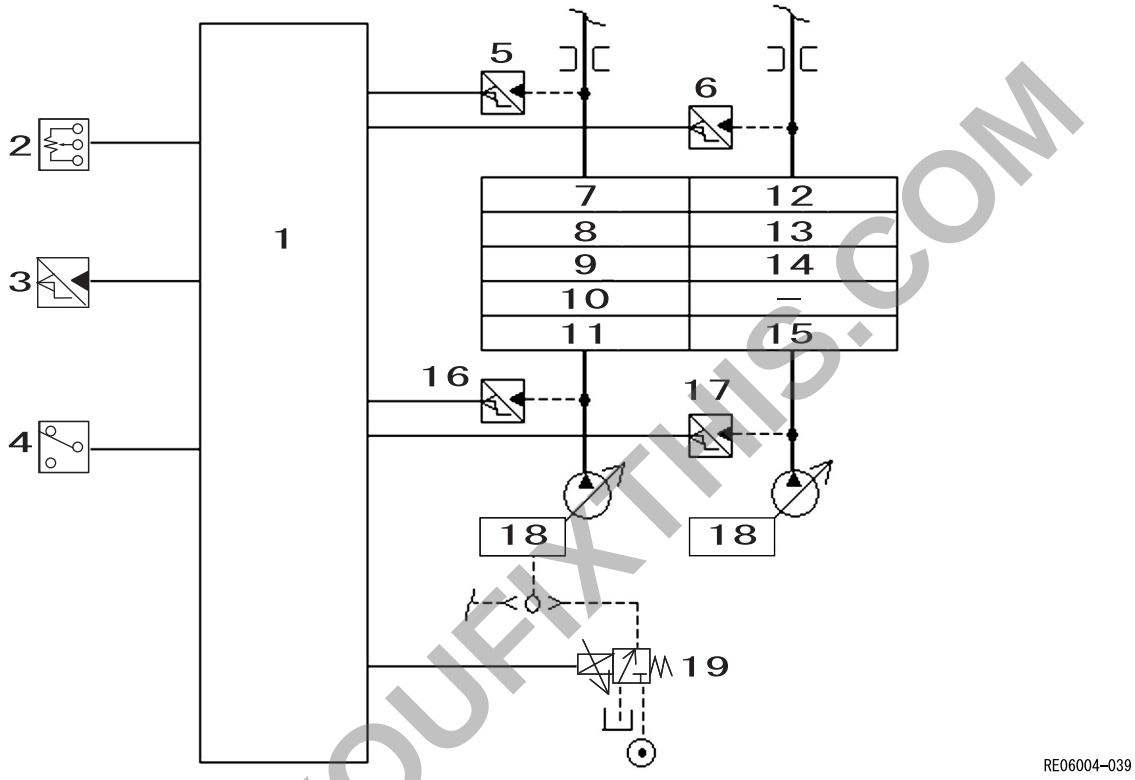
CN51F	Diag. connector
CN52F	ESTConnector: A
CN53M	ESTConnector: B
CN54F	GPS jumper harness
CN54M	GPS service connector

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4. Swing Relief Cut

Purpose

When independent swing operation is running, the pump flow is reduced, and the excess oil ejected from the swing motor relief valve is eliminated.



1	Computer A	8	Boom (2)	15	Travel (right)
2	Throttle volume	9	Swing	16	P1 pressure sensor
3	Travel pressure sensor	10	Option 1	17	P2 pressure sensor
4	1st option pressure switch	11	Travel (left)	18	Regulator
5	N1 pressure sensor	12	Arm (2)	19	P1 flow control proportional valve
6	N2 pressure sensor	13	Boom (1)		
7	Arm (1)	14	Bucket		

Operation explanation

[1] Operation conditions for swing relief cut control

The swing relief cut control provides relief when the pressure is boosted for the start of the swing due to sharp swing operation and the drained off excess oil is held to the lowest amount possible. The purpose is to provide an energy saving effect.

Control is executed when all the conditions below are satisfied.

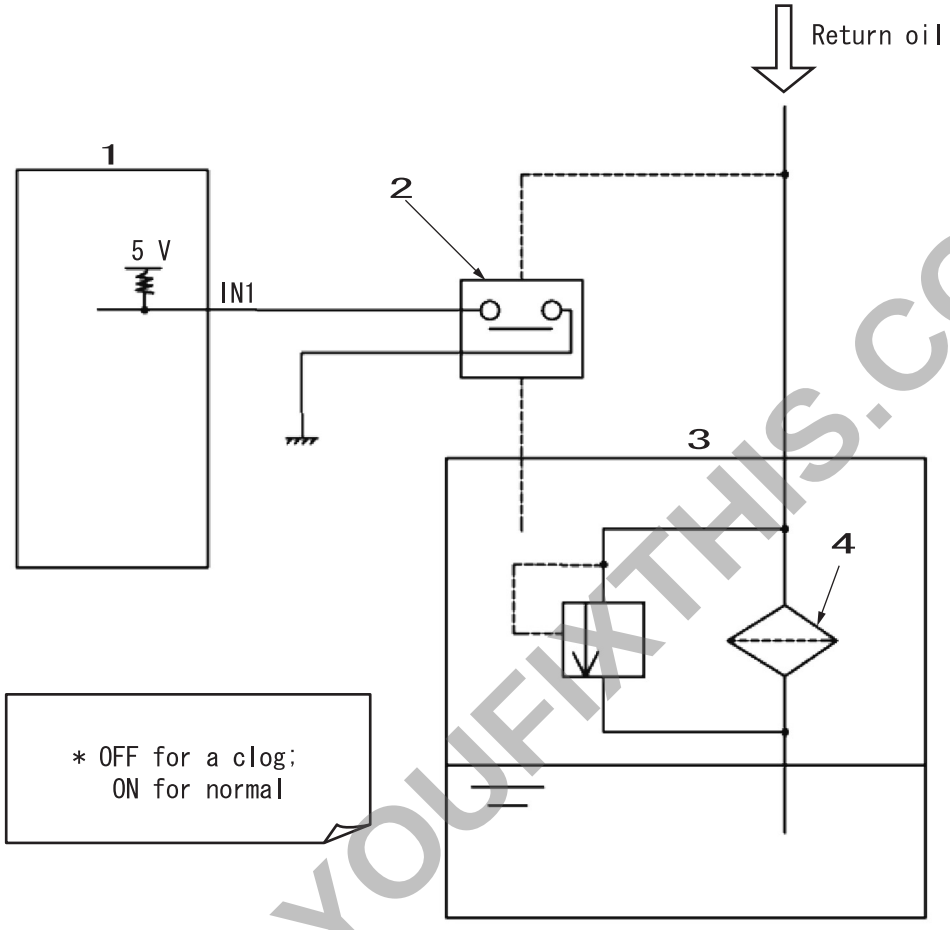
1) Sharp swing operation … When the swing lever is operated, this is judged from the swing pilot pressure sensor pressure rise.
2) Within 1 sec. after start of swing
3) Travel non-operation … Travel pressure sensor OFF
4) Attachments other than boom down non-operation
   … Non-operation of attachments is judged from the N2 negative control pressure and P1 pressure sensor
5) Option line non-operation … Option pressure sensor OFF

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4. Return Filter Clogging Detected

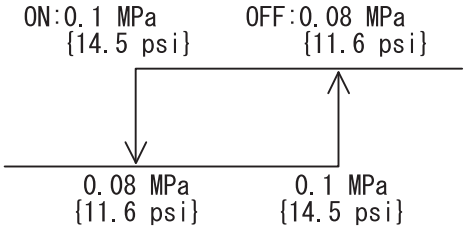
[1] Configuration



RST-05-06-001bl

1	Computer A
2	Return filter clog pressure switch
3	Hydraulic oil tank
4	Return filter

[2] Return filter clog pressure switch specifications



RE06004-029

[3] Detection cancellation when breaker used

When the breaker is used, the return oil pressure pulse is intense, so clog detection is not attempted.

[4] Detection cancellation when oil temperature low

When the oil temperature is less than 30 ℃ , its viscosity rises and filter pressure damage increases, so clog detection is not attempted.

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5) On the model setting screen, the ECM part number is automatically checked.
   If the input model and the ECM part number do not correspond, "ECM ERR" is displayed.
6) Even after the model selection is complete, it is possible to change just the LANGUAGE, CRANE, or ATT. No. setting without one of the half resets or all resets listed below.
7) Half reset

   On the model select screen, if the washer switch and the light switch are held down for 3 sec., data in the table below is erased.
8) All reset

   On the model select screen, if the washer switch and the light switch are held down for 10 sec., data in the table below is erased.

Difference between all reset and half reset

Reset . . . . . ○
Do not reset . . . . . ×
Reset when model information has changed . . . . . △

		Half reset	All reset
Computer A memory information	Model information (*1)	○	○
	Control data (*2)	○	○
	Usage log (*3)	×	○
	Trouble log (*4)	×	○
	Engine information (*5)	×	○
Computer B memory information	Angle sensor compensation value	△	○
	Liftcrane/interference prevention usage log	△	○
Computer S memory information	Transmission information (*6)	×	○

*1 Contents displayed on model selection screen
*2 Contents displayed on CFG screen
*3 Contents displayed on HR screen
*4 Contents displayed on DIAG screen
*5 Contents displayed on engine service screen
*6 When transmission information is reset, transmission with the G@NAV server is restarted from the initial send.
   In this case, transmission with the G@NAV server cannot be done until a send permission signal is sent from the control center.

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Engine Control Summary

Electronic control fuel injection system (common rail type)

This is a system in which the engine speed, engine load, and other information (signals from many sensors) are acquired from the engine control module (ECM) and based on that information, the ECM sends electrical signals to the supply pump, injectors, etc. to appropriately control the fuel injection quantity and timing for each cylinder.

Injection quantity control

To provide the optimum injection quantity, the ECM controls the injectors based mainly on the engine speed and the instructed speed from computer A and controls the fuel injection quantity.

Injection pressure control

The injection pressure is controlled by controlling the fuel pressure in the common rail. The appropriate pressure in the common rail is calculated from the engine speed and fuel injection quantity and by controlling the supply pump, the appropriate quantity of fuel is discharged and the pressure sent to the common rail is controlled.

Injection timing control

Instead of a timer function, the injectors are controlled primarily by calculating the appropriate fuel injection timing from the engine speed, injection quantity, etc.

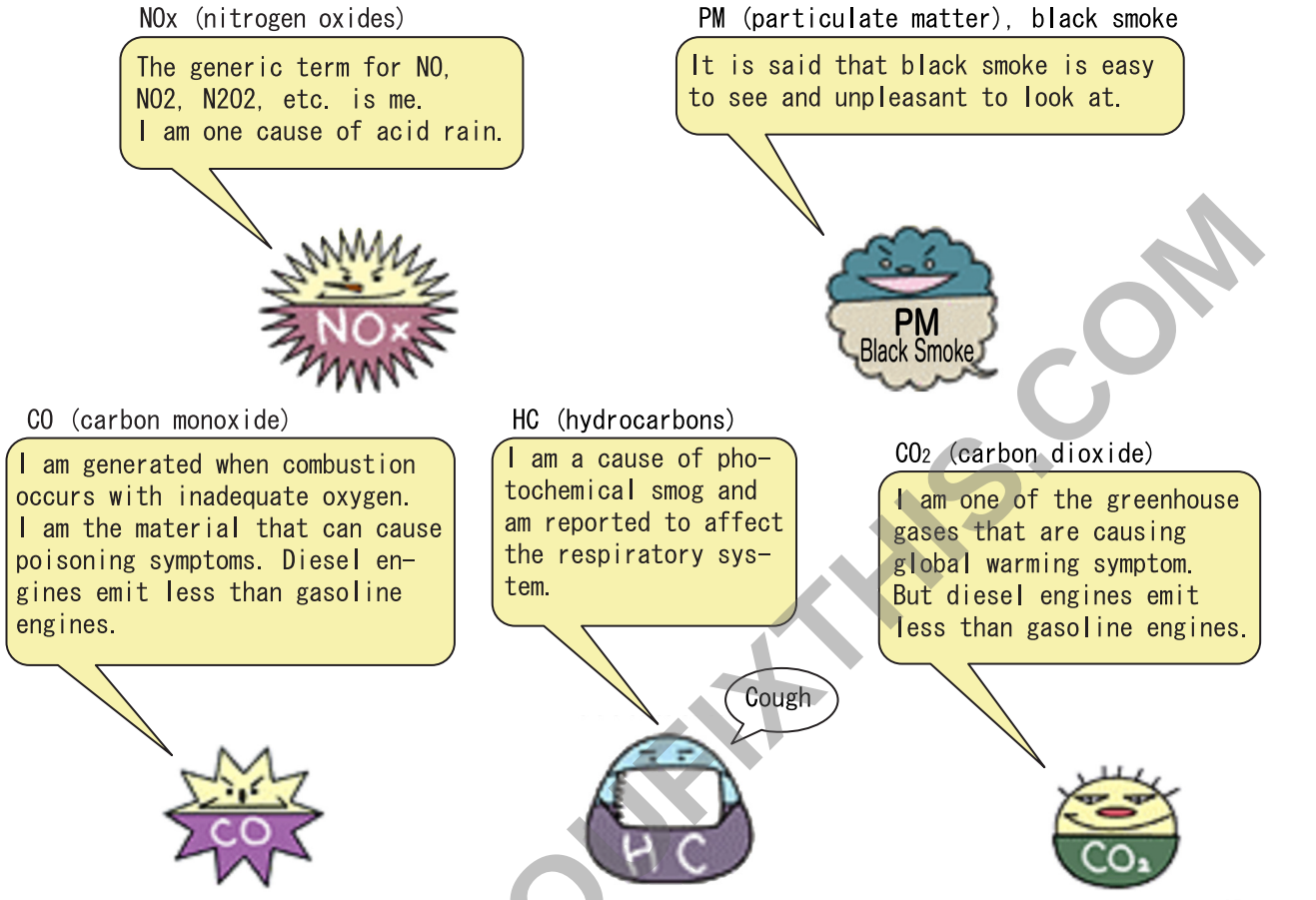
Injection ratio control

In order to improve the combustion in the cylinder, at first only a small amount of fuel is injected (pre-injection), the fuel is ignited, then once the fuel has ignited, a second injection (main injection) is carried out. This injection timing and quantity control is effected by controlling the injectors.

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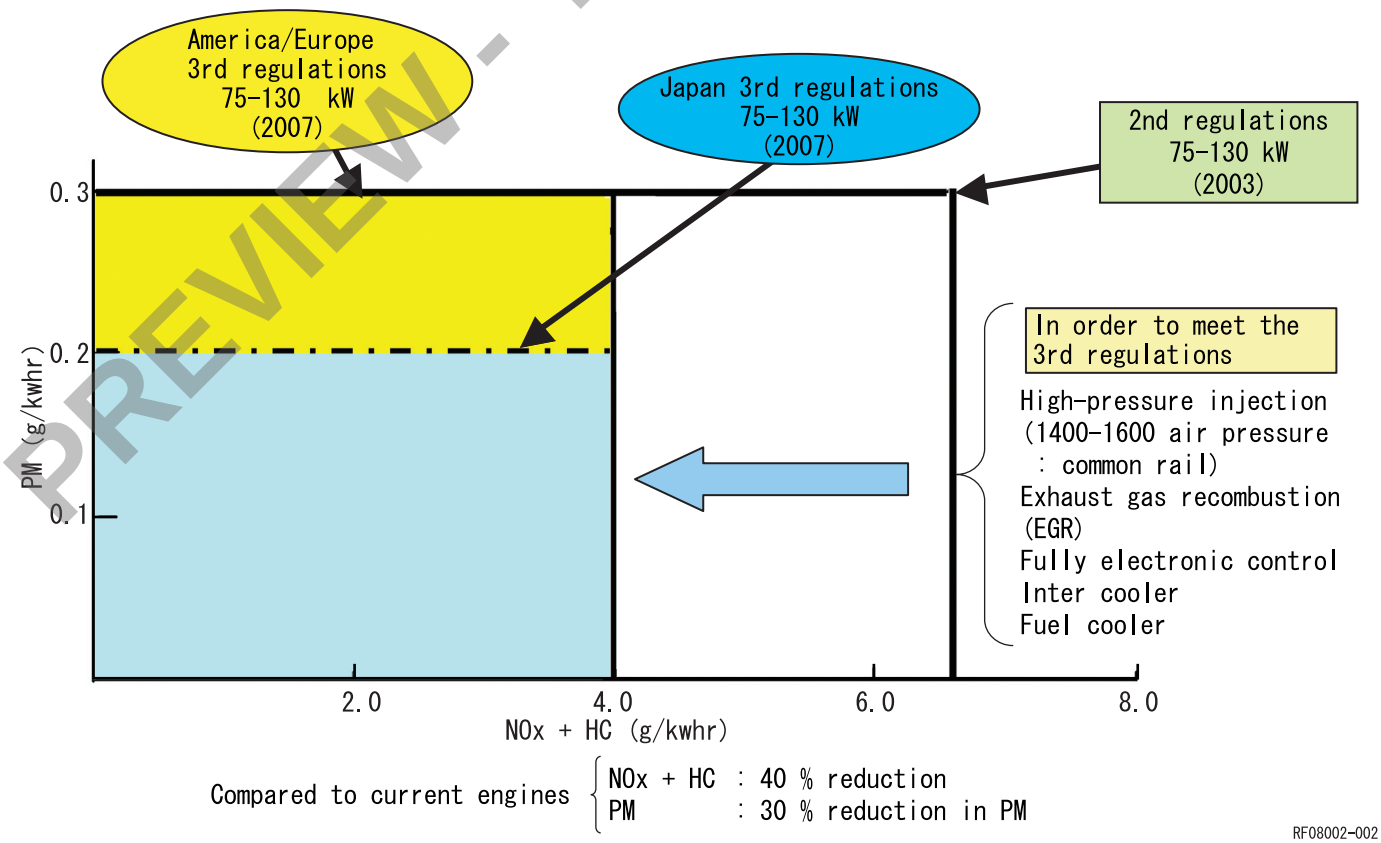
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Features of Materials Subject to Exhaust Gas Regulation



RF08002-003

Exhaust Gas Regulation Values



Compared to current engines { NOx + HC : 40 % reduction
PM : 30 % reduction in PM

RF08002-002

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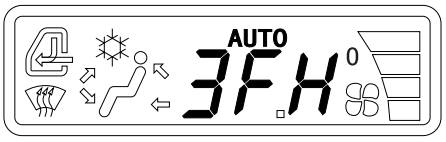
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Self-diagnosis Function with Panel Display

(3) Display contents in monitor mode

See the dedicated monitor 7-segment display table and 3-digit 7-segment table.

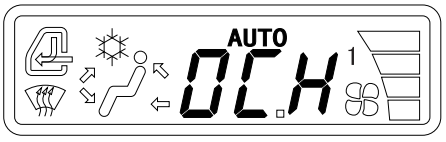
[1] Display example 1



RST-07-05-001j

The dedicated monitor 7-segment display is 0 (indicates the inside air sensor state).
From the 3-digit 7-segment table 3F → The sensor is normal.
→ The inside air sensor is normal.

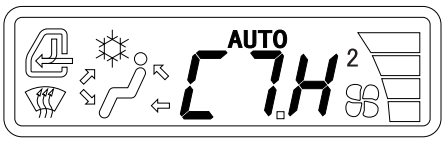
[2] Display example 2



RST-07-05-001k

The dedicated monitor 7-segment display is 1 (indicates the evaporator sensor state).
From the 3-digit 7-segment table 00 → The sensor is disconnected.
→ The evaporator sensor is disconnected.

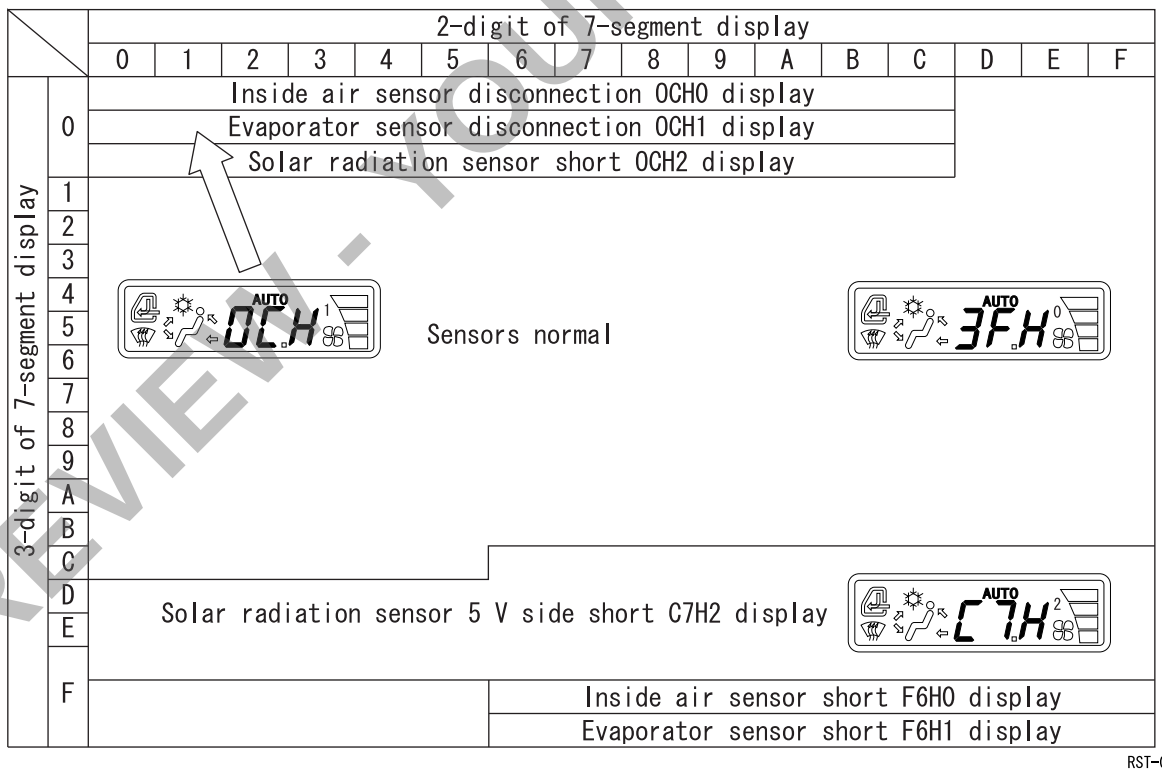
[3] Display example 3



RST-07-05-001l

The dedicated monitor 7-segment display is 2 (indicates the solar radiation sensor state).
From the 3-digit 7-segment table FF → The sensor is shorted.
→ The solar radiation sensor is shorted.

3-digit 7-segment table



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(1) Main relief pressure adjustment

Engine speed	1900 min^{-1}
Work mode	SP mode
Lever operation	Arm-in relief
Oil temperature	45 - 55 °C
Measuring port	P1 port
Measurement pressure	Boosted pressure: 37.3 MPa
	Standard: 34.3 MPa
Pressure per rotation of adjusting screw	Boosted pressure: 28.4 MPa/rotation
	Standard: 21.3 MPa/rotation

Before adjusting, remove the pilot hose for the pressure boost signal (10) connected to the main relief valve (7), then insert the plug (8) into the hose side. The procedures for boosted pressure and standard pressure are different.

For boosted pressure

a) Loosen the standard lock nut (27 mm) (14) and tighten the adjusting screw (27 mm) (13). Fasten with a wrench (27 mm) so that the pressure boost adjusting screw does not turn.

b) After tightening until the adjusting screw stops turning, tighten the lock nut (11).

c) Start the engine and run it at maximum rotation.

d) Move the arm lever to the in side, set the relief state, and hold.

e) Loosen the pressure boost lock nut (32 mm) (11) and adjust the set pressure with the adjusting screw (27 mm) (12).

- When lower than the set pressure, tighten.
- When higher than the set pressure, first lower below the set pressure, then adjust on the tightening side.

f) After adjustment, fasten the adjusting screw with a wrench (27 mm), then tighten the lock nut.

g) After locking, check the pressure on the boosted pressure side.
Repeat a) - f) until the set pressure is correctly adjusted.

For standard pressure

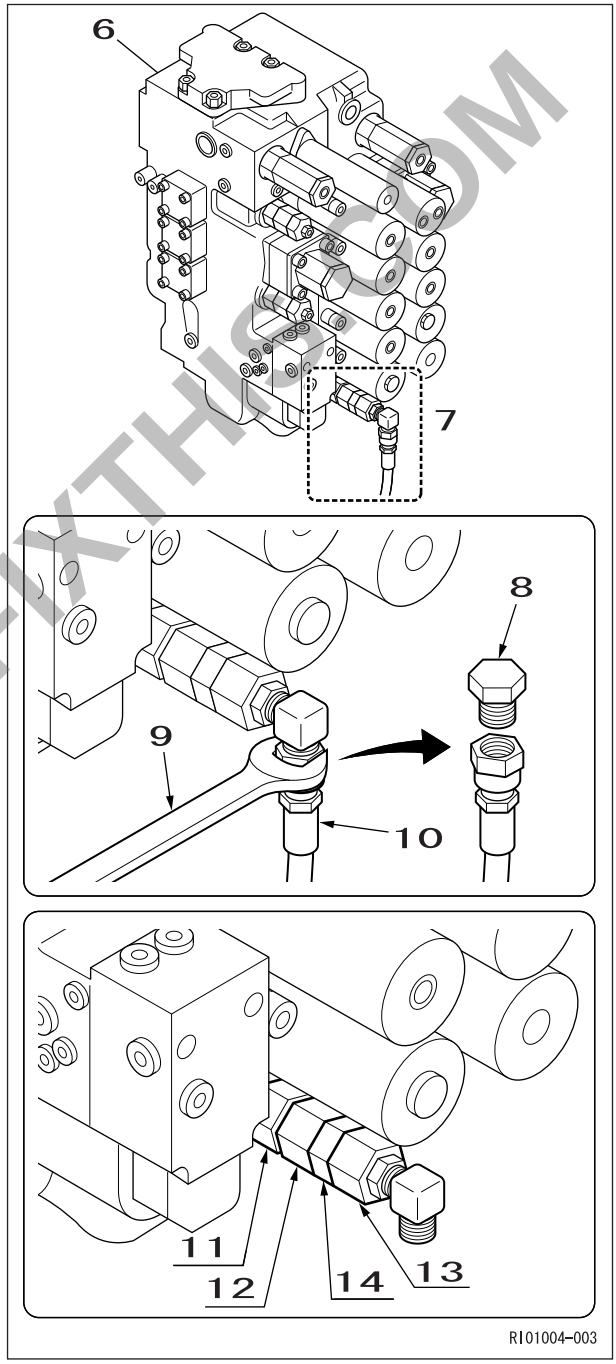
h) Loosen the standard lock nut (27 mm) (14).

i) Loosen the adjusting screw (13), lower below the set pressure, then adjust on the tightening side.

j) After adjustment, tighten the lock nut while fastening the adjusting screw (13) with a wrench (9).

k) After locking, check the pressure.
Repeat h), i), and j) until the set pressure is correctly adjusted.

l) Stop the engine.

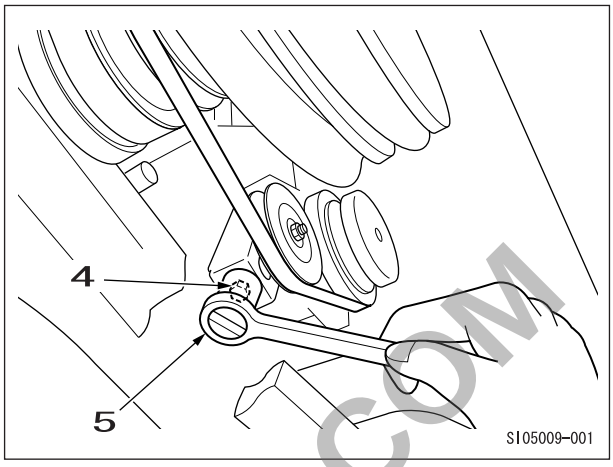


6	Control valve
9	Wrench (19 mm)

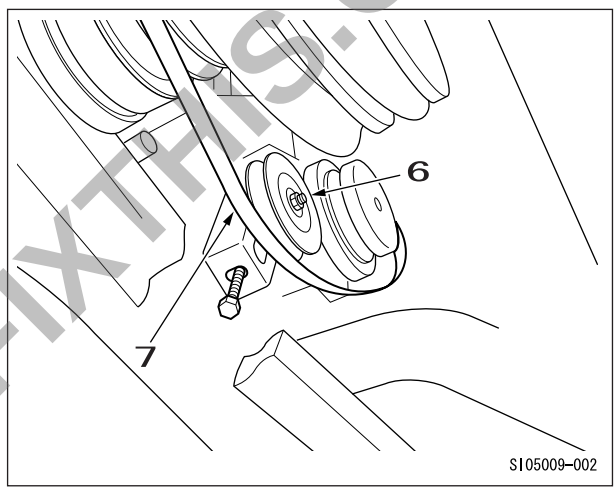
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[4] Use a box wrench (14 mm) (5) to remove the tension bolt (4).



[5] Remove the air conditioner belt (7) from the tension pulley (6) and replace it.



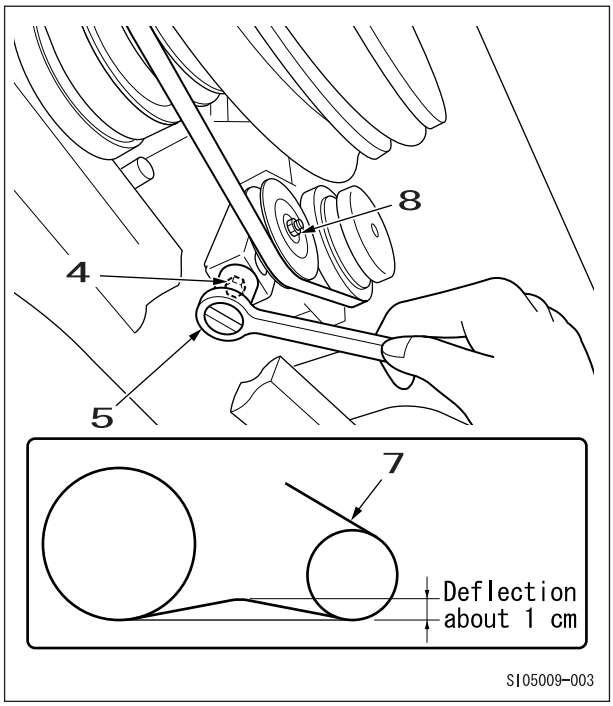
Tension adjustment

After replacing the air conditioner belt, it is necessary to adjust the belt tension.

[1] Use a box wrench (14 mm) (5) to tighten the tension bolt (4).

[2] Adjust the belt so that when the center section of the belt is pressed with a finger, it deflects about 1 cm. (See the figure on the right.)

[3] Securely fasten the nut (8).



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