SEN06503-10

Shop Manual

WHEEL LOADER **WA200-7**

SERIAL NUMBERS 80001 and up

KOMATSU

Foreword, safety and general information
Important safety notice

(Rev. 2012/10)

- Appropriate servicing and repair are extremely important to ensure safe operation of the machine. Theshop manual describes the effective and safe servicing and repair methods recommended by Komatsu.
  Some of these methods require the use of the special tools designed by Komatsu for the specific purpose.
- The symbol mark ⚠ is used for such matters that require special cautions during the work. The work indicated by the caution mark should be performed according to the instructions with special attention to the cautions. Should hazardous situation occur or be anticipated during such work, be sure to keep safe first and take every necessary measure.

General precautions

⚠ **Inappropriate handling causes an extreme danger. Read and understand what is described in the operation and maintenance manual before operating the machine. Read and understand what is described in this manual before starting the work.**

- Before performing any greasing or repairs, read all the safety labels stuck to the machine. For the locations of the safety labels and detailed explanation of precautions, see the operation and maintenance manual.
- Locate a place in the repair workshop to keep the 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, water or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.
- When performing any work, always wear the safety shoes and helmet. Do not wear loose work cloths, or clothes with buttons missing.
  1. Always wear the protective eyeglasses when hitting parts with a hammer.
  2. Always wear the protective eyeglasses when grinding parts with a grinder, etc.
- When performing any work with 2 or more workers, always agree on the working procedure before starting. While working, always keep conversations of the work between your fellow workers and your self on any step of the work.
  During the work, hang the warning tag of "UNDER WORKING" in the operator's compartment.
- Only qualified workers must perform the work and operation which require license or qualification.
- Keep the tools in good condition. And learn the correct way to use the tools, and use the proper ones among them. Before starting the work, thoroughly check the tools, lift truck, service vehicle, etc.
- If welding repairs is required, always have a trained and experienced welder with good knowledge of welding perform the work. When performing welding work, always wear welding gloves, apron, shielding goggles, cap, etc.
- Before starting work, warm up your body thoroughly to start work under good condition.
- Avoid continuing work for long hours and take rests with proper intervals to keep your body in good condition. Take a rest in a specified safe place.

Safety points

1	Good arrangement
2	Correct work clothes
3	Observance of work standard
4	Practice of making and checking signals
5	Prohibition of operation and handling by unlicensed workers
6	Safety check before starting work
7	Wearing protective goggles (for cleaning or grinding work)
8	Wearing shielding goggles and protectors (for welding work)
9	Good physical condition and preparation
10	Precautions against work which you are not used to or you are used to too much

Preparation

- Before adding oil or making any repairs, place the machine on a firm and level ground, and apply the parking brake and chock the wheels or tracks to prevent the machine from moving.
- Before starting work, lower the work equipment (blade, ripper, bucket, etc.) to the ground. If it is not possible to lower the equipment to the ground, insert the lock pin or use blocks to prevent the work equipment from falling. And be sure to lock all the work equipment control levers and hang a warning tag on them.
- When performing the disassembling or assembling work, support the machine securely with blocks, jacks, or stands before starting the work.

Method of disconnecting and connecting of push-pull type coupler

(Rev. 2012/01)

⚠ Loosen the oil filler cap of the hydraulic tank slowly to release the remaining pressure in the hydraulic tank.

⚠ Even if the remaining pressure is released from the hydraulic tank, some hydraulic oil flows out when the hose is disconnected. Accordingly, prepare an oil container.

Type 1

Disconnection

1. Hold adapter (1) and push hose joint (2) into mating adapter (3). (Fig. 1)
   ★ It can be pushed in by approximately 3.5mm.
   ★ Do not hold rubber cap portion (4).
2. While pushing hose joint (2) into adapter (3), push rubber cap (4) against adapter (3) until "click" is heard. (Fig. 2)
3. Hold hose adapter (1) or hose (5) and pull it out. (Fig. 3)
   ★ Since some hydraulic oil flows out, prepare an oil container.

Fig. 1

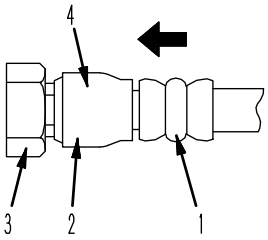


Fig. 2

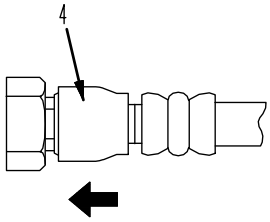
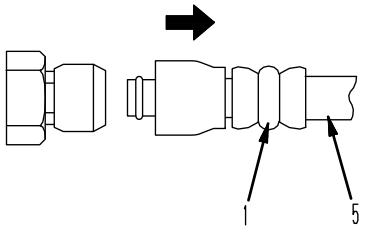


Fig. 3



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Connection

1. Hold hose adapter (1) or hose (5) and insert it in mating adapter (3) aligning them with each other. (Fig. 4)
   ★ Do not hold rubber cap part (4).
2. After inserting the hose fitting in the adapter on the other side perfectly, pull it back to check the connecting condition. (Fig. 4)
   ★ When the hose fitting is pulled back, the rubber cap will move approximately 3.5mm toward the hose, however, it is not a problem.

Fig. 4

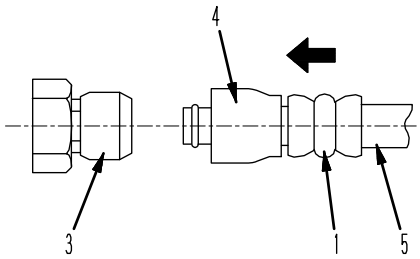
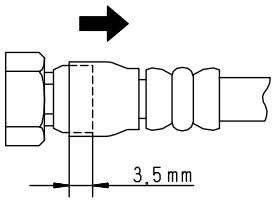


Fig. 5



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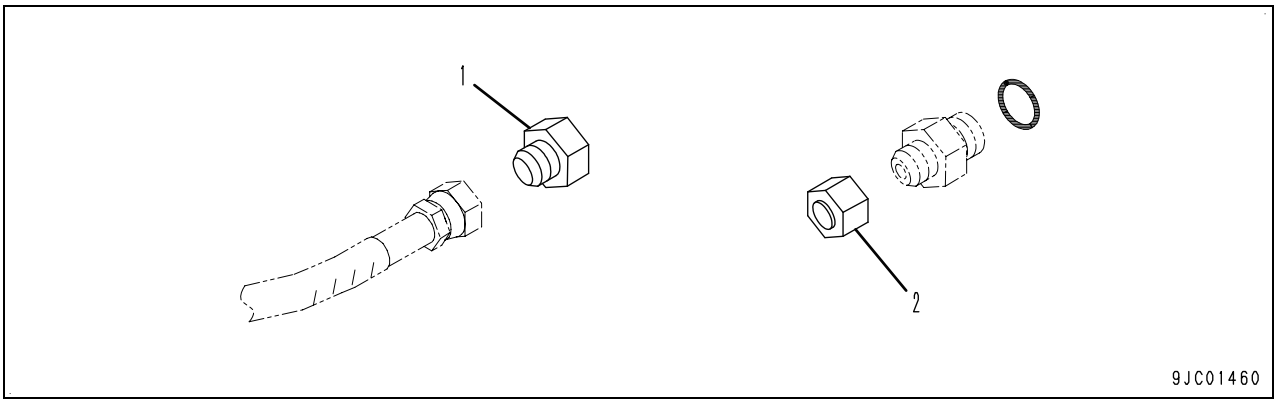
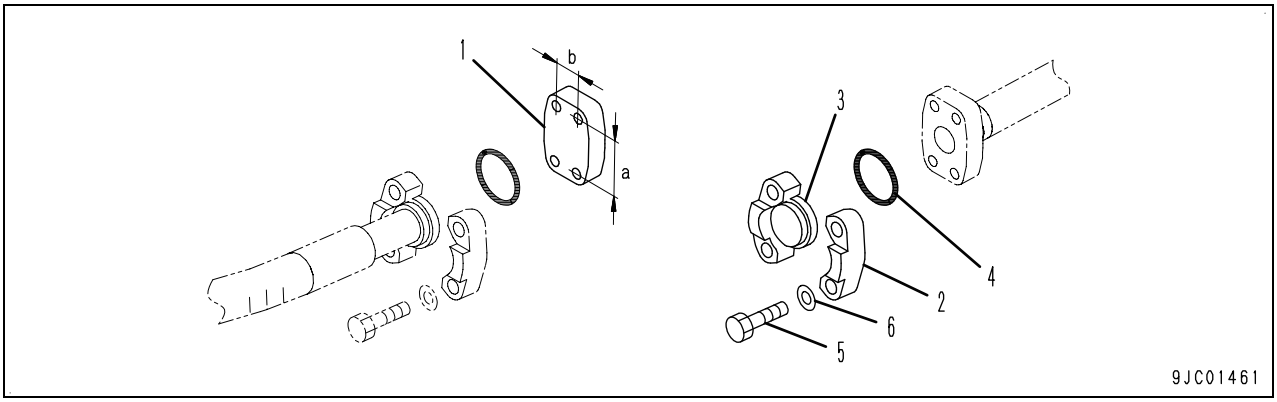
Disconnection of taper seal type hoses and tubes



Nominal No.	Hose side	Pipe joint side
	Plug (1)	Nut (2)
02	07376-50210	07222-00210
03	07376-50315	07222-00312
04	07376-50422	07222-00414
05	07376-50522	07222-00515
06	07376-50628	07222-00616
10	07376-51034	07222-01018
12	07376-51234	07222-01219
14	07376-51443	07222-01422

Disconnection of split flange type hoses and tubes



Nominal No.	Bolt pitch (mm)		Hose side	Tube side		O-ring (4)	Bolt (5)	Washer (6)
	a	b	Flange (1)	Split flange (2)	Sleeve head (3)			
04	38.1	17.5	07379-00400	07371-30400	07378-10400	07000-12021	01010-80825	01643-50823
05	42.9	19.8	07379-00500	07371-30500	07378-10500	07000-13022	01010-80830	01643-50823
06	47.6	22.2	07379-00640	07371-30640	07378-10600	07000-13025	07372-51035	01643-51032
10	52.4	26.2	07379-01044	07371-31049	07378-11000	07000-13032	07372-51035	01643-51032
12	58.7	30.2	07379-01250	07371-31255	07378-11200	07000-13038	07372-51035	01643-51032
	66.7	31.8	07379-01260	07371-51260	07378-11210	07000-13038	01010-81245	01643-51232
14	69.9	35.8	07379-01460	07371-31465	07378-11400	07000-13048	07372-51240	01643-51232

Conversion table

(Rev. 2012/10)

Method of using the conversion table

- The unit conversion table enables the simple conversion in the figures between the different units. For further details of the method of use of the conversion table, see the examples given below.

Example: Method of using the conversion table to convert a unit from millimeters to inches

Convert 55 mm into inches

1. Locate the number 50 in the vertical column at the left side, take this as (A), and then draw a horizontal line from (A).
2. Locate the number 5 in the row across the top, take this as (B), then draw a vertical line down from (B).
3. Take the point where the 2 lines cross as (C). This point (C) gives the value when converting the unit from-millimeters to inches. Therefore, 55 mm = 2.165 in.

Convert 550 mm into inches

1. The number 550 does not appear in the table, so divide it by 10 (move the decimal point one place to the left) to get 55 mm.
2. Then convert 55 mm to 2.165 in by the same procedure as above.
3. The original value (550 mm) was divided by 10, so multiply 2.165 inches by 10 (move the decimal point one place to the right) to get the original value. This gives 550 mm = 21.65 in. Therefore, 550 mm = 21.65 in.

Millimeters to inches

(B)

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0	0	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
50	1.969	2.008	2.017	2.087	2.126	2.165 (C)	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.847	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

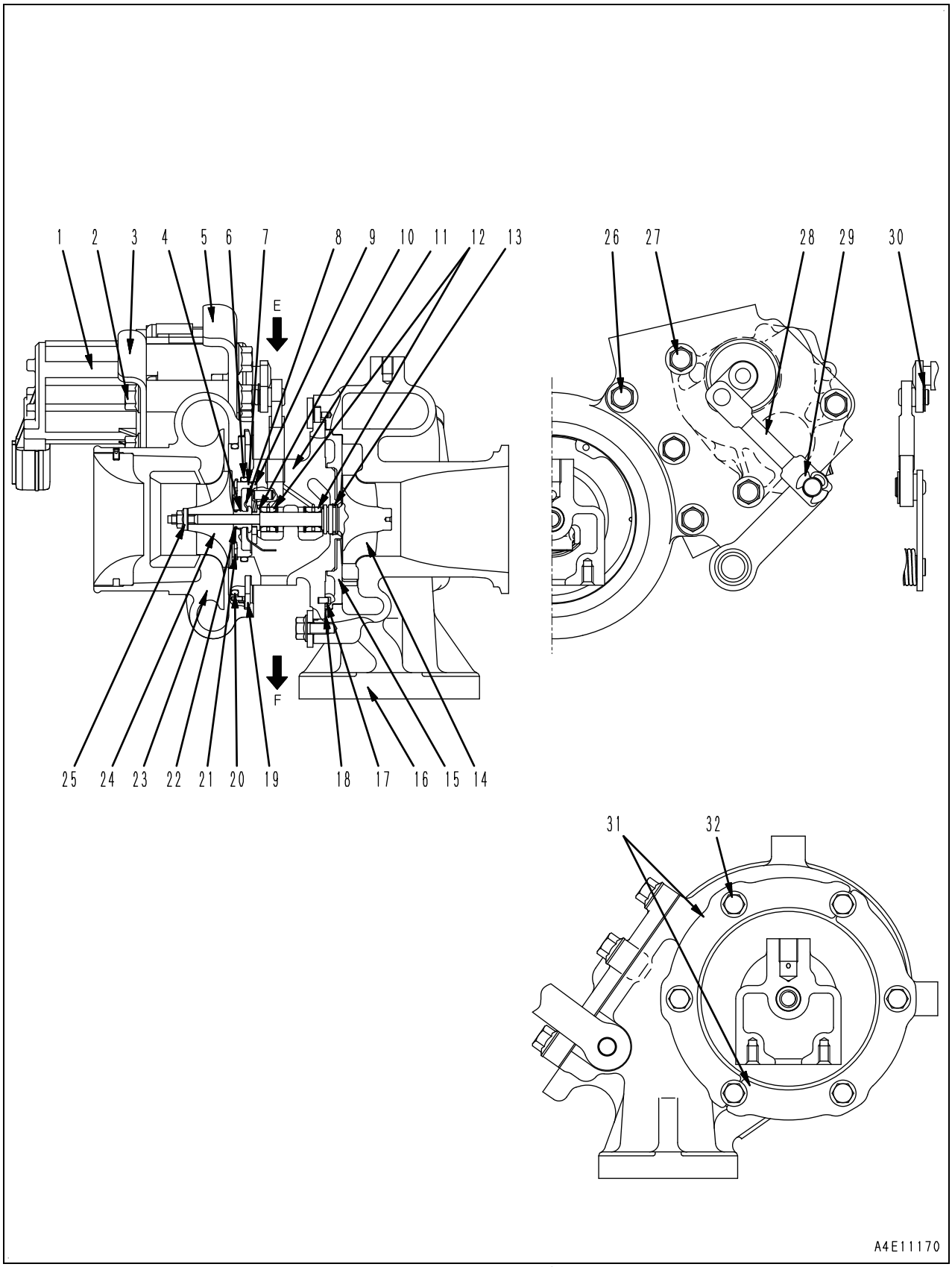
(A)

WA200-7 EU Specifications

Machine model name			WA200-7
Serial number			80001 and up
Weight	Machine weight	kg	11,610
	Machine weight (front wheel) in the JIS travel posture	kg	4,945
	Machine weight (rear wheel) in the JIS travel posture	kg	6,665
Performance	Bucket capacity (heaped)	m^3	2.0
	Rated load	kg	3,200
	Travel speed		
	● Forward 1st	km/h	5.2 to 14.3
	● Forward 2nd		14.3
	● Forward 3rd		23.2
	● Forward 4th		38.0
	● Reverse 1st	km/h	5.2 to 14.3
	● Reverse 2nd		14.3
	● Reverse 3rd		23.2
	● Reverse 4th		38.0
	Max. rim pull		
	● Forward	kN{kg}	78.5 {8,000}
	● Reverse		78.5 {8,000}
	Gradability	deg.	25
	Min. turning radius (center of the outside tire)	mm	5,100
	Turning radius (teeth edge/BOC tip) in the JIS travel posture	mm	5,900/5,925
Dimensions	Overall length (with BOC)	mm	7,090
	Overall width (machine body)	mm	2,470
	Bucket width (with BOC)	mm	2,540
	Overall height (cab top)	mm	3,180
	Overall height with the bucket raised	mm	5,165
	Wheelbase	mm	2,840
	Tread	mm	1,930
	Min. ground clearance	mm	495
	Max. hinge pin height	mm	3,885
	Dumping clearance (*1) (Teeth edge/BOC tip)	mm	3,025/2,965
	Dumping reach (*1) (Teeth edge/BOC tip)	mm	925/950
	Steering angle	deg.	38
	Bucket tilt-back angle (operating posture/max. height)	deg.	47/66
	Bucket tilt-forward angle (max. height)	deg.	45
	Digging depth, 10 degrees (teeth edge/BOC tip)	mm	260/295

*1: Indicates the value when the forward tilt angle of the bucket is 45 degrees.

★ BOC: Abbreviation for Bolt-On Cutting edge



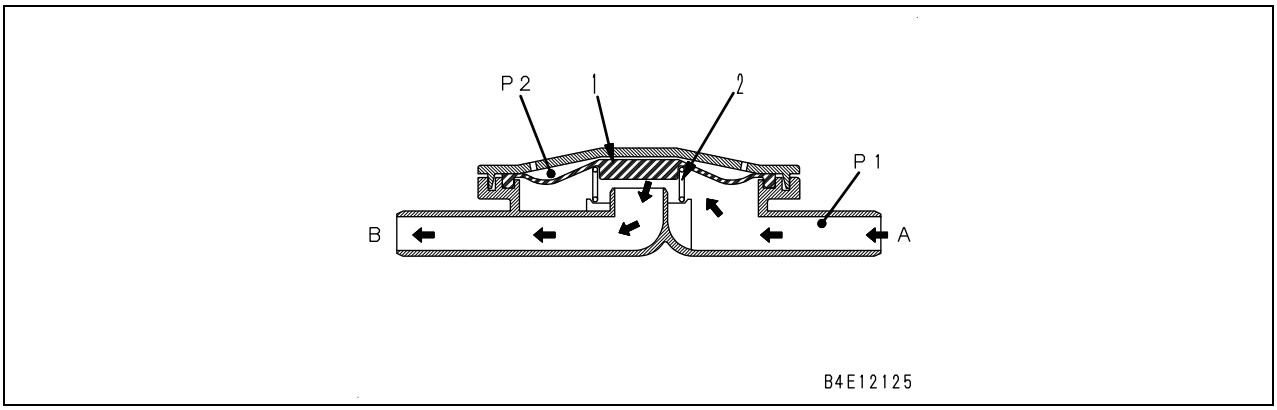
1. VFT motor
2. Flange bolt
3. Bracket
4. Thrust sleeve
5. Bracket
6. O-ring
7. Insert
8. Oil deflector
9. Thrust bearing
10. Thrust ring

Operation

- The blowby gas enters from (A) and large oil particles in the oil mist (atomized engine oil) are separated when the gas passes through the holes of impactor (5) in filter (6).
- Small oil particles in the oil mist are separated by filter (6).
- Separated oil flows on the case wall surface to oil drain port (C), and then flows to the oil pan.
- CDR valve (3) is activated when the crankcase pressure becomes a negative pressure to prevent the generation of excessive negative pressure.
- Crankcase pressure sensor (2) senses the blowby gas pressure (crankcase pressure).
- The engine controller generates failure code CA555 if it determines that the filter is clogged from the detected value of crankcase pressure sensor (2), and generates failure code CA556 if the pressure increases further.
- If filter (6) is clogged, relief valve (7) installed in case (4) operates to protect the KCCV ventilator and the engine.

CDR valve

★ CDR: Abbreviation for Crankcase Depression Regulator

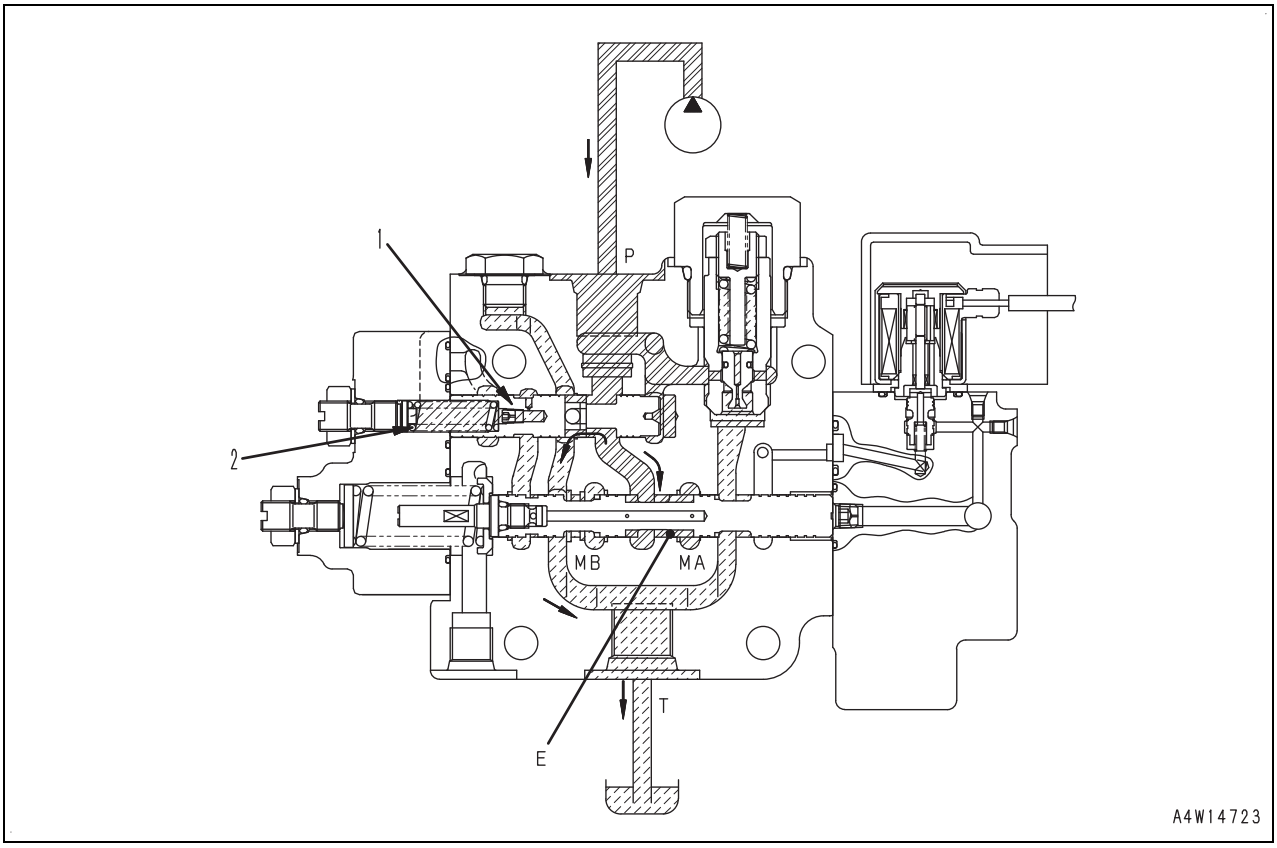


1. Diaphragm
2. Spring

A: Crankcase side
B: VFT side (intake side)

- The CDR valve is a regulator valve that prevents crankcase pressure (P1) from becoming an excessive negative pressure.
- Normally, since diaphragm (1) is pushed up by spring (2), blowby gas flows from crankcase side (A) to VFT side (intake side) (B).
- When pressure (P1) on the crankcase side decreases due to increase in intake air on the VFT side (intake side) (B), the reaction force of spring (2) yields to atmosphere pressure (P2) and the diaphragm blocks the flow passage, temporarily stopping the gas flow.
- After that, when blowby gas accumulates in the crankcase and pressure (P1) recovers, the diaphragm is pushed up again and blowby gas starts to flow again.

Operation

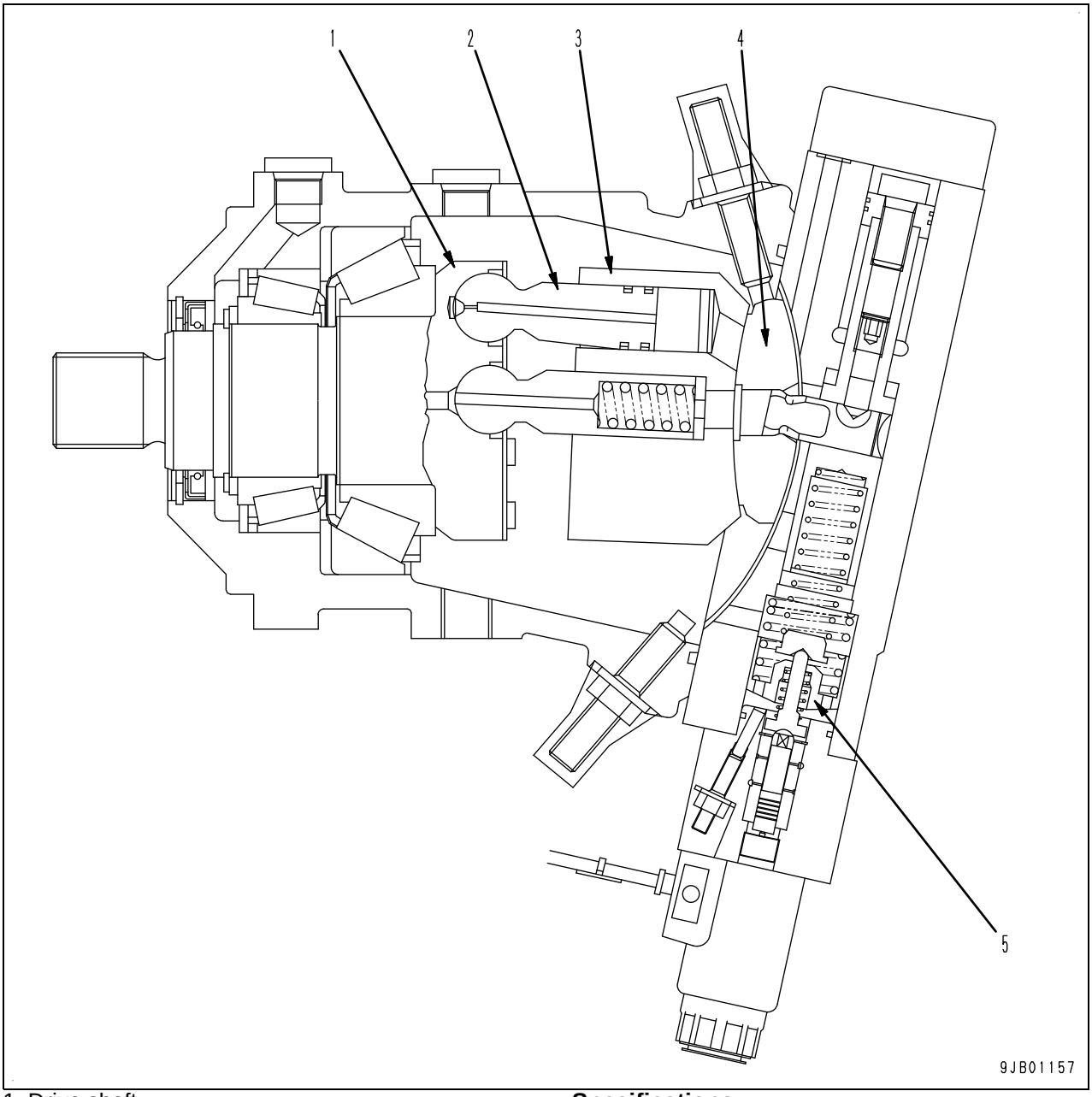


- For the flow control valve, the throttle upstream pressure and downstream pressure are introduced to the right and left sides of spool (1) respectively.
- The differential pressure across throttle (E) for the motor flow acts on spring (2).
- In the Fig. 1, if the motor flow exceeds (Q0), the force exerted by the differential pressure across spool (1) becomes larger than the load at installed length of spring (2).
- Spool (1) moves to the left, and port (P) is connected to port (T).
- The surplus flow rate in portion (Z) shown in Fig. 1 flows from the flow control valve to the tank and the motor speed is kept constant from (A) to (C).
- The flow control valve is the stepless variable type.
- As shown in Fig. 2, the flow control valve can change the motor speed steplessly while keeping the motor speed constant between (A') and (C') by changing the command current for motor speed between (A) and (C).

HST motor

★ HST: Abbreviation for HydroStatic Transmission

HST motor 1



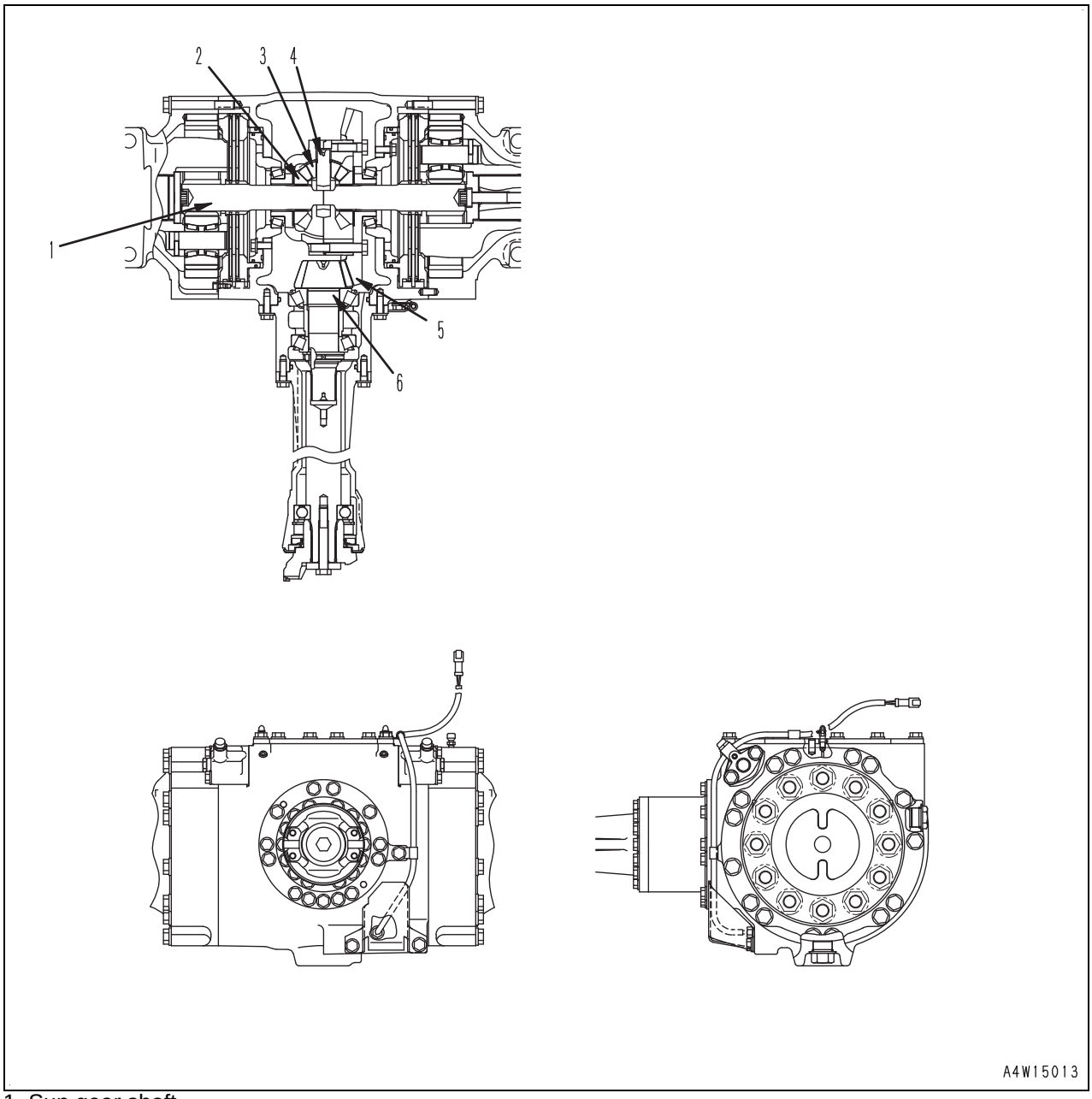
1. Drive shaft
2. Piston
3. Cylinder block
4. Port plate
5. EP servo valve

Specifications

Model	A6VM80EP
Type	Variable displacement bent axis type piston motor
Theoretical discharge (cc/rev)	0 to 80
Set pressure of high pressure oil relief valve (MPa{kg/cm^2})	44.1{450}
Set pressure of high pressure oil cut-off valve (MPa{kg/cm^2})	Effective differential pressure 41.2{420}
Set pressure of low pressure oil relief valve (MPa{kg/cm^2})	2.45{25}

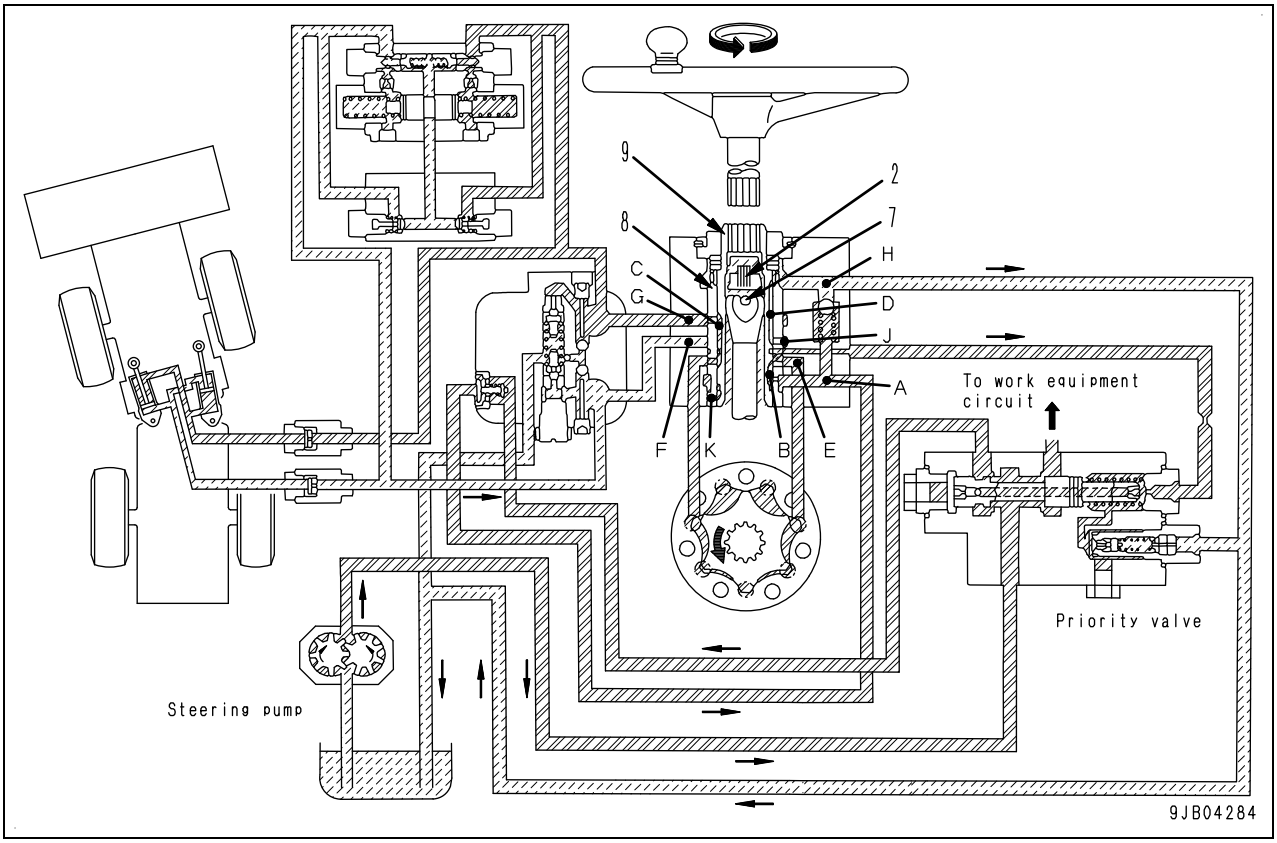
Differential

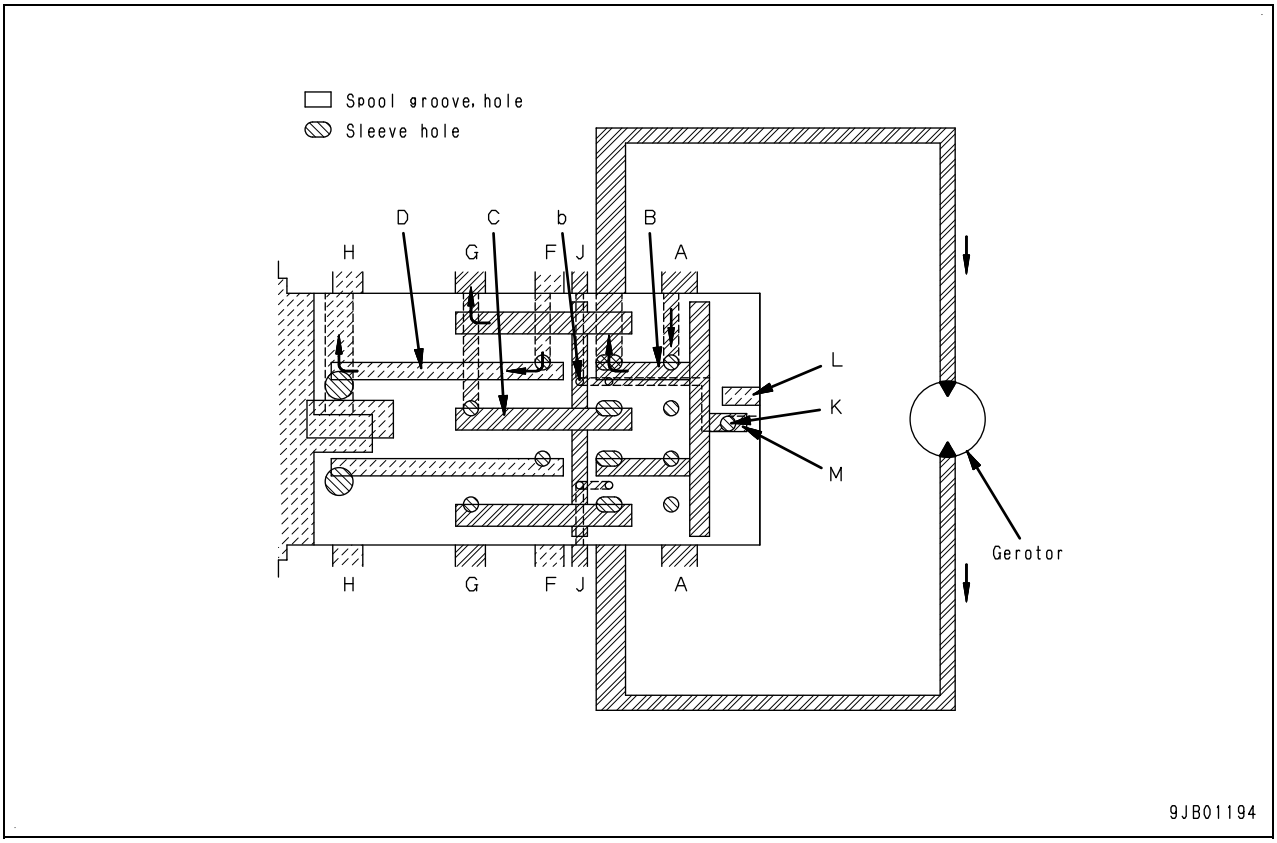
Front differential



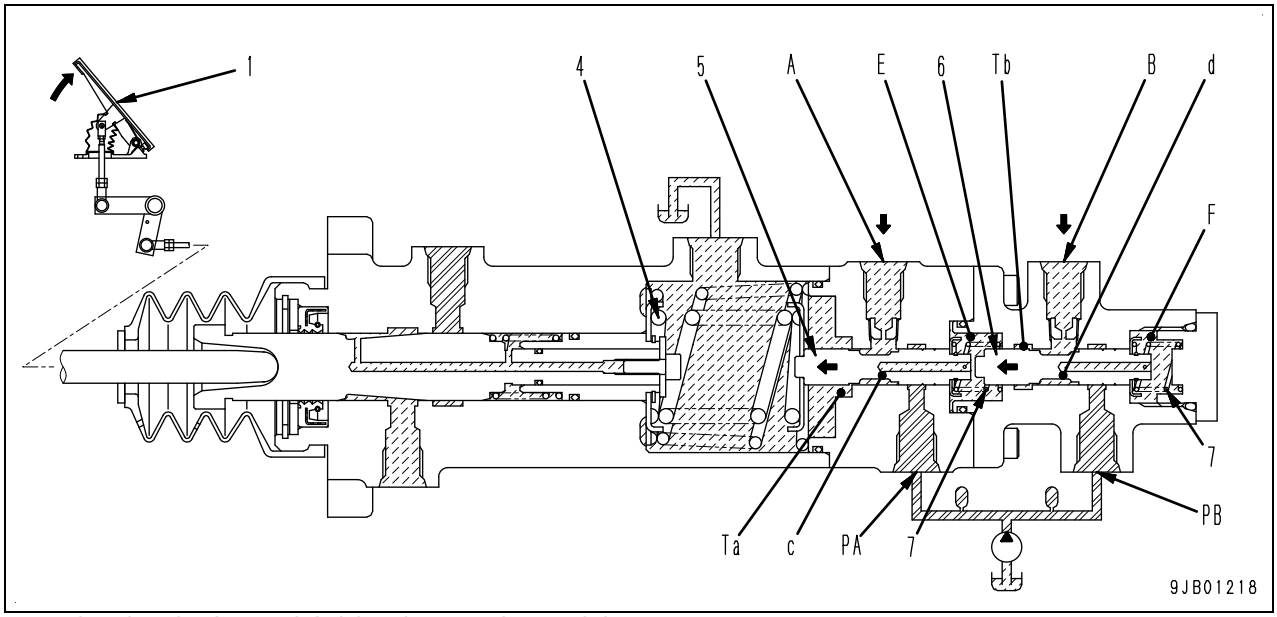
1. Sun gear shaft
2. Side gear
3. Pinion
4. Shaft
5. Bevel gear
6. Bevel pinion

When operating steering wheel for "left turn"





When brake pedal is released

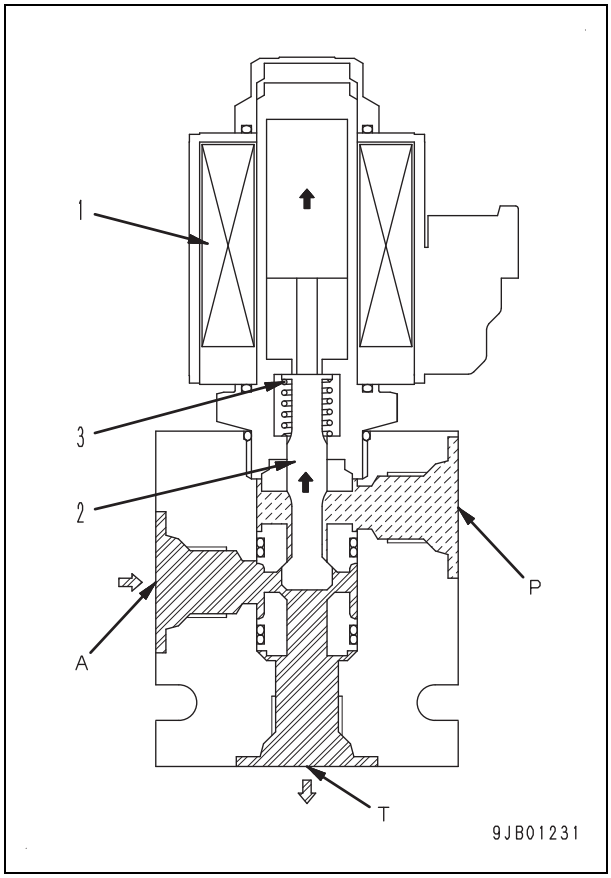


- Releasing brake pedal (1) releases the pedal depressing effort being applied to spool (5).
- Spool (5) is pushed back to the left by the back pressure in the rear brake piston and reaction force of spring (7), disconnecting port (PA) from port (A).
- Since the oil in the rear brake piston flows from port (A) to port (Ta) and is drained to the hydraulic tank, the rear brake is released.
- At the same time as spool (5) moves to the left, spool (6) is also pushed back to the left by the back pressure of the front brake piston and the reaction force of spring (7), disconnecting port (PB) from port (B).
- Since the oil in the front brake piston flows from port (B) to port (Tb) and is drained to the hydraulic tank, the front brake is released.

Operation

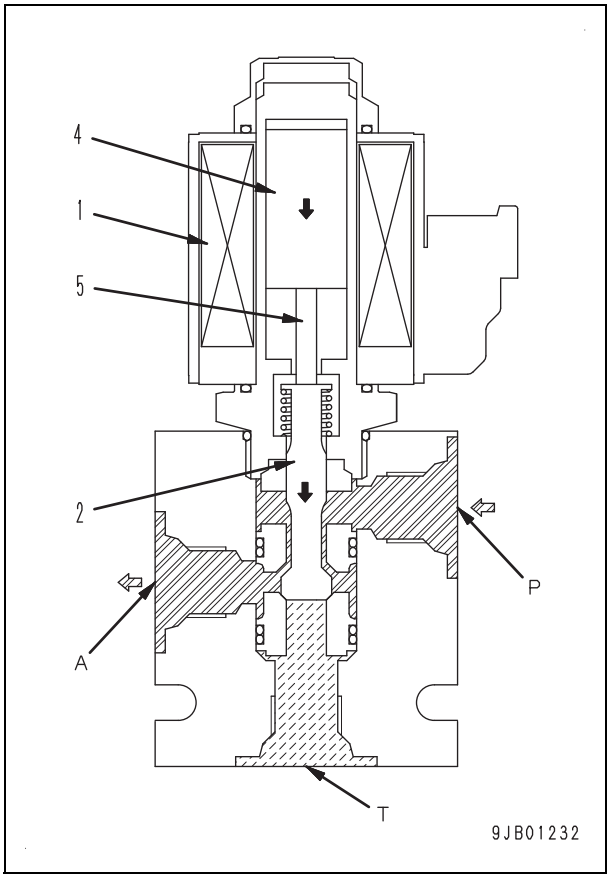
When the solenoid valve is "de-energized"

- When the parking brake switch in the operator compartment is set to ON, coil (1) is de-energized because no signal current flows to the solenoid valve.
- Accordingly, spool (2) is pushed upward by spring (3) and closes port (P). As a result, the oil from the parking brake cylinder flows from port (A) to port (T) and drains to the hydraulic tank.
  This causes the piston in the parking brake cylinder to be pushed back and the multiple disc lever to be pulled up. As a result, the parking brake is applied.

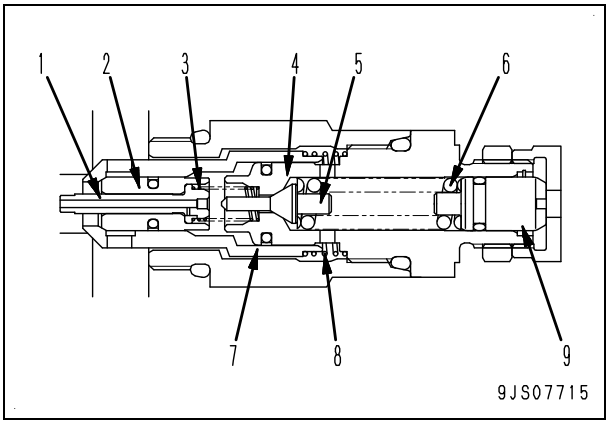


When the solenoid valve is "energized"

- When the parking brake switch in the operator compartment is set to OFF position, coil (1) is energized and downward thrust force is generated in plunger (4) because signal current flows to the solenoid valve.
- Accordingly, spool (2) is pushed downward by push pin (5) to close port (T). As a result, the oil from the pump flows from port (P) to port (A).
- This causes the piston in the parking brake cylinder to be pushed and the multiple disc lever to be pulled down. As a result, the parking brake is released.



Suction safety valve



1. Piston
2. Main valve
3. Piston spring
4. Valve seat
5. Poppet
6. Poppet spring
7. Suction valve
8. Suction valve spring
9. Adjustment screw

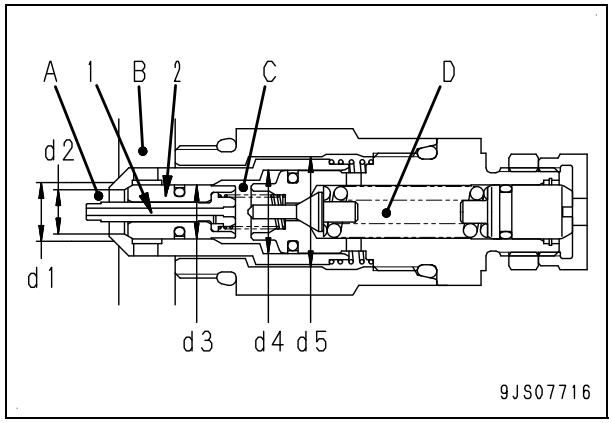
Function

- It is installed in the bucket cylinder circuit inside the work equipment control valve. When the bucket control lever is in NEUTRAL position, if some impact is applied to the cylinder and abnormal pressure is generated, this valve releases the abnormal pressure from it to prevent hydraulic components such as a cylinder, etc. from being damaged.
- This valve also acts as a suction valve when negative pressure is generated in the cylinder circuit.

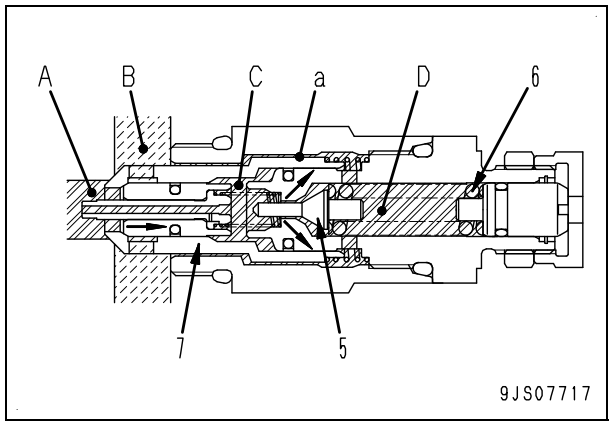
Operation

1. Operation as a safety valve

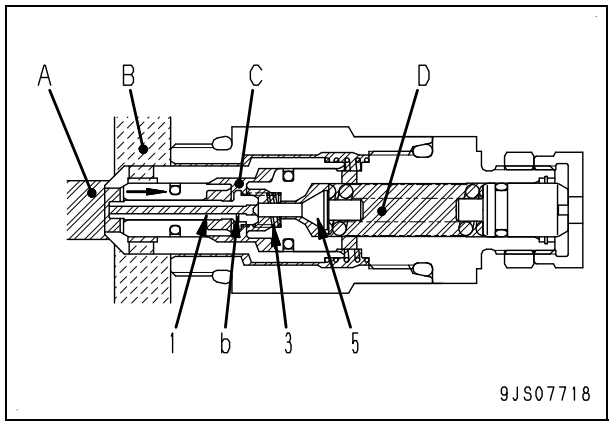
- Port (A) and port (B) are connected to the cylinder circuit and drain circuit, respectively.
- Pressurized oil in port (A) is introduced to port (C) through the hole in piston (1). Main valve (2) contacts the left end due to the relation of (d2) < (d3).
- The order of sizes of cross-section surface radii is as follows; (d5) > (d4) > (d1) > (d3) > (d2)



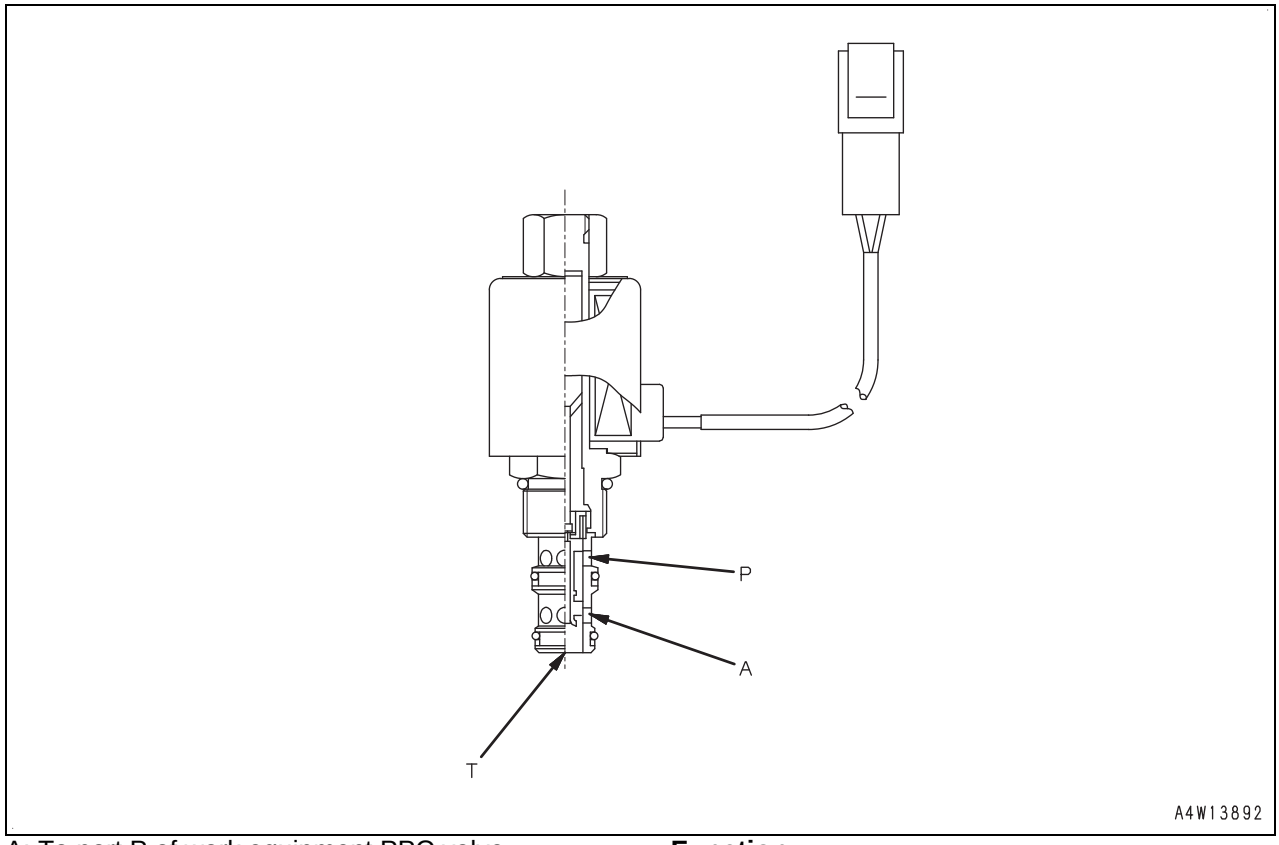
- When abnormal pressure is generated in port (A) and it reaches the set pressure of spring (6), poppet (5) opens to allow pressurized oil in port (C) to flow through the periphery (a) of suction valve (7) from port (D), and drain.



- Opening of poppet (5) causes the pressure in port (C) to drop, so piston (1) moves to the right. Piston (1) contacts the tip of poppet (5), pressurized oil flows through orifice (b) and drains from port (D).



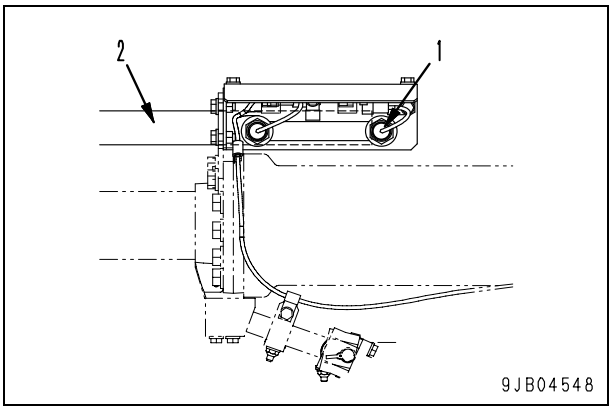
Work equipment lock solenoid valve

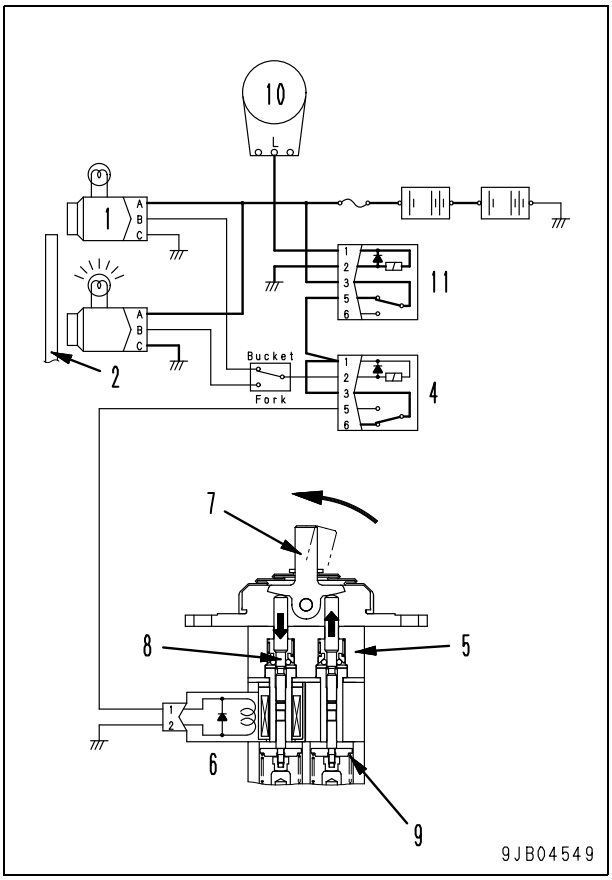


A: To port P of work equipment PPC valve
P: From charge valve
T: Draining

Function

- It is installed between the charge valve and work equipment PPC valve. On receiving the operation signal from the HST controller, the solenoid is "energized" to cut off the oil flowing to the work equipment PPC valve, thus the operator cannot operate the work equipment.





- As the bucket is tilted and moved away from the position set by the positioner, in other words, as bar (2) moves away from the sensing face of proximity switch (1), the lamp of proximity switch (1) goes off and bucket positioner relay (4) is set to "OFF" state.
  Because of above, detent solenoid (6) circuit on work equipment PPC valve (5) is cut off and the coil is de-energized.
  Held bucket spool (8) receives the reaction force of spring (9) and returns work equipment (bucket) control lever (7) to "hold" position.

★ The power supply for detent solenoid (6) operation is turned "ON" or "OFF" by alternator relay (11).
  Detent solenoid (6) circuit is turned off since L signal from alternator (10) is not sent to alternator relay (11) as long as the engine is stopped.
  As the result, the work equipment (bucket) control lever (7) cannot be moved and held in the tilt position as long as bar (2) is positioned in sensing face of proximity switch (1).

Function of proximity switch

When object of sensing is over sensing face of proximity switch

Lamp of proximity switch	Turned ON
Bucket positioner relay	ON
Work equipment PPC valve detent solenoid circuit	Power ON
Work equipment PPC valve detent solenoid	Energized

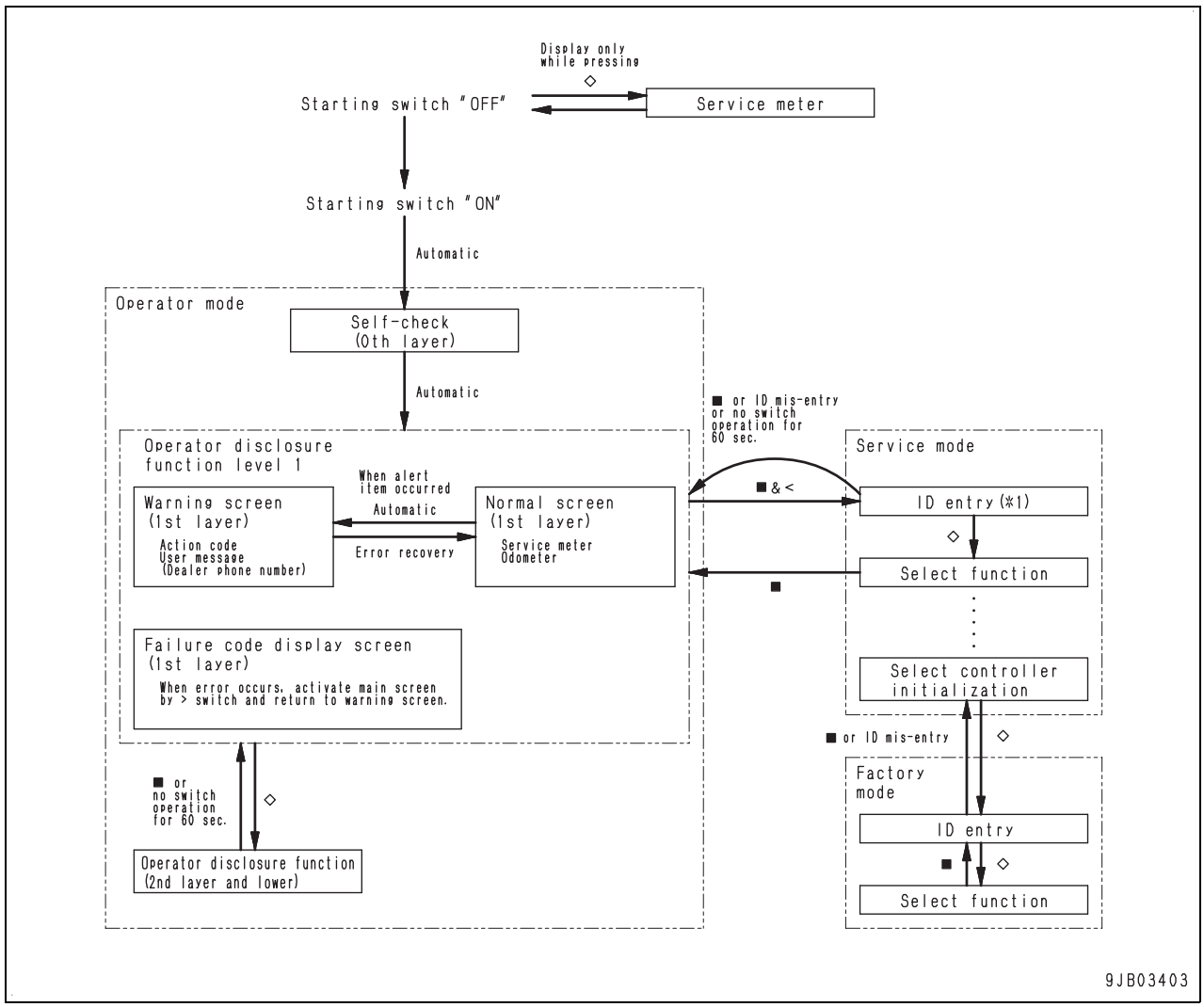
When object of sensing is apart from sensing face of proximity switch

Lamp of proximity switch	Turned OFF
Bucket positioner relay	OFF
Work equipment PPC valve detent solenoid circuit	Power OFF
Work equipment PPC valve detent solenoid	De-energized

Function of character display

- You can use the character display to change the display and settings of the machine monitor.
- The range of operation that the operator is allowed to operate is the part of "Operator mode" shown in the following figure.

★ For operation procedures in the operator mode, see the Operation and Maintenance Manual.



*1: When you have entered the ID on the "ID entry" screen once, if the ID is accepted, the "ID entry" screen does not appear until the starting switch is turned to OFF position and "Function selection" screen is directly displayed.

*2: Available only for load meter specification.

AMP040−8P

Pin No.	Specifications	Input/ output signal	Group	Form of use	Signal name	Remarks
1	(NC)	-	-	-	-	No harness is connected to this pin in this machine.
2	(NC)	-	-	-	-	No harness is connected to this pin in this machine.
3	(NC)	-	-	-	-	No harness is connected to this pin in this machine.
4	(NC)	-	-	-	-	No harness is connected to this pin in this machine.
5	(NC)	-	-	-	-	No harness is connected to this pin in this machine.
6	(NC)	-	-	-	-	No harness is connected to this pin in this machine.
7	(NC)	-	-	-	-	No harness is connected to this pin in this machine.
8	(NC)	-	-	-	-	No harness is connected to this pin in this machine.

Fan reverse function

- When the fan reverse rotation switch is pressed for cleaning the radiator core, the cooling fan EPC solenoid valve of the cooling fan motor is activated to reverse rotation direction of the fan.

1. Fan manual reverse rotation function
   The operator can select the fan rotation direction as he chooses by pressing the fan reverse rotation switch to MANUAL for 0.5 second or more.
   While switching of the fan rotation direction is taking place, the pilot lamp of the machine monitor keeps blinking to inform the operator that the switching is underway. And when the fan rotation is being switched responding to the high engine speed, high coolant or oil temperature, this lamp also keeps on blinking until the switching is completed.
   When the fan rotation switching conditions are met, this function sends the accelerator opening ratio restriction signal to the engine controller so that the engine speed does not reach 1,200 rpm or more while the switching is underway. Note that the control is not applied if the HST oil temperature is 30 °C or more.
   The pilot lamp of the machine monitor remains turned on as long as fan rotation direction is set to reverse.

   The fan rotation direction is switched from "normal" to "reverse" if all of the following conditions are met.

Condition 1	Fan reverse rotation switch has been pressed to MANUAL for 0.5 second or more.
Condition 2	Coolant temperature is below 102 °C. [To prevent overheat]
Condition 3	HST oil temperature is below 100 °C. [To prevent overheat]
Condition 4	More than 5 seconds have elapsed after the control was switched from fan rotation assist control at the start of engine to basic control.
Condition 5	No error is generated in cooling fan speed sensor and engine speed sensor.

   The fan rotation direction is switched from "reverse" to "normal" if any of the following conditions are met.

Condition 1	Fan reverse rotation switch is pressed once more to MANUAL while fan is rotating in reverse.
Condition 2	10 minutes have elapsed after fan started to rotate in reverse.
Condition 3	Engine has stopped.
Condition 4	Abnormality is detected in fan motor EPC solenoid.

2. Overheat prevention function
   If coolant temperature or HST oil temperature overheats when the fan is rotating in reverse, fan reverse rotation is forcibly terminated and switched to normal rotation to increase air flow to the radiator.

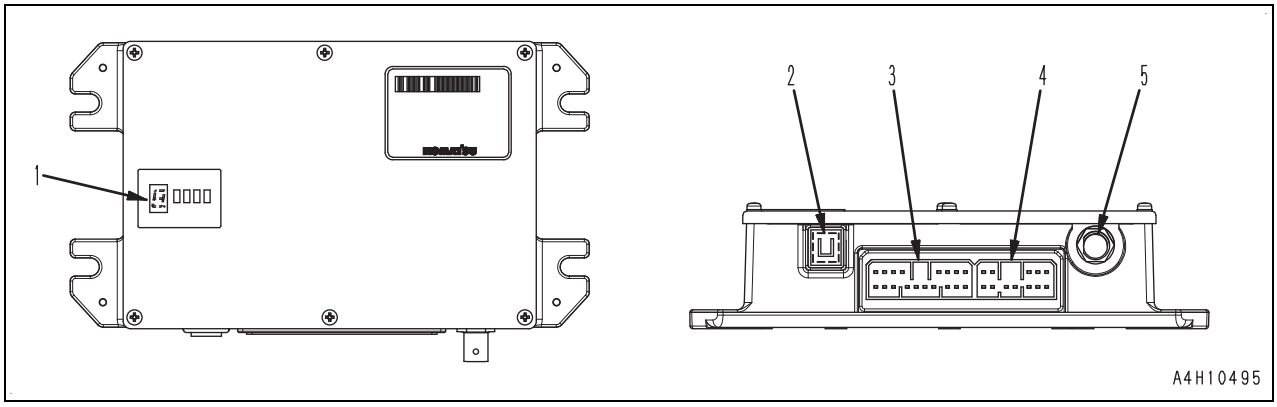
3. Fan speed during reverse rotation
   The fan speed during reverse rotation depends on the engine speed.

Engine speed (rpm)	825	855	1,800	2,250
Target fan speed (rpm)	800	800	1,730	1,730

★ Licensing of KOMTRAX radio station is separately required to use the services.

KOMTRAX terminal

Model: TC330



1. LED lamp display
2. GPS antenna connection
3. Chassis harness connection (CN1A)
4. Chassis harness connection (CN1B)
5. Communication antenna connection

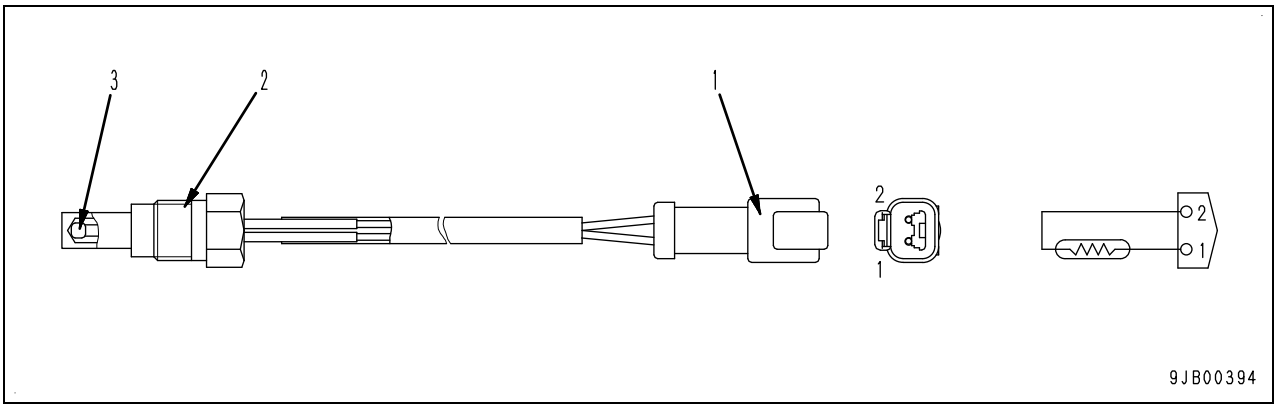
Input and output signals of KOMTRAX terminal

CN1A [CN-KOM1]

Pin No.	Signal name	Input/ output signal
1	(*1)	–
2	(*1)	–
3	(*1)	–
4	(*1)	–
5	(*1)	–
6	(*1)	–
7	(*1)	–
8	(*1)	–
9	(*1)	–
10	CAN_H	Input/ Output
11	CAN_L	Input/ Output
12	(*1)	–
13	(*1)	–
14	External starting signal	Input/ Output
15	System operating lamp	Output
16	(*1)	–
17	(*1)	–
18	(*1)	–

*1: Do not connect the pin because doing so may cause malfunction or failure.

HST oil temperature sensor
Brake oil temperature sensor

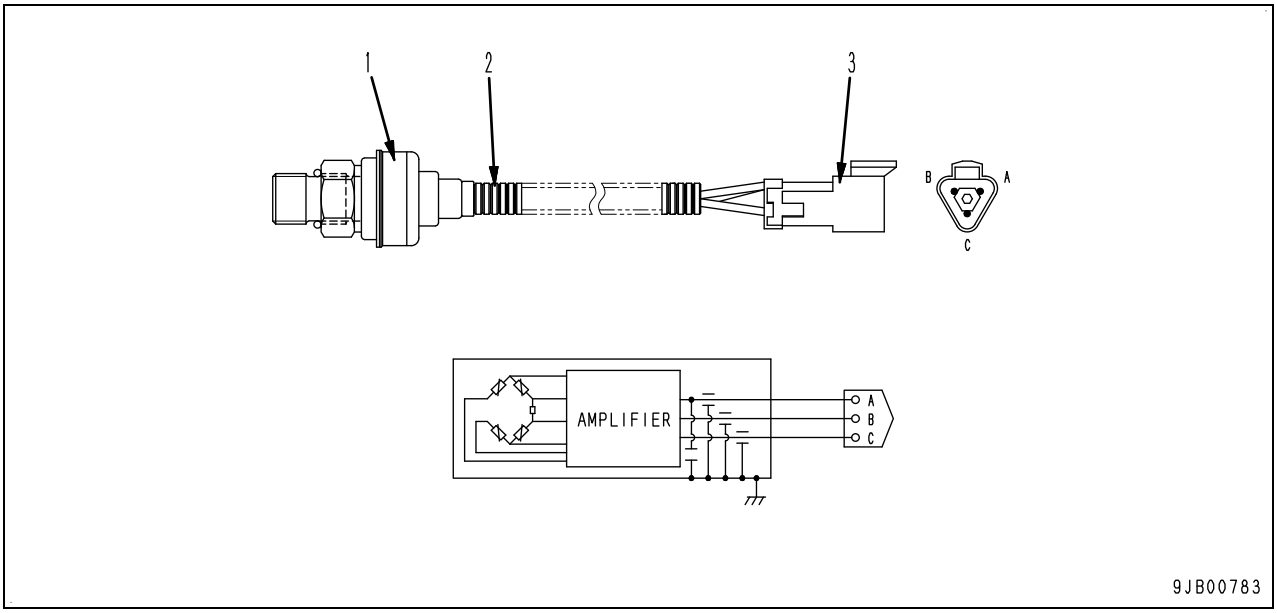


1. Connector 2. Plug 3. Thermistor

Function

- The HST oil temperature sensor and brake oil temperature sensor are installed in the hydraulic pipe of motor 1 and front axle respectively. They generate signals obtained by converting temperature change to resistance change of the thermistor.

HST oil pressure sensor



1. Sensor 2. Lead wire 3. Connector

Function

- This sensor is installed in the motor 2 solenoid block. It measures the oil pressure of HST circuit and generates the signal.

SHOP MANUAL

WHEEL LOADER
WA200-7

Machine model	Serial number
WA200-7	80001 and up

20 Standard value table

Related information on testing and adjusting
Tools for testing and adjusting

Testing/Adjusting item	Sym-bol		Part No.	Part name	Q'ty	Remarks
Testing exhaust gas temperature	A		799-101-1502	Digital thermometer	1	
Testing exhaust gas color	B	1	799-201-9002	Handy smoke checker	1	Bosch index: 0 to 9 levels
		2	Commercially available	Smoke meter	1	
Testing and adjusting valve clearance	C	1	795-799-1131	Gear	1	
		2	Commercially available	Feeler gauge	1	
Testing compression pressure	D	1	795-799-6700	Puller	1	For 107E-2 engine
		2	795-502-1590	Gauge assembly	1	0 to 7 MPa {0 to 70 kg/cm^2}
		3	795-790-4411	Adapter	1	For 107E-2 engine
		4	6754-11-3130	Gasket	1	For 107E-2 engine
		5	Commercially available	Hose	1	Inside diameter of hose: Approximately 15 mm
Testing blowby pressure	E	1	799-201-1506	Blowby checker	1	0 to 10 kPa {0 to 1,000 mmH_2O}
		2	Commercially available	Plug	1	Hose inside diameter: 24 mm
		3	Commercially available	Cap	2	Pipe outside diameter: 25.4 mm
		4	07281-00359	Clamp	2	
Testing engine oil pressure	F	1	799-101-5002	Hydraulic tester	1	Pressure gauge: 2.5, 6, 40, 60 MPa
			790-261-1205	Digital hydraulic tester	1	Pressure gauge: 70 MPa
		2	799-101-5160	Nipple	1	
Testing boost pressure	G		799-201-2202	Boost gauge kit	1	-101 to 200 kPa {-760 to 1,500 mmHg}
Testing fuel pressure	H	1	799-101-5002	Hydraulic tester	1	Pressure gauge: 2.5, 6, 40, 60 MPa
			790-261-1205	Digital hydraulic tester	1	Pressure gauge: 70 MPa
		2	795-471-1450	Adapter	1	8 x 1.25 mm → Rc1/8
			6215-81-9710	O-ring	1	
		3	799-401-2320	Hydraulic tester	1	Pressure gauge: 1 MPa
		4	795-790-5110	Screw	1	
		5	799-201-2202	Boost gauge kit	1	
		6	795-790-5200	Adapter	1	
Testing fuel return rate and leakage	J	1	795-790-4700	Multimeter kit	1	
		2	6164-81-5790	Joint	1	
		3	07206-30812	Joint bolt	1	
		4	6745-71-1130	Seal washer	1	
		5	Commercially available	Measuring cylinder	1	
		6	Commercially available	Stopwatch	1	
		7	Commercially available	Hose	1	Inside diameter 14 mm

Testing boost pressure

Testing tools

Symbol	Part No.	Part name
G	799-201-2202	Boost gauge kit

⚠ **When installing and removing testing tools, be careful not to touch a hot part of the engine.**

⚠ **Place the machine on a level ground, lower the work equipment to the ground, set the parking brake switch and work equipment lock switch in LOCK position, stop the engine, and chock the tires.**

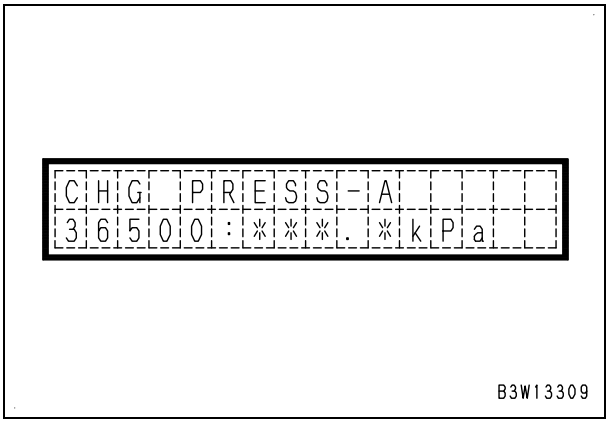
⚠ **Check there is no person around before starting the test.**

★ Check this item under the following conditions.
- Engine coolant temperature: 60 to 100°C
- HST oil temperature: 45 to 55°C
- HST stall + hydraulic stall

Testing with machine monitor

1. Change to real time monitoring function of service mode. For details, see "Special functions of machine monitor".

2. Display "CHG PRESS-A" from monitoring item of machine monitor.
   ★ Code No.36500:
   "CHG PRESS-A" (boost pressure)



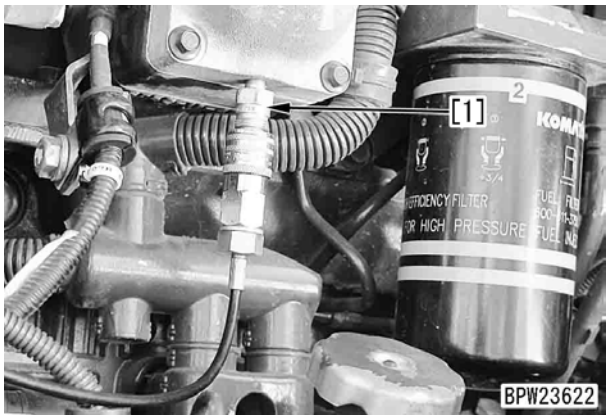
3. Depress the accelerator pedal gradually, and perform HST stall + work equipment circuit relief, and then check the boost pressure.
   ★ Do not keep stalling for 20 seconds or more. Be careful that HST oil temperature does not exceed 120°C.

Measuring by using the testing tools

1. Open the side cover on the right of engine.

2. Remove measurement plug (1) (R1/8).

3. Install nipple [1] of boost gauge kit G, and connect gauge [2] to it.



4. Start the engine to increase the engine coolant temperature to 60 to 100°C.

Testing fuel circuit for leakage

⚠ **Very high pressure is generated in the high-pressure circuit of the fuel system. If fuel leaks while the engine is running, it presents a serious danger that could result in a fire.**

⚠ **After removing or installing the testing tools for the fuel circuit, check the fuel leakage according to the following procedure.**

⚠ **Place the machine on a level ground, lower the work equipment to the ground, set the parking brake switch and work equipment lock switch in LOCK position, stop the engine, and chock the tires.**

★ Clean the engine and the parts around it, and degrease them in advance so that you can check it easily for fuel leakage.

1. Spray color checker (developer) to the fuel supply pump, common rail, fuel injectors, and joints of the high-pressure piping.

2. Start the engine, keep its speed at 1,000 rpm or below, and stop it when the speed is stabilized.

3. Check the fuel piping and component for fuel leakage.
   ★ Check the high-pressure circuit for fuel leakage focusing on the area where the color checker is sprayed.
   ★ If any fuel leakage is detected, repair it and perform the checks from step 1 again.

4. Start the engine, and run it with the accelerator pedal released (low idle).

5. Check the fuel piping and component for fuel leakage.
   ★ Check the high-pressure circuit for fuel leakage focusing on the area where the color checker is sprayed.
   ★ If any fuel leakage is detected, repair it and perform the checks from step 1 again.

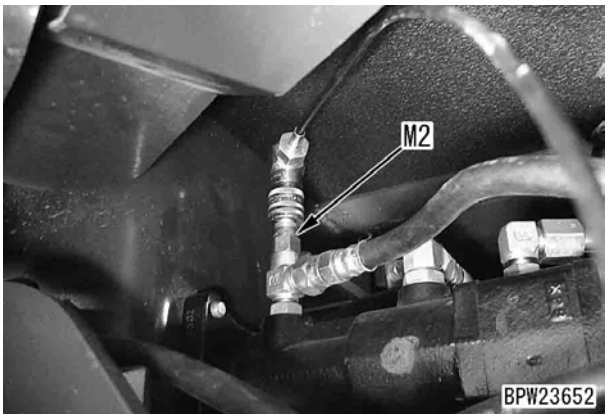
6. Start the engine, depress the accelerator pedal to the stroke end (high idle), and hold it.

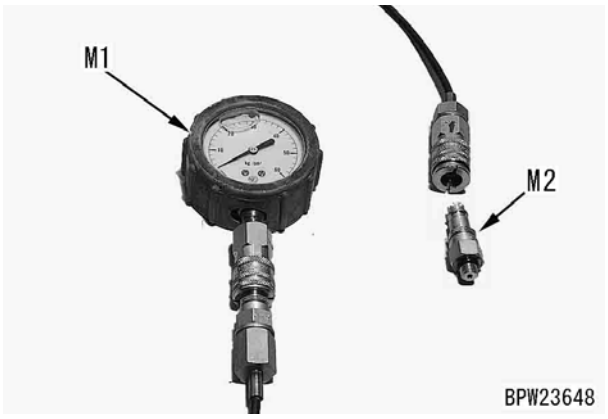
7. Check the fuel piping and component for fuel leakage.
   ★ Check the high-pressure circuit for fuel leakage focusing on the area where the color checker is sprayed.
   ★ If any fuel leakage is detected, repair it and perform the checks from step 1 again.

8. Start the engine, depress the accelerator pedal to the stroke end (high idle), and hold it and apply the load.
   ★ When checking the engine for leakage as it is installed on the machine, stall the torque converter (HST stall) or relieve the hydraulic pump.

9. Check the fuel piping and component for fuel leakage.
   ★ Check the high-pressure circuit for fuel leakage focusing on the area where the color checker is sprayed.
   ★ If any fuel leakage is detected, repair it and perform the checks from step 1 again.
   ★ If no fuel leakage is detected, this check is complete.

3. Install nipple M2, and install gauge M1 (6 MPa {60 kg/cm^2}) to it.



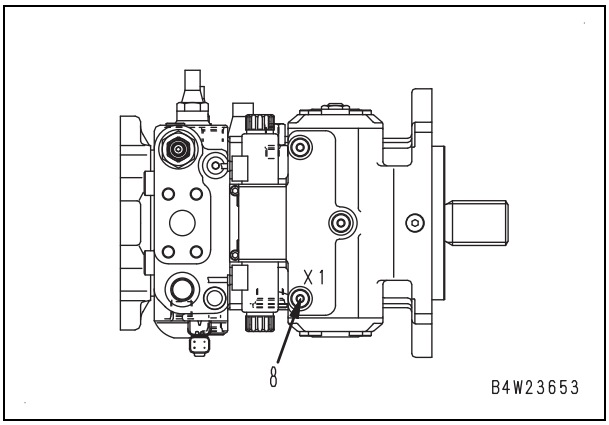


4. Place the directional lever to N (neutral) position, depress the accelerator pedal to the stroke end (high idle), depress and release the brake pedal, and measure the control pressure for both position.
   ★ The brake pedal is connected to the inching valve and control the control oil pressure.
   ★ For standard values, see "Standard value table for machine".

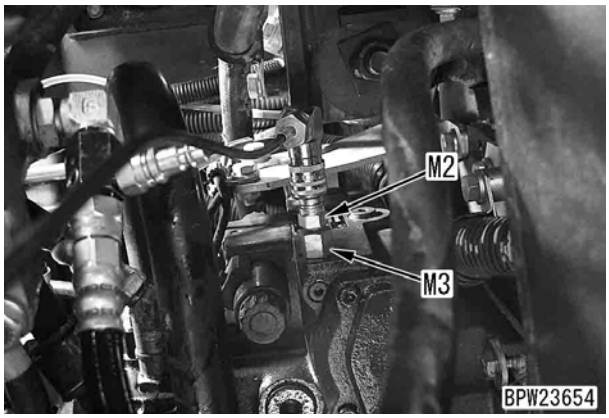
5. After finishing the test, remove the testing tools, and restore the machine.

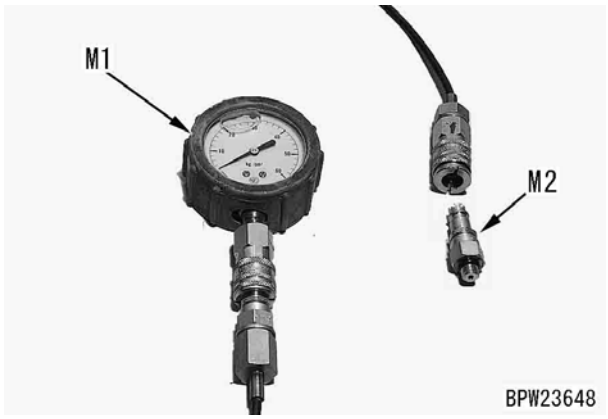
Measuring servo piston operating oil pressure

1. Take out plug (8) (G 1/4) (width across flats for hexagonal head wrench: 8 mm) for measuring servo piston operating oil pressure under the machine.
   - Plug (8): Forward side (port: X1)



2. Install adapter M3, and install nipple M2 and gauge M1 (6 MPa {60 kg/cm^2}) to it.





Adjusting

★ When the accumulator charge cut-out pressure is adjusted, the cut-in pressure also changes in proportion to the valve area ratio.

1. Loosen lock nut (4) of unload relief valve (accumulator charge cut-out valve) (3), and turn adjustment screw (5) to adjust.
   ★ Rotate the adjustment screw:
   - turned clockwise, the pressure is increased.
   - turned counterclockwise, the pressure is decreased.

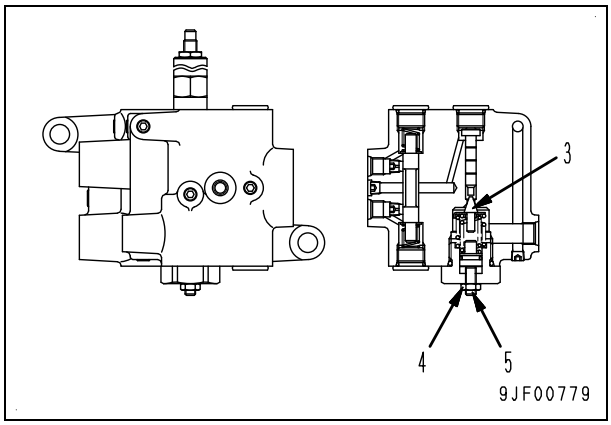
   ★ Quantity of pressure adjustment per turn of adjustment screw:

   1.45 MPa {14.8 kg/cm^2}

2. After finishing the adjustment, tighten lock nut (4).

   Lock nut (4):

   11.8 to 16.7 Nm {1.2 to 1.7 kgm}



   ★ After finishing adjustment, check the accumulator charge cut-in and cut-out pressures again according to the above measuring procedure.

Bleeding air from each part

Bleeding air from work equipment PPC circuit

Operate each work equipment control lever, and relieve for approximately 1 minute while holding it with stroke end.
However, for boom LOWER direction, set the work equipment control lever with floating at the lowest, and hold it.
Perform this operation once for each stroke end.

Bleeding air from cylinder

1. Start the engine, and run it at low idle for approximately 5 minutes.

2. With the accelerator pedal released (low idle), raise and lower the boom 4 to 5 times.
   ★ Stop the piston rod at approximately 100 mm before stroke end, and be careful not to relieve the circuit.

3. Depress the accelerator pedal to the stroke end (high idle), and then perform operation of step 2. Then, operate the piston rod to the stroke end with the accelerator pedal released (low idle) to relieve the circuit.

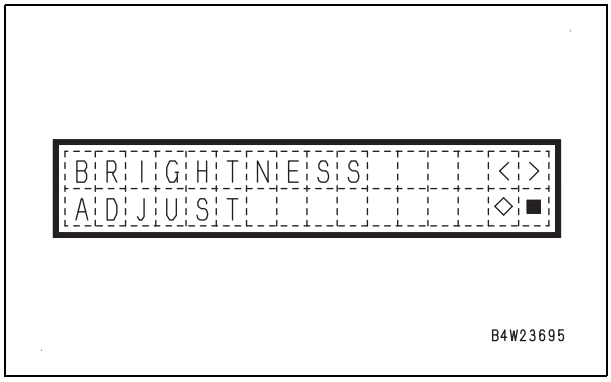
4. Perform the same operation as the one in steps 2 and 3 for the bucket and steering as well.
   ★ When a cylinder is replaced, perform this operation before connecting the piston rod.

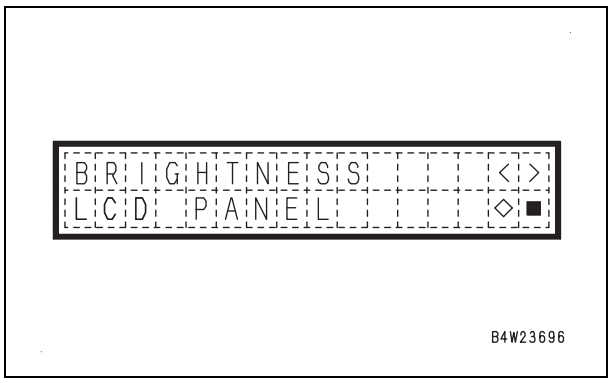
9. Monitor brightness adjustment function

You can adjust the brightness of the machine monitor in 7 levels by switch operations.

★ You can separately adjust the brightness of monitor part and liquid crystal part.

★ For details, see Operation and Maintenance Manual, "Other function of machine monitor".





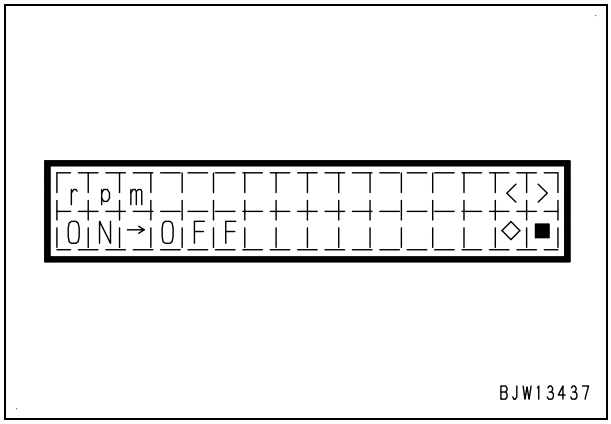
10. Display/Non-display setting function for engine speed in character display

This function sets ON/OFF of engine speed display in character display on the machine monitor.

★ This function is valid only when "RPM/SPEED" of option selection is ON.

★ For details, see Operation and Maintenance Manual, "Other function of machine monitor".

★ When selecting, it sounds pip, pip.



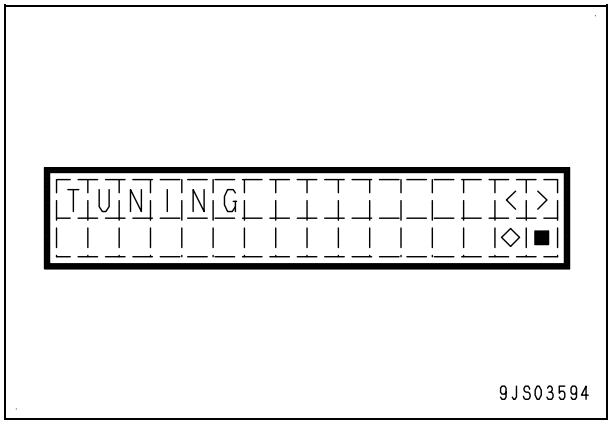
MONITOR PANEL [Machine monitor system]				
No.	Monitoring code	Input/output signal	Item displayed	Contents of ON/OFF switch
5	40904	D-IN-32	Load meter subtotal switch (Load meter specifications)	Press the switch = ON (GND)/OFF (OPEN)
		D-IN-33	Load meter cancel switch (Load meter specifications)	Press the switch = ON (GND)/OFF (OPEN)
		D-IN-34	High beam (dimmer switch)	High beam = ON(GND)/OFF(OPEN)
		D-IN-35	-	-
		D-IN-36	-	-
		D-IN-37	> switch	Press switch =ON(GND)/OFF(OPEN)
		D-IN-38	< switch	Press switch =ON(GND)/OFF(OPEN)
		D-IN-39	-	-
6	40925	D-OUT-0	Alarm buzzer	Output ON =ON(GND)/OFF(OPEN)
		D-OUT-1	System operating lamp	Output ON =ON(GND)/OFF(OPEN)
		D-OUT-2	-	-
		D-OUT-3	-	-

7-5. Adjusting boom angle sensor (Raise)
★ The menu is displayed but it is not used.

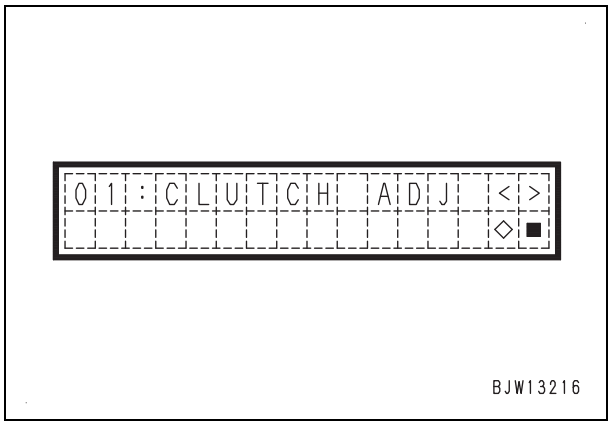
7-6. Adjusting boom angle sensor (Lower)
★ The menu is displayed but it is not used.

7-7. Adjusting travel speed for actuating ECSS
★ This function adjusts the travel speed for actuating/canceling ECSS.
★ Initial setting of travel speed for actuating ECSS is 5 km/h.
★ The travel speed for canceling ECSS is 1 km/h slower than the travel speed for actuating ECSS.
Example:
- When the travel speed for actuating ECSS is 5 km/h, the travel speed for canceling ECSS is 4 km/h.
- When the travel speed for actuating ECSS is 8 km/h, the travel speed for canceling ECSS is 7 km/h.

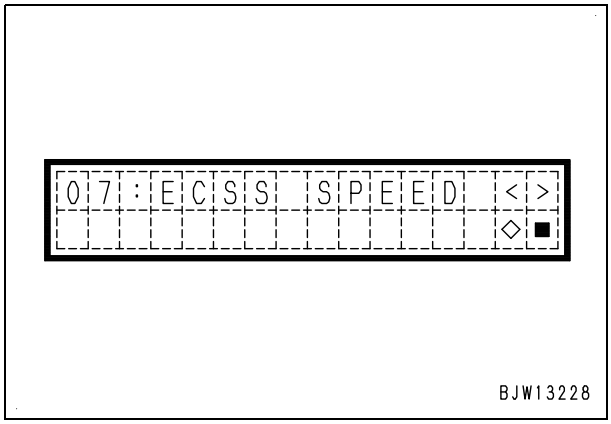
1) On the menu screen of the service mode, select adjusting function ("TUNING") screen.



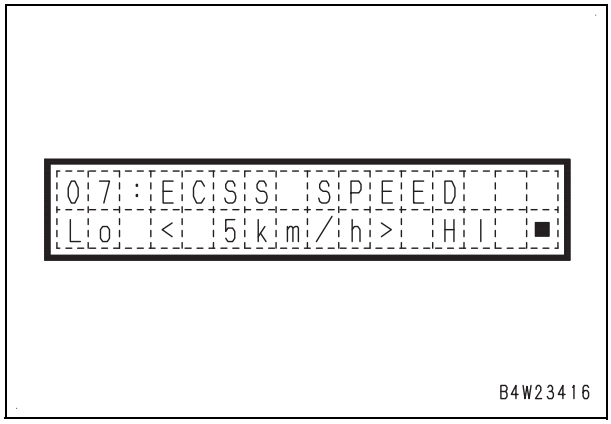
2) Hold down "◇" switch for 5 seconds or longer. When the screen becomes non-display state, release your finger to display the next screen.



3) Set the display to "07: ECSS SPEED" by operating switches "<" and ">".



4) Press "◇" switch to enter.
★ After entering, the screen changes to "07: ECSS SPEED" screen.



5) Press ">" switch to raise the travel speed for actuating ECSS.
★ The speed for actuating increases 1 km/h per 1 switch operation.
★ It is adjustable to 8 km/h maximum.
6) Press "<" switch to lower the travel speed for actuating ECSS.
★ The speed for actuating decreases 1 km/h per 1 switch operation.
★ It is adjustable to 5 km/h minimum.
7) When the speed reaches desired setting value, press "■" switch to complete the setting.

7-8. Fixing auto idle stop time
★ This function selects the range of setting time of auto idle stop in operator mode.
★ This function is displayed only when "IDLE STOP" is "ADD" by option selection.

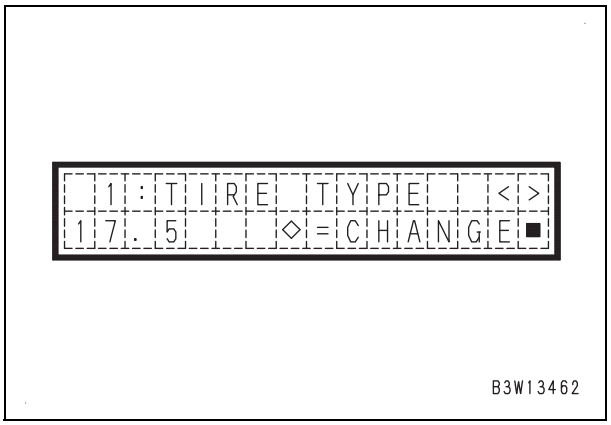
10-2. Option selection of tire type

★ Select tire type ("1: TIRE TYPE") from the optional equipment installation setting list.
Reference:
- This screen is displayed at first when the display moves from option selecting function "OPTIONAL SELECT" screen.
- "17.5" is displayed as a default which is the tire size at delivery.

★ Each time you press "◇" switch, tire type changes from small to large in order.
Selectable size: 17.5, 20.5

★ "15.5" displayed on the monitor is not be used.

★ When the tire size is changed, you will hear the sound (pip, pip) which indicates the completion of operation registration.



10-3. Setting tire deviation option

★ Select tire deviation option ("6:TIRE SIZE") from the optional equipment installation setting list.

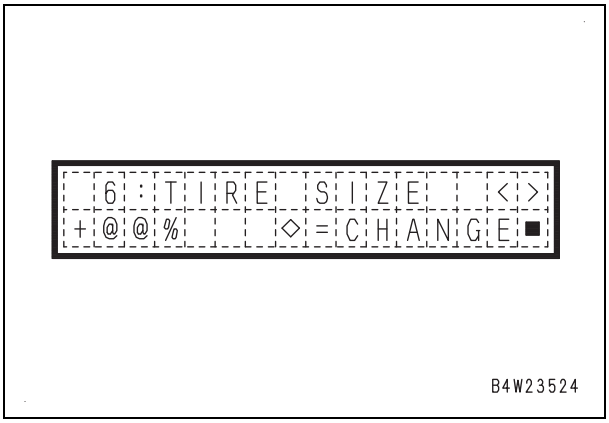
★ Each time you press "◇" switch, "@@"% is switched in the following order.

★ It proceeds from "+00" to "-12", and if you press "◇" switch, it returns to "+00".

Order	No.1	No.2	No.3	No.4	No.5	No.6	No.7
@@	+00	+02	+04	+06	+08	+10	+12

Order	No.8	No.9	No.10	No.11	No.12	No.13	No.14
@@	-02	-4	-6	-8	-10	-12	+00

★ After switching, you will hear the sound (pip, pip) which indicates the completion of operation registration.



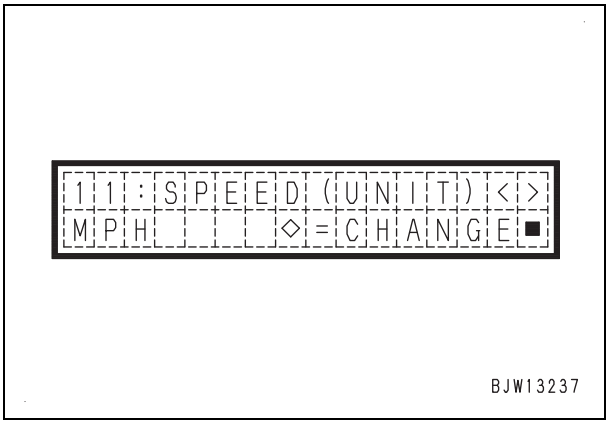
10-4. Option selection of the unit for travel speed

★ When SI unit is selected at factory shipment, this item is not displayed. (The unit is fixed to km/h.)

★ Select speed unit ("11: SPEED(UNIT)") from the optional equipment installation setting list.

★ Each time "◇" switch is pressed, the speed unit changes.
Selectable item: MPH (default), km/h

★ After the unit is changed, you will hear the sound (pip, pip) which indicates the completion of operation registration.



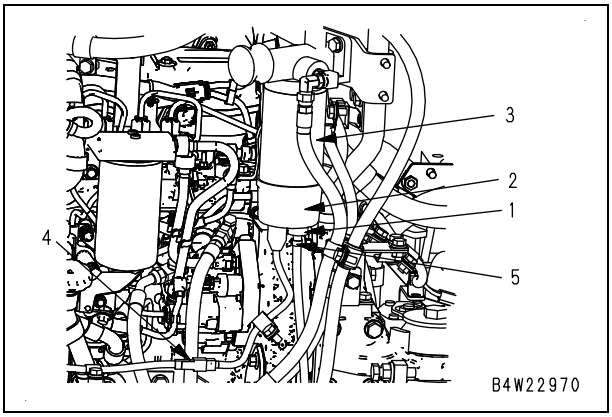
11. Machine model selection function (MACHINE WA***)

★ You can change the machine model setting of the machine monitor by using the machine model selection function.

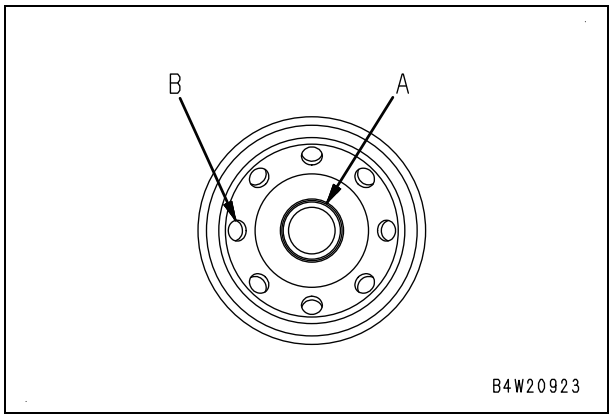
★ After the machine monitor is initialized, perform machine model selection first.

★ When machine model selection is performed, the option selection setting is reset. When machine model selection is performed, perform all option selections starting from the beginning of option selection.

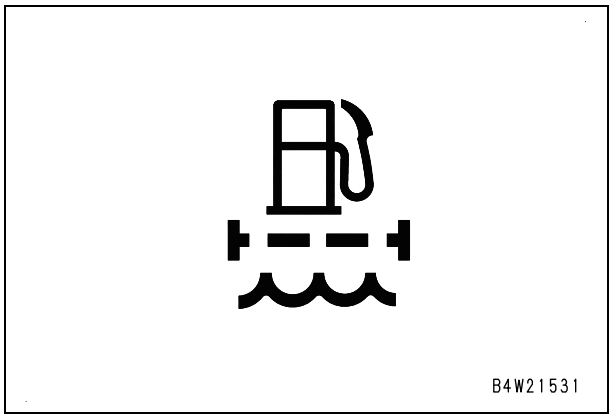
6. Remove connector (4). Wrap the removed connector in a plastic bag so that it is not exposed to fuel, oil, and water.
7. Turn transparent cup (2) counterclockwise by using the filter wrench, and remove it. (This cup is to be reused.)
8. Turn filter cartridge (3) counterclockwise by using the filter wrench, and remove it.
9. Install currently removed transparent cup (2) to the bottom of the new filter cartridge. At this time, be sure to replace the O-ring with a new one.
10. When installing the transparent cup, apply a thin film of oil to the packing surface, contact it to the sealing surface of filter cartridge (3), and then tighten it 1/4 to 1/2 turn. Tightening transparent cup (2) excessively may damage the O-ring, resulting in fuel leak. Tightening it loosely also may cause fuel leak from the clearance to the O-ring, so be sure to follow the tightening angle.



11. Clean the filter head, fill the new filter cartridge with clean fuel, apply a thin film of oil to the packing surface, and then install the filter cartridge to the filter head.
    - ⚠ **When pouring fuel, do not remove cap (A) at the center. Always fill with fuel from dirty side of 8 small holes (B).**
    - ⚠ **After pouring fuel, remove cap (A) at the center and install the fuel filter.**
    - ⚠ **When pouring fuel, use clean fuel and take care to prevent any dirt or dust from entering into it. In particular, since center portion is the clean side, do not remove cap (A) when pouring fuel. Be careful to prevent dirt or dust from entering into the center clean side.**



12. When installing the cartridge, tighten it 3/4 turn after the packing surface contacts the sealing surface of the filter head. If the filter cartridge is tightened excessively, the packing will be damaged and this leads to fuel leak. If the filter cartridge is tightened loosely, fuel will also leak from the clearance to the packing. So, be sure to observe the tightening angle.
13. Make sure that drain valve (1) is securely closed.
14. Remove the plastic bag wrapping connector (4), then connect connector (4).
    - ★ If water gets on connector (4), the sensor may malfunction and the water separator caution lamp may light up. When removing connector (4), be extremely careful to prevent water from attaching to connector (4).
    - ★ If water gets on connector (4), dry it completely before connecting it.



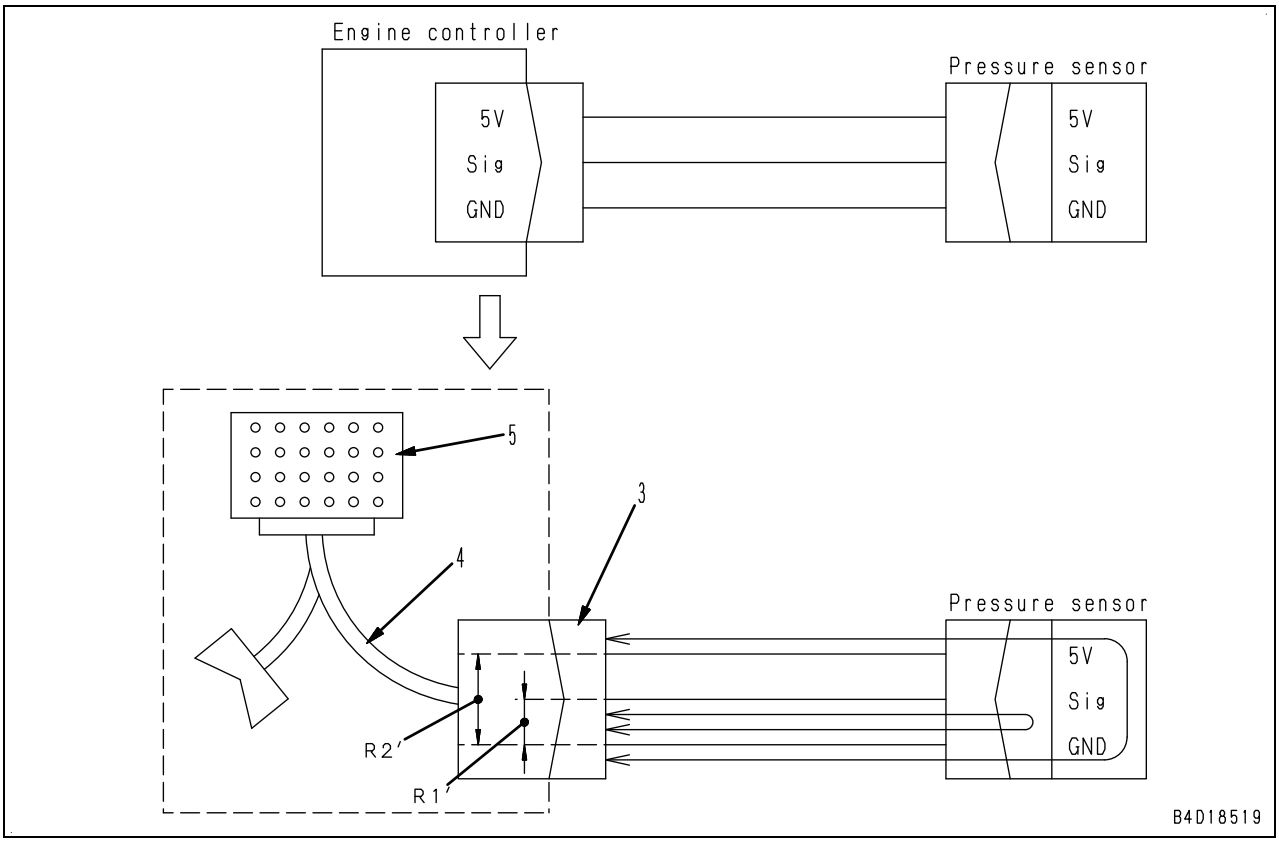
15. On completion of replacement of filter cartridge (3), perform air bleeding.
16. Fill up the fuel tank with fuel (to the level where the float is at its highest position).
17. Loosen the knob of feed pump (6) to pull it out, and then pump it in and out until the knob becomes heavy to move.

- If the voltage is abnormal, repair or replace the alternator.

c15. Check of battery relay operation sound (with starting switch in ON or OFF position)

1. Open the left engine side cover.
2. Turn the starting switch to the ON and OFF positions, and check whether or not the battery relay operation sound is heard.

- If no operation sound is heard, check the related circuits, referring to the troubleshooting for E-1 in the E mode troubleshooting.
- If the related circuit is normal, replace the battery relay.



Measuring location of pressure sensor and list of reference values

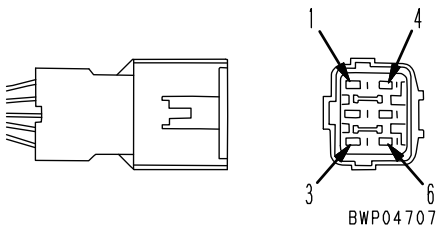
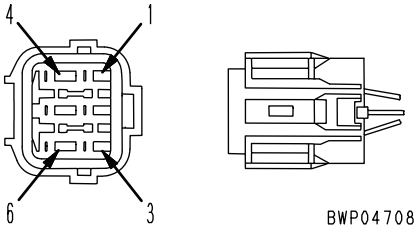
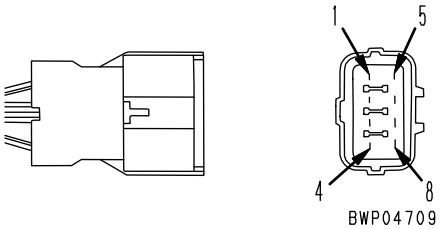
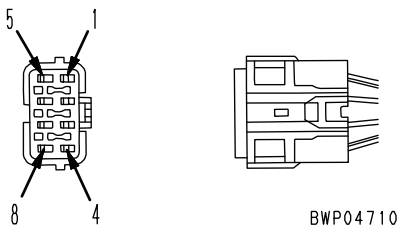
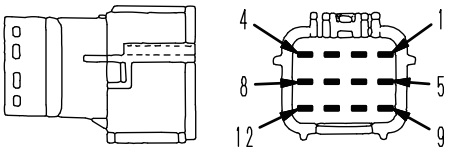
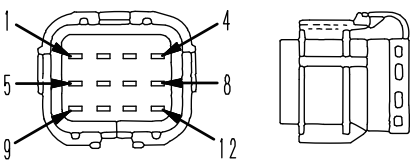
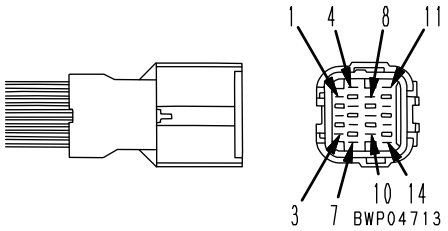
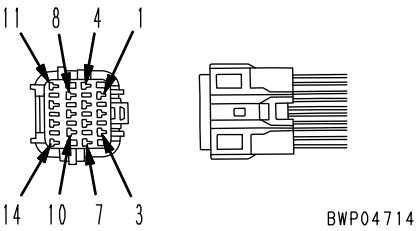
Sensor	Measuring location of sensor pin	Measured resistance inside sensor (reference value)	Remarks
Charge pressure sensor	R2: Between (2) and (4)	Approx. 100 Ω	The sensor is commonly used between 95 and 107 engines and 114 engines.
	R1: Between (1) and (4)	Approx. 200 Ω	

*: Sensor connectors to be disconnected when R2' is measured are shown below. (See the circuit diagram related to each code.)

- When measuring R2' of charge pressure sensor (CA123):
  Connectors of the ambient pressure sensor, CAM sensor, and crankcase pressure sensor

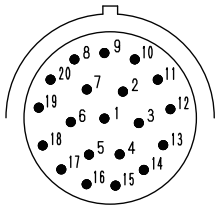
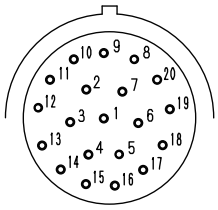
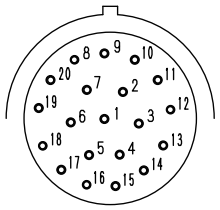
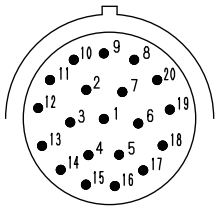
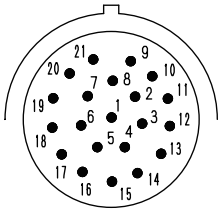
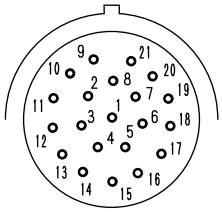
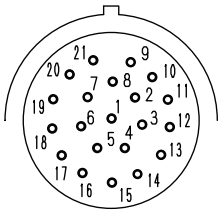
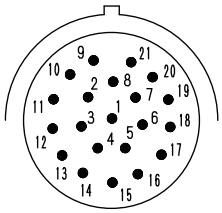
Memorandum for measurement (for measuring locations, see the circuit diagram related to each code)

Sensor	Sensor body (Measuring location of sensor pin)	Measured value	With sensor connected to wiring harness (Measurering locations of harness side of engine controller)	Measured value
Charge pressure sensor	R2: Between (2) and (4)		R2': Between (60) and (59) (*)	
	R1: Between (1) and (4)		R1': Between (15) and (59)	

No. of pins	SWP type connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
6	 BWP04707	 BWP04708	799-601-7050 (T-adapter)
	Part No. : 08055-10681	Part No. : 08055-10691	
8	 BWP04709	 BWP04710	799-601-7060 (T-adapter)
	Part No. : 08055-10881	Part No. : 08055-10891	
12	 BWP04711	 BWP04712	799-601-7310 (T-adapter)
	Part No. : 08055-11281	Part No. : 08055-11291	
14	 BWP04713	 BWP04714	799-601-7070 (T-adapter)
	Part No. : 08055-11481	Part No. : 08055-11491	

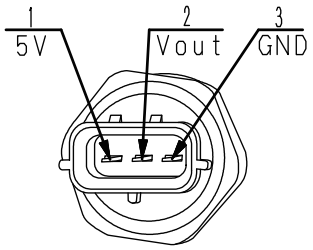
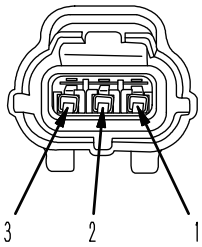
B4D18191

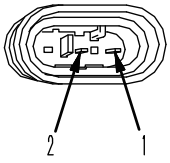
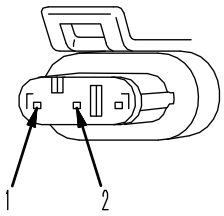
[The pin No. is also marked on the connector (electric wire insertion end)]

Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	Testing connection use special tool Part No.
18-20 (3)	Pin (male terminal)	Socket (female terminal)	799-601-9230 (T-adapter)
	 BWP05009	 BWP05010	
	Part No. :08191-31201, 08191-31202	Part No. :08191-34101, 08191-34102	
	Socket (female terminal)	Pin (male termial)	799-601-9230 (T-adapter)
	 BWP05011	 BWP05012	
	Part No. :08191-32201, 08191-32202	Part No. :08191-33101, 08191-33102	
18-21 (4)	Pin (male terminal)	Socket (female terminal)	799-601-9240 (T-adapter)
	 BWP05013	 BWP05014	
	Part No. :08191-41201, 08191-42202	Part No. :08191-44101, 08191-44102	
	Socket (female terminal)	Pin (male termial)	799-601-9240 (T-adapter)
	 BWP05015	 BWP05016	
	Part No. :08191-42201, 08191-42202	Part No. :08191-43101, 08191-43102	

B4D18406

AMP connelor for engine

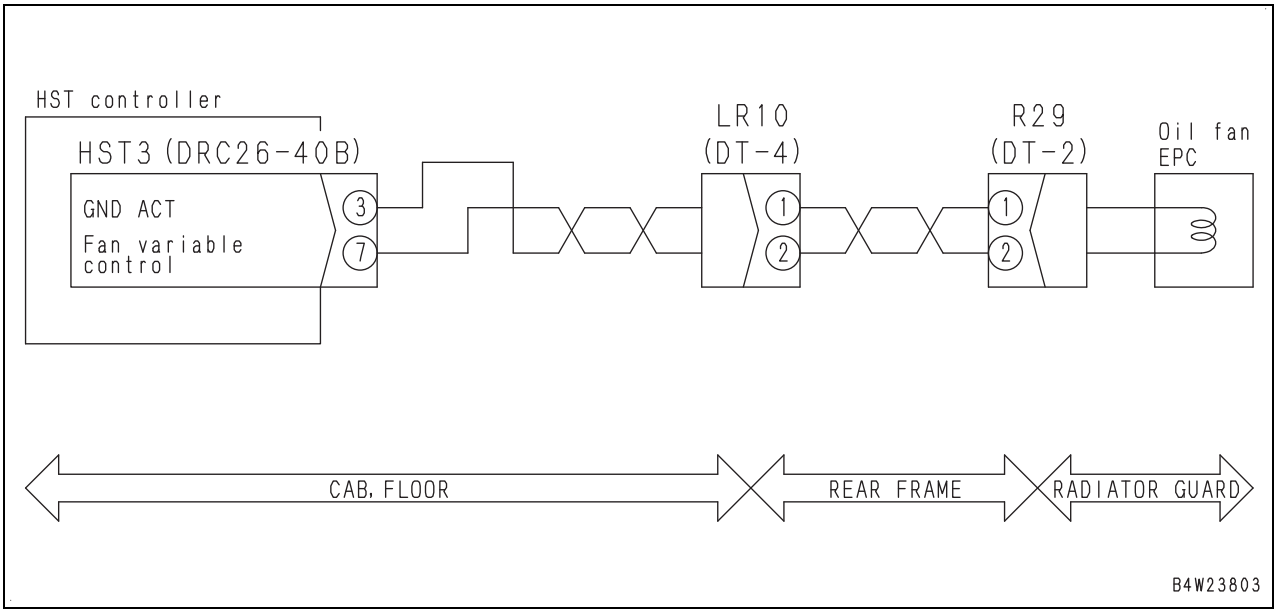
No. of pins	Common rail (fuel) pressure sensor (95, 125, 140 engine)		
	Sensor side (plue)	Harness side (receptacle)	Testing connection use special tool Part No.
3			799-601-9420 (T-adapter) (kit:799-601 -4101) (kit:799-601 -4201)
	—	—	

No. of pins	Turbocharger speed sensor (107, 114 engine)		
	Sensor side (plue)	Harness side (receptacle)	
3			799-601-4660 (Socket) (kit:799-A65 -4600)
	☆ Without pin (3)	☆ Without pin (3)	

B4W21625

Failure code	Failure (displayed on the screen)	Device in charge	Action level	Record category	Remarks
CA452	Failure code [CA452] Common Rail Pressure Sensor Low Error	ENG	L03	Electrical system	
CA466	Failure code [CA466] KVGT Motor Driver Position Error	ENG	L03	Electrical system	
CA488	Failure code [CA488] Chg Air Temp High Torque Derate	ENG	L03	Electrical system	
CA515	Failure code [CA515] Rail Pressure Sensor Sup Volt High Error	ENG	L03	Electrical system	
CA516	Failure code [CA516] Rail Pressure Sensor Sup Volt Low Error	ENG	L03	Electrical system	
CA553	Failure code [CA553] Common Rail Pressure High Error 1	ENG	L01	Electrical system	
CA555	Failure code [CA555] Crankcase Press High Error 1	ENG	L01	Electrical system	
CA556	Failure code [CA556] Crankcase Press High Error 2	ENG	L03	Electrical system	
CA559	Failure code [CA559] Rail Press Low Error 1	ENG	L01	Electrical system	
CA689	Failure code [CA689] Engine Ne Speed Sensor Error	ENG	L01	Electrical system	
CA691	Failure code [CA691] Intake Air Temp Sens High Error	ENG	L01	Electrical system	
CA692	Failure code [CA692] Intake Air Temp Sens Low Error	ENG	L01	Electrical system	
CA697	Failure code [CA697] ECM Internal Temperature Sensor High Error	ENG	L01	Electrical system	
CA698	Failure code [CA698] EMC Internal Temperature Sensor Low Error	ENG	L01	Electrical system	
CA731	Failure code [CA731] Engine Bkup Speed Sensor Phase Error	ENG	L01	Electrical system	
CA778	Failure code [CA778] Engine Bkup Speed Sensor Error	ENG	L01	Electrical system	
CA1117	Failure code [CA1117] Persistent Data Lost Error	ENG	L04	Electrical system	
CA1695	Failure code [CA1695] Sensor 5 Supply Voltage High Error	ENG	L03	Electrical system	
CA1696	Failure code [CA1696] Sensor 5 Supply Voltage Low Error	ENG	L03	Electrical system	
CA1843	Failure code [CA1843] Crankcase Press Sens High Error	ENG	L01	Electrical system	
CA1844	Failure code [CA1844] Crankcase Press Sens Low Error	ENG	L01	Electrical system	
CA1896	Failure code [CA1896] EGR Valve Stuck Error	ENG	L03	Electrical system	
CA1942	Failure code [CA1942] Crankcase Press Sens In-Range Error	ENG	L01	Electrical system	
CA1961	Failure code [CA1961] EGR Motor Driver IC Over Temperature Error	ENG	L03	Electrical system	
CA2185	Failure code [CA2185] Throttle Sensor Supply Voltage High Error	ENG	L03	Electrical system	
CA2186	Failure code [CA2186] Throttle Sensor Supply Voltage Low Error	ENG	L03	Electrical system	
CA2249	Failure code [CA2249] Rail Press Low Error 2	ENG	L03	Electrical system	

Circuit diagram related to fan motor EPC solenoid

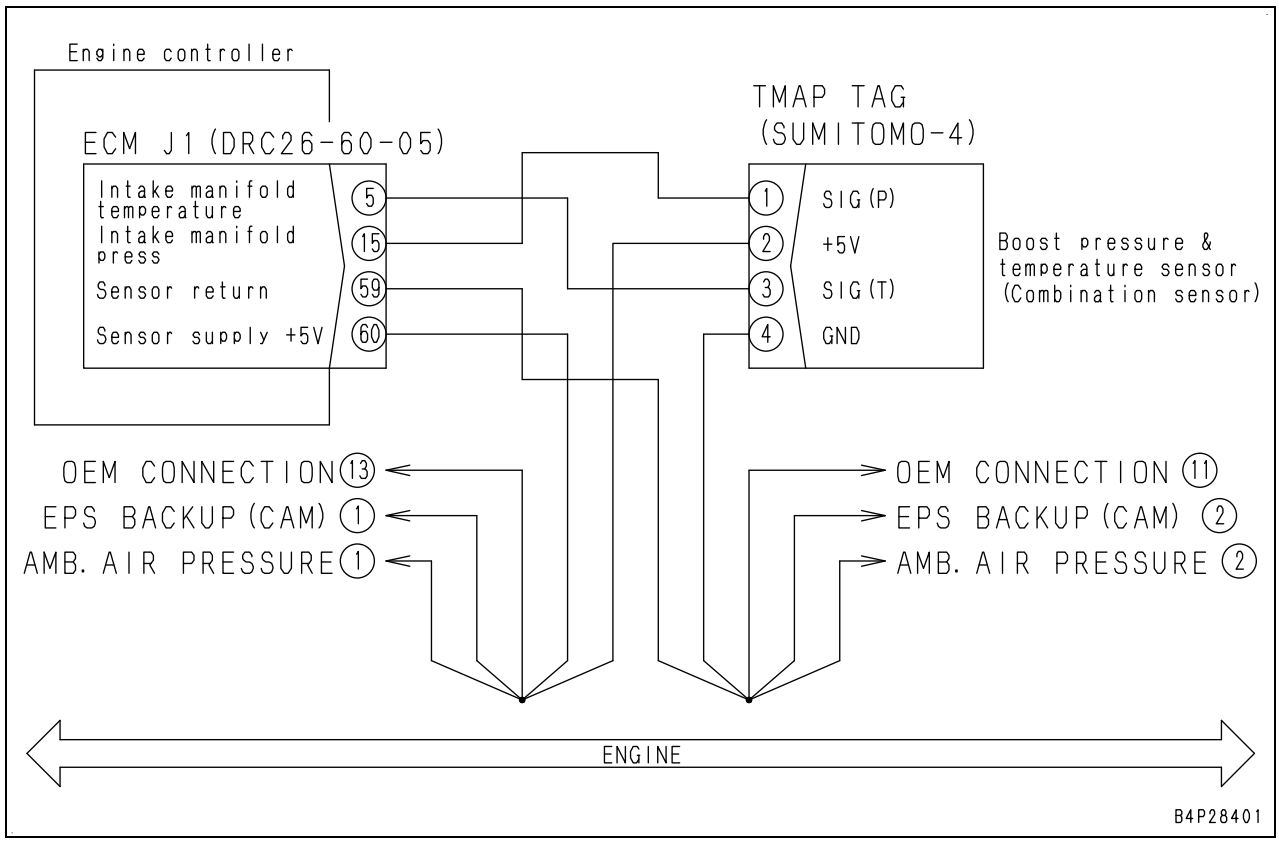


Failure code [B@CRNS] HST Oil Temperature Overheat

Action level	Failure code	Failure	HST Oil Temperature Overheat (Machine monitor system)
L02	**B@CRNS**		
Failure contents	• An overheat of HST oil (105°C or higher) was detected.		
Action of machine monitor	• Lights the HST oil temperature caution lamp. • Lights the centralized warning lamp, and sounds the warning buzzer. • If cause of failure disappears, system resets itself. (Continued oil temperature below 105°C was detected.)		
Problem appearing on the machine	• If machine is used as it is, hydraulic components such as HST pump, HST motor, work equipment steering pump, and fan motor, etc. may be damaged.		
Related information	• The HST oil temperature can be checked with monitoring function. (Monitoring code: HST-04408-HST OIL TEMP (°C)) (Monitoring code: HST-04409-HST OIL TEMP (V))		

No.	Cause	Procedure, measuring location, criteria, and remarks
1	Overheated HST oil (when the system works properly)	HST oil may overheat. Check and remove cause of failure.
2	Defective HST oil temperature sensor system	Perform troubleshooting for failure code [**DGH1KX**].
3	Defective HST controller	If no failure is found by check on cause 2 but if the HST oil temperature of monitoring function (code: HST-04408) largely differs from the actual oil temperature, the HST controller may be defective.
4	Defective machine monitor	If no failure is found by above checks, machine monitor is defective.

Circuit diagram related to charge (boost) temperature sensor



Failure code [CA272] IMV/PCV1 Open Error

Action level	Failure code	Failure	IMV/PCV1 Open circuit (Engine controller system)
L03	**CA272**		
Failure contents	• The drive circuit of supply pump actuator is opened.		
Action of controller	None in particular		
Problem appearing on the machine	• Engine rotates but unstable. • Common rail fuel pressure increases above the specified pressure.		
Related information	• Method of reproducing failure code: Turn starting switch to ON position. • This sensor troubleshooting cable socket has female connectors only. As the female connector at the sensor harness side cannot be plugged into this socket (T-branch is not provided), an open circuit cannot be checked.		

No.	Cause	Procedure, measuring location, criteria, and remarks		
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in "c: Electrical equipment" in "Checks before troubleshooting" of "Related information on troubleshooting", and check it. 2. Turn the starting switch to ON position.		
		If this failure code is not displayed, wiring harness connector is defective. ★ If this failure code is displayed, perform following checks.		
2	Defective supply pump actuator	1. Turn the starting switch to OFF position. 2. Disconnect connector IMV.		
		Resistance	Between IMV (male) (1) and (2)	1 to 5 Ω
			Between IMV (male) (1) and the ground	Min. 100 kΩ
3	Open or short circuiting in the wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connector ECM J1, and connect T-adapter to the female side.		
		Resistance	Between ECM J1 (female) (30) and (40)	1 to 5 Ω
4	Ground fault in wiring harness (Contact with GND circuit)	★ If no failure is found by check on cause 3, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connectors ECM J1 and IMV, and connect T-adapter to female side of ECM J1.		
		Resistance	Between ECM J1 (female) (30) and the ground	Min. 100 kΩ
			Between ECM J1 (female) (40) and the ground	Min. 100 kΩ
5	Hot short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connector IMV. 3. Insert T-adapter into connector ECM J1. 4. Hold the starting switch in ON position (with the IMV connector disconnected) for more than 1 minute. Then start the measurement. ★ Average voltage is displayed by the PWM.		
		Voltage	Between ECM J1 (30) and (40)	Max. 3 V
6	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Failure code [CA356] Mass Air Flow Sensor High Error

Action level	Failure code	Failure	Mass Air Flow Sensor High Error (Engine controller system)
L03	**CA356**		
Failure contents	• High frequency input error occurs in the mass air flow sensor signal circuit.		
Action of controller	• Sets the inlet flow to the fixed value (10 kg/min) and operates the engine. • Closes EGR valve. • Limits engine output and runs engine.		
Problem appearing on the machine	• Engine power drops.		
Related information	• Since the sensor output is approximately 5V pulse waveforms, you cannot use multimeter for measurement. • The mass air flow sensor and the intake air temperature sensor are integrated into one device. • Method of reproducing failure code: Turn starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria, and remarks			
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in "c: Electrical equipment" in "Checks before troubleshooting" of "Related information on troubleshooting", and check it. 2. Turn the starting switch to ON position.			
		If this failure code is not displayed, wiring harness connector is defective. ★ If this failure code is displayed, perform following checks.			
2	Defective sensor power supply system	If failure code [**CA3419**] or [**CA3421**] is also indicated, perform troubleshooting for it first.			
3	Defective mass air flow sensor (Internal defect)	1. Turn the starting switch to OFF position. 2. Disconnect connector R93. 3. Turn the starting switch to ON position.			
		If this failure code changes to [**CA357**], the mass air flow sensor is defective.			
4	Defective sensor power supply system	1. Prepare with starting switch in OFF position. 2. Disconnect connector R93, and connect T-adapter to the female side. 3. Turn the starting switch to ON position.			
		Voltage	Between R93 (female) (2) and (3)	Power supply	Approx. 12 V
5	Open circuit in wiring harness (Wire breakage or connector contact failure)	★ If no failure is found by check on cause 4, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connectors ECM J1 and R93, and connect T-adapter to each female side. ★ Open circuit of GND line			
		Resistance	Between ECM J1 (female) (22) and R93 (female) (3)		Max. 10 Ω
6	Short circuiting in the wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connectors ECM J1 and R93, and connect T-adapter to the female side of ECM J1. ★ Check by using the multimeter in continuity mode.			
		Resistance	Between ECM J1 (female) (23) and each pin, other than pin (23)		No continuity (no sound is heard)
7	Defective engine controller	If no failure is found by above checks, the engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)			

Failure code [CA441] Battery Voltage Low Error

Action level	Failure code	Failure	Battery Voltage Low Error (Engine controller system)
L04	**CA441**		
Failure contents	• Low voltage occurs in the controller power circuit.		
Action of controller	• Sets power supply voltage tot fixed value (24 V) and runs engine.		
Problem appearing on the machine	• Engine stops (if engine is running). • Engine startability is poor (if engine is stopped).		
Related information	• Method of reproducing failure code: Turn starting switch to ON position. • The power voltage of engine controller can be checked with monitoring function. (Code: ENGINE, 03203 POWER SUPPLY (V))		

No.	Cause	Procedure, measuring location, criteria, and remarks		
1	Loose or corroded battery terminal	Battery terminal may be loose or corroded. Check it.		
2	Loose terminal or partial open circuit at terminal	1. Turn the starting switch to OFF position. Check the voltage at each terminal of alternator, battery relay, and ground terminals E14 and E15.		
3	Defective wiring harness connector	See descriptions of wiring harness and connectors in "c: Electrical equipment" in "Checks before troubleshooting" of "Related information on troubleshooting", and check it.		
4	Improper battery voltage	1. Turn the starting switch to OFF position. 2. Perform troubleshooting with the starting switch at OFF position and when starting the engine.		
		Voltage	Between battery terminals (+) and (-).	20 to 30 V
5	Defective alternator	1. Turn the starting switch to OFF position. 2. Insert T-adapter into connector E02. 3. Start engine. (Engine speed: Middle or faster)		
		Voltage	Between E02 (1) or alternator R terminal and the ground	27.5 to 29.5 V
6	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.) • Reference 1. Turn starting switch to OFF position, and turn the battery disconnect switch OFF. 2. Insert T-adapter into connector EC3. 3. Turn the battery disconnect switch ON. 4. Measure the voltage when the starting switch is in OFF position and when you start the engine.		
		Voltage	Between EC3 (1) and (21)	20 to 30 V
			Between EC3 (2) and (22)	20 to 30 V
			Between EC3 (11) and (31)	20 to 30 V
			Between EC3 (12) and (32)	20 to 30 V

Failure code [CA553] Common Rail Pressure High Error 1

Action level	Failure code	Failure	Common rail pressure high error 1 (Engine controller system)
L01	**CA553**		
Failure contents	• A higher pressure (than the specified pressure) continues more than 10 seconds in common rail pressure sensor signal circuit.		
Action of controller	• None in particular		
Problem appearing on the machine	• Engine output lowers.		
Related information	• The signal voltage from common rail pressure sensor can be checked with the monitoring function. (Code: ENGINE, 36401 RAIL PRESS (V)) • The common rail pressure detected by the common rail pressure sensor can be checked with the monitoring mode function. (Code: ENGINE, 36400 RAIL PRESS (MPa)) • Method of reproducing failure code: Start the engine.		

No.	Cause	Procedure, measuring location, criteria, and remarks
1	Defective relevant system	If other failure codes are also displayed, perform troubleshooting for them.
2	Improper fuel is used.	As the improper fuel may be used, check it (for a high viscosity).
3	Defective common rail pressure sensor power system	As an electrical failure of common rail pressure sensor is suspected, troubleshoot for failure codes [**CA451**] and [**CA452**].
4	Defective mechanical system of common rail pressure sensor	As the mechanical system of common rail pressure sensor may be defective, check it.
5	Defective overflow valve	As the spring damage, seat wear, or ball stuck of overflow valve is suspected, check it.
6	Clogged overflow pipe	As the overflow pipe may be clogged, check it.
7	Defective pressure limiter	As the mechanical failure of pressure limiter is suspected, check it.

Fig. 1

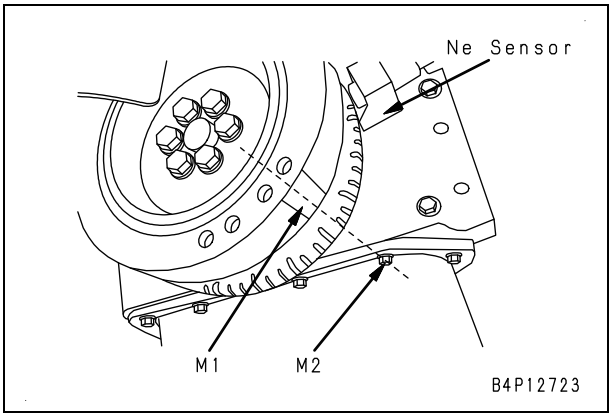


Fig. 2

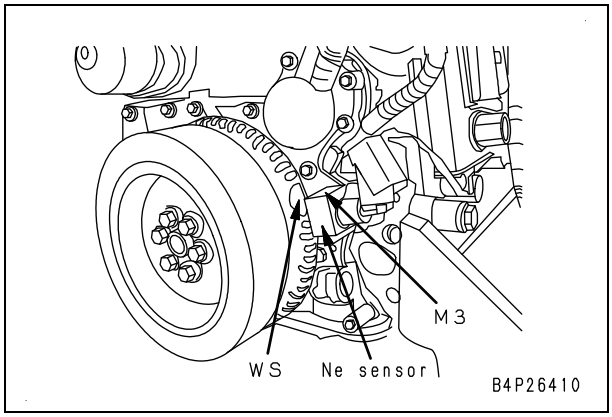


Fig. 3

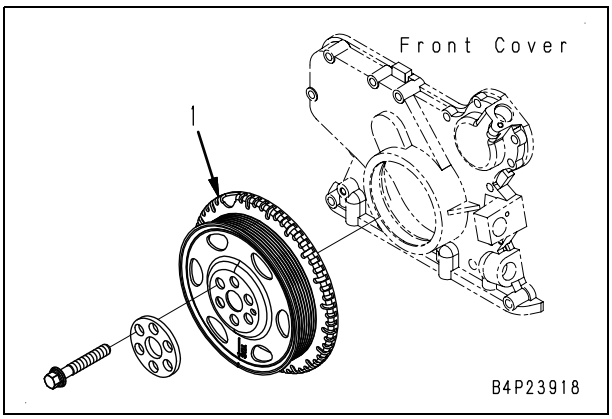
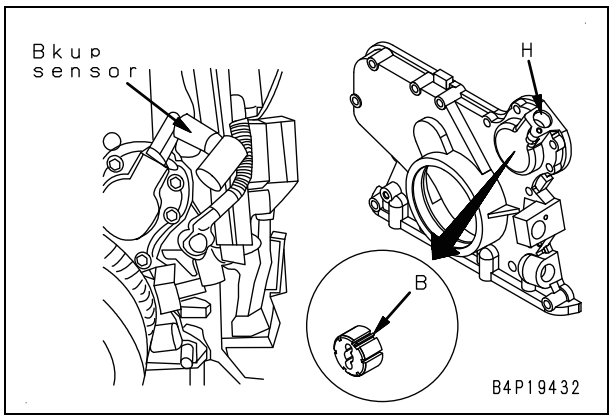


Fig. 4

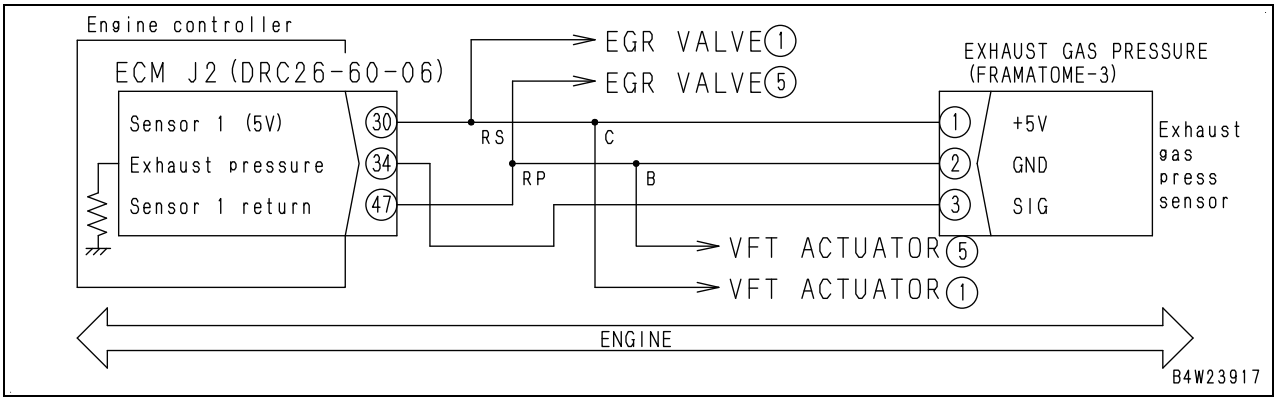


Failure code [CA1961] EGR Motor Driver IC Over Temp Error

Action level	Failure code	Failure	EGR Motor Driver IC Over Temperature Error (Engine controller system)
L03	**CA1961**		
Failure contents	• An over temperature error occurs in the EGR drive IC of engine controller.		
Action of controller	• Closes EGR valve. • Limits engine output and runs engine.		
Problem appearing on the machine	• Engine power drops.		
Related information			

No.	Cause	Procedure, measuring location, criteria, and remarks
1	Improper use of controller	Check that controller is not used in high temperature environment.
2	Defective engine controller	If no failure is found by above checks, engine controller may be defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Circuit diagram related to exhaust manifold pressure sensor



Failure code [CA2973] Charge Air Pressure Sensor In-Range Error

Action level	Failure code	Failure	Charge Air Pressure Sensor In-Range Error (Engine controller system)
L03	**CA2973**		
Failure contents	• The output of charge pressure (boost pressure) sensor is outside of the normal range.		
Action of controller	• Closes EGR valve. • Limits engine output and runs engine. • Runs engine by setting charge (boost) pressure to calculated value.		
Problem appearing on the machine	• Engine power drops.		
Related information	• The signal voltage from charge (boost) pressure sensor can be checked with monitoring function. (Code: 36501 (V)) • The pressure detected by charge (boost) pressure sensor can be checked with monitoring function. (Code: 36500 (MPa)) • Method of reproducing failure code: While the engine coolant temperature is higher than 70 °C, turn the starting switch to OFF position and turn off the system operating lamp, and then turn the starting switch to ON position.		

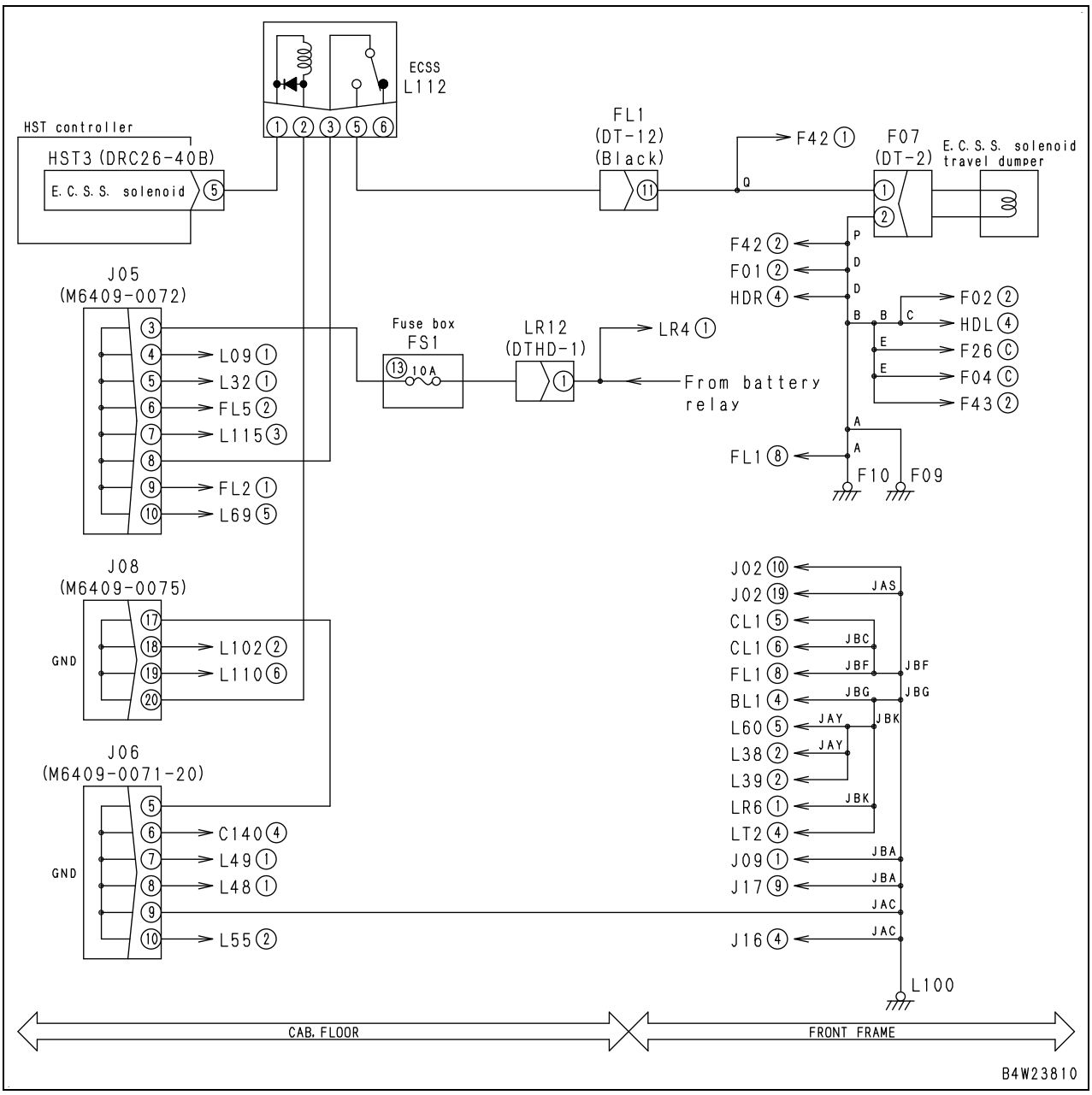
No.	Cause	Procedure, measuring location, criteria, and remarks
1	Defective charge air pressure sensor	As the charge pressure sensor system may be defective, troubleshoot for failure codes [**CA122**] and [**CA123**].

Failure code [D110L4] Disconnection or Short to Ground of Battery Relay Signal Line

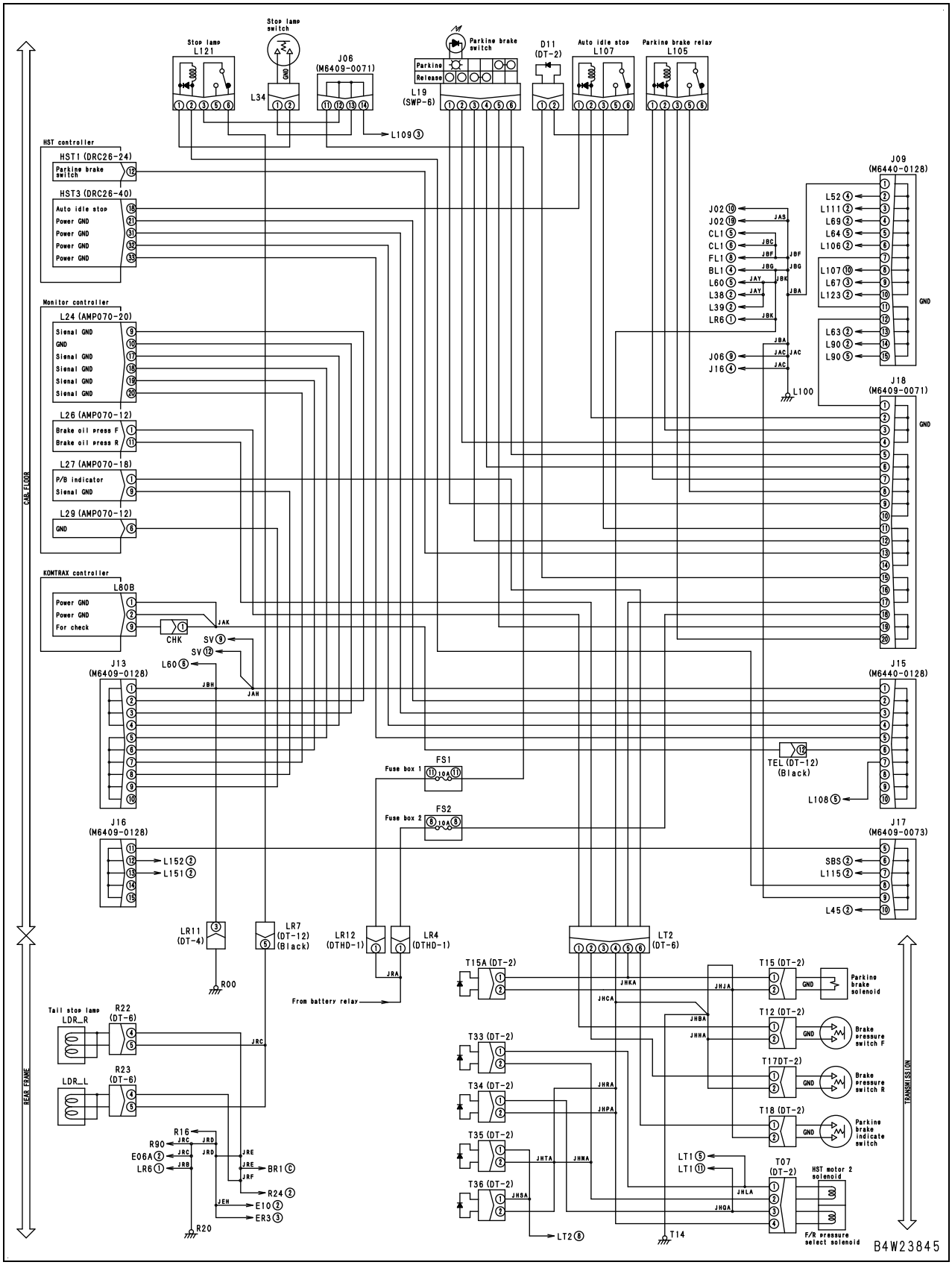
Action level	Failure code	Failure	Disconnection or Short to Ground of Battery Relay Signal Line (HST controller system)
L01	**D110L4**		
Failure contents	● Detect conditions: If battery relay operating status signal < (Battery direct voltage /2), and if engine speed ≧ 500 rpm, and if communication with engine controller is normal ● Open circuit occurs in battery relay circuit.		
Action of controller	● Quickly starts the action when the starting key is in OFF position.		
Problem appearing on the machine	● Failure may be detected incorrectly when the engine is turned OFF. ● Each controller may fail in writing of data into its ROM (non-volatile memory).		
Related information	● Method of reproducing failure code: Start engine, and wait for 30 seconds.		

No.	Cause	Procedure, measuring location, criteria, and remarks		
1	Open circuit in wiring harness (Wire breakage or connector contact failure)	1. Turn the starting switch to OFF position. 2. Turn the battery disconnect switch to OFF position. 3. Disconnect connectors HST1, D09, D10, and E02, and connect T-adapter to each female side. 4. Disconnect terminal R15.		
		Resistance	Between HST1 (female) (15) and D10 (female) (1)	Max. 1 Ω
			Between HST1 (female) (15) and D09 (female) (1)	Max. 1 Ω
			Between HST1 (female) (15) and R15 terminal (harness side)	Max. 1 Ω
2	Ground fault in wiring harness (Contact with GND circuit)	1. Turn the starting switch to OFF position. 2. Turn the battery disconnect switch to OFF position. 3. Disconnect connectors HST1, D09, D10, and E02, and connect T-adapter to the female side of HST1. 4. Disconnect terminal R15.		
		Resistance	Between HST1 (female) (15) or R15 terminal (harness side) and the ground	Min. 1 MΩ
3	Defective HST controller	If no failure is found by above checks, the HST controller is defective. ● Reference 1. Turn the starting switch to OFF position. 2. Disconnect connector HST1, and connect T-adapter to the female side. 3. Turn the starting switch to ON position.		
		Voltage	Between HST1 (female) (15) and (10)	20 to 30 V

Circuit diagram related to ECSS solenoid relay



Circuit diagram related to parking brake relay



Failure code [DAFRKR] Machine Monitor CAN2 Communication Error (Machine Monitor)

Action level	Failure code	Failure	CAN 2 Communication Error (Machine Monitor) (HST controller system)
L03	**DAFRKR**		
Failure contents	• As the CAN2 communication (KOMNET/C) fails, the HST controller cannot detect the machine monitor.		
Action of controller	• Flashes the centralized warning lamp, and sounds the warning buzzer. • Uses the CAN communication information that is received from machine monitor just before the failure occurs. • If cause of failure disappears, machine becomes normal by itself.		
Problem appearing on the machine	• The error or alarm detected by HST controller is not displayed.		
Related information	• Method to reproduce the failure code: Turn starting switch to ON position. • The ACC signal of starting switch notifies each controller to start the CAN communication. • A failure code is transmitted to and displayed on the machine monitor via CAN communication. Accordingly, if CAN communication with the machine monitor fails, failure code [**DAFRKR**] is not displayed on the machine monitor and it can be observed only through the KOMTRAX system. • Since each controller and machine monitor are connected directly to the battery, they are supplied with power even after the starting switch is turned to the OFF position. • Since a signal of the active CAN communication line is pulse voltage, it cannot be measured by using the multimeter.		

No.	Cause	Procedure, measuring location, criteria, and remarks
1	Defective power supply to the machine monitor	Perform troubleshooting for "E-5" in E mode.
2	CAN2 communication failure	Perform checks on causes 4 to 9 for failure code [**DB2QKR**].
3	Defective machine monitor	If no failure is found by above checks, the machine monitor is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Failure code [DAJ5KX] Failure of 5 V Power Source 0 (HST)

Action level	Failure code	Failure	Failure of 5 V Power Source 0 (HST) (HST controller system)
L03	**DAJ5KX**		
Failure contents	• The voltage of 5 V sensor power output 0 circuit drops below 4.7 V or exceeds above 5.3 V.		
Action of controller	• Cannot detect input signals correctly due to abnormal potentiometer signal. • Lights the centralized warning lamp, and sounds the warning buzzer. • Even if cause of failure disappears, machine does not become normal until starting switch is turned to OFF position.		
Problem appearing on the machine	• Failure code [**DK5DKA**] or [**DK5EKA**] of the next sensor is output.		
Related information	• Method of reproducing failure code: Turn starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria, and remarks		
1	Various sensor failure (Internal short circuit)	1. Turn the starting switch to OFF position. 2. Disconnect the 3rd lever potentiometer sensor connector, and turn the starting switch to ON position. ★ If this failure code disappears, the disconnected 3rd lever potentiometer is defective. ★ Since connector is disconnected, other failure codes appear. Ignore all the other failure codes except this one.		
		Connector	3rd lever potentiometer sensor A	MF1
			3rd lever potentiometer sensor B	MF1
2	Ground fault in wiring harness (contact with ground circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connector MF1. 3. Connect T-adapter to the female side of connector HST1.		
		Resistance	Between HST1 (female) (22) and the ground	Min. 1 MΩ
3	Defective HST controller	1. Turn the starting switch to OFF position. 2. Disconnect connector HST1, and connect T-adapter to the male side. 3. Turn the starting switch to ON position.		
		Voltage	Between HST1 (male) (22) and (21)	4.7 to 5.3 V
4	Hot short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connector MF1. 3. Insert T-adapter into connector HST1. 4. Turn the starting switch to ON position (with connector disconnected).		
		Voltage	Between HST1 (22) and the ground	4.7 to 5.3 V

Failure code [DB2RKR] CAN1 Disconnection (Engine Controller)

Action level	Failure code	Failure	CAN1 Disconnection (Engine Controller) (HST controller system)
L03	**DB2RKR**		
Failure contents	• The HST controller cannot recognize the engine controller via the CAN1 communication line (KOMNET/r).		
Action of controller	• Lights the centralized warning lamp, and sounds the warning buzzer. • If cause of failure disappears, machine becomes normal by itself. • Uses CAN information that was sent from engine controller before the occurrence of the error.		
Problem appearing on the machine	• Information to be obtained from engine controller is not displayed, and special functions that need information do not work. The received data is not updated. • Engine control fails. • None of engine speed and coolant temperature can be detected.		
Related information	• Method of reproducing failure code: Turn starting switch to ON position. • Start of CAN communication is recognized by each controller when ACC signal of starting switch is received. • If failure code [**DB2QKR**] is also displayed, engine controller is probably defective (cause 1). • Failure code [**DB2RKR**], indicating the CAN communication failure of CAN1, is sent from HST controller to machine monitor via CAN2 communication. • CAN1 terminating resistor is located in CAN3 at operator's cab side and connector RESISTOR J2 at engine side. (RESISTOR J2 is not located on the CAN1 communication line (KOMNET/r), but output from connector J2.) • Since each controller is connected directly to battery, they are supplied with power even after starting switch is turned to OFF position. • Since a signal of the active CAN communication line is pulse voltage, it cannot be measured by using the multimeter.		

No.	Cause	Procedure, measuring location, criteria, and remarks		
1	Defective engine controller	Perform checks on causes 1 to 3 in troubleshooting for failure code [**DB2QKR**].		
2	Defective CAN terminating resistor (Internal open or short circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connector CAN3, and connect T-adapter to the male side. 3. Disconnect connector ECM J2, and connect T-adapter to the female side.		
		Resistance	Between CAN3 (male) (A) and (B)	120 ± 12 Ω
			Between ECM J2 (female) (24) and (25)	120 ± 12 Ω
3	Open or short circuiting in the wiring harness	• CAN communication line ★ As the 120 Ω CAN termination resistor is connected in parallel, the circuit is not open if the combined resistance is 60 Ω when measured from the connector of HST controller. 1. Turn the starting switch to the OFF position, and disconnect the battery ground cable. 2. Disconnect connectors HST2, ECM J1, and CAN3 one by one, and connect T-adapter to each female side. 3. Disconnect connector ECM J2, and connect T-adapter to the male side. ★ If a short-circuit (if resistance is below 1 Ω), disconnect all CAN communication connectors from each controller. Then, check the harness for shorting or check the circuit for shorting in the controller.		
		Resistance	Between HST2 (female) (33) and (23)	Approx. 60 Ω
			Between CAN3 (female) (A) and (B)	Approx. 120 Ω
			Between ECM J1 (female) (8) and (18)	Approx. 120 Ω
			Between ECM J2 (male) (24) and (25)	Approx. 120 Ω

Failure code [DDE5MA] Disconnection of Steering Oil Pressure Switch (Emergency Steering Control Switch)

Action level	Failure code	Failure	Disconnection of Steering Oil Pressure Switch (Emergency Steering Control Switch) (HST controller system)
L01	**DDE5MA**		
Failure contents	• As the steering oil pressure switch (emergency steering control switch) circuit is open, the steering pump oil pressure is detected when engine is stopped.		
Action of controller	• None in particular		
Problem appearing on the machine	• The steering oil pressure caution lamp does not light up although the steering control pressure drops.		
Related information	• This code applies only to the models having the emergency steering system, but the alarm is not output if this optional function is unselected by the machine monitor. • The input status from steering oil pressure switch can be checked with monitoring function. (Monitoring code: HST-40994-D-IN-18) • Method of reproducing failure code: Turn the starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria, and remarks			
1	Defective steering oil pressure switch (Internal defect)	1. Turn the starting switch to OFF position. 2. Disconnect connector F25, and connect T-adapter to the male side.			
		Resistance	Between F25 (male) (A) and (C)		Min. 1 MΩ
2	Open circuit in wiring harness (Wire breakage or poor contact of connector)	1. Turn the starting switch to OFF position. 2. Disconnect connectors HST2 and F25, and connect T-adapter to each female side.			
		Resistance	Between HST2 (female) (35) and F25 (female) (A)		Min. 1 MΩ
3	Defective HST controller	If no failure is found by above checks, the controller of work equipment is defective. • Reference 1. Turn the starting switch to OFF position. 2. Insert T-adapter into connector HST2. 3. Turn the starting switch to ON position and start engine to make diagnoses.			
		Voltage	Between HST2 (35) and the ground	Starting switch: ON position (Engine stopped) (No oil pressure of steering system)	7 to 10 V
				Engine: Running (The steering system has oil pressure.)	Max. 1 V

<table>
<tr><th>No.</th><th>Cause</th><th colspan="4">Procedure, measuring location, criteria, and remarks</th></tr>
<tr><td rowspan="12">4</td><td rowspan="12">Open circuit in wiring harness
(Wire breakage or poor contact of connector)</td><td colspan="4">1. Turn the starting switch to OFF position.
2. Disconnect connectors HST1, HST2, LT1 and L54, and connect T-adapter to each female side.
3. Operate the speed range selector switch to make diagnoses.
★ See the schematic diagram of speed range selector switch.</td></tr>
<tr><td rowspan="3">Resistance</td><td>Between HST2 (female) (1) and HST1 (female) (21)</td><td>1st (P1:ON)</td><td>Approx. 800 Ω</td></tr>
<tr><td>Between HST2 (female) (1) and HST1 (female) (21)</td><td>2nd (P2:ON)</td><td>Approx. 650 Ω</td></tr>
<tr><td>Between HST2 (female) (1) and HST1 (female) (21)</td><td>3rd (P3:ON)</td><td>Approx. 550 Ω</td></tr>
<tr><td colspan="4">★ If no failure is found by checking above, this check is not required.
1. Turn the starting switch to OFF position.
2. Disconnect connectors HST1, HST2, L70, L03, LT1 and L54, and connect T-adapter to each female side.</td></tr>
<tr><td rowspan="8">Resistance</td><td colspan="2">Between HST1 (female) (21) and L70 (female) (7)</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Between HST1 (female) (3) and L03 (female) (3)</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Between L70 (female) (5) and L70 (female) (3)</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Between L03 (female) (1) and L70 (female) (6)</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Between L03 (female) (2) and L70 (female) (1)</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Between L03 (female) (4) and L70 (female) (8)</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Between HST2 (female) (1) and L70 (female) (2)</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Between HST2 (female) (1) and L70 (female) (4)</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Ground fault in wiring harness
(Contact with GND circuit)</td><td colspan="4">1. Turn the starting switch to OFF position.
2. Disconnect connectors HST1, HST2, L03, LT1 and L54, and connect T-adapter to each female side.</td></tr>
<tr><td rowspan="2">Resistance</td><td colspan="2">Between HST1 (female) (3) and the ground</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Between HST2 (female) (1) and the ground</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="5">6</td><td rowspan="5">Defective HST controller</td><td colspan="4">1. Turn the starting switch to OFF position.
2. Insert T-adapter into connector HST1.
3. Turn the starting switch to ON position.
★ See the schematic diagram and controller's voltage input logical values in each range.</td></tr>
<tr><td rowspan="4">Voltage</td><td rowspan="4">Between HST1 (female) (3) and (21)</td><td>1st (P1)</td><td>1.9 to 2.3 V</td></tr>
<tr><td>2nd (P2)</td><td>2.4 to 2.7 V</td></tr>
<tr><td>3rd (P3)</td><td>2.9 to 3.2 V</td></tr>
<tr><td>4th (P4)</td><td>3.3 to 3.7 V</td></tr>
</table>

Failure code [DHH1KX] Failure of HST Oil Pressure Sensor

Action level	Failure code	Failure	Open circuit or ground fault in HST oil pressure sensor (HST controller system)
L03	**DHH1KX**		
Contents of problem	• Due to open circuit or ground fault in the HST oil pressure sensor system, HST oil pressure signal voltage is lower than normal range (HST oil pressure sensor signal voltage: Max. 0.3 V).		
Action of controller	• While machine is traveling, controller controls machine with the value before error was detected. • Fixes the motor capacity to the maximum after the machine has stopped. • Turns the centralized warning lamp and warning buzzer ON. • Even if cause of failure disappears, machine does not become normal until starting switch is turned to OFF position.		
Problem that occurs on the machine	• Travel speed may not increase, or traction force may become insufficient. • After stopped once, machine is set to the 1st speed range; however, it is possible to adjust the travel speed using the travel speed control dial.		
Related information	• The input voltage from the HST oil pressure sensor can be checked using the monitoring function. (Code: HST-32601 HST PRESS (V)) • The hydraulic pressure from the HST oil pressure sensor can be checked using the monitoring function. (Code: HST-32600 HST PRESS (MPa)) • Method to reproduce the failure code: Start the engine.		

No.	Cause	Procedure, measuring location, criteria, and remarks			
1	Defective HST oil pressure sensor power system	★ If failure code [**DAJ6KX**] is displayed, perform its troubleshooting first.			
		1. Turn the starting switch to OFF position. 2. Disconnect connector T11, and connect T-adapter to female side. 3. Turn the starting switch to ON position.			
		Voltage	Between T11 (female) (B) and (A)	Power supply input	4.8 to 5.2 V
2	Defective HST oil pressure sensor (Internal open or short circuit)	★ Replace the sensor, and check that the failure code is not output. 1. Turn the starting switch to OFF position. 2. Insert T-adapter into connector T11. 3. Start the engine.			
		Voltage	Between T11 (C) and (A)	HST pressure: Always	0.50 to 4.40 V
		Sensor voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness, too, for another cause of trouble, and then judge.			
3	Open circuit in wiring harness (wire breakage or defective contact of connector)	1. Turn the starting switch to OFF position. 2. Disconnect connectors HST1, HST2, and T11, and connect T-adapters to each female side.			
		Resistance	Between HST1 (female) (8) and T11 (female) (C)		Max. 1 Ω
			★ If no failure is found by check on cause 1, this check is not required. Between HST2 (female) (1) and T11 (female) (B)		Max. 1 Ω
			★ If no failure is found by check on cause 1, this check is not required. Between HST1 (female) (21) and T11 (female) (A)		Max. 1 Ω
4	Ground fault in wiring harness (Short circuit with ground circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connectors HST1 and T11, and connect T-adapter to either female side.			
		Resistance	Between ground and HST1 (female) (8) or T11 (female) (C)		Min. 1 MΩ
5	Short circuiting in the wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connectors HST1 and T11, and connect T-adapter to either female side.			
		Resistance	Between HST1 (female) (8) and (21), or between T11 (female) (C) and (A)		Min. 1 MΩ

Failure code [DK5DKY] Hot Short of 3rd Lever Potentiometer Sensor (Main)

Action level	Failure code	Failure	Hot short circuit of 3rd lever potentiometer sensor (Main) (HST controller system)
L03	**DK5DKY**		
Contents of problem	• Due to hot short in the 3-spool valve (PCS) potentiometer (main: A line), the signal voltage is higher than normal range (3-spool valve (PCS) potentiometer (main: A line) signal voltage: Min. 4.7 V).		
Action of controller	• Controls using the 3-spool valve (PCS) potentiometer (sub: B line) if normal. However, the work equipment speed is decreased to 30%. • Turns the centralized warning lamp and warning buzzer ON. • Even if cause of failure disappears, machine does not become normal until the 3-spool valve (PCS) is set to NEUTRAL.		
Problem that occurs on the machine	• Machine retracts for a moment, but can be operated by the sub potentiometer; however, the work equipment speed is decreased to 30%.		
Related information	• When the 3-spool valve (PCS) is not installed, this failure code is not displayed. (If this failure code is displayed in a machine without the 3-spool valve (PCS), select "None" in the 3-spool valve (PCS) optional setting on the optional setting of the machine monitor.) • Input voltage from the 3-spool valve (PCS) potentiometer (main: A line) can be checked using the monitoring function. (Monitoring code: HST-42018-3RD LEVER MAIN) • Input voltage from the 3-spool valve (PCS) potentiometer (sub: B line) can be checked using the monitoring function. (Monitoring code: HST-42019-3RD LEVER SUB) • Method to reproduce the failure code: Turn the starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria, and remarks			
1	Defective 5 V sensor power supply system	If failure code [**DAJ5KX**] is displayed, perform its troubleshooting first.			
		1. Turn the starting switch to OFF position. 2. Disconnect connector HST1, and connect T-adapter to the male side. 3. Turn the starting switch to ON position. ★ If the power supply voltage is abnormal, go to check on cause 3.			
		Voltage	Between HST1 (male) (22) and (4)		4.8 to 5.2 V
2	Defective 3-spool valve (PCS) potentiometer (Internal short circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connector HST1, and connect T-adapter to the male side.			
		Resistance	Between HST1 (4) and ground		Min. 1 MΩ
			Between HST1 (13) and ground		
			Between HST1 (19) and ground		
			Between HST1 (22) and ground		
		3. Turn the starting switch to OFF position. 4. Insert T-adapter into connector HST1. 5. Set the work equipment lock switch to LOCK position. 6. Turn the starting switch to ON position. 7. Operate the 3-spool valve (PCS) to make a diagnosis.			
		Voltage	Between HST1 (19) and (4)	3-spool valve (PCS): NEUTRAL	2.3 to 2.7 V
				3-spool valve (PCS): Full extension operation	4.7 to 5.0 V
				3-spool valve (PCS): Full retraction operation	0 to 0.3 V

Failure code [DLT3KX] Vehicle Speed Sensor Circuit Failure (B)

Action level	Failure code	Failure	Open circuit, ground fault, or hot short circuit of vehicle speed sensor circuit (B) (HST controller system)
L03	**DLT3KX**		
Contents of problem	• No input signal of vehicle speed sensor B is detected during travel of approximately 4 km/h or faster.		
Action of controller	• Recognizes the travel speed with the input signal of vehicle speed sensor A. • Turns the centralized warning lamp and warning buzzer ON. • If cause of failure disappears, machine becomes normal by itself.		
Problem that occurs on the machine	• No effect.		
Related information	• Method to reproduce the failure code: Start the engine to travel at speed of 5 km/h or faster. • Since inside of speed sensor is not coil but electronic circuit, you cannot determine whether speed sensor is normal by measuring resistance of speed sensor with multimeter. • Since output of normal speed sensor is 5 V pulse voltage, you cannot use multimeter for measurement.		

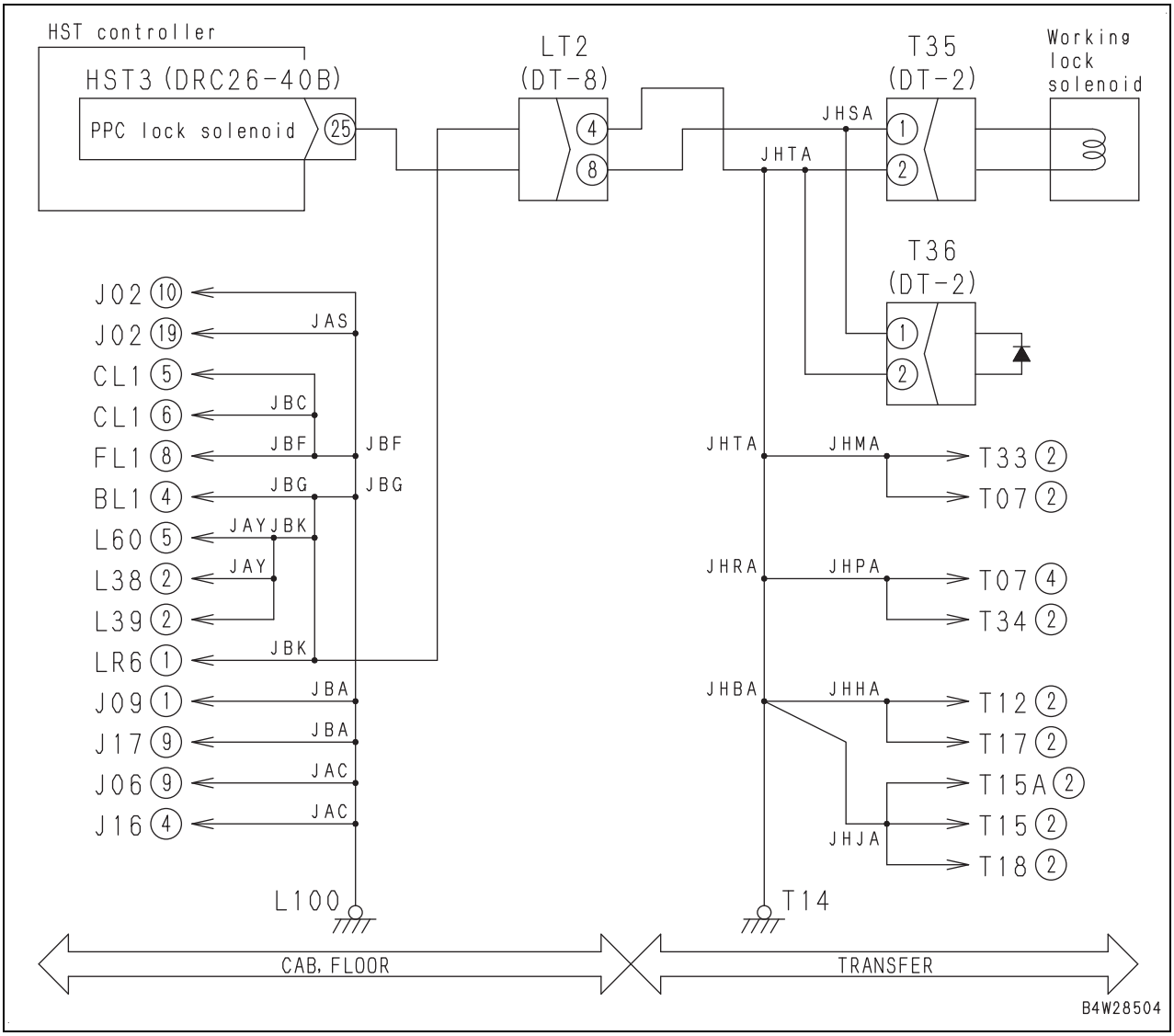
No.	Cause	Procedure, measuring location, criteria, and remarks			
1	Defective 5V sensor power supply system	If failure code [**DAJ6KX**] is also displayed, perform troubleshooting for [**DAJ6KX**] first.			
		1. Turn the starting switch to OFF position. 2. Disconnect connector T09, and connect T-adapter to female side. 3. Turn the starting switch to ON position.			
		Voltage	Between T09 (female) (1) and (2)	Power supply	4.7 to 5.3 V
2	Defective travel speed sensor (Internal defect)	1. Turn the starting switch to OFF position. 2. Replace travel speed sensor with new one.			
		If problem disappears, travel speed sensor is defective.			
3	Open circuit in wiring harness (Wire breakage or poor contact of connector)	1. Turn the starting switch to OFF position. 2. Disconnect connectors HST2 and T09, and connect T-adapter to each female side.			
		Resistance	Between HST2 (female) (27) and T09 (female) (4)		Max. 1 Ω
4	Ground fault in wiring harness (Poor contact with ground circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connectors HST2 and T09, and connect T-adapter to either female side.			
		Resistance	Between ground and HST2 (female) (27) or T09 (female) (4)		Min. 1 MΩ
5	Hot short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connector T09, and connect T-adapter to female side. 3. Turn the starting switch to ON position.			
		Voltage	Between T09 (female) (4) and ground		Max. 1 V
6	Defective HST controller	If no failure is found by above checks, HST controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.) • Reference 1. Turn the starting switch to OFF position. 2. Insert T-adapter into connectors HST1 and HST2. ⚠ **Take care not to cause collision accident while driving machine.** 3. Start engine, and drive machine.			
		Voltage	Between HST2 (27) and HST1 (4) ★ Since the multimeter indicates the average voltage of pulses, judge that the machine is normal if voltage changes according to travel speed.		Pulse of 1 V to 4 V or more (changes at constant frequency)

Failure code [DW26KB] Ground Fault of Motor 2 Solenoid

Action level	Failure code	Failure	Ground fault of motor 2 solenoid (HST controller system)
L03	**DW26KB**		
Contents of problem	• Due to ground fault in the motor 2 solenoid output signal system, abnormal power has been detected when the motor 2 solenoid output was ON.		
Action of controller	• Turns the centralized warning lamp and warning buzzer ON. • Even if cause of failure disappears, machine does not become normal until starting switch is turned to OFF position.		
Problem that occurs on the machine	• Traction force decreases. • The maximum travel speed increases during travel at 1st, 2nd, or 3rd. • The engine overrun prevention function works during travel at 1st or 2nd. • The wiring harness or controller may be burnt out.		
Related information	• Whether signal is output to the motor 2 solenoid (ON/OFF) can be checked using the monitoring function. (Monitoring code: HST-40980-D-OUT-28) • Method to reproduce the failure code: Turn the starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria, and remarks		
1	Defective motor 2 solenoid (Internal open circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connector T07, and connect T-adapter to the male side.		
		Resistance	Between T07 (male) (1) and (2)	5 to 25 Ω
			Between T07 (female) (1) or (2) and ground	Min. 1 MΩ
2	Defective diode (Internal open circuit or short circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connector T33, and connect T-adapter to the male side. ★ Check by using the multimeter in the diode range.		
		Resistance	Between T33 (male) (1) (+) and (2) (-)	No continuity
			Between T33 (male) (2) (+) and (1) (-)	Continuity
3	Open or short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connectors HST2 and T33, and connect T-adapter to the female side. ★ Coil resistance of solenoid		
		Resistance	Between HST2 (female) (18) and ground	5 to 25 Ω
4	Ground fault in wiring harness (Contact with ground circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connectors HST2, T07, and T33, and connect T-adapter to either female side.		
		Resistance	Between ground and HST2 (female) (18) or T07 (female) (1)	Min. 1 MΩ
5	Short circuit in wiring harness	★ If no failure is found by check on cause 3, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connectors HST2, T07, and T33, and connect T-adapter to either female side.		
		Resistance	Between ground and HST2 (female) (18) or between T07 (female) (1) and (2)	Min. 1 MΩ
6	Defective HST controller	If no failure is found by above checks, the HST controller may be defective. (Since this is an internal defect, troubleshooting cannot be performed).		

Circuit diagram related to work equipment neutral lock solenoid



Failure code [DXH7KA] Disconnection of Reverse Solenoid

Action level	Failure code	Failure	Disconnection of reverse solenoid (HST controller system)
L03	**DXH7KA**		
Contents of problem	• Due to open circuit in the HST pump solenoid (reverse) output signal system, no current flows when the HST pump solenoid (reverse) output is turned ON.		
Action of controller	• Turns the centralized warning lamp and warning buzzer ON. • Turns the reverse solenoid output OFF. • Even if cause of failure disappears, machine does not become normal until starting switch is turned to OFF position.		
Problem that occurs on the machine	• No reverse.		
Related information	• The HST pump R (reverse) solenoid output status of the HST controller can be checked using the monitoring function. (Monitoring code: HST-40980-D-OUT-19) • Method of reproducing failure code: Start engine.		

No.	Cause	Procedure, measuring location, criteria, and remarks		
1	Defective diode (Internal open or short circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connector T01B, and connect T-adapter to the diode. ★ Check by using the multimeter in the diode range.		
		Continuity	Between T01B (male) (1) (+) and (2) (-)	No continuity
			Between T01B (male) (2) (-) and (1) (+)	Continuity
2	Defective HST pump solenoid (reverse), open or short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connector HST2, and connect T-adapter to female side. ★ If resistance is 1 MΩ or higher, harness has open circuit. If it is 1 Ω or below, harness has short circuit.		
		Resistance	Between HST2 (female) (9) and ground	15 to 30 Ω
3	Open circuit, short circuit, ground fault, hot short circuit of wiring harness, or defective HST controller	★ If no failure is found by checking cause 2, this check is not required. ★ It is difficult to remove connector T01; therefore, first make a diagnosis through connector ER3. 1. Turn the starting switch to OFF position. 2. Disconnect connector ER3, and connect T-adapter to the male side. 3. Turn the starting switch to ON position. ★ Shake the harness while measuring the voltage. If voltage drops to 0V during wire shaking, the circuit is open at around this point.		
		Voltage	Between ER3 (male) (2) and (3)	1 to 4.5 V
4	Defective HST pump solenoid (reverse) (Internal defect)	★ If no failure is found by checking cause 2, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connector ER3, and connect T-adapter to the female side.		
		Resistance	Between ER3 (female) (2) and (3)	15 to 30 Ω
5	Open circuit in wiring harness	★ If no failure is found by check on cause 2, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connectors ER3 and T01, and connect T-adapter to the female side of each connector.		
		Resistance	Between ER3 (female) (2) and T01 (female) (3)	Max. 1 Ω
			Between ER3 (female) (3) and T01 (female) (4)	Max. 1 Ω
		★ If no failure is found by check on causes 2 and 3, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connectors ER3 and HST2, and connect T-adapter to the female side of each connector.		
		Resistance	Between HST2 (female) (9) and ER3 (female) (2)	Max. 1 Ω
			Between ER3 (male) (3) and ground	Max. 1 Ω

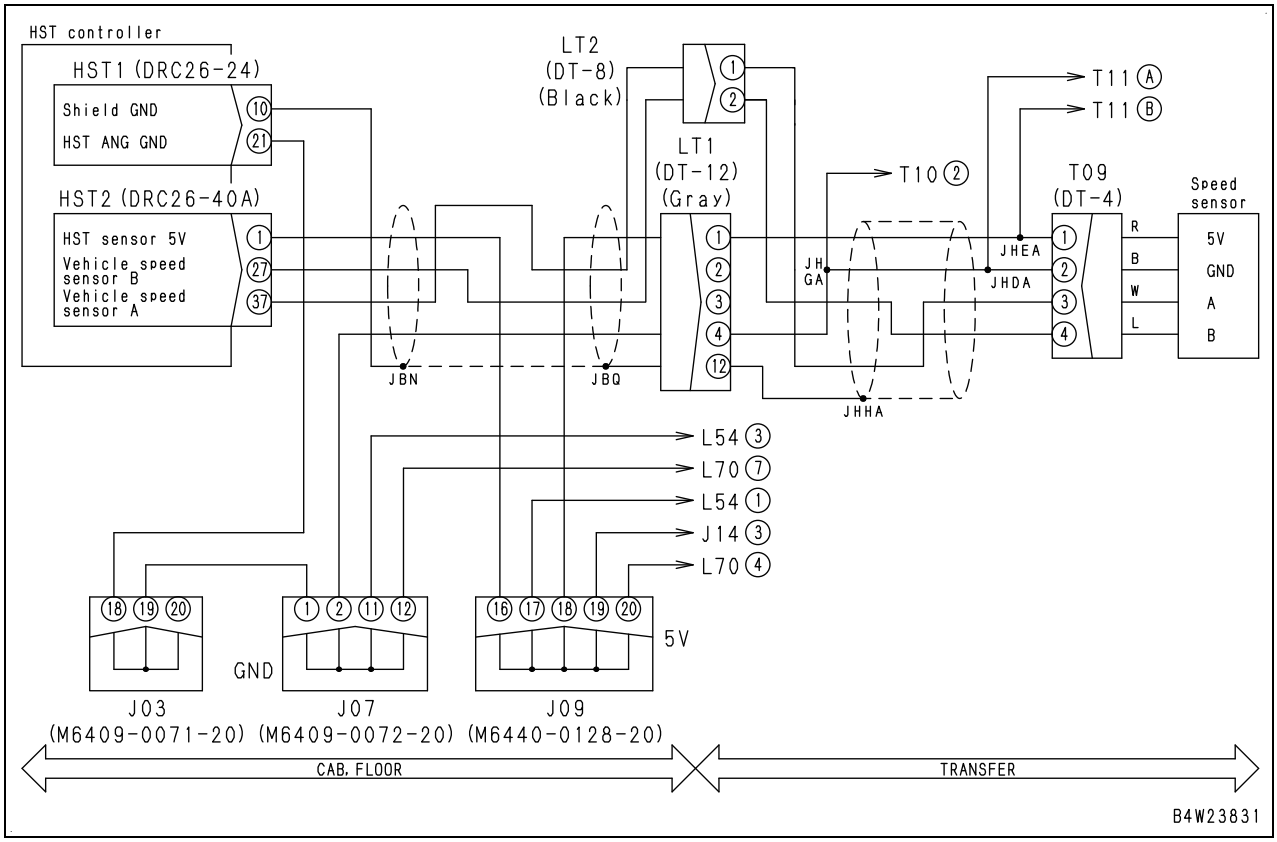
Failure code [DXHKKA] Disconnection of 3rd EPC Solenoid (RET)

Action level	Failure code	Failure	Disconnection of 3-spool valve retract EPC solenoid (HST controller system)
L03	**DXHKKA**		
Contents of problem	• Due to open circuit in the 3-spool valve (PCS) retract EPC solenoid output signal system, no current flows when the 3-spool valve (PCS) retract EPC solenoid output is turned ON.		
Action of controller	• Continues outputting. • Turns the centralized warning lamp and warning buzzer ON. • Even if cause of failure disappears, machine does not become normal until starting switch is turned to OFF position.		
Problem that occurs on the machine	• The 3-spool valve (PCS) cylinder does not retract.		
Related information	• When the 3-spool valve (PCS) is not installed, this failure code is not displayed. If this failure code is displayed in a machine without the 3-spool valve (PCS), select "None" for the 3-spool valve (PCS) lever on the optional setting of the machine monitor. • The value of the current output to the 3-spool valve (PCS) retract EPC solenoid can be checked using the monitoring function. (Monitoring code: HST-41924-3RD RET EPC (mA)) • Specification only with 3-spool valve (PCS) • Method to reproduce the failure code: Start the engine, and retract the 3-spool valve (PCS).		

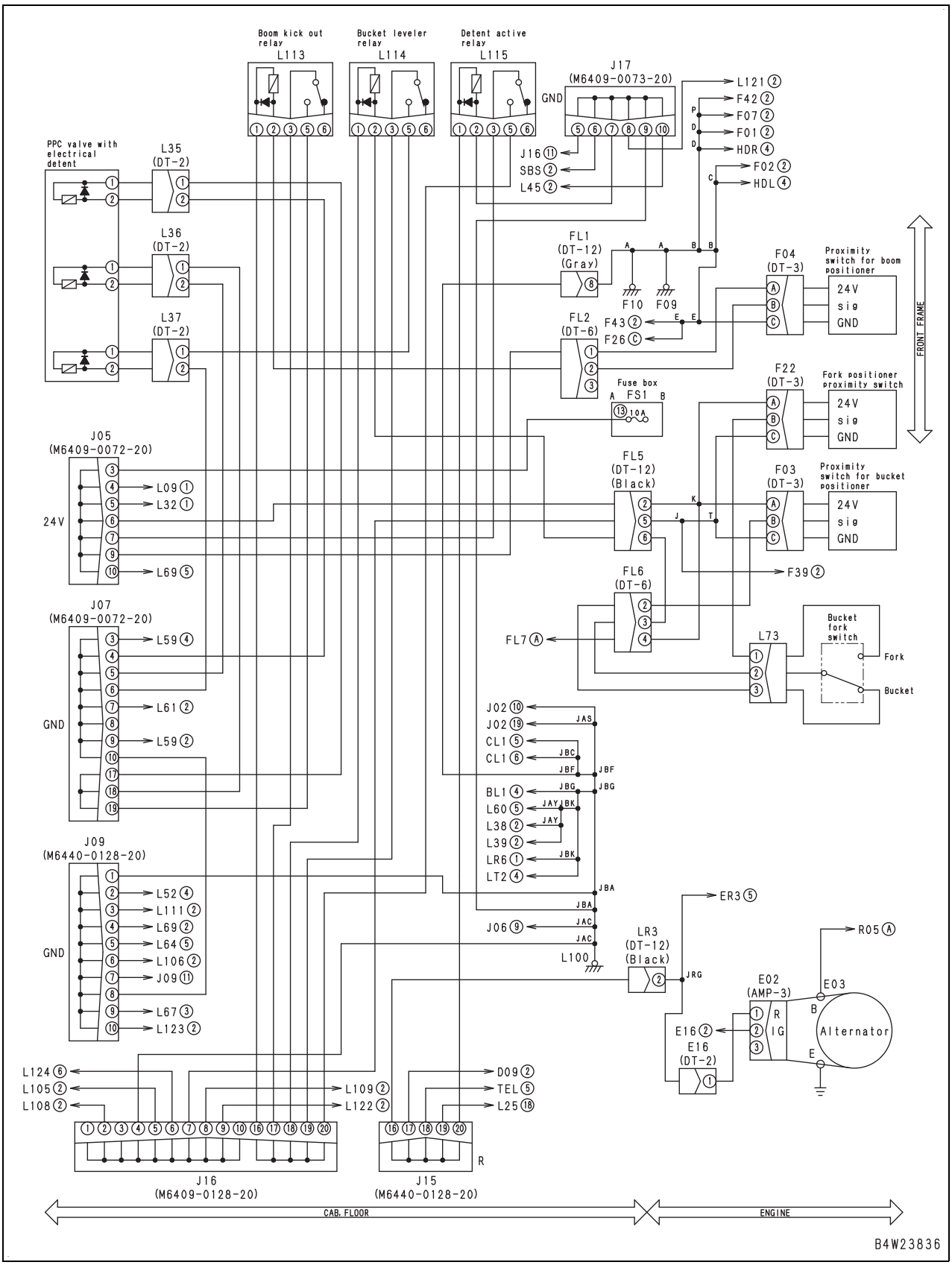
No.	Cause	Procedure, measuring location, criteria, and remarks		
1	Defective 3-spool valve (PCS) retract EPC solenoid (Internal open circuit)	1. Turn the starting switch to OFF position. 2. Disconnect connector F24, and connect T-adapter to the male side.		
		Resistance	Between F24 (male) (1) and (2)	5 to 15 Ω
2	Open circuit, short circuit, ground fault, hot short circuit of wiring harness, or defective HST controller	1. Turn the starting switch to OFF position. 2. Disconnect connector F24, and connect T-adapter to the female side. 3. Turn the starting switch to ON position. ★ Shake the harness while measuring the voltage. If voltage drops to 0V during wire shaking, the circuit is open at around this point.		
		Voltage	Between F24 (female) (1) and (2)	1 to 4.5 V
3	Open or short circuit in wiring harness	★ If no failure is found by check on cause 2, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connector HST3, and connect T-adapter to female side. ★ If resistance is 1 MΩ or higher, wiring harness has open circuit. If it is 1 Ω or less, wiring harness has short circuit.		
		Resistance	Between HST3 (female) (6) and (23)	5 to 15 Ω
4	Open circuit in wiring harness (Wire breakage or connector contact failure)	★ If no failure is found by check on cause 3, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connectors HST3 and F24, and connect T-adapters to each female side.		
		Resistance	Between HST3 (female) (23) and F24 (female) (2)	Max. 1 Ω
			Between HST3 (female) (6) and F24 (female) (1)	Max. 1 Ω
5	Defective HST controller	If no failure is found by above checks, the work equipment controller may be defective. (Since this is an internal defect, troubleshooting cannot be performed).		

<table>
<tr><th>No.</th><th>Cause</th><th colspan="4">Procedure, measuring location, criteria, and remarks</th></tr>
<tr><td rowspan="3">9</td><td rowspan="3">Defective starting motor
(Internal defect)</td><td colspan="4">1. Turn starting switch to OFF position.
2. Insert T-adapter into connector E01.
3. Turn starting switch to START position.
★ If starting motor does not run while power supply input, starting input, and generation input (cause 9) are normal, starting motor is defective.</td></tr>
<tr><td rowspan="2">Voltage</td><td>Between starting motor terminal B and ground</td><td>Power supply input</td><td>20 to 30 V</td></tr>
<tr><td>Between E01 (1) and ground</td><td>Starting input</td><td>20 to 30 V</td></tr>
<tr><td rowspan="5">10</td><td rowspan="5">Defective diode D21 or D22
(Internal open or short circuit)</td><td colspan="4">★ If no failure is found by check on cause 7, this check is not required.
1. Turn starting switch to OFF position.
2. Disconnect connectors D21 and D22, and connect T-adapter to each male side.
★ Check by using multimeter in diode range.</td></tr>
<tr><td rowspan="4">Continuity</td><td colspan="2">Between D21 (male) (2) (+) and (1) (-)</td><td>Continuity</td></tr>
<tr><td colspan="2">Between D21 (male) (1) (-) and (2) (+)</td><td>No continuity</td></tr>
<tr><td colspan="2">Between D22 (male) (2) (+) and (1) (-)</td><td>Continuity</td></tr>
<tr><td colspan="2">Between D22 (male) (1) (-) and (2) (+)</td><td>No continuity</td></tr>
<tr><td rowspan="2">11</td><td rowspan="2">Defective neutral safety relay</td><td colspan="4">★ If no failure is found by check on cause 7, this check is not required.
1. Turn starting switch to OFF position.
2. Replace neutral safety relay L106 with horn relay L116.
3. Start engine.</td></tr>
<tr><td colspan="4">If engine starts, original neutral safety relay is defective.</td></tr>
<tr><td rowspan="2">12</td><td rowspan="2">Defective engine cut relay</td><td colspan="4">★ If no failure is found by check on cause 7, this check is not required.
1. Turn starting switch to OFF position.
2. Replace engine cut relay L79 with horn relay L116.
3. Start engine.</td></tr>
<tr><td colspan="4">If engine starts, original engine cut relay L79 is defective.</td></tr>
<tr><td rowspan="7">13</td><td rowspan="7">Defective starting switch
(Internal open circuit)</td><td colspan="4">★ If no failure is found by check on cause 7, this check is not required.
1. Turn starting switch to OFF position.
2. Check that system operating lamp does not light up, and then turn battery disconnect switch to OFF position.
3. Disconnect connector L02, and connect T-adapter to male side.
4. Turn starting switch to ON and START positions to make diagnoses again.</td></tr>
<tr><td rowspan="6">Resistance</td><td rowspan="2">Between L02 (male) (1) and (2) (terminal BR)</td><td>Starting switch: OFF</td><td>Min. 1 MΩ</td></tr>
<tr><td>Starting switch: ON</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">Between L02 (male) (1) and (4)
(terminal ACC)</td><td>Starting switch: OFF</td><td>Min. 1 MΩ</td></tr>
<tr><td>Starting switch: ON</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">Between L02 (male) (1) and (3)
(C terminal)</td><td>Starting switch: OFF</td><td>Min. 1 MΩ</td></tr>
<tr><td>Starting switch: ON</td><td>Max. 1 Ω</td></tr>
</table>

Circuit diagram related to travel speed sensor system



Circuit diagram related to boom kick-out and bucket positioner



E-14 Fan remains in reverse rotation mode

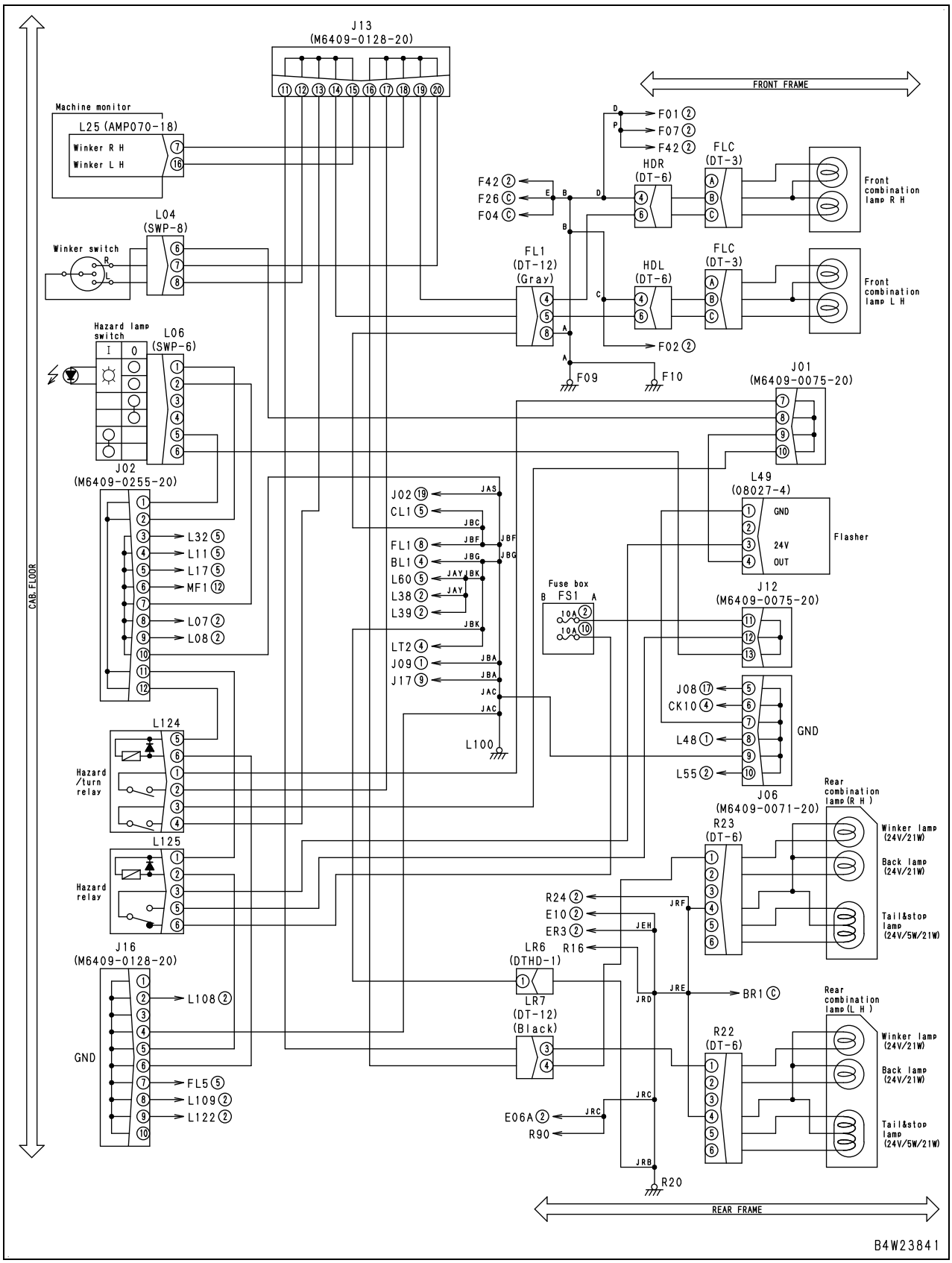
Failure	● Fan remains in reverse rotation mode while fan manual reverse switch is set to OFF. ● Fan remains in reverse rotation mode while fan auto reverse switch is set to OFF.
Related information	● Input state (ON/OFF) from fan auto/manual reverse switch can be checked by using monitoring function. (Fan manual reverse switch: Monitoring code: HST-40977-D-IN-5, Pressing switch: ON (24 V) / OFF (OPEN)) (Fan auto reverse switch: Monitoring code: HST-40977-D-IN-4, Pressing switch: ON (24 V) / OFF (OPEN)) ● Output to fan motor EPC solenoid can be checked by using monitoring function. (Monitoring code: HST-40978-D-OUT-4)

No.	Cause	Procedure, measuring location, criteria, and remarks			
1	Defective fan motor EPC solenoid	● If failure code [**7RHYKA**], [**7RHYKB**], or [**7RHYKY**] is displayed, perform troubleshooting for it.			
2	Defective cooling fan auto reverse switch (Internal defect)	● If failure code [**DD1NL4**] or [**DD1NLD**] is displayed, perform troubleshooting for it.			
		1. Turn starting switch to OFF position. 2. Disconnect connector L69, and connect T-adapter to male side.			
		Resistance	Between L69 (male) (5) and (6)	Switch position: Manual reverse ON	Max. 1 Ω
				Switch position: Manual reverse OFF	Min. 1 MΩ
			Between L69 (male) (5) and (4)	Switch position: Auto reverse ON	Max. 1 Ω
				Switch position: Auto reverse OFF	Min. 1 MΩ
3	Hot short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connector HST1 or L69, and connect T-adapter to either female side. 3. Turn starting switch to ON position.			
		Voltage	Between L69 (female) (4) and (2), or between HST1 (female) (24) and ground		Max. 1 V
			Between L69 (female) (6) and (2), or between HST1 (female) (18) and ground		Max. 1 V
4	Defective HST controller	If no failure is found by above checks, HST controller is defective. (Since this is internal defect, troubleshooting cannot be performed).			

Failure	(4) Headlamp "high beam" does not light up or go out.
Related information	• Switch, lamp, or wiring harness of headlamp (high beams) system has open circuit or ground fault. • Perform following troubleshooting when headlamp low beam lights up (goes out) normally. • Input state (ON/OFF) from lamp switch (headlamp) to machine monitor can be checked by using monitoring function. (Monitoring code: MONITOR PANEL-40900-D-IN-0) • Input state (ON/OFF) from dimmer switch (high beam) to machine monitor can be checked by using monitoring function. (Monitoring code: MONITOR PANEL-40904-D-IN-34)

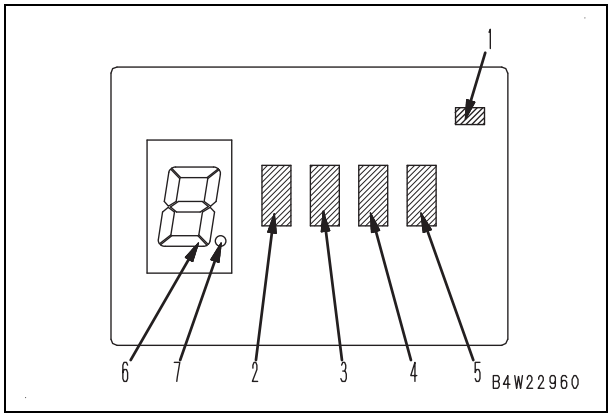
No.	Cause	Procedure, measuring location, criteria, and remarks			
1	Burned-out bulb	If specific headlamp does not light up, its bulb may be broken or may have poor contact. Check it.			
2	Defective dimmer switch (Internal defect)	1. Turn starting switch to OFF position. 2. Disconnect connector L04, and connect T-adapter to male side.			
		Resistance	Between L04 (male) (4) and (3) (Low beam)	Dimmer switch: Low	Max. 1 Ω
				Dimmer switch: High	Min. 1 MΩ
			Between L04 (male) (5) and (3) (High beam)	Dimmer switch: Low	Min. 1 MΩ
				Dimmer switch: High	Max. 1 Ω
3	Open circuit in wiring harness (Wire breakage or poor contact of connector)	1. Turn starting switch to OFF position. 2. Disconnect connectors L04, L.H. FLH, and R.H. FLH, and connect T-adapter to each female side.			
		Resistance	Between R.H. FLH (female) (C) and L04 (female) (5)		Max. 1 Ω
			Between L.H. FLH (female) (C) and L04 (female) (5)		Max. 1 Ω
4	Ground fault in wiring harness (Contact with GND circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors L04, L.H. FLH, and R.H. FLH, and connect T-adapter to each female side.			
		Resistance	Between ground and R.H. FLH (female) (C) or L04 (female) (5)		Min. 1 MΩ
			Between ground and L.H. FLH (female) (C) or L04 (female) (5)		Min. 1 MΩ

Circuit diagram related to turn signal and hazard lamp



Cause		Standard value when it is normal and remarks for troubleshooting	
5	Number of unsent messages	Turn starting switch to ON position.	
		LED (6) 7-segment	Normal state
			0 to 9
6	GPS positioning status	Turn starting switch to ON position. (See *.)	
		LED (7) Dot	Normal state
			Lights up
		* It may take 1 minute or longer from turning on of starting switch to completion of positioning in outdoor location where radio signals can be received.	

LED display



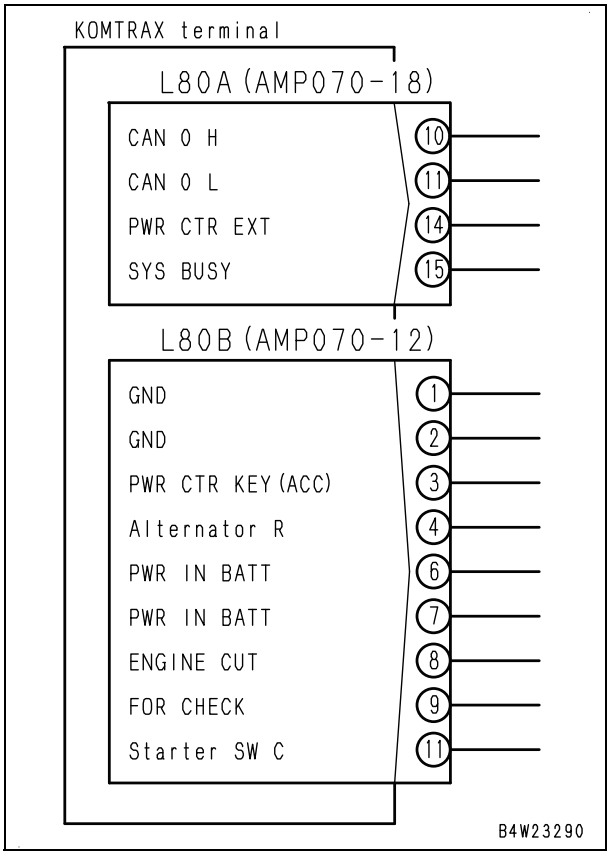
LED for communication module

1. Modem (State of ORBCOMM modem)
2. LED-1 (State of starting switch ACC signal and alternator R signal)
3. LED-2 (Lock)
4. LED-3 (State of starting switch C signal)
5. LED-4 (State of CD line)

7-segment and dot for CPU

6. 7-segment (Number of unsent messages)
7. Dot (GPS positioning state)

L80 connector



<table>
<tr><th>No.</th><th>Cause</th><th colspan="4">Procedure, measuring location, criteria, and remarks</th></tr>
<tr><td rowspan="4">6</td><td rowspan="4">Defective clutch solenoid valve</td><td colspan="4">● When machine travels neither forward or in reverse, if HST oil pressure (MB) remains low after engine speed is increased in check on cause 4, and unusual noise is heard due to idle running of motor 1, check clutch pressure because clutch may remains released due to defective clutch solenoid valve or clutch itself.</td></tr>
<tr><td rowspan="2">Clutch pressure</td><td rowspan="2">Travel speed</td><td>Max. 8 km/h (with machine stopped)</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>Min. 10 km/h</td><td>2.7 ± 0.15 MPa {27.6 ± 1.5 kg/cm^2}</td></tr>
<tr><td colspan="4">If clutch pressure becomes high due to defect in clutch solenoid valve while machine is traveling at high speeds, machine becomes incapable of traveling because transfer clutch remains released at low-speed setting and motor 1 runs idle.</td></tr>
<tr><td>7</td><td>Defective transfer clutch</td><td colspan="4">● When machine travels neither forward or in reverse, if HST oil pressure (MB) remains low after engine speed is increased, unusual noise is heard due to idle running of motor 1, and clutch pressure is normal, clutch may not engage normally due to defective transfer clutch.</td></tr>
</table>

H-13 Machine sways or large shocks are made while machine turns

Failure	Machine sways or large shocks are made while machine turns.
Related information	● Check that oil level and type of oil are correct. ● Check center hinge pin bearing and steering cylinder pin and bushing for play ● Check that steering wheel has proper play. ● Check that tire inflation is correct. ● Check steering shaft for damage.

No.	Cause	Procedure, measuring location, criteria, and remarks			
1	Defective Orbitrol	In following cases, Orbitrol may be defective. ● When machine sways on bumpy road while it is traveling without turning steering wheel ● When machine sways if steering wheel is turned rapidly during working or traveling ● When machine sways if travel speed is increased ● When machine sways at starting engine ★ Be ready with engine stopped, then perform troubleshooting with engine at high idle and machine stopped.			
		Steering cylinder pressure	Steering wheel	Operated	Pressure appears while steering whei is being operated.
2	Defective Orbitrol (safety valve)	If either of right and left relief pressures is low, Orbitrol (safety valve) may be defective. Replace Orbitrol assembly because you cannot adjust it being installed on machine. ★ Be ready with engine stopped, then perform troubleshooting with engine at high idle and machine stopped.			
		Steering and work equipment pump pressure	Steering cylinder	Relieved hydraulically	20.6 (± 2.0) MPa {210 (± 20) kg/cm^2}
3	Defective priority valve (main spool)	If machine sways while steering wheel is being turned, priority valve (main spool) may be defective. Check that spool moves smoothly and is not stuck.			
4	Defective steering cylinder	If machine sways while traveling on bumpy road without turning steering wheel, steering cylinder may be defective. ★ Be ready with engine stopped, then perform troubleshooting with engine at high idle and machine stopped.			
		Disconnect hydraulic hose from head end of steering cylinder, set frame lock bar, and extend that steering cylinder to relieve it hydraulically. If oil flows out of cylinder, piston ring of steering cylinder is defective. For method of checking oil leakage in cylinder, see "H-11 Method of checking oil leakage in steering cylinder".			
5	Defective cushion valve	If machine sways while traveling on uneven road without turning steering wheel, and excessive shocks are made at starting, ending or reversing steering wheel rotation, cushion valve may be defective. Check for stuck spool.			

H-25 Bucket does not tilt back

Failure	Bucket does not tilt back.
Related information	• Check that oil level and type of oil are correct. • If any failure code is displayed, perform troubleshooting for it first. • Check that engine speed at high idle is correct by using monitoring function. (Monitoring code: ENGINE-01002-ENG SPEED) • Check hydraulic hoses, pumps, etc. for oil leak. • Check that lever travel of bucket control lever is correct.

No.	Cause	Procedure, measuring location, criteria, and remarks			
1	Defective pump coupling	When boom is inoperative, if bucket does not tilt back and cooling fan malfunctions, pump coupling may be defective.			
2	Air sucked into suction line of steering and work equipment pump	Check suction piping for cracks, etc.			
3	Defective HST charge pump or defective low-pressure relief valve of HST pump	★ Be ready with engine stopped, then perform troubleshooting with engine at high idle, directional lever in "N" position, and machine being stopped.			
		Low-pressure line relief pressure (source pressure of work equipment PPC circuit)	Work equipment control lever	NEUTRAL	2.7 ± 0.15 MPa {27.6 ± 1.5 kg/cm^2}
		When boom is inoperative, if bucket does not tilt back and relief pressure of low-pressure line is low, HST charge pump or low-pressure relief valve of HST pump may be defective.			
4	Malfunction of PPC valve	If boom is operable but bucket does not tilt back, PPC valve spool may malfunction.			
		PPC valve output pressure	Boom control lever	TILT operation (Full stroke)	Approx. 2.45 MPa {Approx. 25 kg/cm^2}
5	Defective slow return valve of PPC line	Check slow return valve on bucket DUMP side for clogging and clean it.			
6	Defective work equipment main relief valve	★ Be ready with engine stopped, then perform troubleshooting with engine at high idle.			
		Steering and work equipment pump pressure	All control levers	Hydraulic relief	20.6 (± 2.0) MPa {210 (± 20) kg/cm^2}
		• When boom is inoperable, if bucket does not tilt back, or if bucket tilts back without load but does not tilt back with load, main relief valve of work equipment valve may be defective.			
7	Malfunction of boom spool of work equipment valve	When no failure is found by checks on causes 3 and 6, if bucket is operable but boom is inoperable, or hydraulic drift of lift cylinder is large, boom spool may malfunction. Check for stuck or damaged spool.			
8	Defective bucket cylinder	• If hydraulic drift of bucket cylinder is large, piston ring of bucket cylinder may be defective.			
9	Defetive work equipment and steering spump	• When boom is inoperable and bucket does not tilt back • When bucket tilts back without load but does not tilt back with load • When steering wheel is heavy to turn with engine at full throttle			
10	Malfunction of work equipment lock solenoid valve (for control valve pilot circuit)	Be ready with engine stopped, then perform troubleshooting with engine at high idle.			
		If output pressures of all PPC valves including bucket (TILT) are low in check on cause (4), work equipment lock solenoid valve may malfunction. Check work equipment lock solenoid valve for stuck spool			
		Lock switch	Solenoid output pressure		
		When locked	0 MPa {0 kg/cm^2}		
		When unlocked	2.7 ± 0.15 MPa {27.6 ± 1.5 kg/cm^2}		

S-1 Engine does not crank when starting switch is turned to START position

Failure	Engine does not crank when starting switch is turned to START position.
Related information	• See E mode (E-1) for troubleshooting of electrical system. • If any failure code is displayed, perform troubleshooting for that code first.

No.	Cause	Point to check, remarks	Remedy
1	Defective wiring harness in starting circuit	• When starting switch is turned to START position, starting motor pinion is not pushed out.	Perform troubleshooting for E-1 and take remedies.
2	Defective starting motor	• Grating noise is heard from starting motor pinion. (When starting switch is turned to START position, starting motor pinion is pushed out.) • Starting motor pinion disengages during operation. (When starting switch is turned to START position, starting motor pinion is pushed out.) • Rattling noise is heard and starting motor does not rotate. (When starting switch is turned to START position, starting motor pinion is pushed out.) (Reference: Rattling noise is caused when starting motor pinion is repeatedly pushed out and pulled in.)	Perform troubleshooting for E-1 and take remedies.
3	Broken flywheel ring gear	• If grating noise is heard from starting motor pinion and starting motor does not rotate, visually check flywheel ring gear.	Replace if damaged.
4	Cracked EGR cooler (Reference: coolant in exhaust gas)	• Remove EGR cooler outlet gas piping and check whether cooling water containing coolant flows out. ★ Water in exhaust gas can be normally condensed, so check that condensate is coolant or not.	Replace EGR cooler and drain water from engine cylinders.

S-12 Fuel consumption is excessive

Failure	Fuel consumption is excessive.
Related information	• If any failure code is displayed, perform troubleshooting for that code first.

No.	Cause	Point to check, remarks	Remedy
1	Excessive spill of fuel from injector	• Measure spill rate from injector. (Reference: See Testing and adjusting, "Measuring fuel delivery, return and leakage".)	Replace injector. Lots of dusts are probably in fuel. Check storage management of fuel.
2	Clogged fuel return piping	• Check fuel return piping for clogging. (Injection rate may be increased due to clogged fuel return piping.)	Clean or replace fuel return piping.
3	Defective injector	• Some cylinder is found to be cool when exhaust manifolds are touched by hand immediately after engine is started. • When engine is run in cylinder cutout mode with some cylinder cut out, engine speed does not change. (Reference: See Testing and adjusting, "Handling cylinder cutout mode operation".)	Replace injector.
4	Fuel leakage from cylinder head	• Check for increased oil level. • Check for smell of diesel fuel.	Repair defective parts.
5	Fuel leakage from feed pump oil seal	• Check for increased engine oil level and smell of diesel fuel. • Check feed pump oil seal.	Replace feed pump oil seal.
6	Fuel leakage outside engine	• Check for fuel leakage outside engine.	Repair defective parts.

Coating materials list

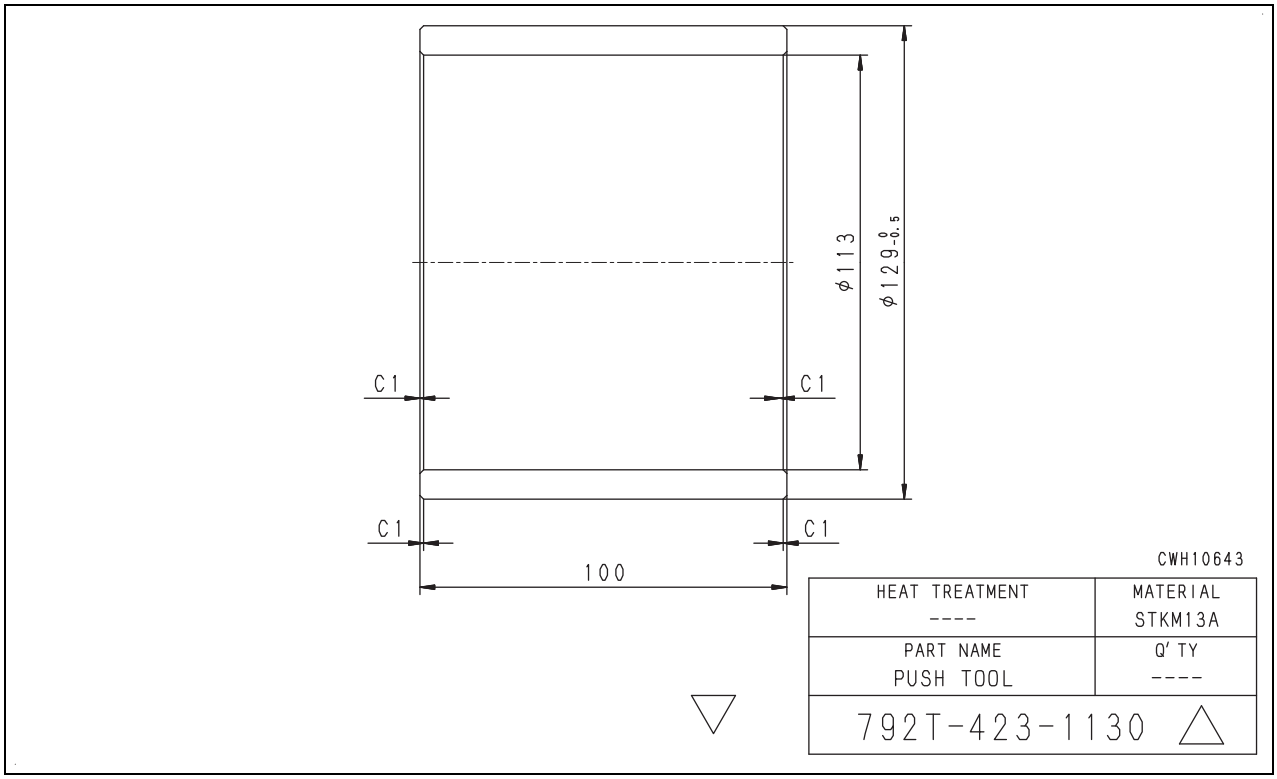
(Rev. 2010.10)

★ The coating materials such as adhesives, liquid gasket, and grease used for disassembly and assembly are listed below.
★ For coating materials not listed below, use the equivalent of products shown in this manual.

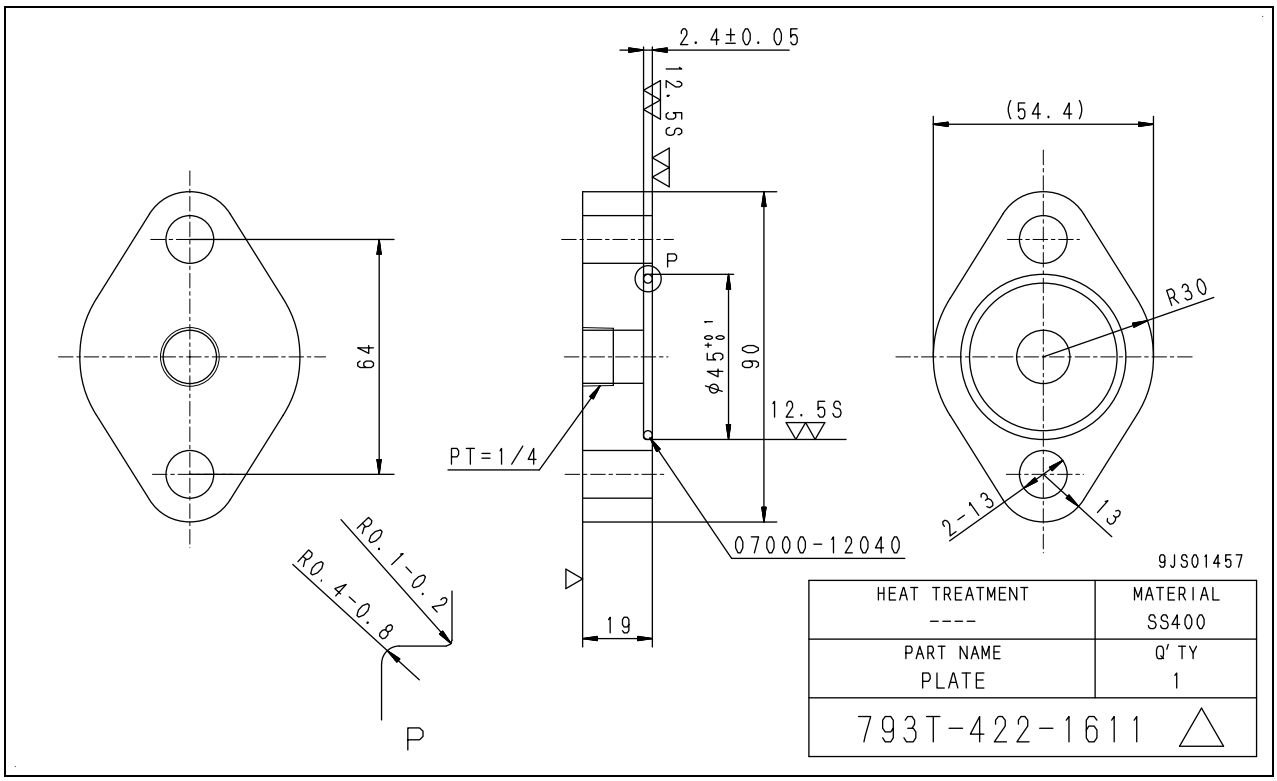
Cate-gory	Komatsu code	Part No.	Capacity	Container	Main feature and application
Adhesive	LT-1A	790-129-9030	150 g	Tube	• Use to prevent rubber gasket, rubber cushion, and cork stopper from coming off.
	LT-1B	790-129-9050	20 g (2 containers)	Plastic container	• Use for plastic (except polyethylene, polypropylene, tetrafluoroethylene and vinyl chloride), rubber, metal, and non-metal parts which require immediate and strong adhesion.
	LT-2	09940-00030	50 g	Plastic container	• Features: Resistance to heat and chemicals • Use to prevent bolts and plugs from coming loose and as sealant.
	LT-3	790-129-9060 (Set of adhesive and hardener)	Adhesive: 1 kg Hardener: 500 g	Can	• Use to bond or seal metal, glass, and plastic parts.
	LT-4	790-129-9040	250 g	Plastic container	• Use to seal drilled hole plugs, etc.
	Holts MH705	790-126-9120	75 g	Tube	• Heat-resistant sealant for engine repair
	ThreeBond 1735	790-129-9140	50 g	Plastic container	• Instantaneous adhesive • Curing time: From 5 sec. to 3 min. • Use to bond metal, rubber, plastic, and wood mainly.
	Aron Alpha 201	790-129-9130	2 g	Plastic container	• Instantaneous adhesive • Quick-curing type (max. strength is obtained after 30 minutes) • Use to bond plastic and metal mainly.
	Loctite 411	790-129-9190	20 g	Tube	• General-purpose instantaneous adhesive with excellent heat, impact, and peeling resistances. • Use on bushing mounting surface on axle support
	Locktite 515	–	50 g	Tube	• Anaerobic sealant for low-strength metal flange for prevention of leakage and displacement • Use on mating surfaces on axle.
	Loctite 648-50	79A-129-9110	50 cc	Plastic container	• Features: Resistance to heat and chemicals • Use to bond high-temperature fit parts.

Note) Komatsu does not take any responsibility for special tools manufactured according to these sketches.

H18 Push tool



H22 Plate



Removal and installation of engine hood assembly

Removal

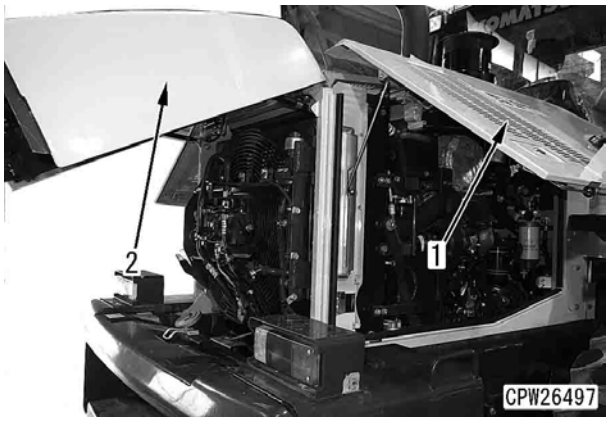
⚠ Place the machine on a level surface, and set the lock bar to frames to lock front and rear frames.

⚠ Lower the work equipment to the ground completely and stop the engine. Apply the parking brake and put the blocks under the wheels.

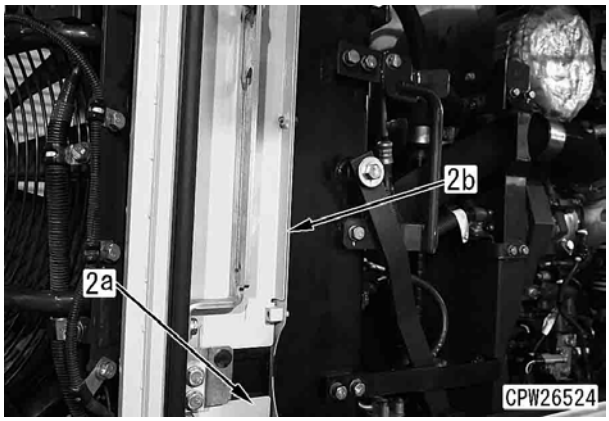
⚠ Turn the battery disconnect switch to OFF position, and remove the key. (For details, see Testing and adjusting, "Handling battery disconnect switch".)

1. Open engine side cover (1) on each side and lock it.
   ★ Check that the lock is securely engaged.

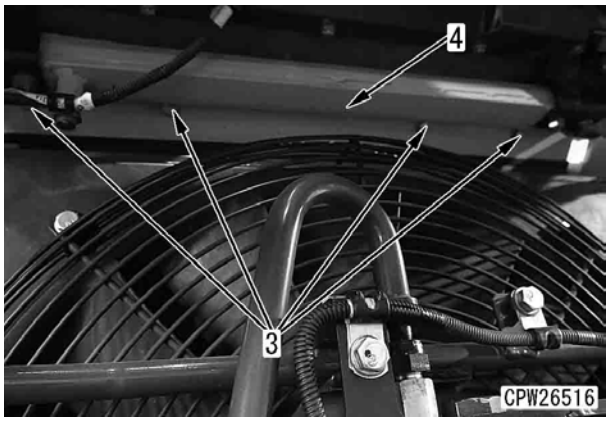
2. Open radiator grille (2).



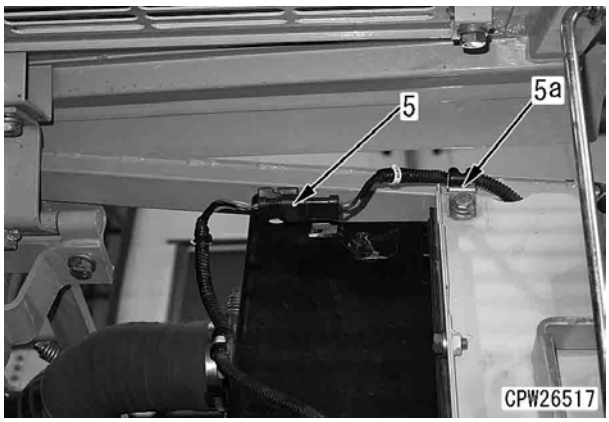
3. Remove plates (2a) and (2b) on each side.



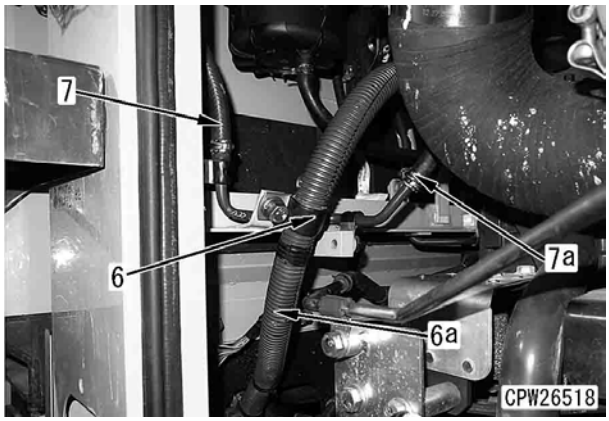
4. Remove 4 mounting bolts (3), and remove cover (4).



5. Disconnect connector BR1 (5) for the rear combination lamp, and disconnect clamp (5a).



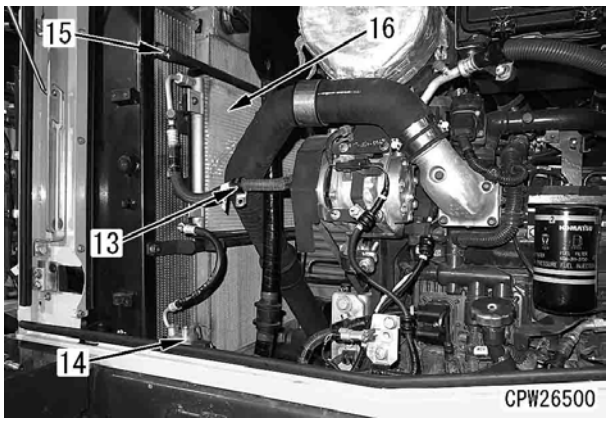
6. Unlock 2 clamps (6), and disconnect air conditioner hose (6a) from the engine hood side.
7. Unlock clip (7a), and remove air cleaner outlet hose (7).
8. Disconnect MAF sensor connector R03 (7b).
9. Unlock clamp (8), and remove air cleaner outlet hose (9). [*1]



11. Remove 3 air conditioner hose clamps (13).

12. Remove air conditioner receiver tank and bracket assembly (14). [*1]

13. Remove 4 mounting bolts (15), and remove air conditioner condenser assembly (16) and the bracket as a unit.
    ★ Secure air conditioner assembly (16) and air conditioner receiver tank (14) to the machine body by using rope.



14. Remove rear view mirror (17).

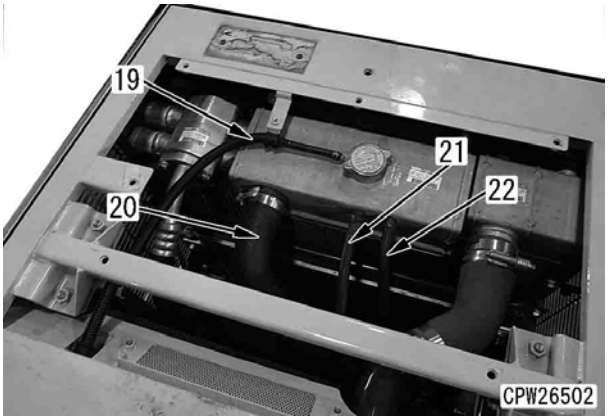
15. Remove cover (18).

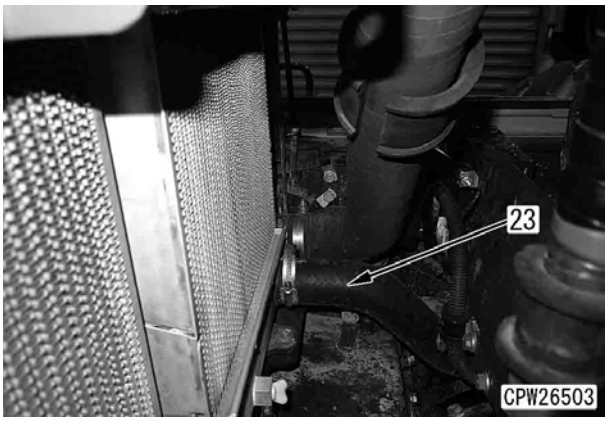
16. Disconnect overflow hose (19).

17. Disconnect radiator upper hose (20). [*2]

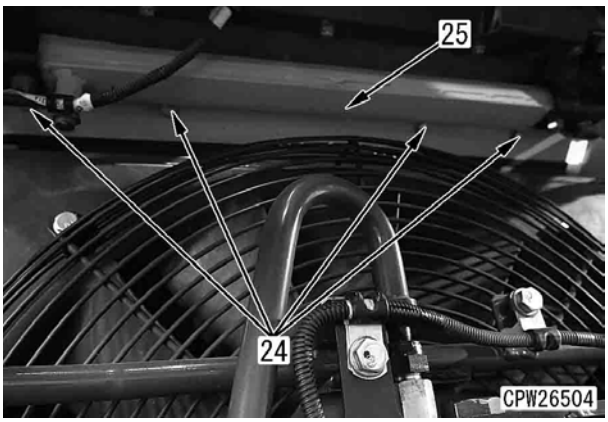
18. Disconnect hoses (21) and (22).

19. Disconnect radiator lower hose (23). [*3]

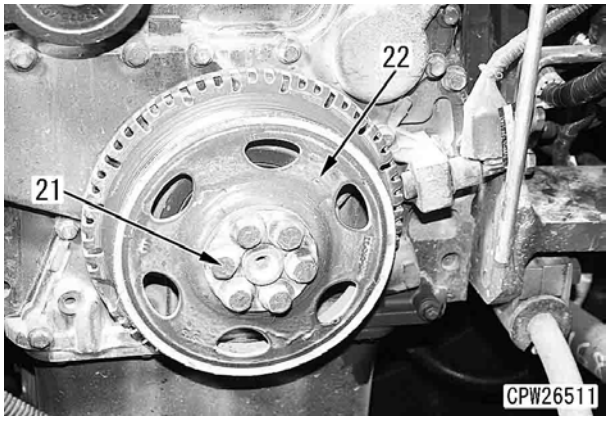




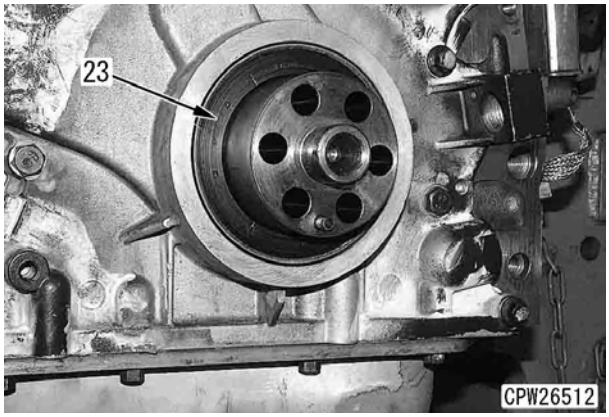
20. Remove 4 mounting bolts (24), and remove plate (25).



16. Remove 6 mounting bolts (21), and remove crankshaft pulley (22).



17. Remove engine front oil seal (23).



Removal and installation of EGR valve assembly

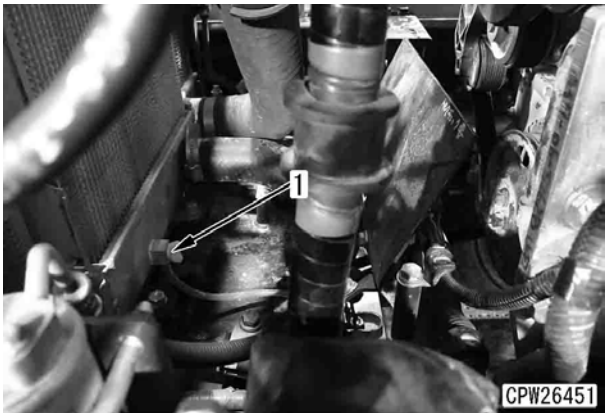
Removal

⚠ Place the machine on a level surface, and set the lock bar to frames to lock front and rear frames.

⚠ Lower the work equipment to the ground completely and stop the engine. Apply the parking brake and put the blocks under the wheels.

⚠ Turn the battery disconnect switch to OFF position, and remove the key. (For details, see Testing and adjusting, "Handling battery disconnect switch".)

1. Loosen radiator drain plug (1), and drain the coolant.
   Radiator: **24.6 ℓ**



2. Remove the engine hood assembly. For details, see "Removal and installation of engine hood assembly".

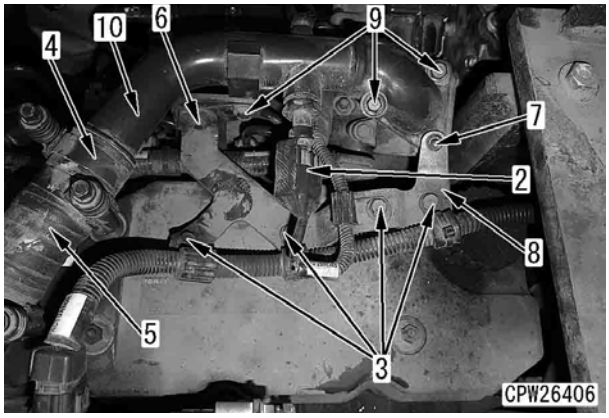
3. Disconnect connector (2).

4. Remove 4 wiring harness clamps (3).

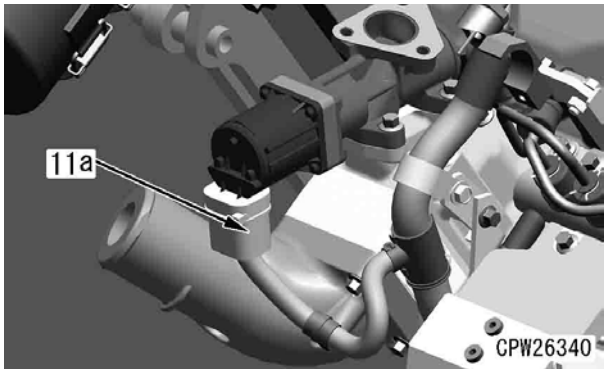
5. Loosen 3 hose clamps (4), and disconnect hose (5). [*1]

6. Remove mounting bolt (6) and nut (7), and remove bracket (8).

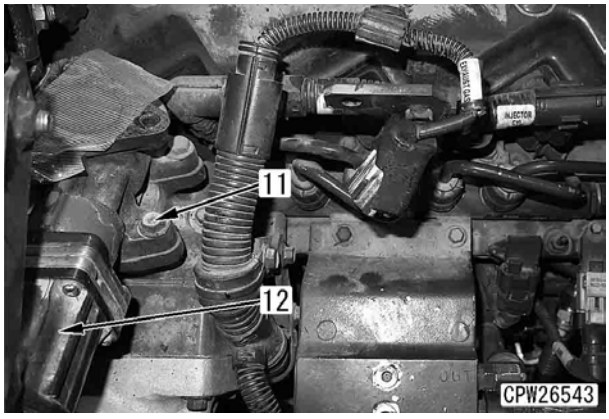
7. Remove mounting bolts (9), and remove EGR pipe (10). [*2]



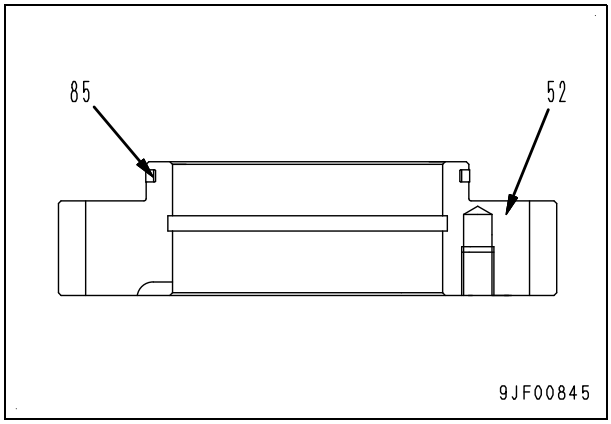
8. Disconnect harness connector (11a).



9. Remove mounting bolts (11), and remove EGR valve (12). [*3]

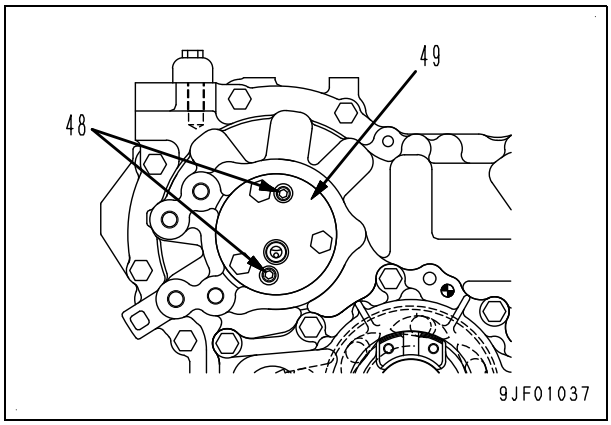


2) Remove seal ring (85) from HST motor 1 gear (52).

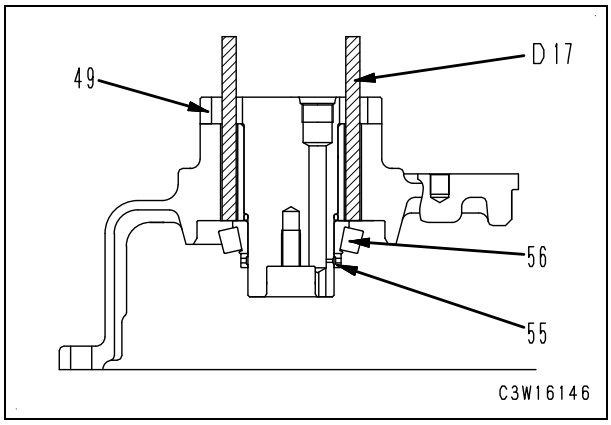


27. Bearing

1) Remove 2 plugs (48) from shaft (49).

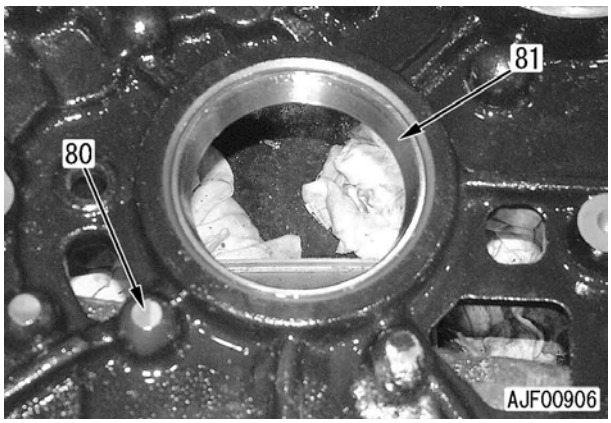


2) Remove spacer (55).
3) Insert 2 tools D17 into the plug holes, tap them evenly to remove bearing (56) from shaft (49).
   ★ Do not remove shaft (49).



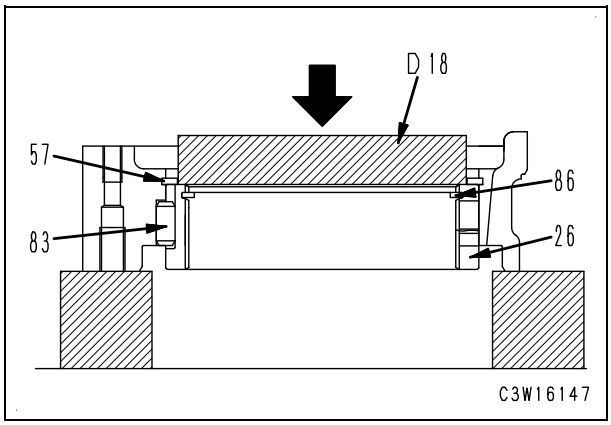
28. Rear case

1) Remove outer race (81) from rear case (80).

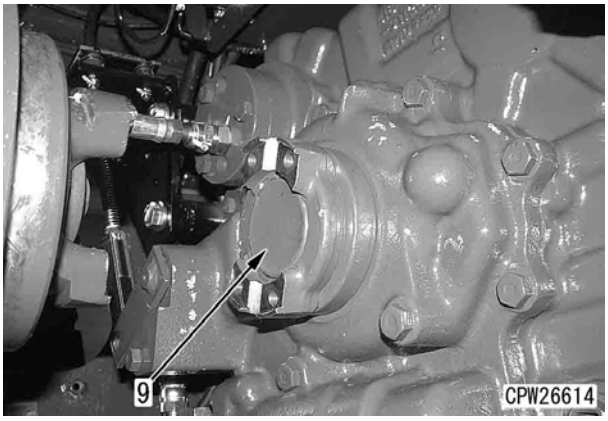


29. Clutch housing

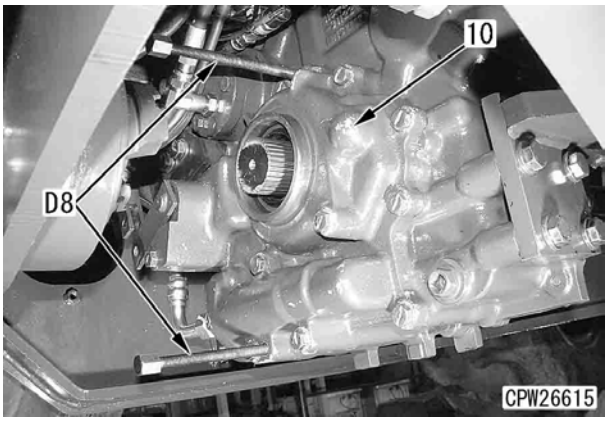
1) Remove clutch housing (26) and 3 pins (83) by using tool D18.
2) Remove snap ring (86) from clutch housing (26).
3) Remove snap ring (57).



10. Remove coupling (9).
    - Prepare an oil container to receive outflowing oil.



11. Remove parking brake mounting bolts, and remove parking brake assembly (10) by using tools D8. [*3]



Installation

- Perform installation in the reverse order to removal.

[*1]

Rear drive shaft mounting bolt:
59 to 74 Nm {6.0 to 7.5 kgm}

- Precautions for installing the rear drive shaft
  1) Check that the keyway of the spider cap is completely nested in the keyway of the counter yoke before tightening mounting bolts.
  2) Check that the lateral misalignment between the rear axle and transfer is within 3 mm.
  3) If the misalignment in item 2) is 3 mm or more, correct it by adjusting the positions of the transfer cushion and transfer mount.

[*2]

★ For the split pin (2) of the parking brake, be sure to open it 180 degrees bilaterally to lock it.

[*3]

★ Use tool D8 to install parking brake assembly (10).

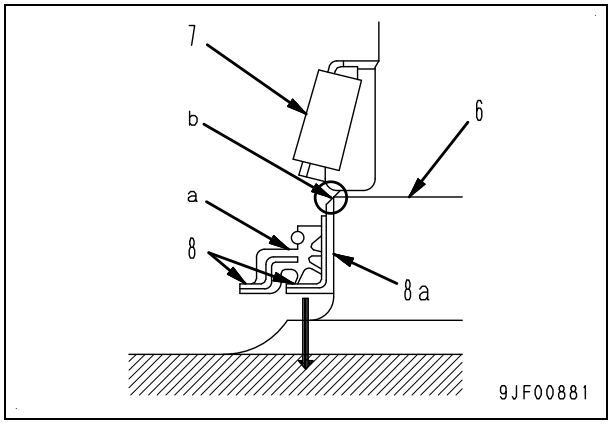
Parking brake mounting bolt:
98 to 123 Nm {10.0 to 12.5 kgm}

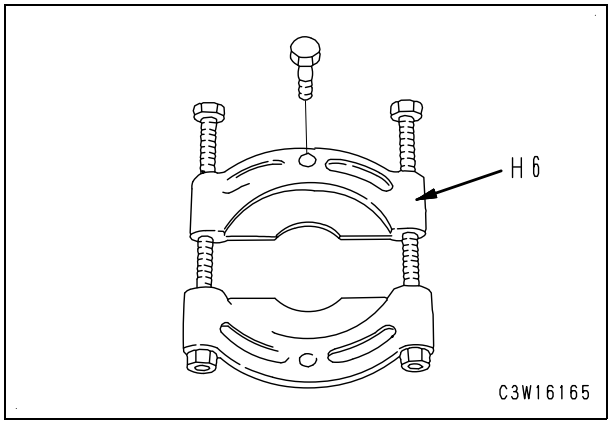
- **Refilling with oil (transfer case)**
  Refill with oil to the specified level through the oil filler port. Run the engine to circulate the oil through the piping, and check the oil level again.
  Power train oil: **Approximately 5.5 ℓ (TO10)**
  (For details of oil and grease, see "Table of fuel, coolant and lubricants".)

6. Axle shaft bearing

★ Do not heat or flame-cut the bearing to remove it.

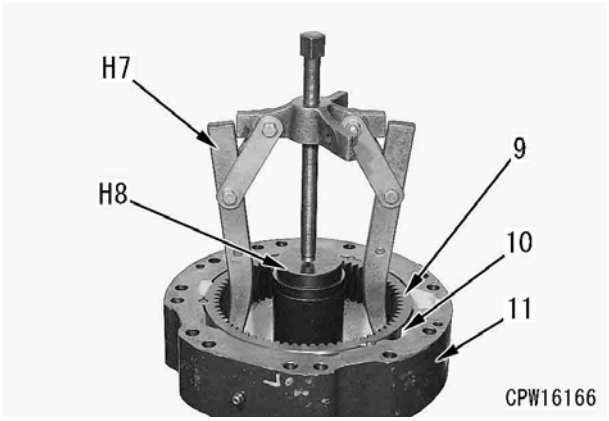
1) To remove bearing (7) of axle shaft (6), push in part (a) of oil seal sleeve (8) to the flange side by tapping its circumference evenly with a screwdriver, etc.
2) In the contact region between bearing (7) and sleeve (8a), provide clearance (b) for hooks of the puller to catch.
3) Install tool H6 to the bottom of the bearing and fix it securely.
4) Install tool H6 to clearance (b).
5) Tighten the bolt of tool H6 to remove bearing (7).
   ⚠ **Do not use a gas burner when disassembling a bearing.**
6) Remove oil seal (8).

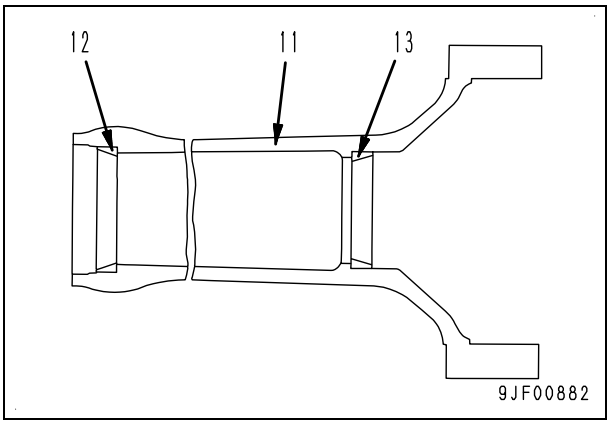




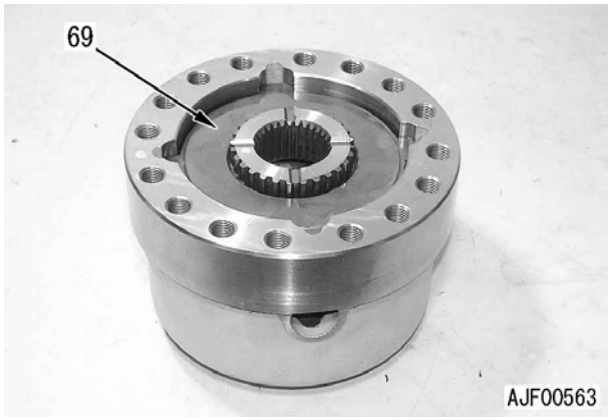
7. Axle housing

1) Evenly pull up ring gear (9) and 3 pins (10) to remove them from axle housing (11) by using tool H7.
   ★ Install tool H8 to the bolt end of tool H7 to adjust the height of the bolt.
   ★ Be careful that the hooks of tool H7 do not come off the ring gear.
2) Remove bearing outer races (12) and (13) from axle housing (11).

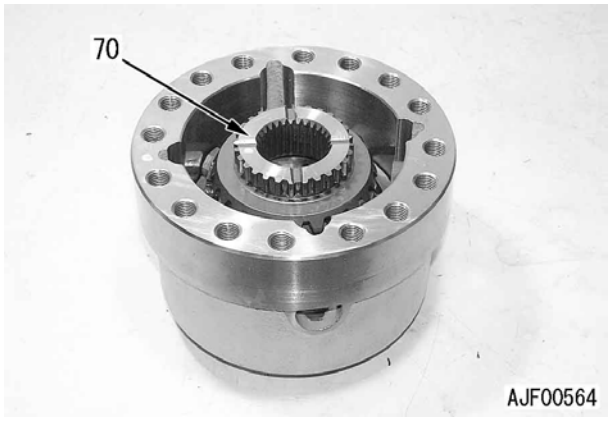




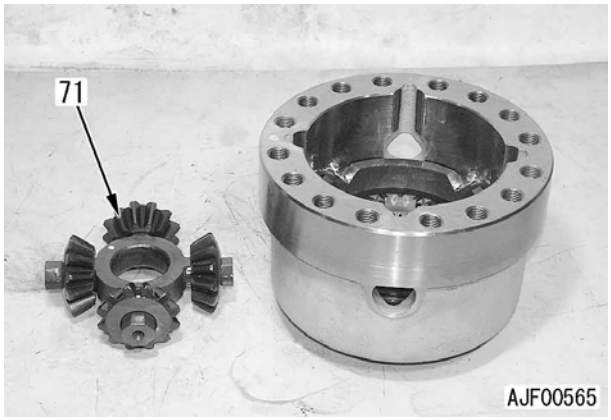
5) Remove pressure ring (69).
   ★ Bring it up by putting finger in the hole of the case side.



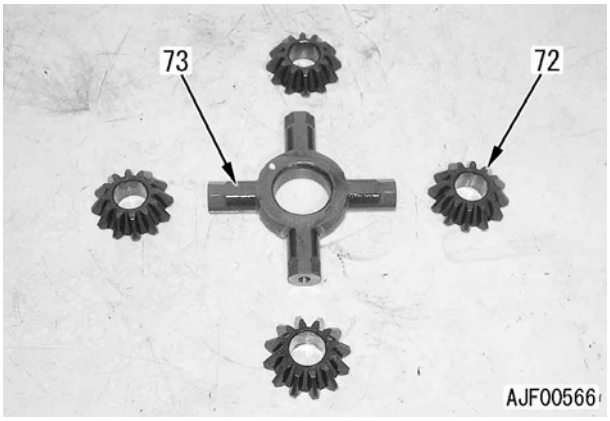
6) Remove side gear (70).



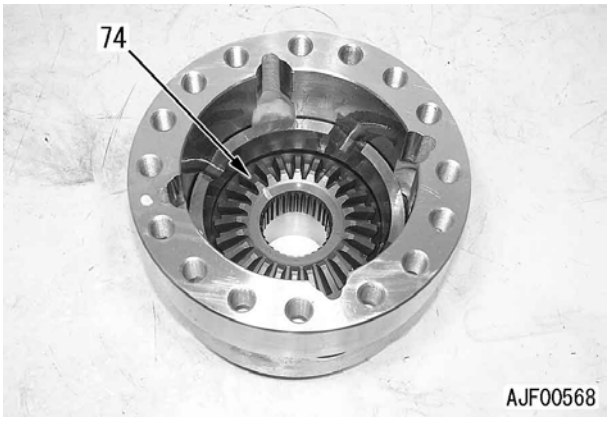
7) Remove pinion gear assembly (71).



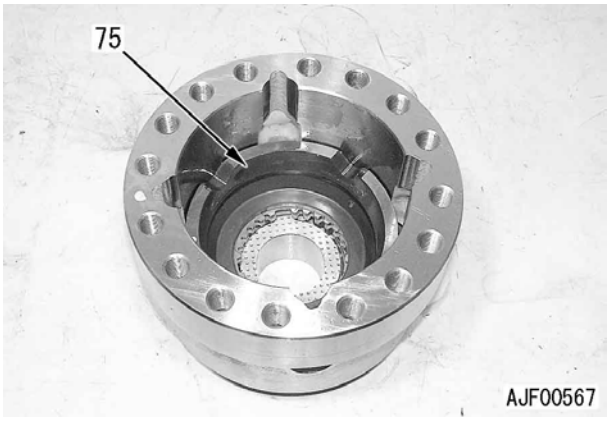
8) Remove 4 pinion gears (72) from spider shaft (73).

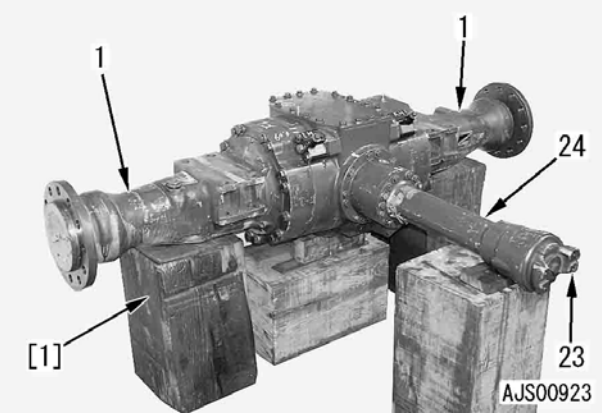


9) Remove side gear (74).



10) Remove pressure ring (75).

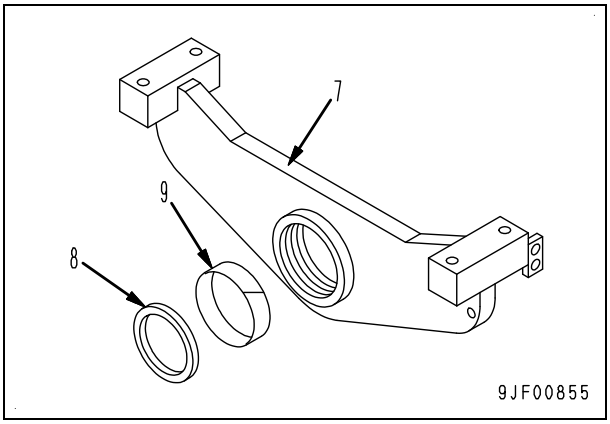




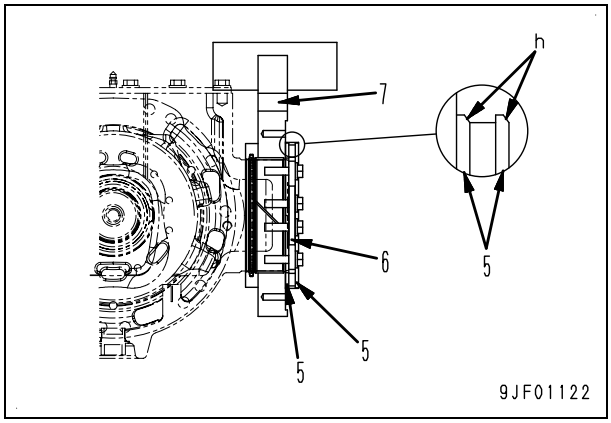
3) Install the brake tube assembly.

19. Rear axle support

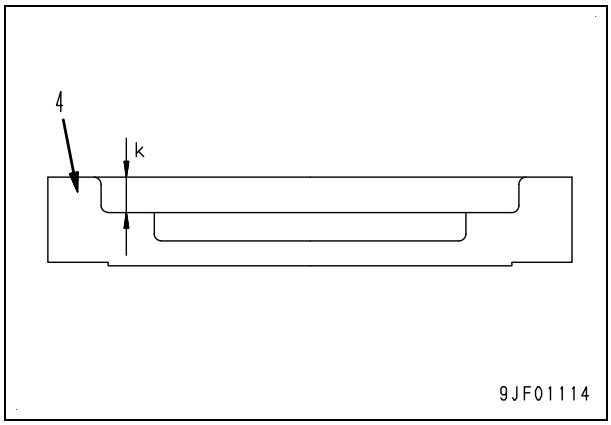
1) Install bushing (9) and packing (8) to rear axle support (7).
   ★ Install the bushing with its chamfered section facing the axle and with its slit sideways.
   ★ Install the packing with its lip facing the outside (axle side) of rear axle support.

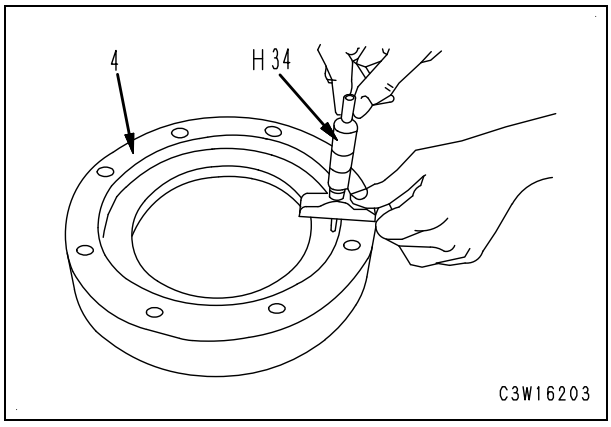


2) Sling and install rear axle support (7).
3) Install thrust plate (6) and 2 thrust washers (5).
   ★ Thoroughly clean the mating faces of the thrust plate and thrust washer.
   ★ Install thrust washer (5) with chamfered side (h) facing outside.
   ★ Check that there is no clearance between the thrust plate and thrust washer by inserting a feeler gauge all around the mating faces.
   Periphery of pivot mounting portion: **Grease (G2-LI)**
   Mounting bolt: **Adhesive (Loctite 262)**
   Mounting bolt: **93.1 to 122.5 Nm {9.5 to 12.5 kgm}**

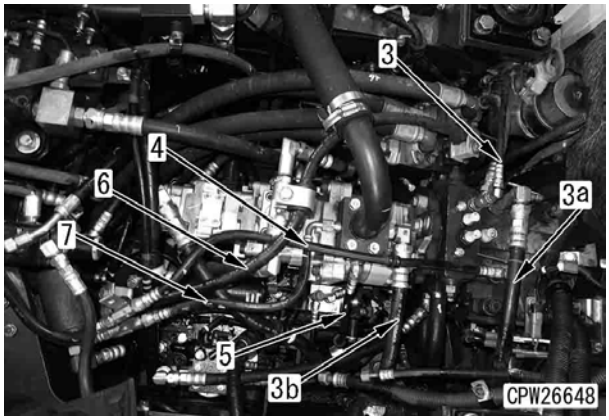


20. Adjust the shims of cover (trunnion cap) (4).
   1) Measure dimension (k) of cover (4) at 4 diagonal points by using tool H34, and then calculate the average.
      ★ Clean the contact surface of tool H34 (depth micrometer).
      • Standard average value (k): **19.85 to 20.00 mm**

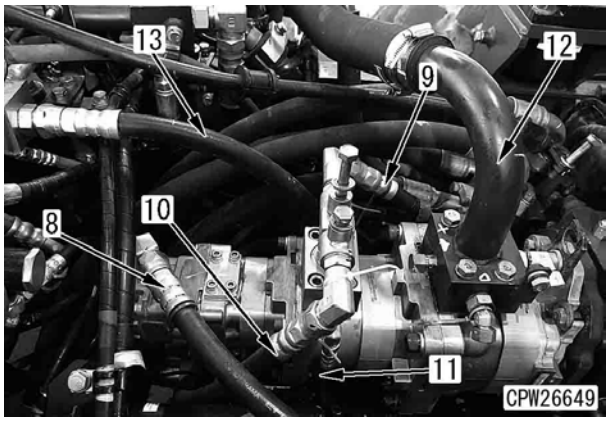




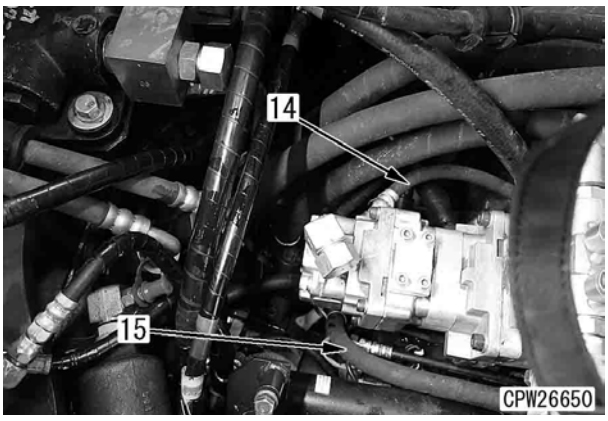
   2) Measure dimension (m) between rear axle support (7) and thrust washer (5) at 4 diagonal points by using tool H34, and then calculate the average.
      ★ Clean the contact surface of tool H34 (depth micrometer).



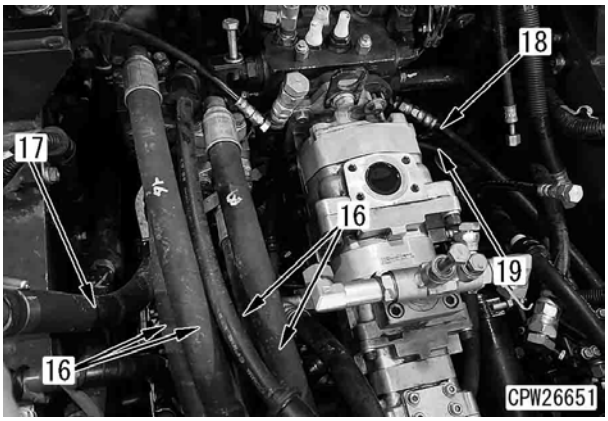
- (8): Transfer lubrication pump suction hose
- (9): Work equipment pump suction hose
- (10): Work equipment pump suction hose
- (11): Clutch solenoid valve return hose
- (12): Steering pump suction tube [*2]
- (13): Steering pump hose



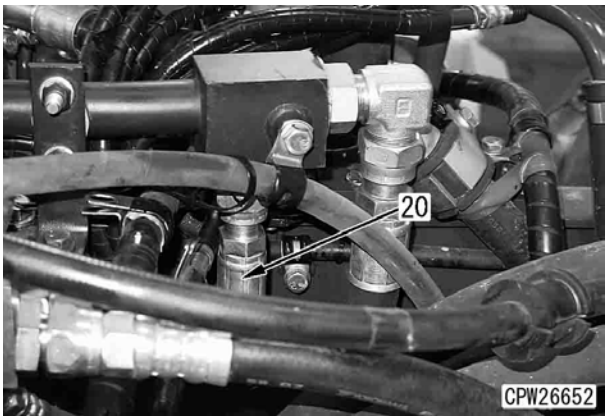
- (14): Transfer lubrication hose
- (15): Brake and fan pump discharge hose



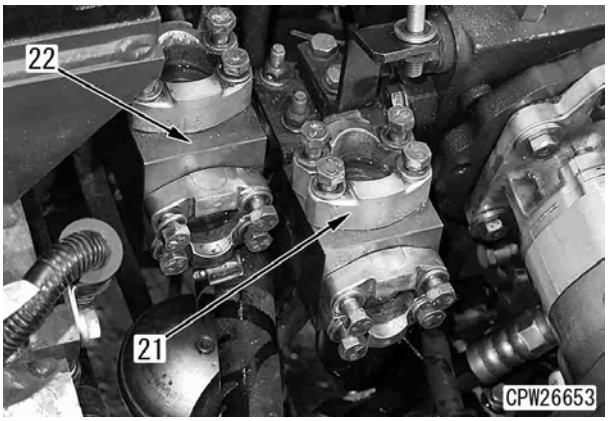
- (16): 4 HST pump discharge hoses
- (17): Hydraulic tank return hose [*3]
- (18): HST pump Fa port hose
- (19): HST pump Fa port hose



- (20): Work equipment discharge hose

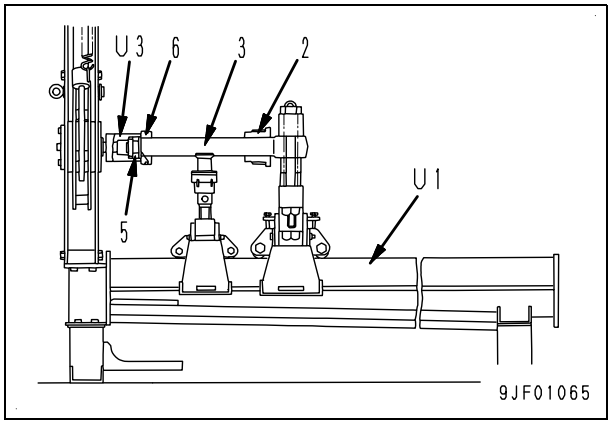


- (21): HST pump A port discharge tube
- (22): HST pump B port discharge tube



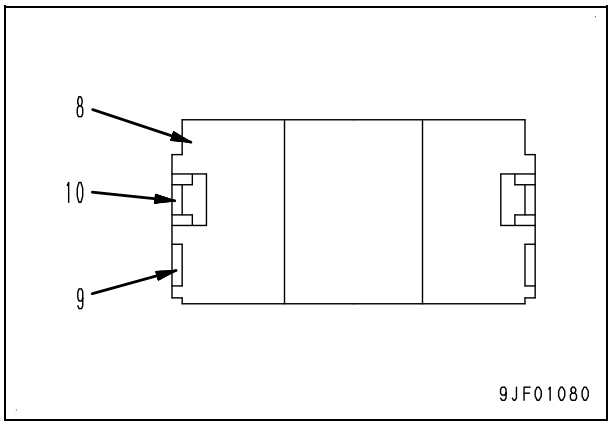
3. Piston and cylinder head

1) Set cylinder head and piston rod assembly (3) to tool U1.
2) Remove nut (5) by using tool U3.
   - Width across flats of nut (steering): **46 mm**
     (boom): **70 mm**
     (bucket): **75 mm**
3) Remove piston assembly (6), and remove cylinder head assembly (2).



4. Disassembly of piston assembly

Remove wear ring (9) and piston ring (10) from piston (8).

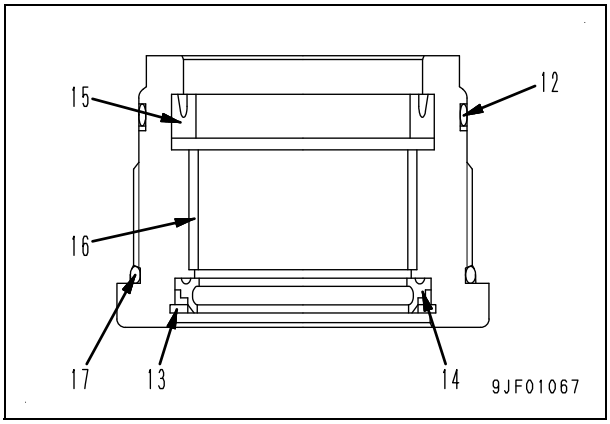


5. Fine disassembly of cylinder head assembly

- **Serial number: 80001 to 82013**

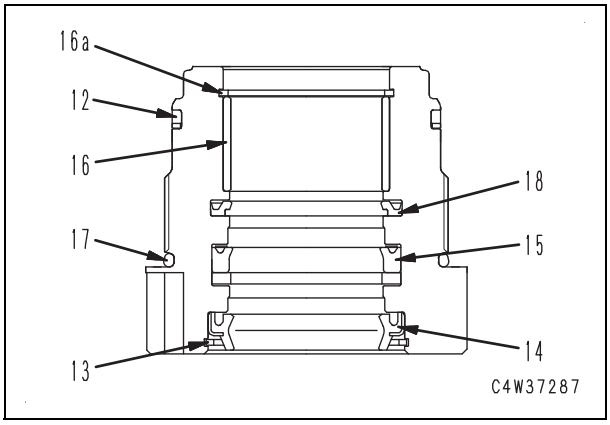
★ If the modification is done according to Service News "AT17313", disassemble the cylinder head referring to the disassembly procedure for serial number 82014 and up.

1) Remove O-ring and backup ring (12).
2) Remove snap ring (13) and dust seal (14).
3) Remove rod packing (15).
4) Remove bushing (16).
5) Remove O-ring (17).



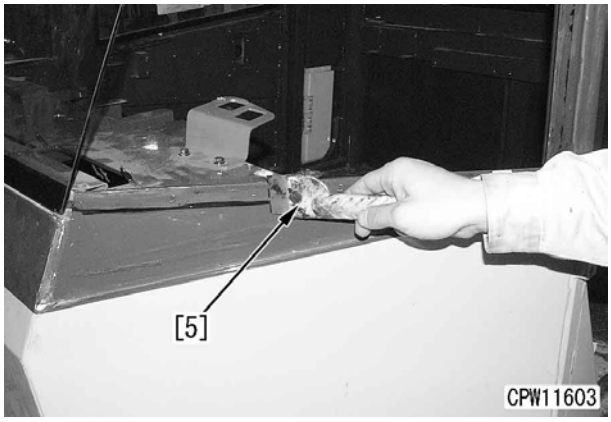
- **Serial number: 82014 and up**

1) Remove the O-ring and backup ring (12).
2) Remove snap ring (13), and remove dust seal (14).
3) Remove rod packing (15).
4) Remove buffer ring (18).
5) Remove snap ring (16a).
6) Remove bushing (16).
7) Remove O-ring (17).



Installation

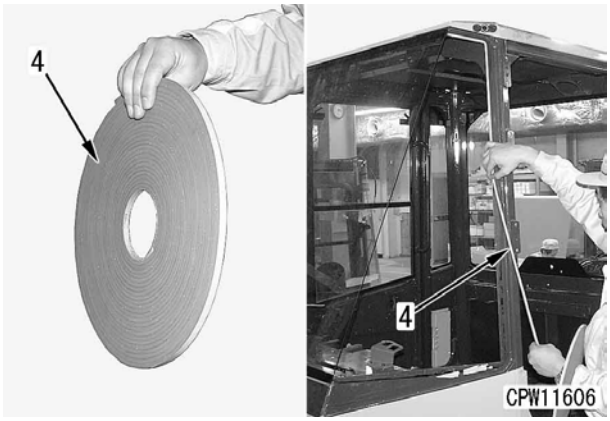
1. Using scraper [5], remove the remaining adhesive.
   ★ Be careful not to damage the painted surface when cleaning adhesive.



2. Remove oil, dusts and stains from bonding surfaces on operator's cab (2) and window glass (3) by using white gasoline.
   ★ If bonding surfaces are not cleaned well, the glass may not be stuck perfectly.
   ★ For the window glass, clean the all black part on the back side.
   ★ After cleaning, naturally dry them for more than 5 minutes.

3. If you have peeled off painting unintentionally while removing adhesives by using a scraper, coat such portions with paint.
   ★ If the glass is installed without repairing the bare part, that part will be rusted.
   ★ Do not apply paint to a part which will be coated with primer.

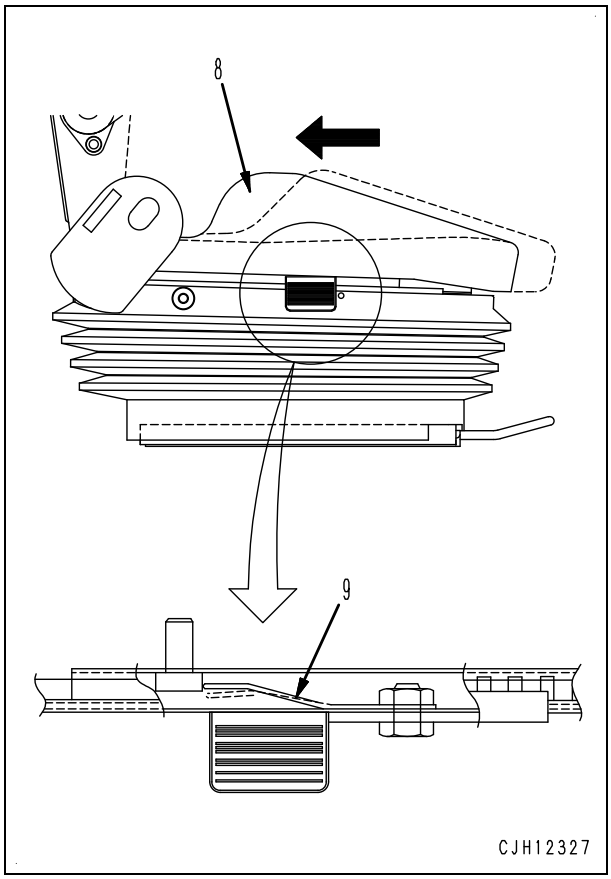
4. Stick both-sided adhesive tape (4) along the inside edge of the glass sticking section.
   • Size of both-sided adhesive tape: 7 x 4.8 mm
   ★ When sticking the both-sided adhesive tape, do not touch the cleaned surface as long as possible.
   ★ Do not remove the tape on glass-adhering side of the dam rubber until installation of the window glass is started.



   ★ Be careful not to allow dam rubber (4) to peel off from the cab surface at corner portion (b).

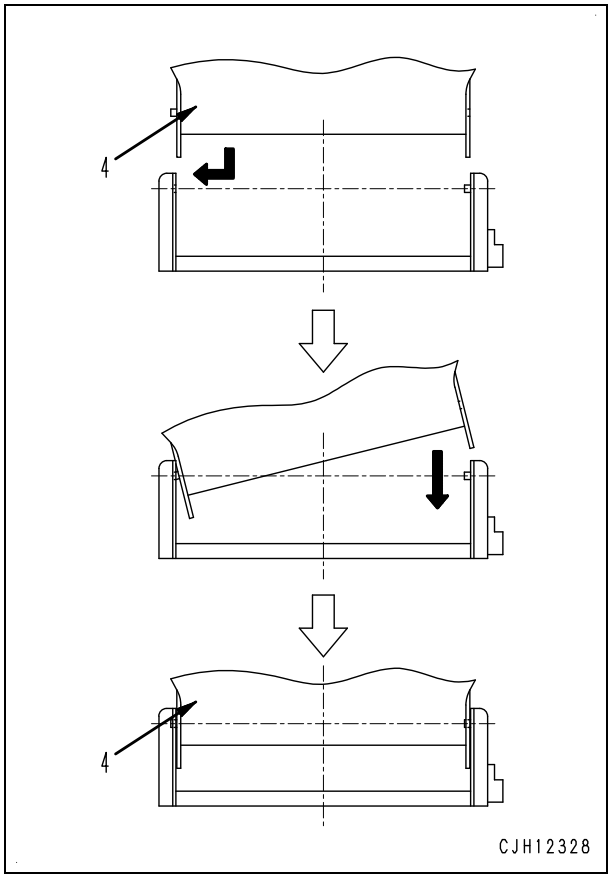
4. Seat cushion

1) Slide in the seat cushion from the front of the fitting position.
   ★ If seat cushion (8) is slid to the rear, it is locked by cushion stopper wire (9).

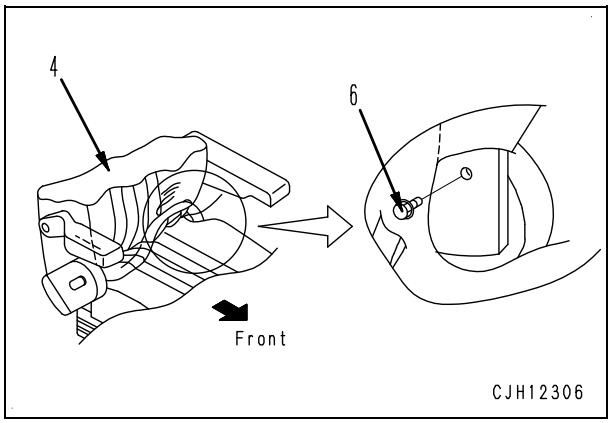


5. Backrest

1) Insert the left end of backrest (4), and then lower the right end.



2) Install backrest hinge mounting bolt (6).
   Backrest hinge mounting bolt:
   21.4 to 27.6 Nm {2.18 to 2.82 kgm}



Removal and installation of KOMTRAX terminal assembly

Removal

⚠ **Place the machine on a level surface, and set the lock bar to frames to lock front and rear frames.**

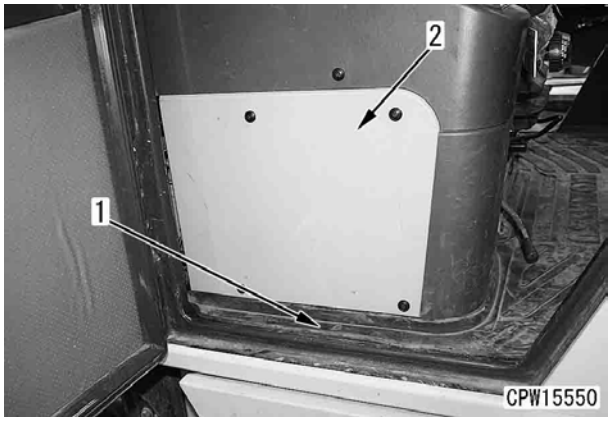
⚠ **Lower the work equipment to the ground completely and stop the engine. Apply the parking brake and put the blocks under the wheels.**

⚠ **Turn the battery disconnect switch to OFF position, and remove the key. (For details, see Testing and adjusting, "Handling battery disconnect switch".)**

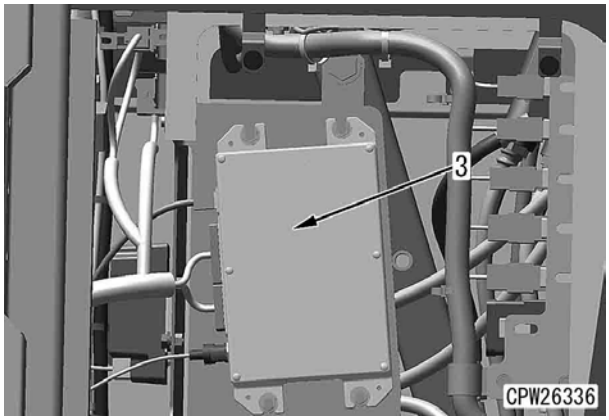
1. Open the right door of the operator's cab.
   ★ Be sure to set the door lock securely.

2. Roll up floor mat (1) below cover (2), and leave it fixed.

3. Remove outside cover (2) on the right armrest of the operator's seat.

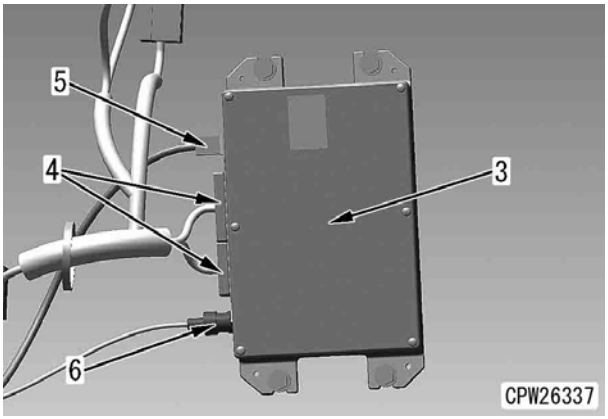


4. Remove 4 mounting bolts, and remove KOMTRAX terminal assembly (3).



5. Disconnect chassis wiring harness connector CN-L80 (4) from KOMTRAX terminal assembly (3).
   ★ Disconnect the chassis wiring harness first, and then disconnect antenna cable, etc. (If the antenna cable, etc. is disconnected first, an antenna cable open circuit error will be recorded in the KOMTRAX system.) [*1]

6. Disconnect antenna cable connectors (5) and (6) from KOMTRAX terminal assembly (3).



Installation

- Perform installation in the reverse order to removal.

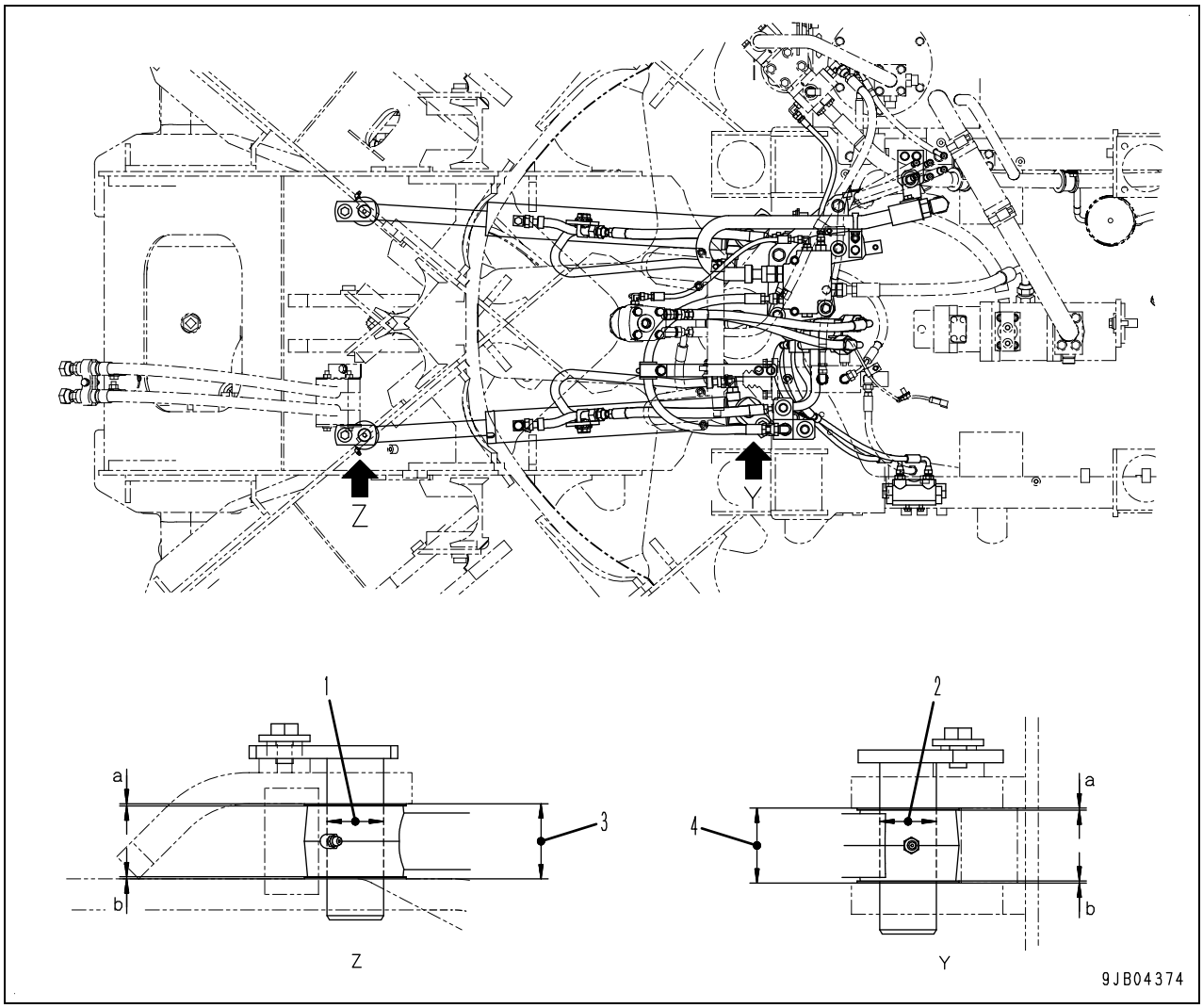
★ Before installation, be sure to remove foreign matters (dust, water, etc.) from wiring harness connectors of the KOMTRAX terminal assembly.

[*1]
★ When connecting connectors, connect antenna cables, etc. first, and then connect chassis wiring harness connectors.

Unit: mm

No.	Item	Criteria					Remedy
1	Clearance (front) between the output shaft and the bearing	Standard dimension	Tolerance		Standard clearance	Allowable clearance	Replace
			Shaft	Hole			
		60	+0.030 +0.011	0 -0.015	-0.045 to -0.011	-	
2	Clearance (front) between the output shaft bearing and the cage	110	0 -0.018	-0.015 -0.040	-0.040 to 0.003	-	
3	Clearance (rear) between the output shaft and the bearing	65	+0.030 +0.011	0 -0.015	-0.045 to -0.011	-	
4	Clearance (rear) between the output shaft bearing and the rear case	120	0 -0.018	-0.015 -0.040	-0.040 to 0.003	-	
5	Clearance (front) between the oil seal and the cage	100	+0.170 +0.080	+0.054 0	-0.170 to -0.026	-	
6	Clearance (front) between the dust seal and the cage	100	+0.400 +0.200	+0.054 0	-0.400 to -0.146	-	
7	Clearance (rear) between the oil seal and the cage	100	+0.170 +0.080	+0.054 0	-0.170 to -0.026	-	
8	Clearance (rear) between the dust seal and the cage	100	+0.400 +0.200	+0.054 0	-0.400 to -0.146	-	
9	Clearance between the output shaft and the spacer	60	0 -0.030	+0.030 0	0 to 0.060	-	
10	Outside diameter (front) of the coupling oil seal contact surface	Standard dimension		Tolerance	Repair limit		
		75		0 -0.074	74.8		
11	Outside diameter (rear) of the coupling oil seal contact surface	75		0 -0.074	74.8		
12	Clearance between the cage and the front case	Standard dimension		Standard clearance	Allowable clearance		Shim adjustment
		0.7		0.1 to 1.3	-		
13	Free rotational torque of the output shaft (Assembly state without front coupling and rear coupling)	3.9 to 5.9 Nm {0.4 to 0.6 kgm}					

Steering cylinder



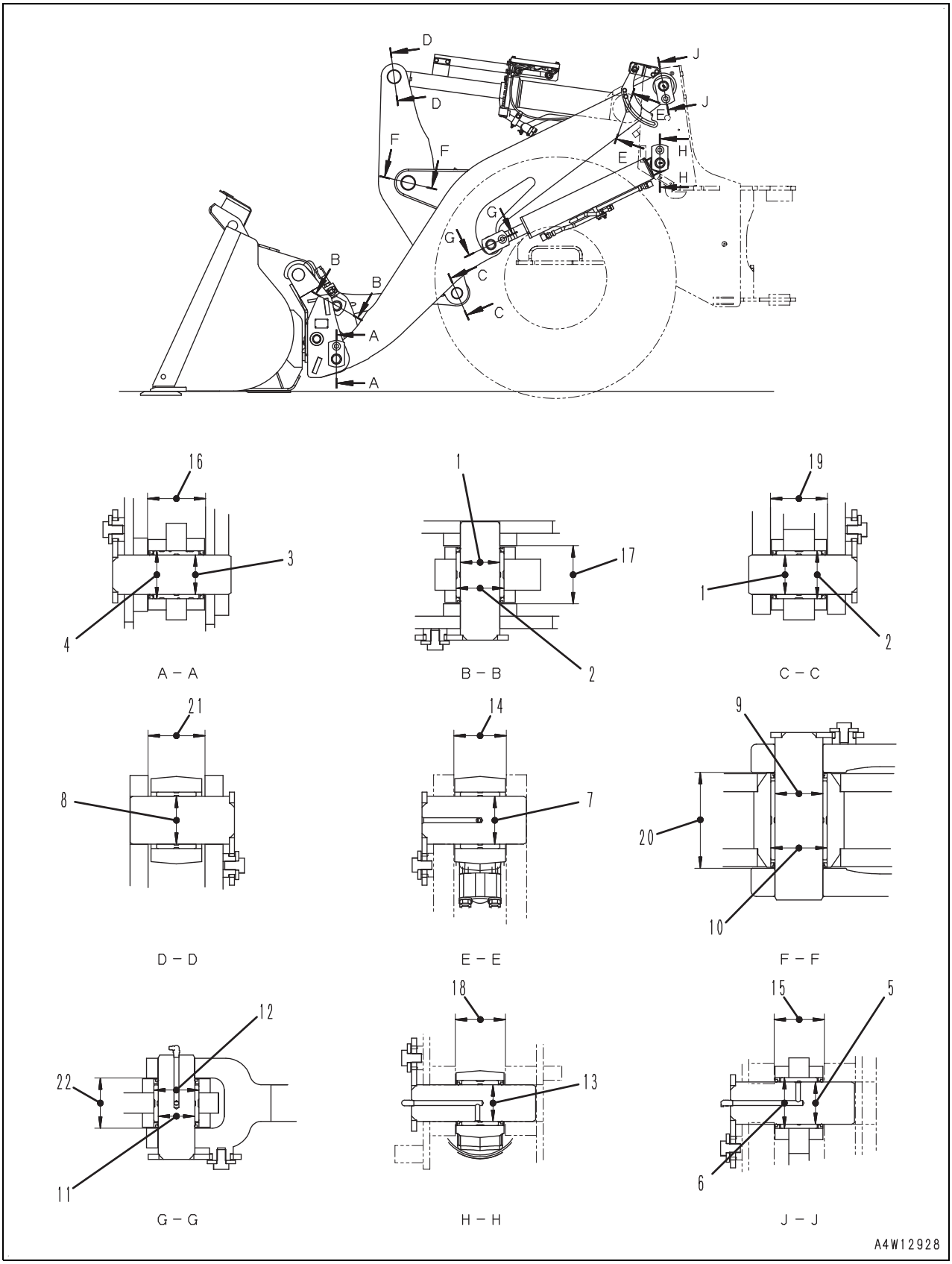
Unit: mm

No.	Item	Criteria					Remedy
1	Clearance between the cylinder rod frame connection bushing and the installation pin	Standard dimension	Tolerance		Standard clearance	Allowable clearance	Replace
			Shaft	Hole			
		40	0 -0.025	+0.180 +0.042	0.042 to 0.205	-	
2	Clearance between the cylinder bottom frame connection bushing and the installation pin	40	0 -0.025	+0.180 +0.042	0.042 to 0.205	-	
3	Connection point of the steering cylinder and front frame	Boss width		Hinge width	Standard (a+b) clearance		
		50		53	Max. 0.5 (After the shim is adjusted)		
4	Connection point of the steering cylinder and rear frame	50		53	Max. 0.5 (After the shim is adjusted)		

Unit: mm

No.	Item	Criteria					Remedy
1	Clearance (small) between the upper hinge pin and the rear frame	Standard dimension	Tolerance		Standard clearance	Allowable clearance	Replace
			Shaft	Hole			
		50	-0.038 -0.068	+0.100 0	0.038 to 0.168	-	
2	Clearance between the upper hinge pin and the spacer	50	-0.038 -0.068	+0.25 0	0.038 to 0.318	-	
3	Clearance between the upper hinge pin and the bearing	50	-0.038 -0.068	0 -0.012	0.026 to 0.068	-	
4	Clearance (large) between the upper hinge pin and the rear frame	66	-0.073 -0.103	± 0.05	0.023 to 0.153	-	
5	Clearance between the front frame and the spacer	105	-0.08 -0.68	-0.02 -0.12	-0.04 to 0.66	-	
6	Clearance between the front frame and the upper hinge bearing	105	0 -0.015	-0.02 -0.12	-0.120 to -0.005	-	
7	Clearance of the seal press-fit of the upper hinge pin	89	+0.07 -0.02	-0.05 -0.15	-0.220 to -0.030	-	
8	Clearance between the lower hinge pin and the rear frame bushing	70	-0.20 -0.21	-0.083 -0.123	0.077 to 0.127	-	
9	Clearance between the lower hinge pin and the bearing	70	-0.20 -0.21	-0.097 -0.122	0.078 to 0.113	-	
10	Clearance between the front frame and the lower hinge bearing	89	-0.1 -0.12	-0.05 -0.15	-0.05 to 0.07	-	
11	Clearance between the rear frame and the bushing	80	+0.084 +0.059	+0.054 0	-0.084 to -0.005	-	
12	Upper hinge spacer height	Standard dimension	Tolerance		Repair limit		
		23	± 0.1		-		
13	Standard shim thickness of the upper hinge and retainer	1.3					Adjust
14	Standard shim thickness of the upper hinge and retainer	1.0					
15	Tightening torque of the upper hinge pin retainer mounting bolt	3.92 to 5.88 Nm {0.4 to 0.6 kgm} (when the shim is adjusted)					
		59 to 74 Nm {6.0 to 7.5 kgm} (final value)					

Work equipment
Work equipment linkage



Functions of main components in air conditioner unit

Functions of main components

★ For the numbers used in the text, see the previous page.

Evaporator (1)

- Evaporator fins are cooled by the low-pressure, low-temperature refrigerant gas being sent from the expansion valve. Air from the blower motor is cooled and dehumidified when passing through the fins.

Heater core (2)

- Fins of the heater core are heated by the hot water (coolant) being sent from the engine. Air from the blower motor is heated as it passes through the fins.

Expansion valve (5)

- This valve turns high-pressure, high-temperature liquid refrigerant sent from the receiver into low-pressure, low-temperature atomized refrigerant through the throttling action.
  It controls flow rate of refrigerant by changing level of throttling depending on the thermal load in the operator's cab. Flow rate of refrigerant flowing to evaporator (1) determines the temperature of air blowing from the grille.

★ Use 4-mm hexagonal wrench.

Expansion valve mounting bolt:
6.9 Nm {0.7 kgm}

Blower amplifier (6)

- It controls the blower motor speed according to the signal current received from the air conditioner panel.

Blower OFF relay (7)

- Signal current from the air conditioner panel controls the relay coil. When the relay coil is energized and relay (7) is set to ON, power is supplied to the blow motor.

Compressor clutch relay (8)

- Signal current from the air conditioner control panel, that is sent when dual pressure switch (11) is actuated, controls the relay coil. When the relay coil is energized and relay (8) is set to ON, the compressor magnet clutch is engaged allowing the compressor to run.

Air mix actuator (9)

- "Air mix" means the temperature control by mixing cooled air with heated air.
- When the actuator receives signal current from the air conditioner control panel, it starts the built-in motor that opens or closes air mix dampers (3) and (4) through the link mechanism to set the opening level to any of 8 levels.
- The motor rotating direction is determined according to the position of the potentiometer being built in the actuator, that is read by the air conditioner control panel when the target temperature is set from the temperature control switch on the air conditioner control panel.
- Rotation of the motor is stopped as the contact, which is to move interlocked with the motor, moves away or signal current from the air conditioner control panel is turned OFF.

Evaporator temperature sensor (10)

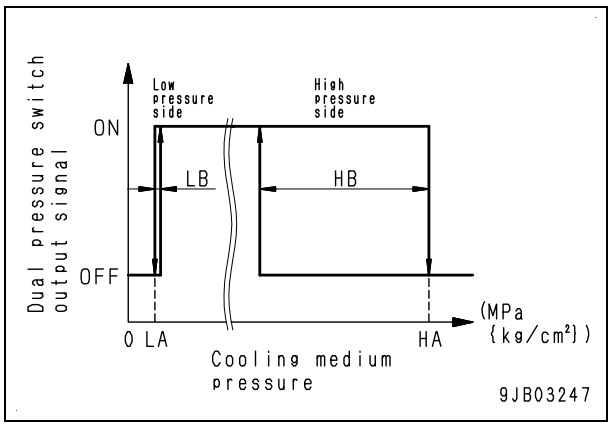
- To prevent evaporator (1) from freezing, the temperature of the evaporator is sensed as the change in resistance of the sensor. The air conditioner control panel checks the sensor voltage and performs ON/OFF control of the compressor so that evaporator (1) does not supercool.
  Resistance: 7.2 kΩ (0°C)
  2.2 kΩ (25°C)

Dual pressure switch (11)

★ Dual pressure switch (11) is installed to the air conditioner hose near the air conditioner unit.

- If abnormally low or high pressure is generated in the refrigerant circulation circuit, this switch disengages the magnet clutch of the compressor to protect a series of cooler-related equipment.

★ The switch outputs ON signal when the pressures are normal, and OFF signal when it detects an abnormal pressure for compressor operation.



LA: 0.20 MPa {2 kg/cm^2}
LB: 0.02 MPa {0.2 kg/cm^2}
HA: 3.14 MPa {32 kg/cm^2}
HB: 0.59 MPa {6 kg/cm^2}