SEN00046-14

Shop Manual

BULLDOZER

D65EX -15E0
D65PX -15E0
D65WX-15E0

SERIAL NUMBERS D65EX- 69001
D65PX- 69001 and up
D65WX- 69001

ecot3

KOMATSU

Explanation of terms for maintenance standard

The maintenance standard chapter explains the criteria for replacing or reusing products and parts in the machine maintenance work. The following terms are used to explain the criteria.

1. Standard size and tolerance

- To be accurate, the finishing size of parts is a little different from one to another.
- To specify a finishing size of a part, a temporary standard size is set and an allowable difference from that size is indicated.
- The above size set temporarily is called the “standard size” and the range of difference from the standard size is called the “tolerance”.
- The tolerance with the symbols of + or – is indicated on the right side of the standard size.

Example:

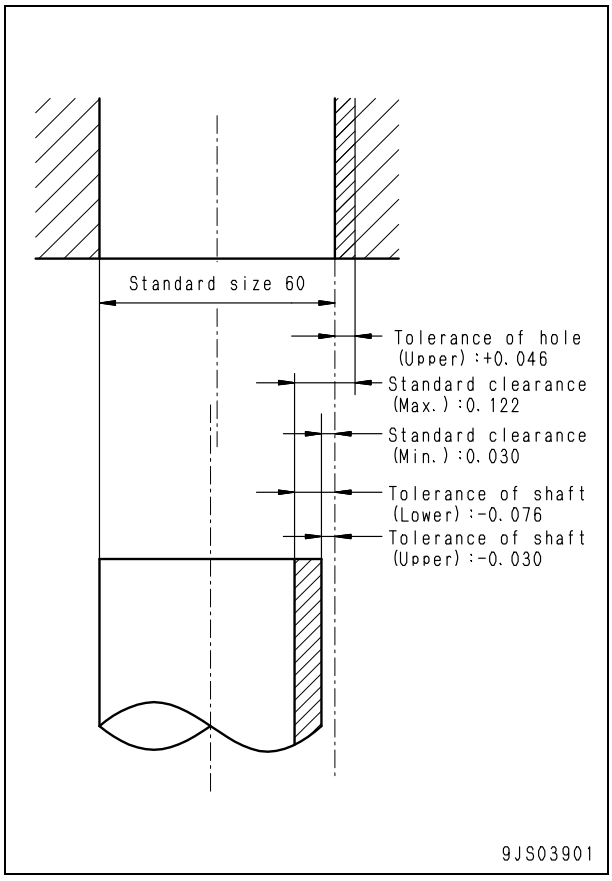
Standard size	Tolerance
120	–0.022 –0.126

★ The tolerance may be indicated in the text and a table as [standard size (upper limit of tolerance/lower limit of tolerance)].
Example) 120 (–0.022/–0.126)

- Usually, the size of a hole and the size of the shaft to be fitted to that hole are indicated by the same standard size and different tolerances of the hole and shaft. The tightness of fit is decided by the tolerance.
- Indication of size of rotating shaft and hole and relationship drawing of them

Example:

Standard size	Tolerance	
	Shaft	Hole
60	–0.030 –0.076	+0.046 0



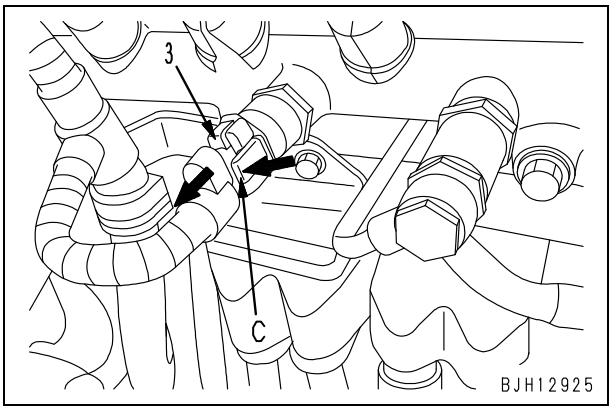
3. Push lock type

- 95, 107, 114 engines
  Example)
  Fuel pressure sensor in common rail
  (**BOSCH-03**)

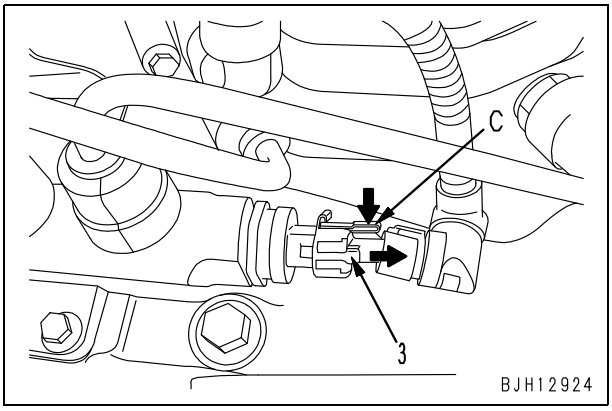
Disconnect connector (3) according to the following procedure.

1) While pressing lock (C), pull out connector (3) in the direction of the arrow.

- 114 engine

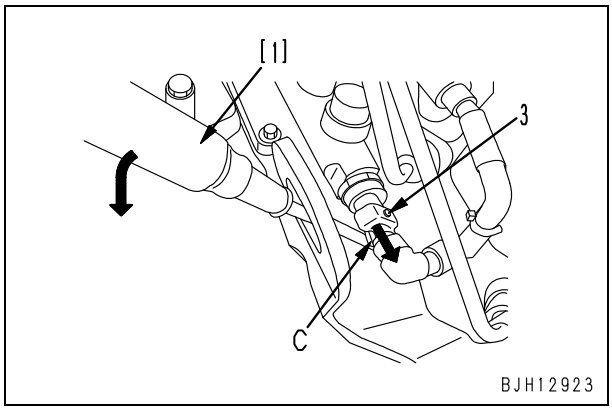


- 107 engine



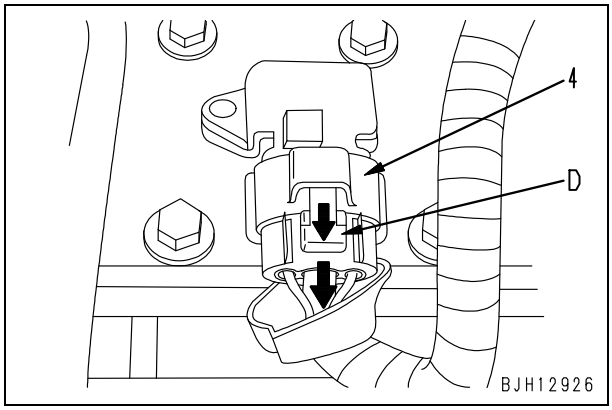
★ If the lock is on the underside, use flat-head screwdriver [1] since you cannot insert your fingers.

2) While pressing up lock (C) of the connector with flat-head screwdriver [1], pull out connector (3) in the direction of the arrow.



- 107, 114 engines
  Example)
  Intake air pressure/temperature sensor in intake manifold
  (**SUMITOMO-04**)

3) While pressing lock (D), pull out connector (4) in the direction of the arrow.



2. Table of tightening torques for split flange bolts

★ Unless there are special instructions, tighten split flange bolts to the torque below.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
10	14	59 – 74	6.0 – 7.5
12	17	98 – 123	10.0 – 12.5
16	22	235 – 285	23.5 – 29.5

3. Table of tightening torques for O-ring boss piping joints

★ Unless there are special instructions, tighten O-ring boss piping joints to the torque below.

Nominal No.	Thread diameter	Width across flats	Tightening torque Nm {kgm}	
	mm	mm	Range	Target
02	14	Varies depending on type of connector.	35 – 63 { 3.5 – 6.5}	44 { 4.5}
03,04	20		84 – 132 { 8.5 – 13.5}	103 {10.5}
05,06	24		128 – 186 {13.0 – 19.0}	157 {16.0}
10,12	33		363 – 480 {37.0 – 49.0}	422 {43.0}
14	42		746 – 1,010 {76.0 – 103}	883 {90.0}

4. Table of tightening torques for O-ring boss plugs

★ Unless there are special instructions, tighten O-ring boss plugs to the torque below.

Nominal No.	Thread diameter	Width across flats	Tightening torque Nm {kgm}	
	mm	mm	Range	Target
08	8	14	5.88 – 8.82 {0.6 – 0.9}	7.35 {0.75}
10	10	17	9.81 – 12.74 {1.0 – 1.3}	11.27 {1.15}
12	12	19	14.7 – 19.6 {1.5 – 2.0}	17.64 {1.8}
14	14	22	19.6 – 24.5 {2.0 – 2.5}	22.54 {2.3}
16	16	24	24.5 – 34.3 {2.5 – 3.5}	29.4 {3.0}
18	18	27	34.3 – 44.1 {3.5 – 4.5}	39.2 {4.0}
20	20	30	44.1 – 53.9 {4.5 – 5.5}	49.0 {5.0}
24	24	32	58.8 – 78.4 {6.0 – 8.0}	68.6 {7.0}
30	30	32	93.1 – 122.5 { 9.5 – 12.5}	107.8 {11.0}
33	33	–	107.8 – 147.0 {11.0 – 15.0}	127.4 {13.0}
36	36	36	127.4 – 176.4 {13.0 – 18.0}	151.9 {15.5}
42	42	–	181.3 – 240.1 {18.5 – 24.5}	210.7 {21.5}
52	52	–	274.4 – 367.5 {28.0 – 37.5}	323.4 {33.0}

Specifications

Machine name and type				D65EX-15E0		D65PX-15E0	D65WX-15E0
				Semi-U dozer	Semi-U dozer with long track	Power tilt dozer	Semi-U dozer
Serial number				69001 and up		69001 and up	69001 and up
Weight	Machine weight						
	• Bare tractor		kg	17,270	18,010	18,240	18,050
	• With work equipment		kg	19,550	20,290	20,270	20,410
	• With work equipment and ROPS cab		kg	20,280	21,020	21,000	21,140
	• With work equipment, ripper, and ROPS cab		kg	(21,960)	(22,700)	—	(22,820)
Performance	Min. turning radius		m	–[Counter-rotation]	–[Counter-rotation]	–[Counter-rotation]	–[Counter-rotation]
	Gradeability		deg.	30	30	30	30
	Stability (front, rear, left, right)		deg.	35	35	35	35
	Travel speed	Forward 1st	km/h	3.3	3.3	3.3	3.3
		Forward 2nd	km/h	6.3	6.3	6.3	6.3
		Forward 3rd	km/h	10.1	10.1	10.1	10.1
		Reverse 1st	km/h	4.4	4.4	4.4	4.4
		Reverse 2nd	km/h	8.2	8.2	8.2	8.2
		Reverse 3rd	km/h	12.9	12.9	12.9	12.9
	Ground pressure	Tractor unit	kPa {kg/cm^2}	62.1 {0.63}	52.7 {0.54}	29.8 {0.30}	40.9 {0.42}
		With work equipment	kPa {kg/cm^2}	70.3 {0.72}	59.4 {0.61}	33.1 {0.34}	46.2 {0.47}
		With work equipment and ROPS cab	kPa {kg/cm^2}	72.9 {0.74}	61.5 {0.63}	34.3 {0.35}	47.9 {0.49}
		With work equipment, ripper, and ROPS cab	kPa {kg/cm^2}	(79.0) ({0.80})	(66.5) ({0.68})	—	(51.7) ({0.53})
Dimensions	Overall length	Tractor unit	mm	4,335	4,520	4,520	4,335
		With work equipment	mm	5,440	5,750	5,520	5,440
	Overall width	Tractor unit	mm	2,390	2,390	2,965	2,890
		With work equipment [3 m blade specification]	mm	3,460	3,460 [2,990]	3,970	3,640
	Overall height	To top of exhaust pipe [EU specification]	mm	2,990 [3,220]	2,990 [3,220]	2,990 [3,220]	2,990 [—]
		To top of operator seat	mm	2,315	2,315	2,315	2,315
		When ROPS cab is installed (excluding antenna)	mm	3,220	3,220	3,220	3,220
		When ROPS canopy is installed	mm	3,220	3,220	3,220	3,220
		When cab is installed (excluding antenna)	mm	3,080	3,080	3,080	3,080
	Track gauge		mm	1,880	1,880	2,050	2,050
	Length of track on ground		mm	2,675	3,285	3,285	2,675
	Track width (Standard track shoe)		mm	510	510	915	810
	Min. ground clearance		mm	405	405	405	405

Values in ( ) are shown for reference.

A: Power train oil cooler inlet
B: Power train oil cooler outlet
C: Hydraulic oil cooler inlet
D: Hydraulic oil cooler outlet

1. Cooling fan motor
2. Aftercooler inlet hose
3. Radiator inlet hose
4. Reservoir tank
5. Aftercooler outlet hose
6. Radiator outlet hose
7. Power train oil cooler
8. Aftercooler
9. Radiator cap
10. Radiator
11. Hydraulic oil cooler
12. Drain plug
13. Cooling fan

Specifications

	Radiator	Power train oil cooler	Hydraulic oil cooler	Aftercooler
Core type	Corrugated aluminum	PTO-OL	Corrugated aluminum	Corrugated aluminum
Fin pitch (mm)	8.0/2	—	8.0/2	8.0/2
Total heat dissipation surface (m^2)	52.97	1.722	1.53	20.74
Cracking pressure of pressure valve (kPa {kg/cm^2})	88.3 ± 14.7 {0.9 ± 0.15}	—	—	—
Cracking pressure of vacuum valve (kPa {kg/cm^2})	0 – 4.9 {0 – 0.05}	—	—	—

2. Suction valve

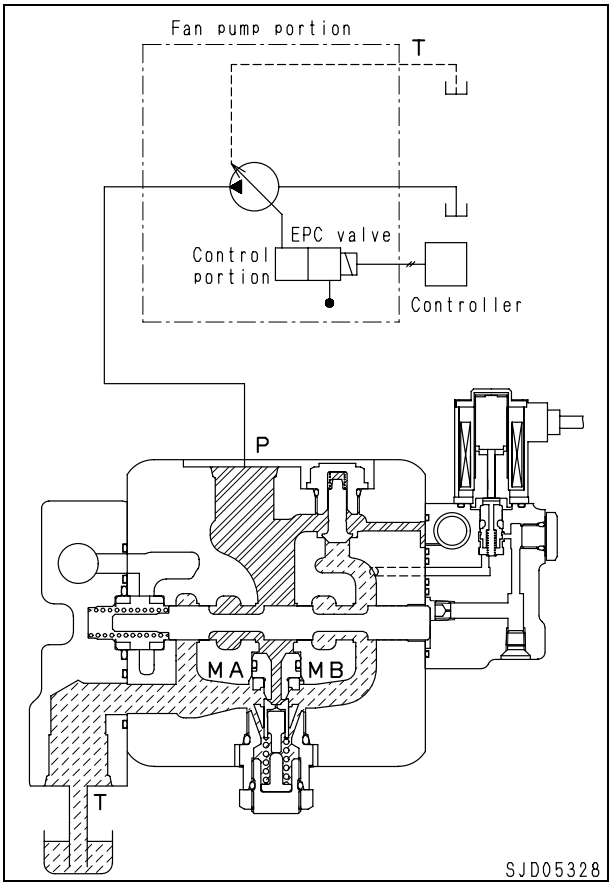
Function

- If the fan pump stops, the pressurized oil does not flow into the motor. Since the motor continues revolution because of the force of inertia, however, the pressure on the outlet side of the motor rises.
- When the oil stops flowing in from inlet port (P), the suction valve sucks in the oil on the outlet side and supplies it to port (MA) where there is not sufficient oil to prevent cavitation.

Operation

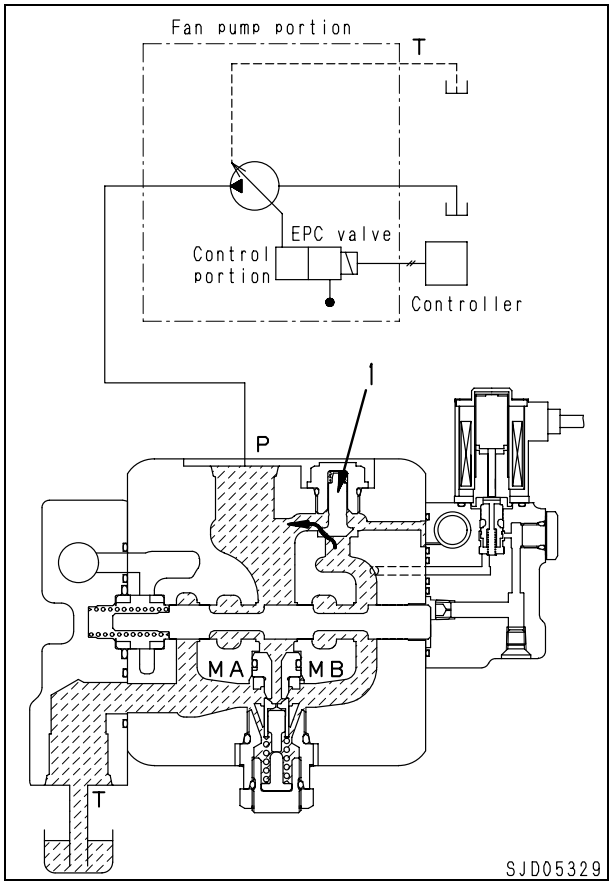
(1) When starting

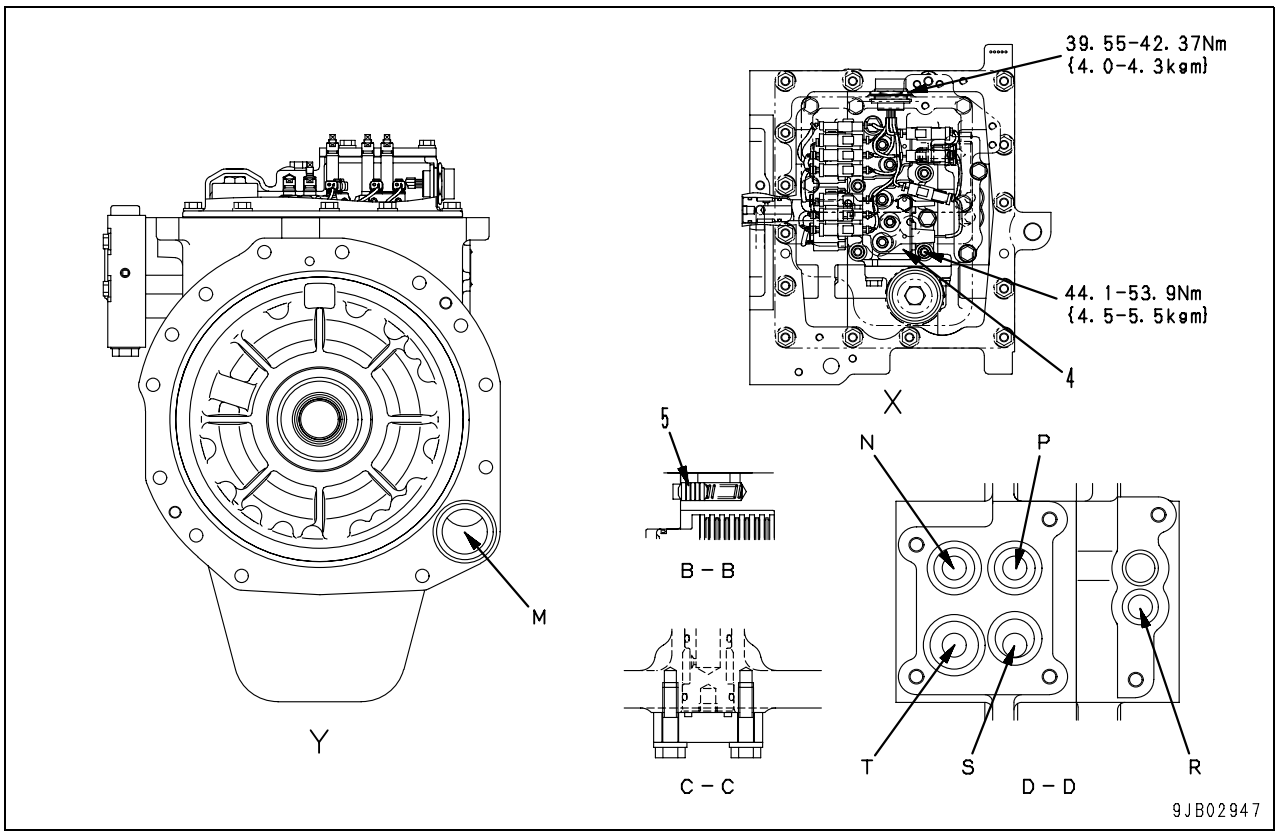
- If the pressurized oil from the pump is supplied to port (P) and the pressure on (MA) side rises and starting torque is generated in the motor, the motor starts revolution. The oil on motor outlet (MB) side of the motor returns through port (T) to the tank.



(2) When stopping

- If the engine is stopped and the input revolution of the fan pump lowers to 0 rpm, the pressurized oil from the pump is not supplied to port (P) any more. As the pressurized oil is not supplied to (MA) side of the motor, the motor speed lowers gradually to stop.
- If the motor shaft is revolved by the force of inertia while the oil flow in port (P) is reducing, the oil in port (T) on the outlet side is sent by suction valve (1) to (MA) side to prevent cavitation.





A: 1st clutch oil pressure pick-up port
B: 3rd clutch oil pressure pick-up port
C: R clutch oil pressure pick-up port
D: 2nd clutch oil pressure pick-up port
E: F clutch oil pressure pick-up port
F: From power train pump (to brake valve)
G: To PTO case (to torque converter)
H: From oil cooler
J: To PTO case (to scavenging pump)
K: From PTO case (Drain)
L: To PTO case (to power train and lubrication pump)
M: From steering case
N: From transmission ECMV (For R clutch)
P: From transmission ECMV (For 3rd clutch)
R: From transmission ECMV (For 1st clutch)
S: From transmission ECMV (For 2nd clutch)
T: From transmission ECMV (For F clutch)

F ring gear (4) of F clutch and 3rd ring gear (14) of 3rd clutch are fixed hydraulically.

The power from torque converter
↓
Input shaft (1)
↓
F sun gear (2)
↓
F planetary pinion (3)
↓
F carrier (10)
↓
2nd and 3rd carrier (11)
↓
3rd planetary pinion (12)
↓
Output shaft (21)

The power from HSS
↓
No.1 pinion (1)
↓
No.1 gear (2)
↓
Pinion (3)
↓
Planetary pinion (4)
↓
Pinion shaft (5)
↓
Carrier (6)
↓
Sprocket hub (7)
↓
Sprocket teeth (8)

1. Idler
2. Carrier roller (*3)
3. Track frame
4. Sprocket teeth (*3)
5. Track roller guard (*3)
6. Track roller (*3)
7. Yoke
8. Seal
9. Piston
10. Recoil spring
11. Wear ring
12. U-packing
13. Cabin
14. Nut
15. Lubricator
16. Cylinder
17. Bushing
18. Holder

*3: Machines equipped with the PLUS type track shoe use special parts.

★ If the standard type track shoe parts are used to the PLUS type track shoe, the life span of the track shoe will be shortened. Accordingly, use only the special parts to the PLUS type track shoe.

Unit: mm

<table>
<tr><th>No.</th><th>Check item</th><th colspan="5">Criteria</th><th>Remedy</th></tr>
<tr><td rowspan="2">19</td><td rowspan="2">Deformation of track frame</td><td colspan="3">Item</td><td colspan="2">Repair limit</td><td rowspan="2">Repair</td></tr>
<tr><td colspan="3">Bend
Twist
Opening of idler</td><td colspan="2">7 (in length of 3,000)
3 (in length of 300)
5</td></tr>
<tr><td rowspan="3">20</td><td rowspan="3">Recoil spring</td><td colspan="3">Standard size</td><td colspan="2">Repair limit</td><td rowspan="3">Replace</td></tr>
<tr><td>Free length x outer diameter</td><td>Installation length</td><td>Installation load</td><td>Free length</td><td>Installation load</td></tr>
<tr><td>791.5 x 239</td><td>634</td><td>189.5 kN {19,320 kg}</td><td>772</td><td>168.6 kN {17,195 kg}</td></tr>
<tr><td rowspan="3">21</td><td rowspan="3">Clearance between piston and bushing</td><td rowspan="2">Standard size</td><td colspan="2">Tolerance</td><td rowspan="2">Standard clearance</td><td rowspan="2">Clearance limit</td><td rowspan="3">Replace bushing</td></tr>
<tr><td>Shaft</td><td>Hole</td></tr>
<tr><td>90</td><td>–0.039
–0.090</td><td>+0.270
+0.061</td><td>0.100 – 0.360</td><td>1.0</td></tr>
<tr><td>22</td><td>Press-fitting force of idler yoke</td><td colspan="5">392 kN {40 ton}</td><td>Adjust</td></tr>
<tr><td rowspan="2">23</td><td rowspan="2">Guide height of track roller guard</td><td colspan="3">Standard size</td><td colspan="2">Repair limit</td><td rowspan="2">Build-up welding or replace</td></tr>
<tr><td colspan="3">27</td><td colspan="2">16</td></tr>
<tr><td>—</td><td>Quantity of grease</td><td colspan="5">140 cc (Grease: G2-LI)</td><td>—</td></tr>
</table>

Outline

- The idler cushion moves piston (9) back and forth by filling or draining grease from lubricator (15) and adjusts the track shoe tension. Recoil spring (10) also dampens sudden shock forced on idler (1).

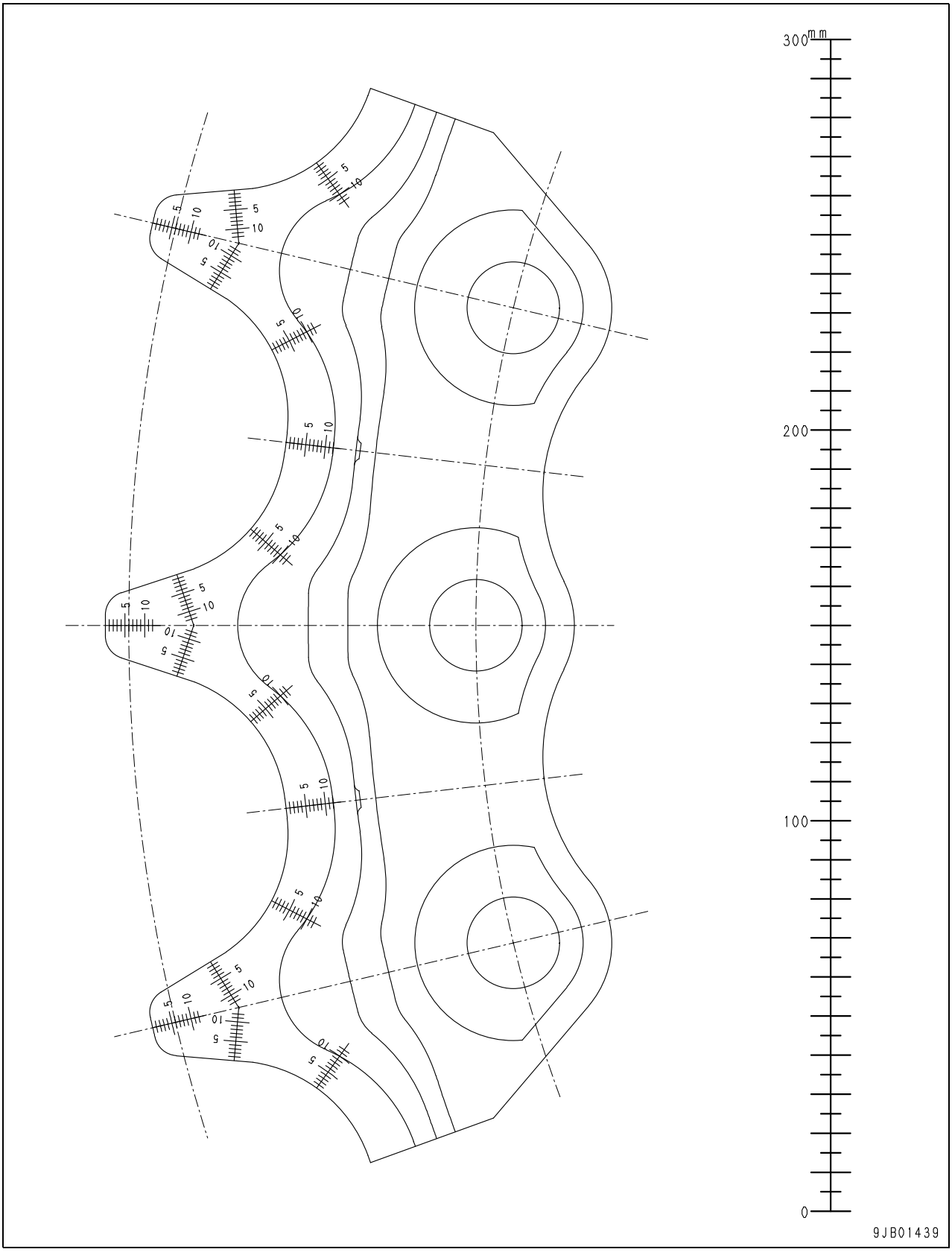
Track roller

	Quantity for one side	Flange type and arrangement
D65EX-15E0 D65WX-15E0	7 pieces	(*1) S,S,D,S,D,S,S (*2) D,D,D,D,D,D,S

S: single flange
D: double flange
*1: Machines equipped with conventional type track shoe
*2: Machines equipped with PLUS type track shoe

Full-size drawing of sprocket tooth shape

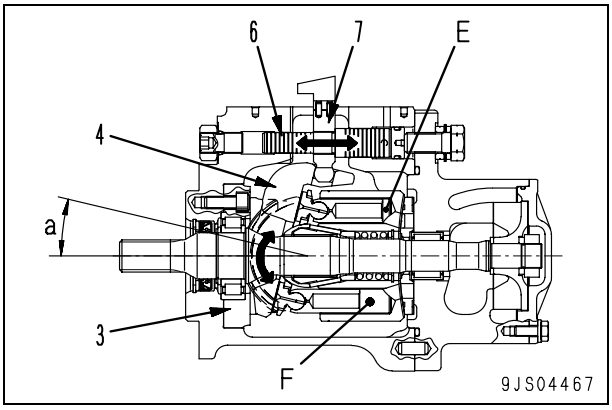
★ Set the rule to the full-scale size, and then copy the whole drawing to an OHP sheet.



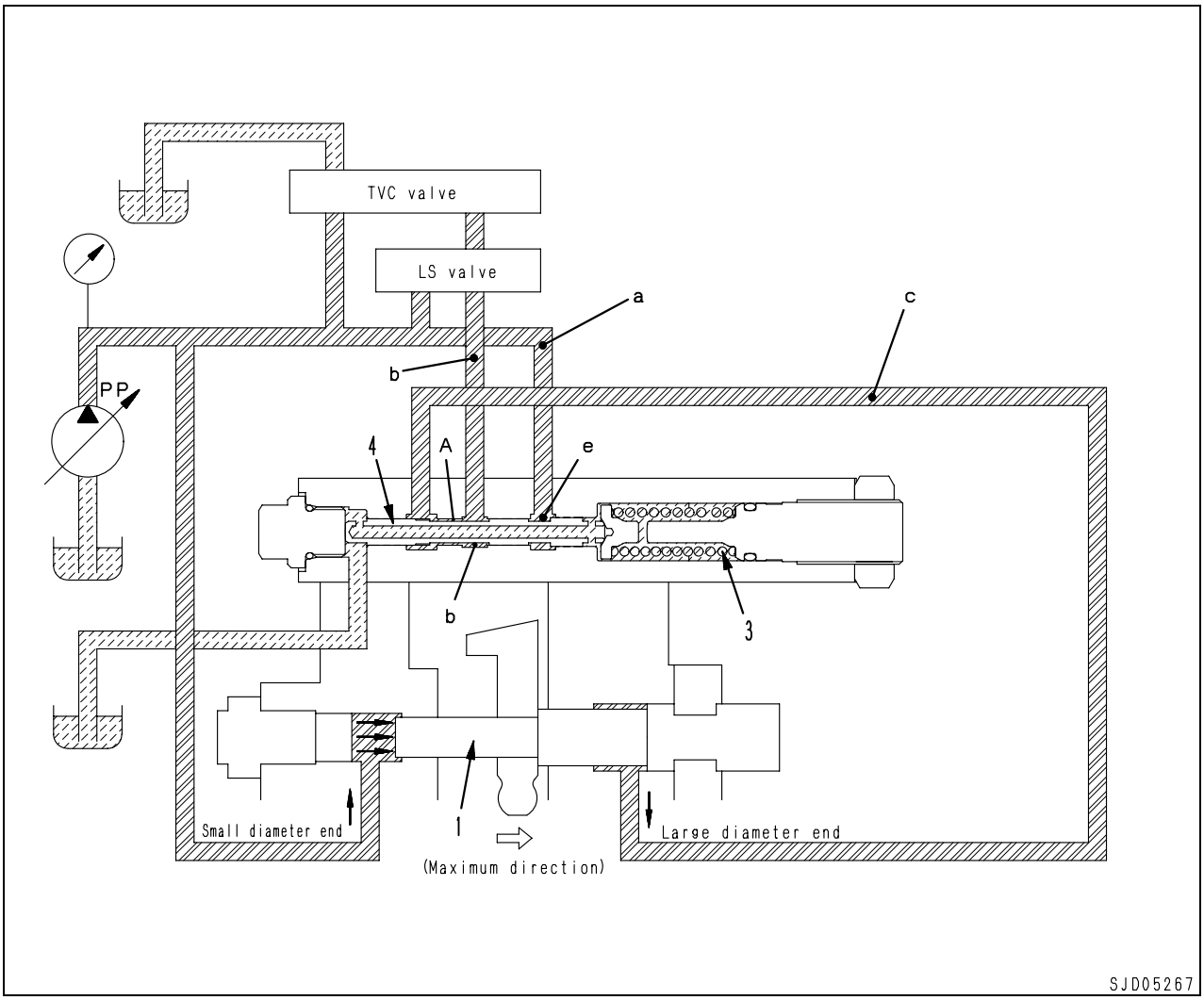
1. Cooling fan motor
2. Quick drop valve
3. Tilt cylinder (PT, SEMI-U dozer)
   Pitch cylinder (PTP dozer)
4. Lift cylinder
5. Radiator
6. Self pressure reducing valve
7. HSS pump
8. Cooling fan pump
9. PPC lock valve
10. Power train oil filter
11. Control valve
12. Hydraulic tank
13. HSS motor
14. Transmission ECMV
15. Main relief valve
16. Blade PPC valve
17. Power train and lubrication pump
18. Accumulator
19. Tilt cylinder (PTP dozer)
20. Scavenging pump
21. Power train oil cooler
22. Hydraulic oil cooler bypass valve
23. Hydraulic oil cooler

2. Control of discharge

- The discharge amount is increased by the increase of capacity difference of (E) and (F) as swash plate angle (a) is increased. Swash plate angle (a) is changed by servo piston (6).
- Servo piston (6) reciprocates straight according to the signal pressure of the servo valve. This straight line movement is transmitted to rocker cam (4) through rod (7), and rocker cam (4) which is supported on the cylindrical surface by cradle (3) rotates with sliding motion.
- The area receiving the pressure is different at the left and right sides of servo piston (6), and the receiving pressure at the small diameter piston end is always connected with the main pump discharge pressure [self pressure (PP)].
- Output pressure (PNC) of the servo valve is applied to the pressure chamber at the large diameter piston end.
- The movement of servo piston (6) is controlled by the relationship of the size of the pressure at the large diameter piston end and self pressure (PP), and the comparative size of the ratio of the area receiving the pressure at the large diameter piston end and small diameter piston end.



3. Variable throttle valve



(1) Operation in direction for maximum pump delivery

- Pump discharge pressure (PP) enters the variable throttle valve through port (a).

1) When main pump pressure (PP) is high

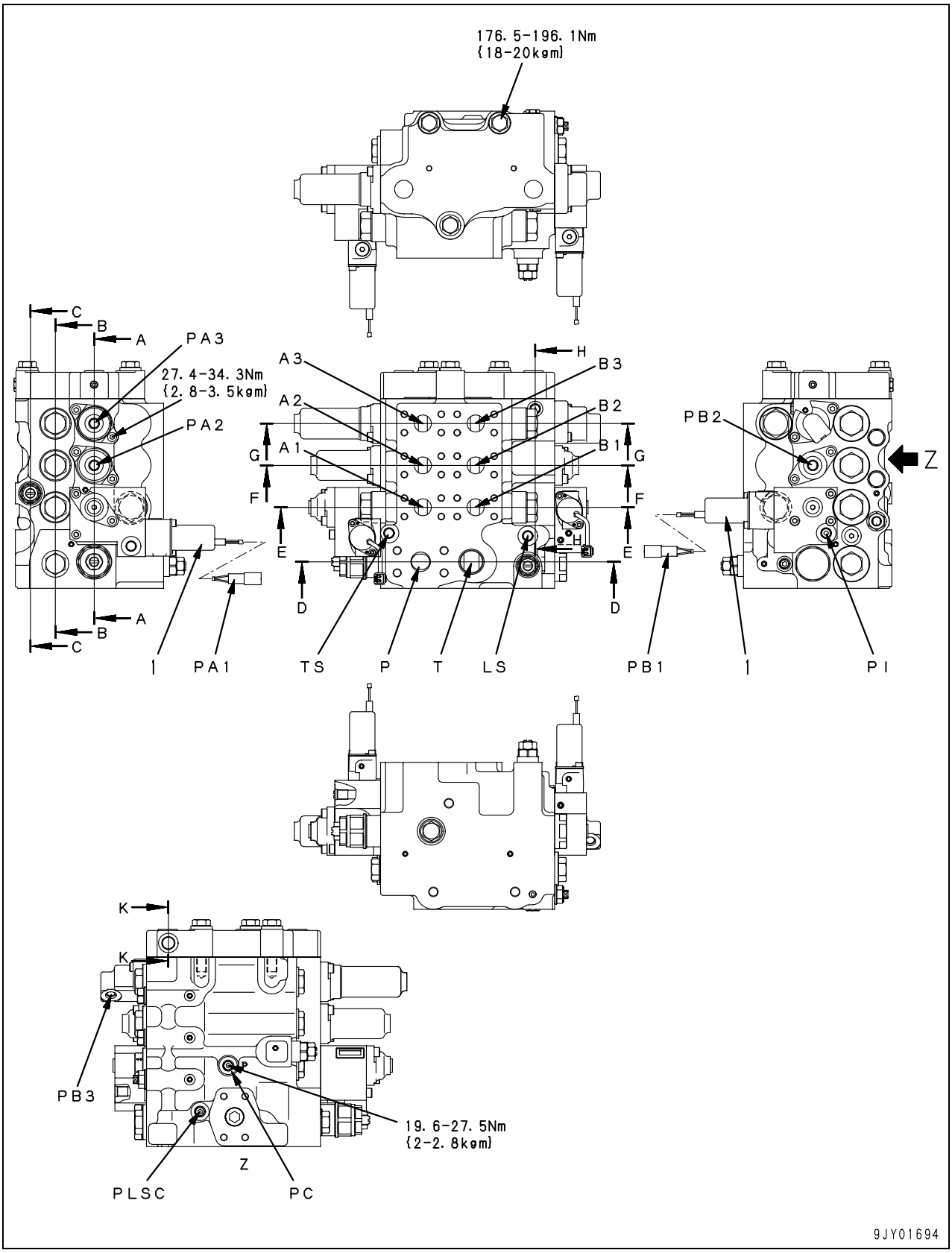
- If the pressure becomes higher than the force of spring (3) because of the difference in sectional area of spool (4) in chamber (e), spool (4) moves to the right.
- If spool (4) moves to the right, the opening area between ports (c) and (b) is reduced by the notch at part (A). Accordingly, less oil flows from the large diameter end of servo piston (1) and the moving speed of servo piston (1) is lowered.

2) When main pump pressure (PP) is low

- Even if main pump pressure (PP) enters chamber (e) through port (a), spool (4) pushes spring (3) less strongly and moves to the right for shorter distance.
- The opening area of part (A) increases and the oil flowing from the large diameter end of servo piston (1) through port (c) to port (b) is not limited and the moving speed of servo piston (1) is heightened.

(2) Operation in the direction for smaller pump discharge amount

- The hydraulic oil flows from port (b) through port (c) to the large diameter side of servo piston (1).
- Spool (4) operates according to main pump pressure (PP) as explained in the above section.

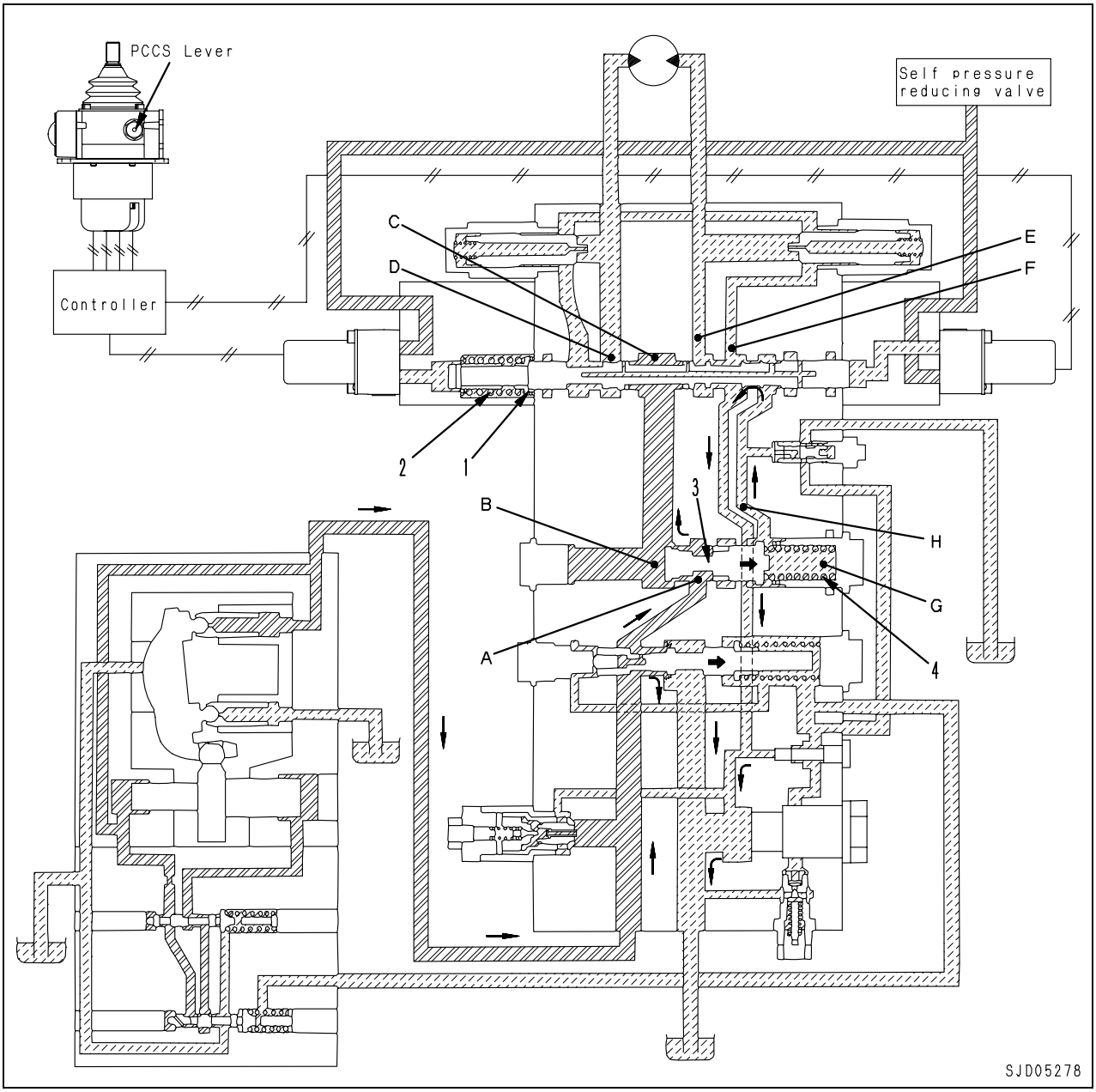

176.5-196.1Nm
{18-20kgm}
C
B
A
PA3
27.4-34.3Nm
{2.8-3.5kgm}
PA2
A3
A2
A1
H
B3
B2
B1
G
F
E
D
PB2
Z
PA1
TS
P
T
LS
PB1
PI
K
PB3
19.6-27.5Nm
{2-2.8kgm}
PLSC
PC
9JY01694

Control of oil flow

Function

- Use of the CLSS circuit (Closed center Load Sensing System) makes it possible to control the oil flow by adjusting the area of opening of the spool driven by the EPC valve regardless of the load.

1. Steering valve
   1) At “hold“



Operation

- When the spool is at the “hold“ position, the pump pressure is sent from chamber (A) through the notch in spool (3) of the steering priority valve, and passes through chamber (B) to chamber (C).
- Chamber (G) is drained through chamber (H) to chamber (F). When this happens, the pump pressure is acting on the left end of spool (3) of the steering priority valve, so it pushes against the load of spring (4) and moves to the right to the maximum stroke position.
- In this condition, the area of the opening to spool (1) of the steering valve is at its minimum.

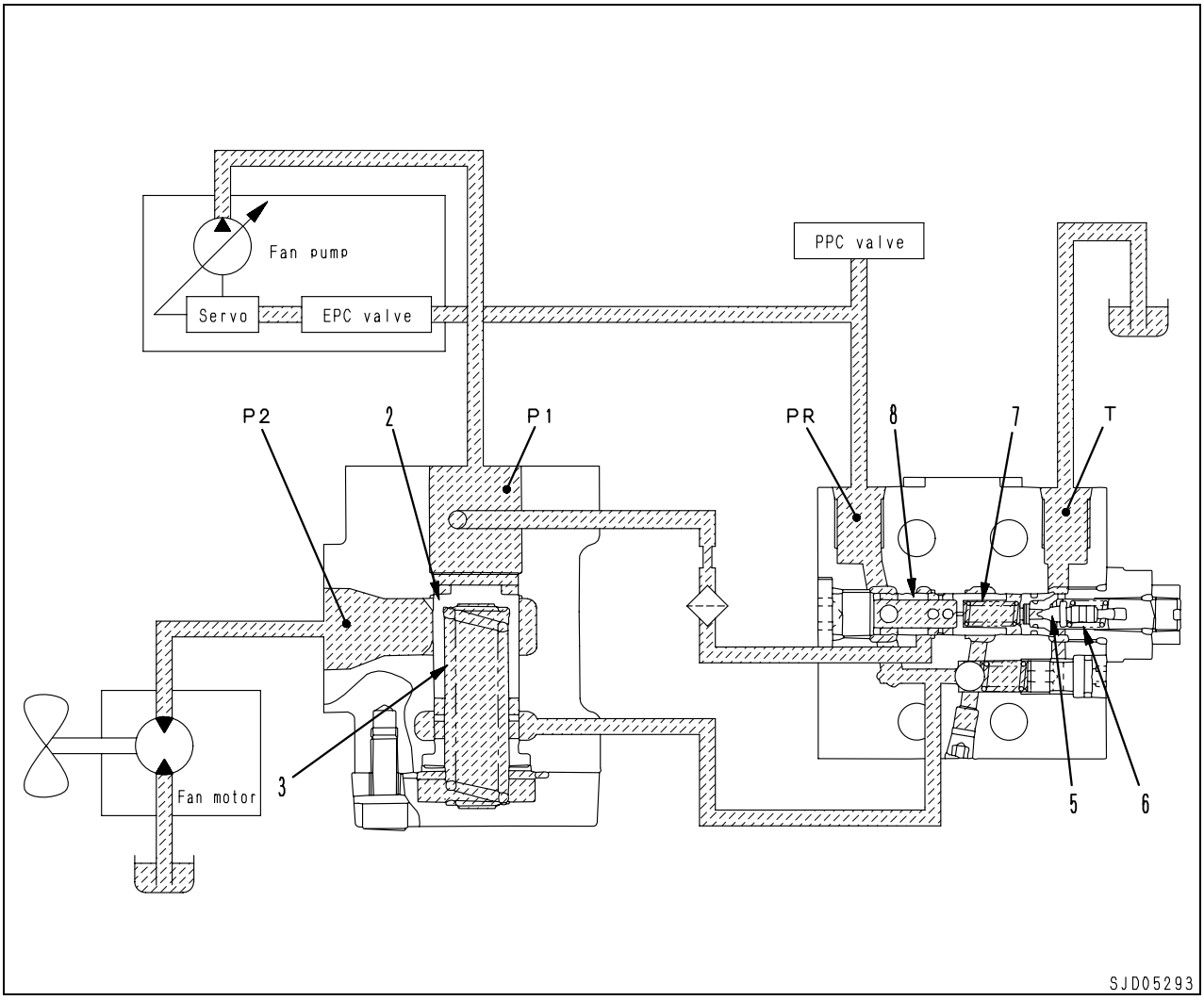
- ΔP1 = ΔP3 + ΔP4 = Differential pressure between ports (M) and (P)
- ΔP2 = Differential pressure between ports (P) and (N)
- ΔP3 = Differential pressure between ports (M) and (B)
- ΔP4 = Differential pressure between ports (B) and (P)
- ΔLS = ΔP1 + ΔP2 = Differential pressure between ports (M) and (N) = 2.0 MPa {20 kg/cm^2}

Operation

- If blade tilt spool (1) is moved and the pressure of tilt cylinder (8) becomes higher, the poppet of work equipment LS relief valve (5) will start to open and oil will be drained from LS circuit (O). [Ports (E), (F), (G), (J), (K) and (L)]
- As a result, there will be a drop in pressure in LS passage (O) starting from LS sensing hole (F), and (ΔP2) will become larger.
- For the same reason, if the pressure in chambers (H) and (I) drops, spool (2) will push against spring (3) and move to the right, and will make the opening between chambers (B) and (C) smaller, so the flow to chambers (B) and (C) will be throttled and (ΔP4) will become larger.
- Because of the pump swash plate control, the system circuit is balanced at a circuit pressure which makes the pressure loss generated by the flow at work equipment LS relief valve (5). (ΔP1) + (ΔP2) equal to LS differential pressure (ΔLS).
- When this happens, pump LS valve (6) detects the differential pressure generated by work equipment LS relief valve (5), and moves the pump swash plate from the maximum to the minimum position. The pump swash plate is balanced at a position where the LS differential pressure is 2.0 MPa {20 kg/cm^2}.
- When the pump is at the minimum swash plate angle (minimum oil flow), if the minimum oil flow is greater than the [LS relief oil flow + leakage at any part], the pressure is confined in the pump circuit (between the pump and chambers (A) and (B)), so the LS differential pressure rises.
- If this differential pressure goes above the set pressure for unload valve (4), the unload valve is actuated to relieve the excess oil flow and balance the circuit.

Operation

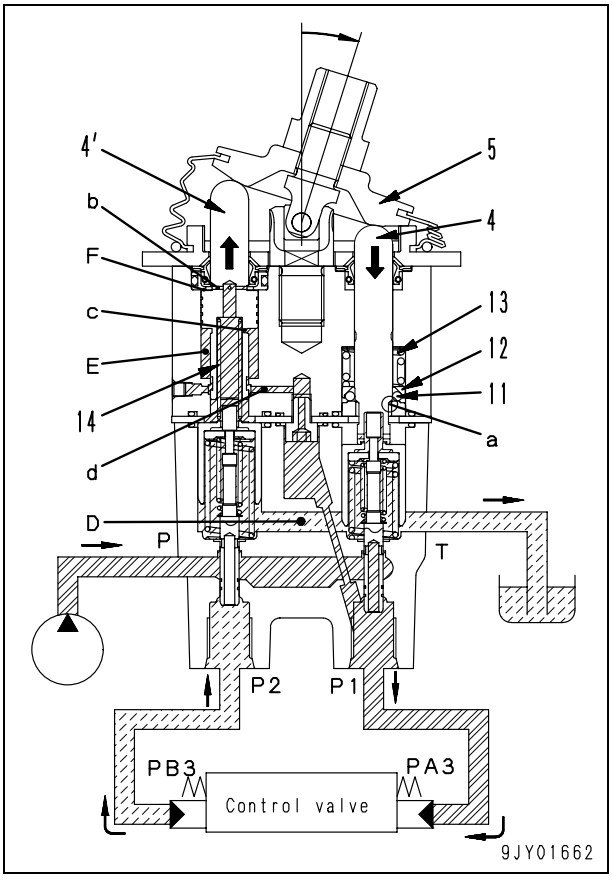
At engine stop (total low pressure)



- Spring (6) pushes poppet (5) to the seat, and the circuit between ports (PR) and (T) is closed.
- Spring (7) pushes valve (8) to the left side, and the circuit between ports (P1) and (PR) is open.
- Spring (3) pushes valve (2) to the upper side, and the circuit between ports (P1) and (P2) is closed.

5. When blade is operated to "Float"

- When piston (4) at port (P1) “lower“ side is pushed by disc (5) and moves down, ball (11) contacts protrusion (a) of the piston during the stroke. [Detent starts to act]
- When piston (4) is pushed in further, ball (11) pushes up collar (12), which is being held by detent spring (13). While pushing up collar (12), it escapes to the outside and passes over protrusion (a) of the piston.
- When this happens, piston (4') on the opposite side is pushed up by spring (14).
- As a result, the oil inside chamber (F) passes through (b) and (c), and flows to chamber (E), and piston (4') follows disc (5). Passage (d) is connected to port (P1), so more or less the same pressure is applied as is applied to port (P1).
- Chamber (E) is normally connected to drain chamber (D), but if ball (11) passes over protrusion (a) of the piston, passage (d) and chamber (E) which were shut off, are connected and the pressure oil flows.
- At the same time, the control valve also moves to “float“ position and the circuit is set to the “float“ condition.
- Piston (4') is being pushed up by the oil pressure inside chamber (E), so even if the lever is released, it is held at the “float“ position.

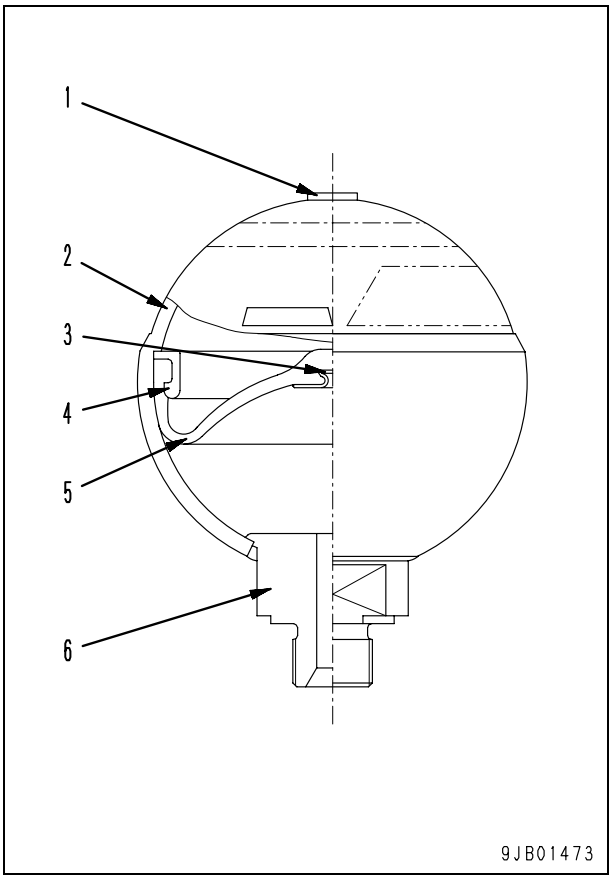


6. When blade is released from "float"

- When disc (5) is returned from the “float“ position, it is pushed down by a force greater than the hydraulic force in chamber (E).
- As a result, chamber (E) is shut off from passage (d) and is connected to the drain chamber. Therefore, the oil pressure inside chamber (E) is lost, and the “float“ position is canceled.

Accumulator

(For PPC circuit)



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

Outline

- The accumulator is installed between the cooling fan pump and blade PPC valve. Even if the engine is stopped with the work equipment raised, the operator can send pilot oil pressure to the control valve to have the work equipment lower with its own weight by using nitrogen gas pressure in the accumulator.

Specifications

Gas used:	Nitrogen gas
Quantity of gas:	300 cc
Charged gas pressure:	1.18 MPa {12 kg/cm^2} (at 80 °C)
Max. allowable working pressure:	6.86 MPa {70 kg/cm^2}

Piston valve

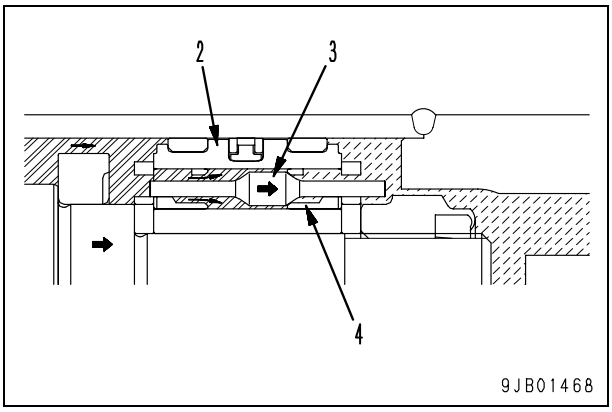
(lift cylinder)

Outline

- The piston valve is installed to the piston of the lift cylinder.
- When the piston rod is at the stroke end, oil from the pump is released to the port on the opposite side to lower the oil pressure applied to the piston.
  Oil is also released to the port on the opposite side before the piston rod reaches the stroke end to lower the surge pressure and reduce the shock made when the piston rod reaches the stroke end.

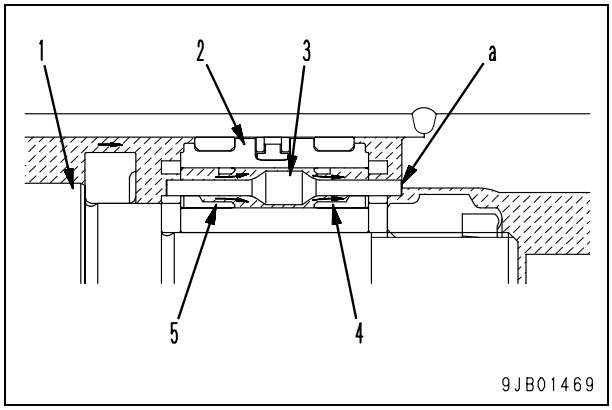
Operation

Piston valve “closed“



- The oil from the pump acts on piston (2) and piston valve (3).
  Then, piston valve (3) is pushed to the right to seal the tapered part of piston valve seat (4).
  As a result, the oil pressure in the cylinder rises to move piston (2) to the right.

Piston valve “open“



- The end of piston valve (3) touches cylinder bottom (a) before piston rod (1) reaches the stroke end, and then only piston (2) continues moving.
  At this time, the oil which has been stopped by piston valve (3) is released through piston valve seats (4) and (5) to the bottom side, thus the oil pressure in the cylinder lowers.

Buzzer cancel switch

- If the switch is operated while the alarm buzzer is sounding, the buzzer is turned off temporarily.
  While the buzzer is turned OFF, if a new trouble which turns on the buzzer is detected, the buzzer sounds again.

★ The lamp lights up and goes off at the intervals of about 0.8 seconds.
★ The flashing intervals of the lamp may change a little when the temperature is low (below about –10°C). This does not indicate a trouble.

Input and output signals

AMP070-20P [CN-S03]

Pin No.	Signal name	Input/Output signal
1	Power source (24 V)	Input
2	Power source (24 V)	Input
3	GND	—
4	GND	—
5	Constant power source (24 V)	Input
6	Constant power source (24 V)	Input
7	Starting switch (C)	Input
8	Night lightning	Input
9	Preheating	Input
10	NC	—
11	NC	—
12	NC	—
13	NC	—
14	NC	—
15	NC	—
16	Service switch	Input
17	NC	—
18	Alarm buzzer	Output
19	NC	—
20	NC	—

AMP070-12P [CN-S04]

Pin No.	Signal name	Input/Output signal
1	CAN0-H	Input/Output
2	CAN0-H	Input/Output
3	CAN0-L	Input/Output
4	CAN0-L	Input/Output
5	CAN shield	—
6	NC	—
7	NC	—
8	NC	—
9	Alternator (R)	Input
10	Fuel level	Input
11	NC	—
12	Power train oil temperature	Input

Outline

- The transmission and steering controller monitors the coolant, power train oil, and hydraulic oil temperatures and controls the fan speed according to those temperatures.

Function

Fan speed control

- The transmission and steering controller controls the discharge of the cooling fan pump to set the fan speed properly according to the information from the coolant, power train oil, and hydraulic oil temperature sensors.
- The transmission and steering controller selects the maximum target fan speed obtained from the coolant, power train oil, and hydraulic oil temperatures and outputs it as the pump control signal to the cooling fan pump.
- The cooling fan pump changes its swash plate angle to control its oil discharge for the cooling fan motor.

Selection of fan rotation mode

- While the starting switch is in the “on“ position and the engine is stopped, one of the following fan rotation modes can be selected with the fan rotation selector switch.
  Fan rotation mode includes;
  1) Forward rotation mode
  2) Cleaning mode
  According to the selected mode, the transmission and steering controller operates the reverse solenoid valve of the cooling fan motor to change the rotation direction of the fan.

  1) Forward rotation mode
     In this mode, the reverse solenoid valve does not operate and the fan rotates forward. The fan speed varies with the temperature sensor signal. This mode is selected normally.

  2) Cleaning mode
     In this mode, the fan rotates in reverse at high speed to blow off dirt from the radiator fins, regardless of the temperature sensor signals. If this mode is used periodically, the cleaning interval of the radiator fins can be expanded.
     While in the “Cleaning mode“, the machine does not move for the radiator protection even if the PCCS lever is shifted to “forward“ or “reverse“ position.The starting switch needs to be turned from “off“ to “on“ to restart the machine under the “forward rotation mode“.

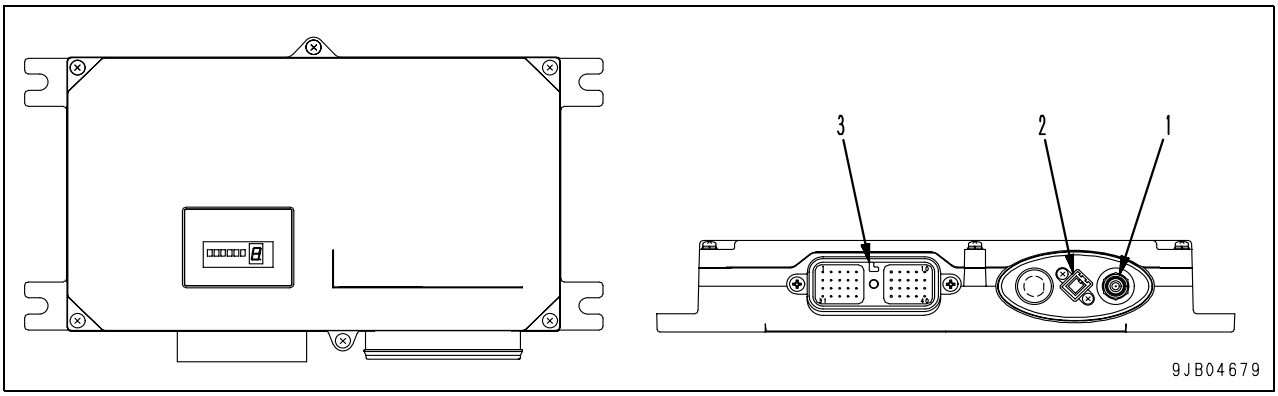
Interlock for changing rotation mode

- If the rotation direction of the fan is changed while the fan is rotating, the fan drive circuit is broken. To prevent this, the fan rotation selector switch signal is ignored while the engine is running. In this case, the fan operation pilot lamp on the monitor panel flashes for 3 seconds.

KOMTRAX terminal

Model name: TC301

The KOMTRAX system uses satellite communication technology.



1. Communication antenna connector
2. GPS antenna connector
3. Machine harness connector (DEUTSCH-40P)

Input and output signals

DEUTSCH-40P [CN-G01]

Pin No.	Signal name	Input/Output signal
1	NC	—
2	NC	—
3	NC	—
4	NC	—
5	NC	—
6	CAN shield GND	—
7	CAN signal (L)	Input/Output
8	CAN signal (H)	Input/Output
9	NC	—
10	NC	—
11	NC	—
12	NC	—
13	NC	—
14	NC	—
15	NC	—
16	NC	—
17	NC	—
18	NC	—
19	NC	—
20	Immobilizing signal	Output

Pin No.	Signal name	Input/Output signal
21	Operation mode selection 1	Input
22	Operation mode selection 2	Input
23	NC	—
24	NC	—
25	NC	—
26	NC	—
27	Starting switch (C)	Input
28	Alternator (R)	Input
29	NC	—
30	NC	—
31	NC	—
32	NC	—
33	NC	—
34	NC	—
35	NC	—
36	Starting switch (ACC)	Input
37	Power source GND	—
38	Power source GND	—
39	Constant power source (24V)	Input
40	Constant power source (24V)	Input

Outline

- The KOMTRAX terminal can send information via wireless communication antenna, acquiring various information of the machine from the network signal in the machine and the input signal. Also, the controller incorporates CPU (Central Processing Unit) and provide the wireless communication function and the GPS function.
- Use of KOMTRAX terminal must be limited for the countries in which such communication is allowed.
- There are the LED lamp and the 7-segment indicator lamp in the display area, and these lamps are used for the testing and the troubleshooting.
- The information of the LED lamp and the 7-segment indicator lamp can be checked on the monitor panel by EMMS.

D65PX-15E0					
Standard value for new machine	Permissible value				
29.4 ± 9.8 {3.0 ± 1.0}	29.4 ± 9.8 {3.0 ± 1.0}				
74.5 ± 19.6 {7.6 ± 2.0}	74.5 ± 19.6 {7.6 ± 2.0}				
25.5 ± 9.8 {2.6 ± 1.0}	25.5 ± 9.8 {2.6 ± 1.0}				
—	—				
—	—				
0.1 – 0.5 {1 – 5}	0.1 – 0.5 {1 – 5}				
Max. 0.88 {Max. 9}	Max. 0.88 {Max. 9}				
0.05 – 0.29 {0.5 – 3}	0.05 – 0.29 {0.5 – 3}				
0.39 – 0.69 {4 – 7}	0.39 – 0.69 {4 – 7}				
3.13 ± 0.1 {32 ± 1.0}	Min. 2.84 {Min. 29}				
3.33 ± 0.1 {34.0 ± 1.0}	Min. 3.04 {Min. 31}				
3.13 ± 0.1 {32 ± 1.0}	Min. 2.84 {Min. 29}				
3.33 ± 0.1 {34.0 ± 1.0}	Min. 3.04 {Min. 31}				
3.13 ± 0.1 {32 ± 1.0}	Min. 2.84 {Min. 29}				
3.33 ± 0.1 {34.0 ± 1.0}	Min. 3.04 {Min. 31}				
3.13 ± 0.1 {32 ± 1.0}	Min. 2.84 {Min. 29}				
3.33 ± 0.1 {34.0 ± 1.0}	Min. 3.04 {Min. 31}				
3.13 ± 0.1 {32 ± 1.0}	Min. 2.84 {Min. 29}				
3.33 ± 0.1 {34.0 ± 1.0}	Min. 3.04 {Min. 31}				
3.13 ± 0.1 {32 ± 1.0}	Min. 2.84 {Min. 29}				
3.33 ± 0.1 {34.0 ± 1.0}	Min. 3.04 {Min. 31}				
0.1 – 0.25 {1.0 – 2.5}	0.1 – 0.25 {1.0 – 2.5}				

Tools for testing, adjusting, and troubleshooting

Testing or adjusting item	Symbol		Part No.	Part name	Quantity	Remarks
Air boost pressure (boost pressure)	A		799-201-2202	Boost gauge kit	1	–101 – 200 kPa {–760 – 1,500 mmHg}
Water temperature, oil temperature and exhaust temperature	B		799-101-1502	Digital temperature gauge	1	–99.9 – 1,299°C
Exhaust gas color	C	1	799-201-9001	Handy smoke checker	1	Bosch index: 0 – 9
		2	Commercial item	Smoke meter	1	
Valve clearance	D	1	795-799-1131	Gear	1	
		2	Commercial item	Clearance gauge	1	
Compression pressure	E	1	795-799-6700	Puller	1	
		2	795-502-1590	Gauge assembly	1	
		3	795-790-6110	Adapter	1	For 114E-3
		4	6754-11-3130	Gasket	1	
Blow-by pressure	F	1	799-201-1504	Blow-by checker	1	0 – 5 kPa {0 – 500 mmH_20}
		2	795-790-3300	Blow-by tool	1	
			799-201-1511			
Engine oil pressure	G	1	799-101-5002	Hydraulic tester	1	Pressure gauge: 2.5, 6, 40, 60 MPa {25, 60, 400, 600 kg/cm^2}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 60 MPa {600 kg/cm^2}
		2	799-401-2320	Gauge	1	Pressure gauge: 1 MPa {10 kg/cm^2}
		3	6732-81-3170	Adapter	1	10 x 1.0 mm → R1/8
			6215-81-9710	O-ring	1	
Testing fuel pressure	H	1	799-101-5002	Hydraulic tester	1	*As common as G1
			790-261-1204	Digital hydraulic tester	1	
		2	6732-81-3170	Adapter	1	*As common as G3
			6215-81-9710	O-ring	1	
		3	799-401-2320	Gauge	1	*As common as G2
		4	795-790-6210	M10 computer check fitting	1	
		5	795-790-1500	Fuel vacuum gauge	1	(0 – 30 inHg)
			799-201-1201		1	0 – 107 kPa {0 – 800 mmHg}
Inspection of quantity of fuel return and leakage	J	1	795-790-4800	Hose kit	1	
		2	795-790-6700	Adapter	1	
		4	Commercial item	Measuring cylinder	1	
Power train oil pressure	K	1	799-101-5002	Hydraulic tester	1	*As common as G1
			790-261-1204	Digital hydraulic tester	1	
		2	799-401-2320	Gauge	1	*As common as G2
		3	799-101-5220	Nipple (10 x 1.25 mm)	1	
			07002-11023	O-ring	1	

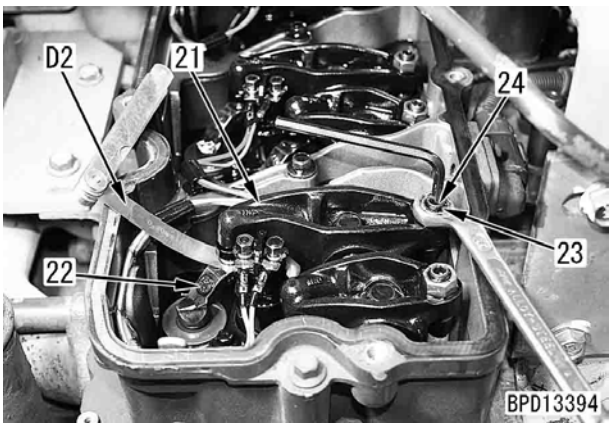
6. While the No.1 cylinder is at the compression top dead center, adjust the clearance of valve marked with ● in the valve arrangement figure.

Valve arrangement

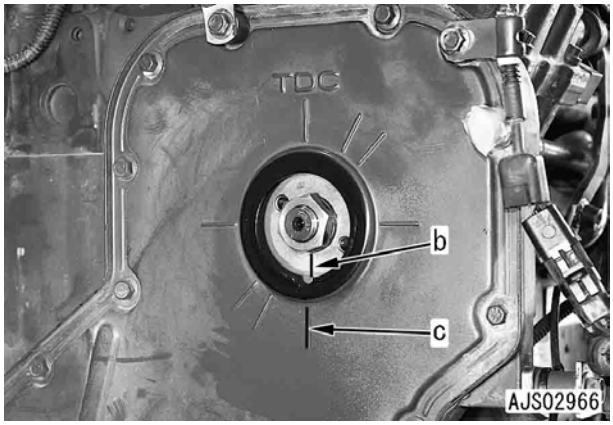
Cylinder No.	1	2	3	4	5	6
Exhaust valve	●	○	●	○	●	○
Intake valve	●	●	○	●	○	○

TDD00723

7. Adjust the valve clearance in the following procedure.
   1) Insert clearance gauge **D2** into the clearance between rocker lever (21) and crosshead (22).
   2) Loosen locknut (23) and adjust valve clearance with adjustment screw (24).
      ★ With the clearance gauge inserted, turn the adjustment screw so that you can move clearance gauge **D2** lightly.
   3) Fix adjustment screw (24) and tighten locknut (23).
      ⇦ Locknut: **24 ± 4 Nm {2.4 ± 0.4 kgm}**
      ★ After tightening the locknut, check the valve clearance again.



   4) After finishing the adjustment of all valves marked with ●, turn the crankshaft 360° forward and align stamp line (**c**) of the front gear cover and stamp line of supply pump gear (**b**).
      ★ The No.6 cylinder comes to the compression top dead center position.



   5) While the No. 6 cylinder is at the compression top dead center, adjust the clearance of valve marked with ○ in the valve arrangement figure.
      ★ Procedure for the adjustment is as same as 1) – 3).

8. After finishing adjustment, reinstall the removed parts.

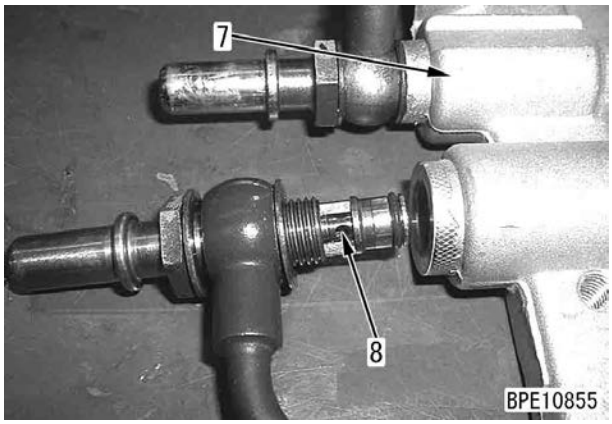
[*1]
⇦ Air intake connector hose clamp bolt:
- Radiator side
  10.5 ± 0.5 Nm {1.07 ± 0.05 kgm}
- Turbocharger outlet side tube clamp bolt
  7 ± 1.1 Nm {0.71 ± 0.11 kgm}

[*2]
⇦ Air cleaner air intake hose clamp bolt:
10.5 ± 0.5 Nm {1.07 ± 0.05 kgm}

[*3]
⇦ Air cleaner mounting band bolt:
9.8 – 11.8 Nm {1.0 – 1.2 kgm}

[*4]
⇦ Cylinder head cover mounting bolt:
11.8 ± 1.96 Nm {1.2 ± 0.2 kgm}

- If the fuel lift pump outlet pressure is not in the standard range while fuel is in the fuel lift pump, remove check valve (8) of engine controller cooling plate (7) and check to see if the valve is seized.



4) After finishing measurement, remove the measuring instruments and return the removed parts.
   Fuel pressure pickup plug:
   20 – 22 Nm {2.0 – 2.2 kgm}

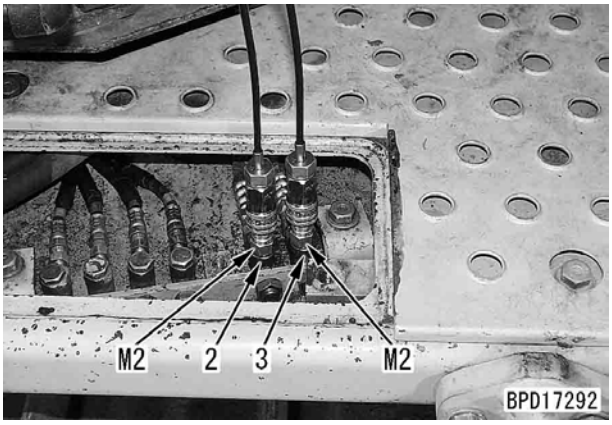
1) Measuring transmission forward clutch pressure
   1] Remove oil pressure pickup plug (6) and attach nipple **K3**, and connect oil pressure gauge [1] of hydraulic tester **K1**.
      ★ Use an oil pressure gauge of 6 MPa {60 kg/cm^2}.
   2] Run the engine and set the parking brake lever in free position.
   3] With the brake pedal depressed, set the PCCS lever in the “forward” and 3rd gear speed position.
   4] Measure the oil pressure while the engine is running at high idle.
   ⚠ **Since the torque converter is stalled, keep pressing the brake pedal securely.**
   5] After finishing measurement, remove the measuring instrument and reinstall the removed parts.
2) Measuring transmission reverse clutch pressure
   1] Remove oil pressure pickup plug (6) and attach nipple **K3**, and connect oil pressure gauge [1] of hydraulic tester **K1**.
      ★ Use an oil pressure gauge of 6 MPa {60 kg/cm^2}.
   2] Run the engine and set the parking brake lever in free position.
   3] With the brake pedal depressed, set the PCCS lever in the “forward” and 3rd gear speed position.
   4] Measure the oil pressure while the engine is running at high idle.
   ⚠ **Since the torque converter is stalled, keep pressing the brake pedal securely.**
   5] After finishing measurement, remove the measuring instrument and reinstall the removed parts.
3) Measuring transmission 1st clutch pressure
   1] Remove oil pressure pickup plug (7) and attach nipple **K3**, and connect oil pressure gauge [1] of hydraulic tester **K1**.
      ★ Use an oil pressure gauge of 6 MPa {60 kg/cm^2}.
   2] Run the engine and set the parking brake lever in free position.
   3] With the brake pedal depressed, set the PCCS lever in the “forward” and 1st gear speed position.
   4] Measure the oil pressure while the engine is running at low idle.
   ⚠ **Since the torque converter is stalled, keep pressing the brake pedal securely.**
   ⚠ **Do not run the engine at high idle while measuring.**
   5] After finishing measurement, remove the measuring instrument and reinstall the removed parts.
4) Measuring transmission 2nd clutch pressure
   1] Remove oil pressure pickup plug (8) and attach nipple **K3**, and connect oil pressure gauge [1] of hydraulic tester **K1**.
      ★ Use an oil pressure gauge of 6 MPa {60 kg/cm^2}.
   2] Run the engine and set the parking brake lever in free position.
   3] With the brake pedal depressed, set the PCCS lever in the “forward” and 2nd gear speed position.
   4] Measure the oil pressure while the engine is running at low idle.
   ⚠ **Since the torque converter is stalled, keep pressing the brake pedal securely.**
   ⚠ **Do not run the engine at high idle while measuring.**
   5] After finishing measurement, remove the measuring instrument and reinstall the removed parts.
5) Measuring transmission 3rd clutch pressure
   1] Remove oil pressure pickup plug (9) and attach nipple **K3**, and connect oil pressure gauge [1] of hydraulic tester **K1**.
      ★ Use an oil pressure gauge of 6 MPa {60 kg/cm^2}.
   2] Run the engine and set the parking brake lever in free position.
   3] With the brake pedal depressed, set the PCCS lever in the “forward” and 3rd gear speed position.
   4] Measure the oil pressure while the engine is running at low idle.
   ⚠ **Since the torque converter is stalled, keep pressing the brake pedal securely.**
   ⚠ **Do not run the engine at high idle while measuring.**
   5] After finishing measurement, remove the measuring instrument and reinstall the removed parts.

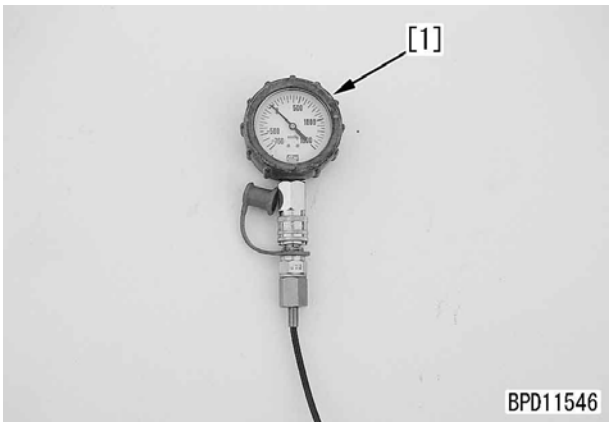
2. Measuring work equipment and HSS oil pressure

Remove plugs of pump oil pressure pickup port (2) and load sensing pressure pickup port (3), and install nipples **M2**.

Connect oil pressure gauges [1] of hydraulic tester **M1**.

★ Use the following oil pressure gauges
Work equipment oil pressure:
40 MPa {400 kg/cm²}
HSS oil pressure: **60 MPa {600 kg/cm²}**





- **Work equipment oil pressure**
  1] Run the engine and set the work equipment lock lever in the free position.
  2] Run the engine at high idle and operate the blade lever and ripper lever. When each cylinder is relieved at the stroke end, measure the oil pressure.
  ★ Block the return hose of the blade lift cylinder.
  3] After finishing measurement, remove the measuring instrument and reinstall the removed parts.

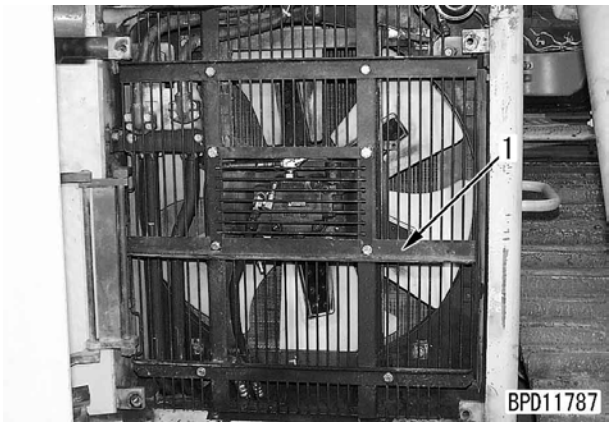
- **HSS oil pressure**
  1] Run the engine, set the parking brake lever in the free position, and depress the brake pedal.
  ⚠ **Since the steering circuit will be stalled, keep pressing the brake pedal securely and keep your right foot on the decelerator pedal for safety until the work is finished.**
  2] Run the engine at high idle and steer to the right or left with the PCCS lever. When the steering circuit is relieved, measure the oil pressure.
  3] After finishing measurement, remove the measuring instrument and return the removed parts.

Measuring fan pump circuit pressure

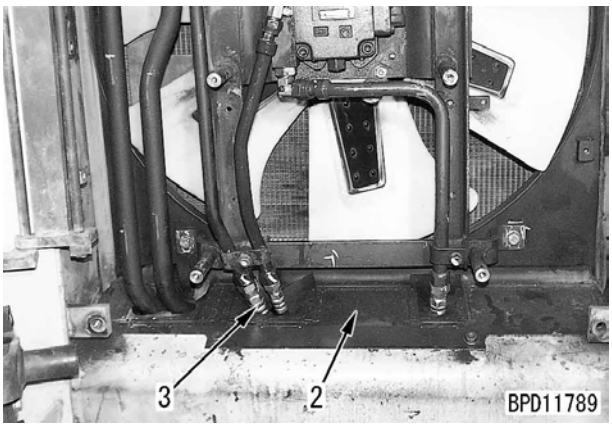
★ Measuring instruments for fan pump circuit pressure

Symbol		Part No.	Part name
R	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-401-3400	Adapter (size 05)
	3	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring

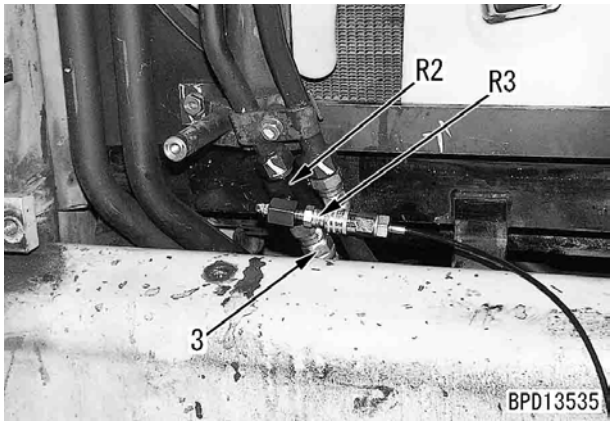
1. Open the radiator mask.
2. Remove fan guard (1).



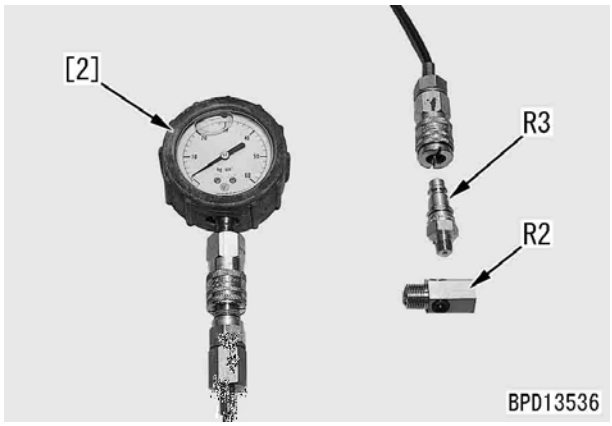
3. Remove cover (2) and disconnect fan motor drive circuit hose (3).



4. Install adapter **R2** and connect hose (3) again. Install nipple **R3** and connect oil pressure gauge [2].
   ★ Use an oil pressure gauge of 40 MPa {400 kg/cm^2}.



5. Run the engine, and turn the monitor panel to the adjustment mode.
   ★ For the operation method of the adjustment mode, see “Special functions of monitor panel (EMMS)”.
   ★ Adjustment code:
   1005 (Fan 100% speed mode)
6. Measure the oil pressure of fan circuit while the engine is running at high idle.



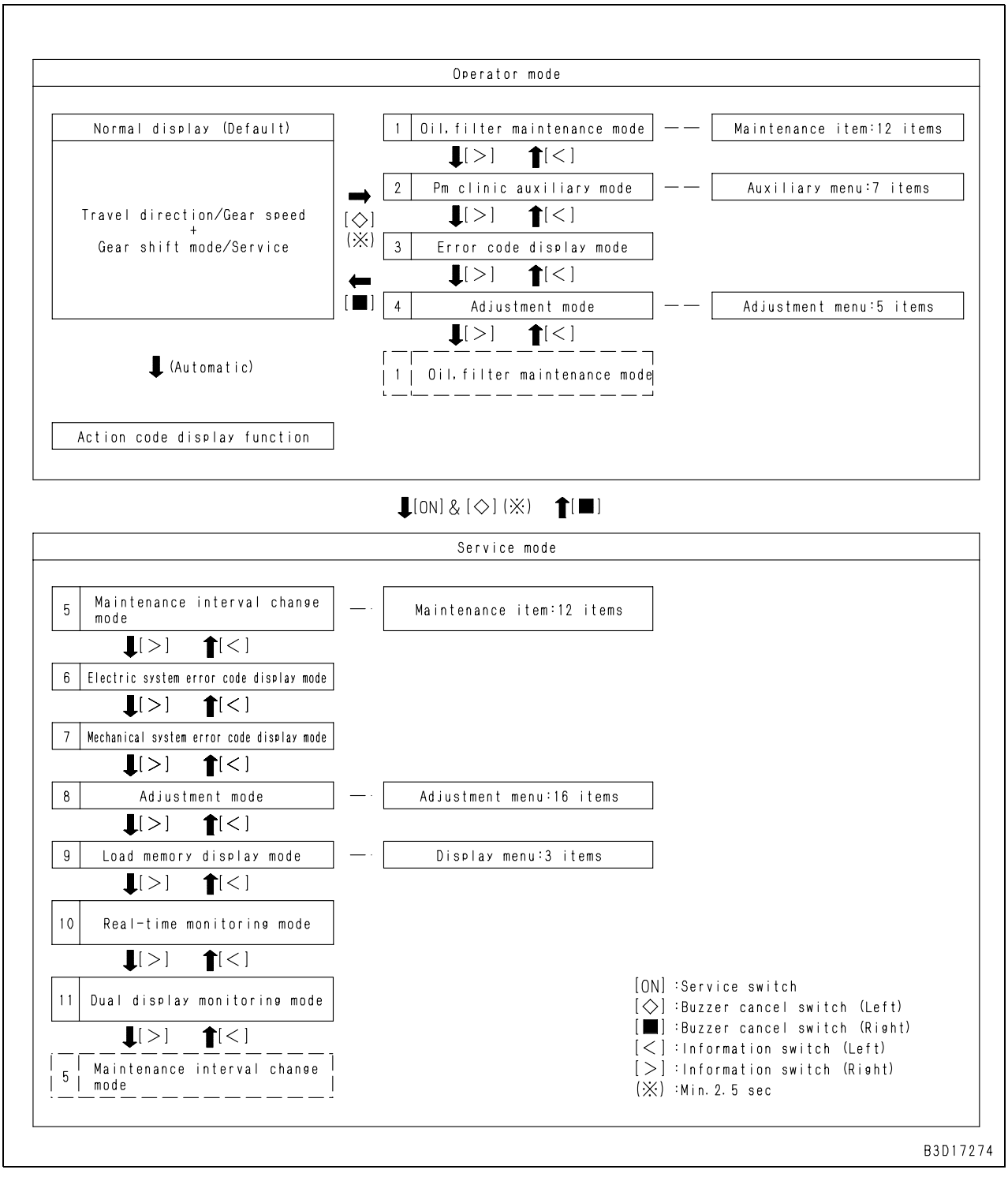
7. After finishing measurement, remove the measuring instrument and reinstall the removed parts.

Normal function and special functions of monitor panel (EMMS)

The monitor panel (EMMS) has the normal and special functions, and displays information of various types at the gear speed display section at the center of the monitor panel and the multi-information section.
Some items are displayed automatically according to the internal setting of the monitor panel and the others are displayed according to the operation of the switches.

1. Normal function: Operator mode
   With this function, an operator can view and change the items displayed normally or displayed by the operation of the switches.
2. Special function: Service mode
   With this function, a serviceman can display and change the displayed items by the specified switching operation for testing, adjusting and troubleshooting.

Flow of each mode and function



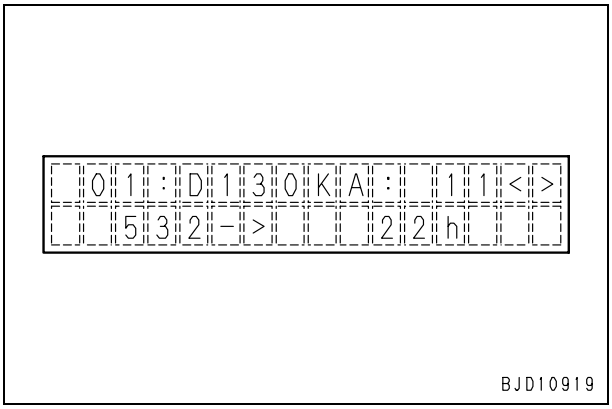
★ Conditions for detecting and keeping failure code
When a failure is detected, the failure code other than communication related or engine-related keeps flashing until the starting switch is turned off. After turning the starting switch OFF temporarily, if the starting switch is turn on or the engine is started again, the failure code keeps lighting until the same trouble is detected.
Communication related or engine related failure code is switched to the lighting when the problem is solved, even if the starting switch is not turned off.

4) Operations in case that multiple codes are recorded
When multiple codes are recorded, they can be displayed one by one by operating information switch (5).
- [>]: Go to next failure code
- [<]: Return to previous code

★ The failure codes are displayed in the order of their first occurrence times.

5) Method of deleting failure code
While displaying a failure code that is to be deleted, operate shift up switch (6) or shift down switch (7).
- [Up] or [Down]: Delete failure code.

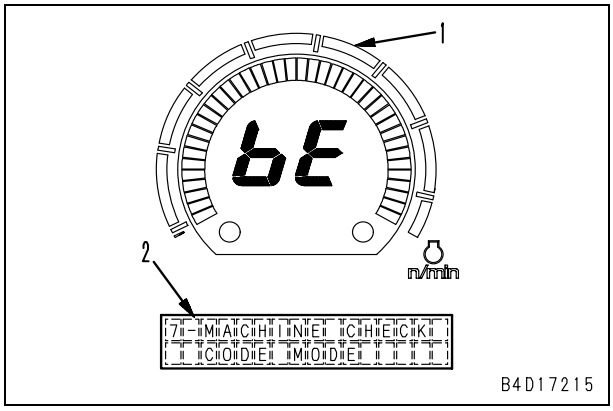
★ A failure code which is active currently (code is flashing) cannot be deleted.



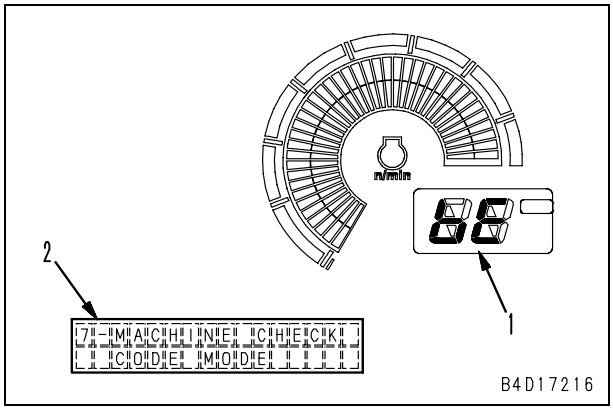
7. Mechanical system failure code display mode
(7-MACHINE FAULT CODE MODE)
In this mode, you can check the mechanical system failure codes among the information of the troubles that occurred on the machine.

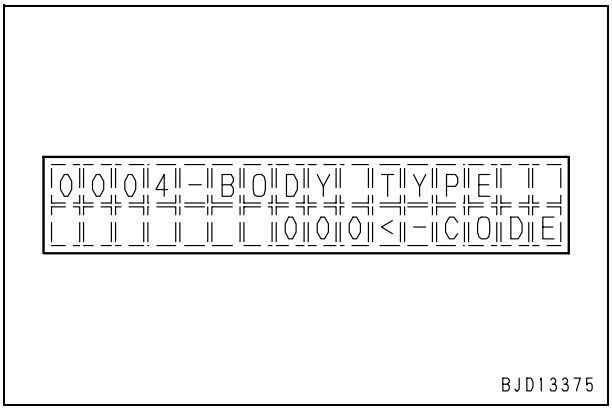
1) Selecting and implementing a mode
1] Select “Mechanical system failure code display mode” on the mode selection screen.
★ If the mode is selected, code (bE) is displayed on gear speed display section (1) and the title is displayed on multi-information section (2).
2] Display the failure code display screen by operating buzzer cancel switch (4).
- [◇]: Execute mode.

D65EX, PX Serial No.: 69001 – 71068
D65WX Serial No.: 69001 – 69104



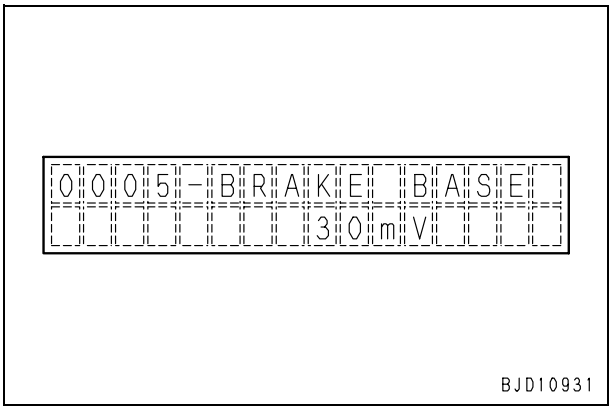
D65EX, PX Serial No.: 71069 and up
D65WX Serial No.: 69105 and up



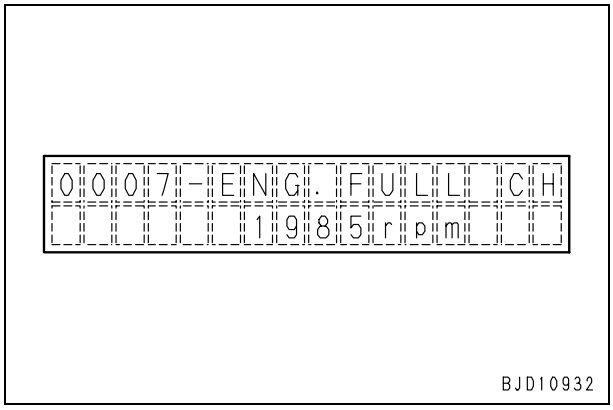


No.	Specifications
000	Standard
010	Pitch specification

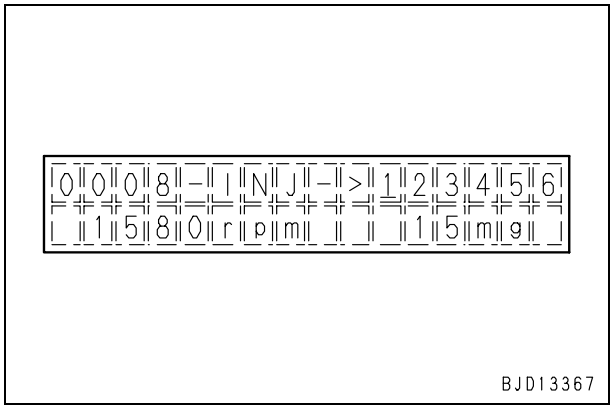
[4] **0005**: Brake potentiometer zero point adjustment
- This code is used to adjust the zero point of the potentiometer of the brake pedal.
- The deviation from the standard is displayed by voltage on the lower line (Display range: –2500 – 2500).
- Adjustment method:
  With the brake pedal released, set buzzer cancel switch (4) in the [◇] position and check that the alarm buzzer sounds.
  - ★ Even if the adjustment is carried out, the display of the lower line does not change.
  - ★ Even if this code is turned off, the setting is effective.
  - ★ This code is not for the adjustment of the braking performance, etc..



[5] **0007**: Engine deceleration-cut mode
- This code is used to stop the auto-deceleration function of the engine and check the high idle speed of the engine unit.
- The engine speed is displayed on the lower line (Display range: 0 – 3000).
- How to use:
  While this code is displayed, its function is enabled and the auto-deceleration function is stopped.
  - ★ If this code is turned off, its function is disabled.



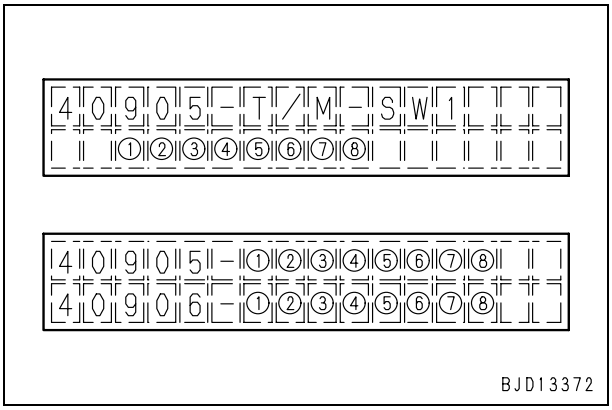
[6] **0008**: Common rail reduced cylinder mode
- ★ When the engine common rail system seems to be defective, this code is used to stop injecting fuel into 1 or more cylinders (reduce the number of effective cylinders) while the engine is running and find out a defective cylinder from the change of the engine speed.
- ★ Since this function diagnoses a failure based on the difference of the engine speed in the reduced cylinder mode operation from that in the normal mode operation, use this function while the engine is running.
- The engine speed and fuel injection rate are displayed on the lower line (Display range: 0 – 3000, 0 – 1000).
- How to use:
  Select the cylinders to be turned off for the reduced cylinder mode operation by operating information switch (5) and buzzer cancel switch (4).
  Use this method to turn on the selected cylinders again, too.
  - [>]: Moves cursor rightward.
  - [<]: Moves cursor leftward.
  - [◇]: Executes or stops reduced cylinder mode operation.



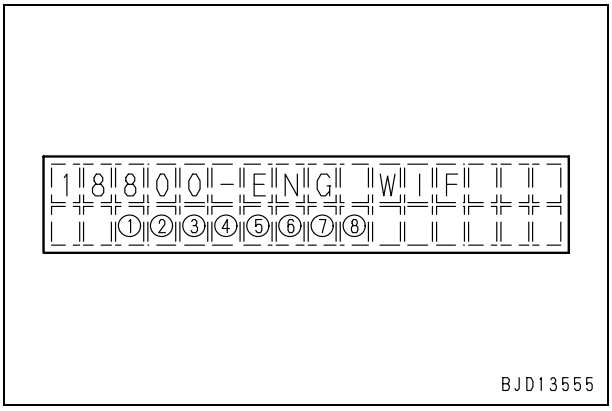
Detailed information on bit display codes

Display of bit information:

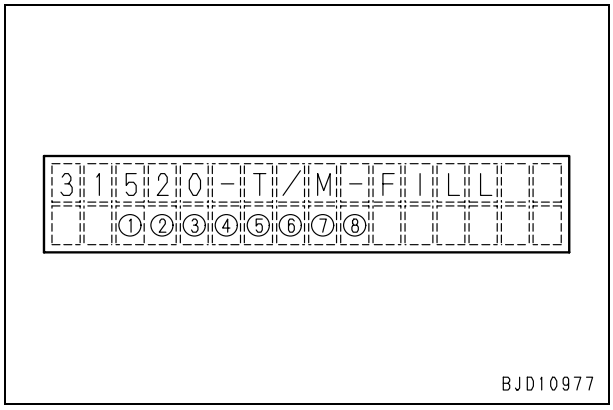
★ The display position of the bit information in the “Real-time monitoring mode (Display of only 1 item)” is different from that in the “Dual display monitoring mode (Simultaneous display of 2 items)”.
★ The bit information is displayed by [_] for OFF and [o] for ON in the places from 1 to 8.
★ The state of each item shown in this section is the condition for turning on the bit.



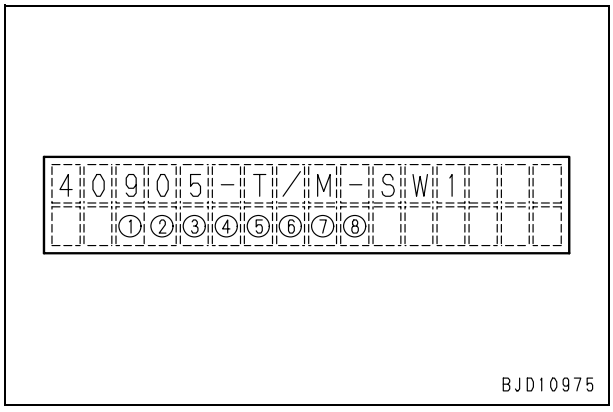
18800:
Water level signal of fuel filter
1: Water level in fuel filter: When detecting
2: (Unused)
3: (Unused)
4: (Unused)
5: (Unused)
6: (Unused)
7: (Unused)
8: (Unused)



31520:
Input state of transmission-related fill switch
1: Forward clutch fill switch: ON
2: Reverse clutch fill switch: ON
3: 1st clutch fill switch: ON
4: 2nd clutch fill switch: ON
5: 3rd clutch fill switch: ON
6: (Unused)
7: (Unused)
8: (Unused)

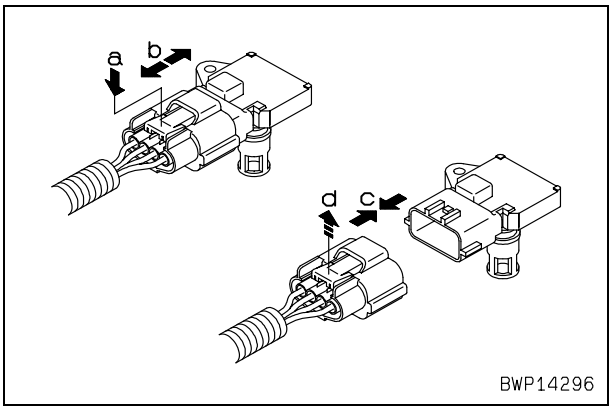


40905:
Transmission-related controller input signal 1
1: Shift up switch: OFF
2: Shift up switch: ON
3: Shift down switch: OFF
4: Shift down switch: ON
5: (Unused)
6: (Unused)
7: (Unused)
8: (Unused)



6. Boost pressure sensor and intake manifold temperature sensor (BOOST PRES & IMT)

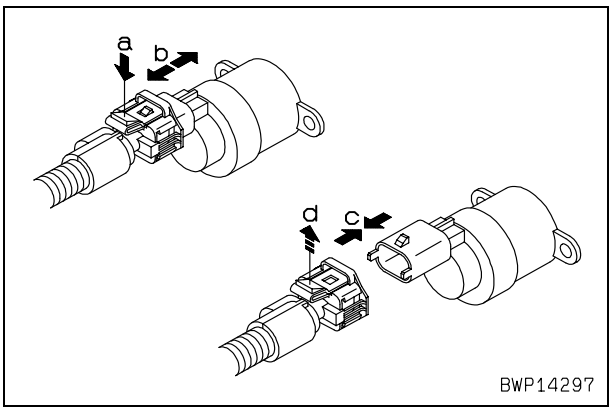
★ Disconnecting and connecting connectors
Since the connectors of boost pressure and temperature sensor have special lock mechanism, disconnect in the order of (a) – (b) and connect in the order of (c) – (d) as shown in the below figure.
Disconnect: (a) release lock – (b) disconnect connector
Connect: (c) connect connector – (d) mesh lock



★ Removal and installation of sensor
When removing and installing boost pressure and intake manifold temperature sensor, use T type torque wrench [bearing number : T15].

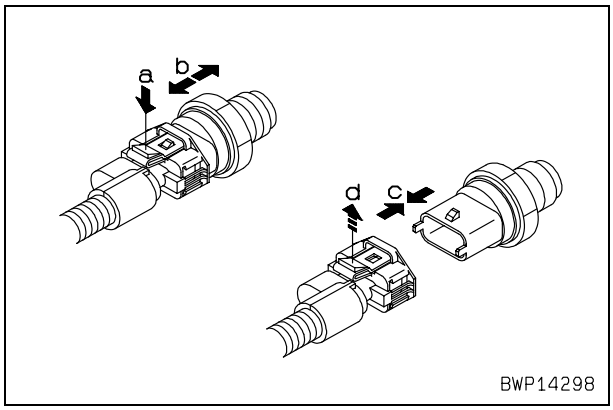
7. Fuel supply pump IMV solenoid (FUEL REGULATOR)

★ Disconnecting and connecting connectors
Since the connector of fuel supply pump IMV solenoid has special lock mechanism, disconnect in the order of (a) – (b) and connect in the order of (c) – (d) as shown in the below figure.
Disconnect: (a) release lock – (b) disconnect connector
Connect: (c) connect connector – (d) mesh lock



8. Common rail pressure sensor (FUEL RAIL PRESS)

★ Disconnecting and connecting connectors
Since the connector of common rail pressure sensor has special lock mechanism, disconnect in the order of (a) – (b) and connect in the order of (c) – (d) as shown in the below figure.
Disconnect: (a) release lock – (b) disconnect connector
Connect: (c) connect connector – (d) mesh lock



Undercarriage troubleshooting report (Impact) (Program form No.: SELA195001)

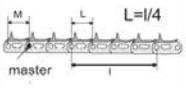
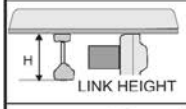
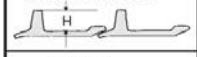
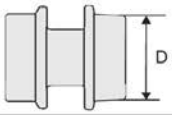
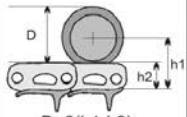
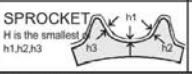
KUC

Komatsu
Undercarriage Inspection

Customer name:

Address:

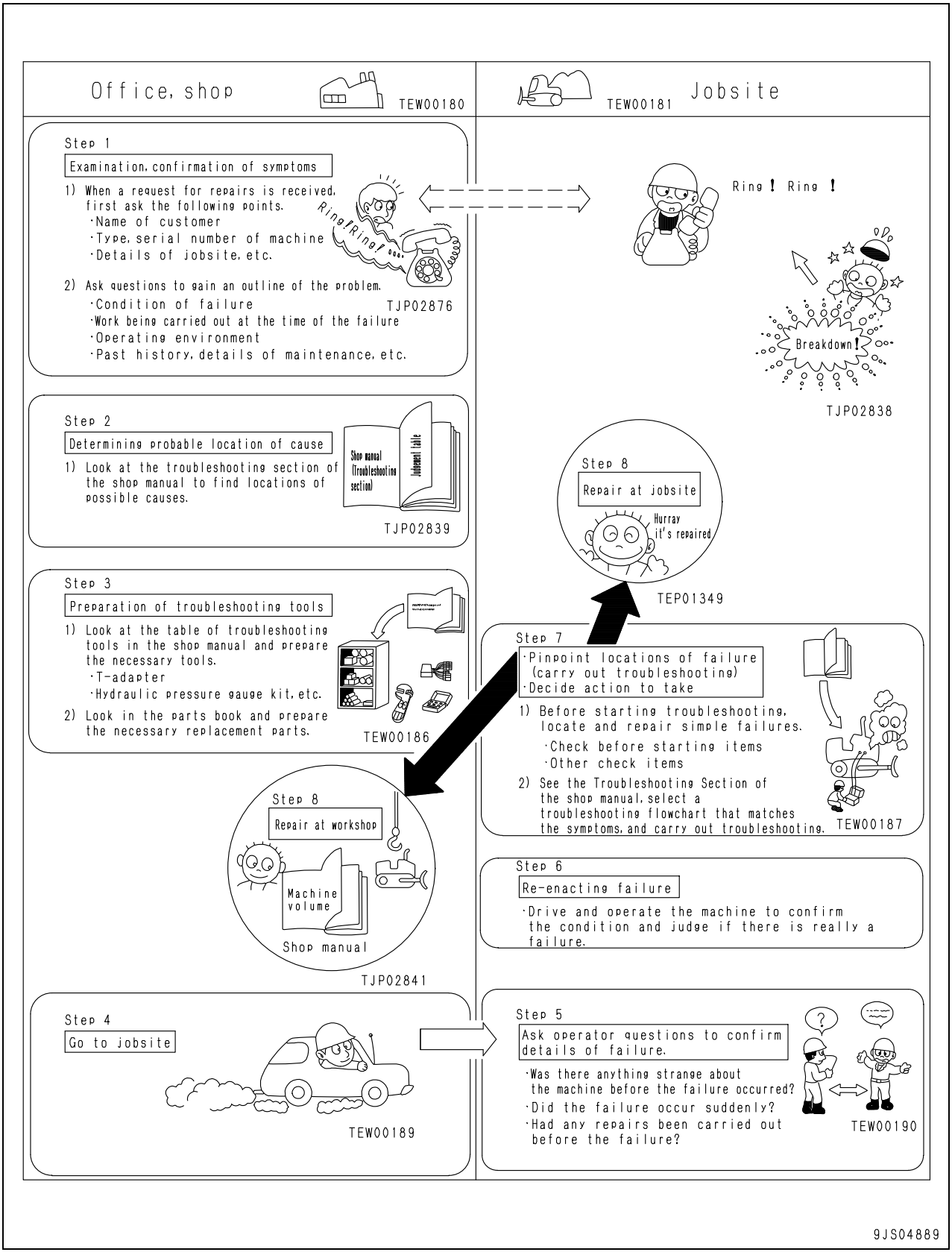
Model	D65EX, PX, WX-15E0	Serial No		Equip No	Work Order No	
Location		SMR			Wet,AR,HD or Dry	Wet
Soil condition		Dealer			Shoe width (mm)	
Working condition		Inspector			Shoe type	SINGLE
		Insp.Date(yy/mm/dd)		(yyyy/m/d)	Wear type	IMPACT

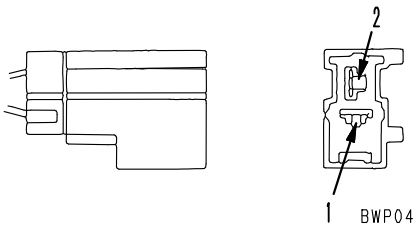
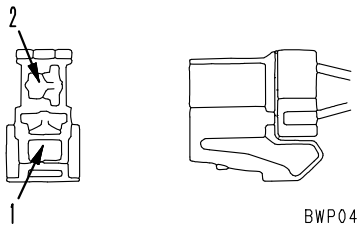
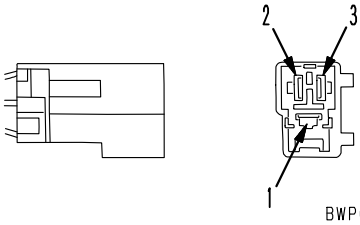
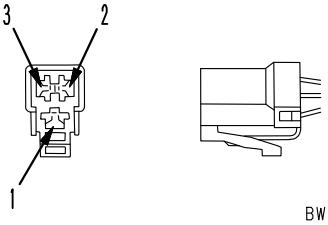
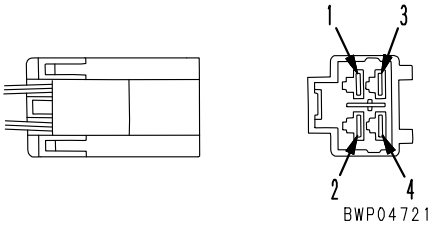
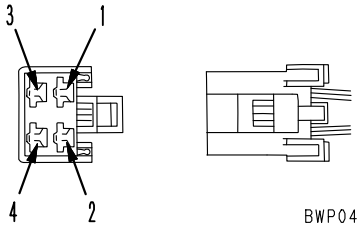
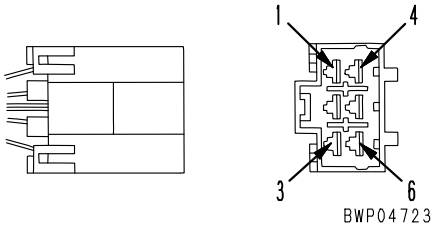
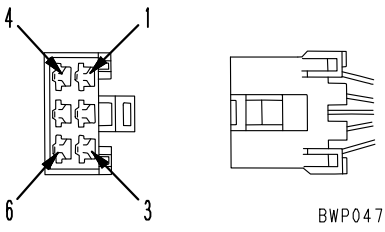
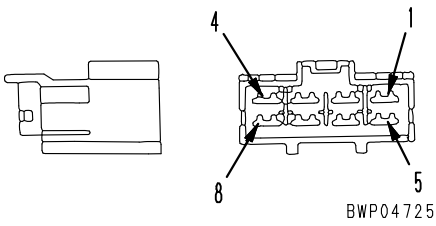
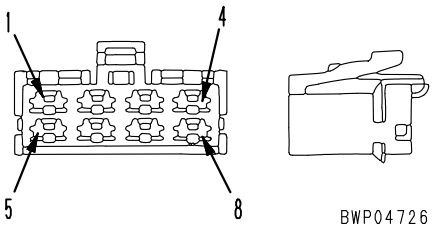
			New	100% Wear	Measured mm	Wear %	SMR New	SMR Rebuilt	Hours on Parts:	Comments/Observation
LINK PITCH 	R	LH	813.8	825.8						
		RH	813.8	825.8						
	M	LH	203.45	206.45						
		RH	203.45	206.45						
		LH	132.0	119.5						
		RH	132.0	119.5						
BUSHIN G 		LH	73.0	65.4			New	Turned		
		RH	73.0	65.4			New	Turned		
GROUSER HIGHT 		LH	65.0	25.0						
		RH	65.0	25.0						
CARRIER 	Front	LH	185.0	163.0						
		RH	185.0	163.0						
	Rear	LH	185.0	163.0						
		RH	185.0	163.0						
IDLER 	Front	LH	20.0	30.0						
		RH	20.0	30.0						
	Rear	LH	20.0	30.0						
		RH	20.0	30.0						
TRACK ROLLER 	1	LH	210.0	174.0						
	2	LH	210.0	174.0						
	3	LH	210.0	174.0						
	4	LH	210.0	174.0						
	5	LH	210.0	174.0						
	6	LH	210.0	174.0						
	7	LH	210.0	174.0						
	8	LH	210.0	174.0						
	9	LH	210.0	174.0						
	10	LH	210.0	174.0						
	1	RH	210.0	174.0						
	2	RH	210.0	174.0						
	3	RH	210.0	174.0						
	4	RH	210.0	174.0						
	5	RH	210.0	174.0						
	6	RH	210.0	174.0						
	7	RH	210.0	174.0						
	8	RH	210.0	174.0						
	9	RH	210.0	174.0						
	10	RH	210.0	174.0						
SPROCKET 		LH	0.0	9.0						
		RH	0.0	9.0						

Remarks:

How to proceed troubleshooting

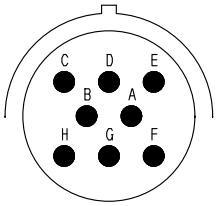
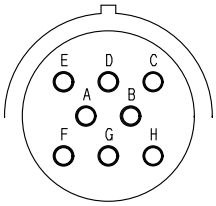
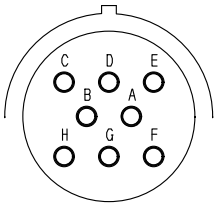
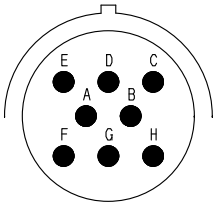
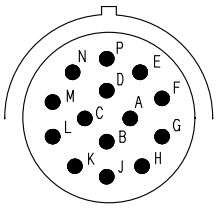
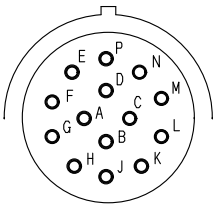
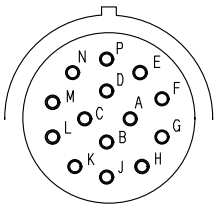
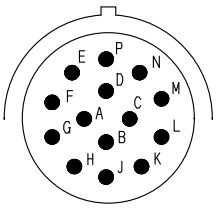
(Rev. 2007.12)



No. of pins	M type connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
1	Part No. : 08056-00171	Part No. : 08056-00181	799-601-7080 (T-adapter)
2	 BWP04717	 BWP04718	799-601-7090 (T-adapter)
	Part No. : 08056-00271	Part No. : 08056-00281	
3	 BWP04719	 BWP04720	799-601-7110 (T-adapter)
	Part No. : 08056-00371	Part No. : 08056-00381	
4	 BWP04721	 BWP04722	799-601-7120 (T-adapter)
	Part No. : 08056-00471	Part No. : 08056-00481	
6	 BWP04723	 BWP04724	799-601-7130 (T-adapter)
	Part No. : 08056-00671	Part No. : 08056-00681	
8	 BWP04725	 BWP04726	799-601-7340 (T-adapter)
	Part No. : 08056-00871	Part No. : 08056-00881	

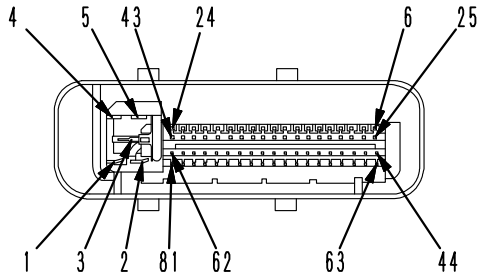
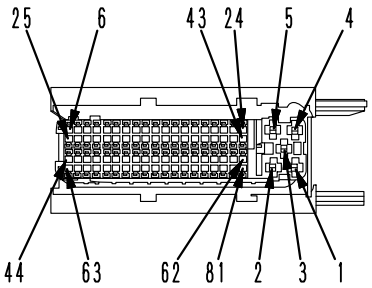
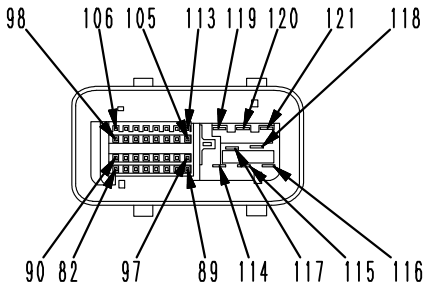
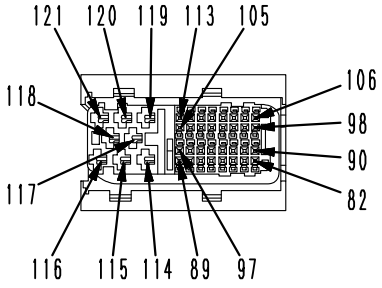
B4D18193

[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.
18-8 (1)	Pin (male terminal)	Socket (female terminal)	799-601-9210 (T-adapter)
	 BWP05001	 BWP05002	
	Part No. :08191-11201, 08191-11202, 08191-11205, 08191-11206	Part No. :08191-14101, 08191-14102, 08191-14105, 08191-14106	
	Socket (female terminal)	Pin (male termial)	799-601-9210 (T-adapter)
	 BWP05003	 BWP05004	
	Part No. :08191-12201, 08191-12202, 08191-12205, 08191-12206	Part No. :08191-13101, 08191-13102, 08191-13105, 08191-13106	
18-14 (2)	Pin (male terminal)	Socket (female terminal)	799-601-9220 (T-adapter)
	 BWP05005	 BWP05006	
	Part No. :08191-21201, 08191-12202, 08191-21205, 08191-12206	Part No. :08191-24101, 08191-24102, 08191-24105, 08191-24106	
	Socket (female terminal)	Pin (male termial)	799-601-9220 (T-adapter)
	 BWP05007	 BWP05008	
	Part No. :08191-22201, 08191-22202, 08191-22205, 08191-22206	Part No. :08191-23101, 08191-23102, 08191-23105, 08191-23106	

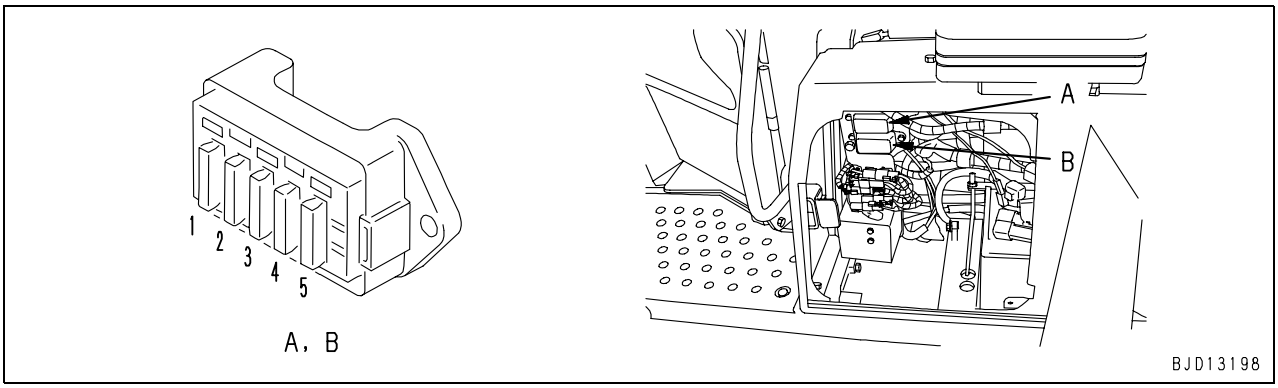
B4D18405

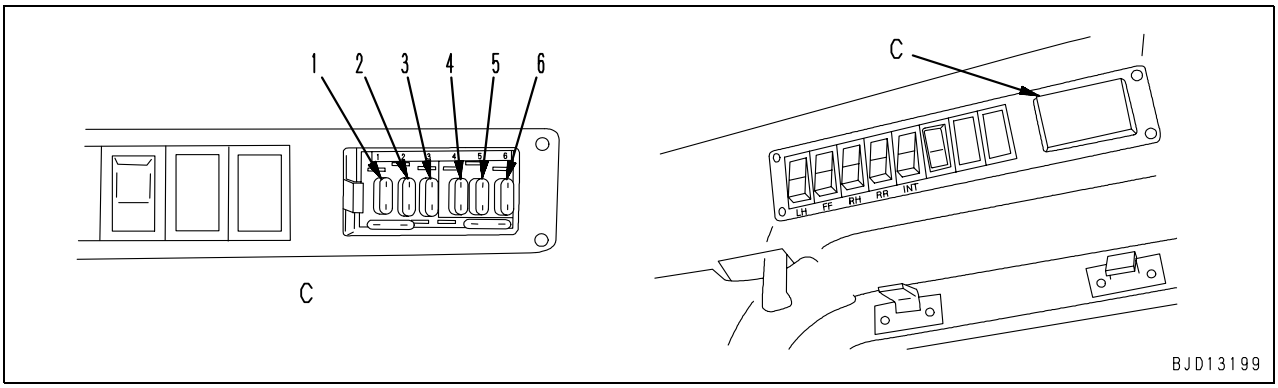
AMP connector for pump controller (CH700)

No. of pins	PC200/220-8, PC270-8, PC300-8, PC400-8, PC128/138US-8 and so on	Testing connection use special tool Part No.
	Controller side (plug)	
		
	—	
81	Harness side (receptacle)	
		
	Part No. : 7880-70-9040	799-601-4280 (Socket)
	Controller side (plug)	
		
	—	
40	Harness side (receptacle)	
		
	Part No. : 7880-70-9010	

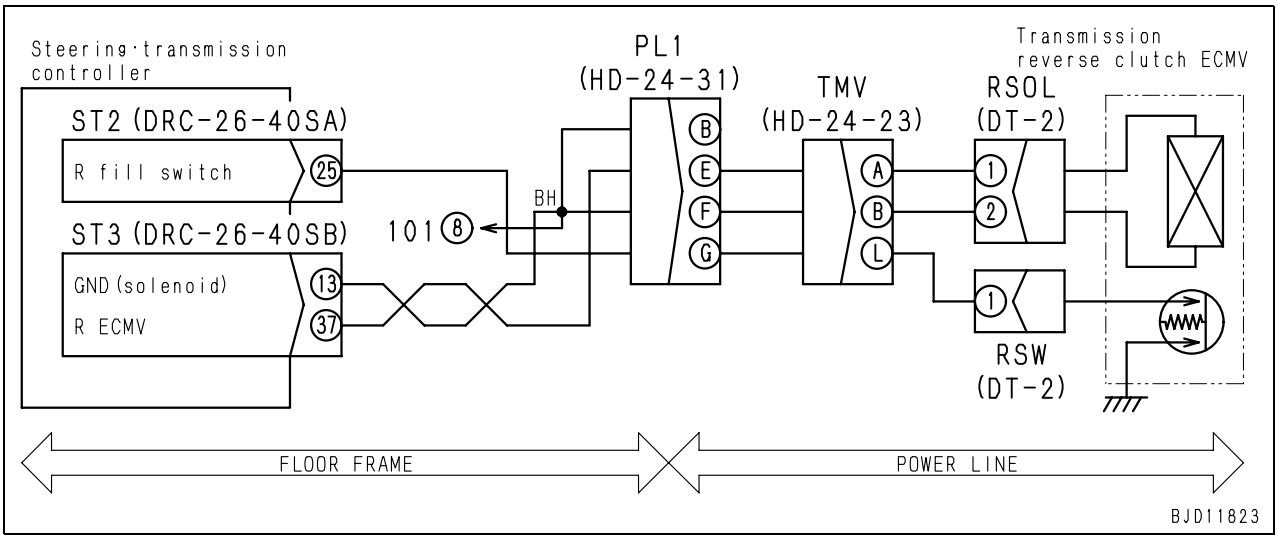
B4D18417

Fuse installation position and No.





Circuit diagram related to transmission reverse clutch ECMV



Failure code [B@BCNS] Radiator coolant: Overheat

Action code	Failure code	Failure symptom	Radiator coolant: Overheat (Mechanical system)
—	**B@BCNS**		
Failure content	• While engine is running, radiator coolant temperature caution lamp flashes.		
Controller's action	• Flashes warning lamp and turns on alarm buzzer. (Function of monitor panel) • Limits operation of engine.		
Symptoms that appears on machine	• If the machine is operated in the same condition, engine may be damaged. • After warning, engine output is limited to half of rated horsepower.		
General information	• Duplication of failure code: Start the engine.		

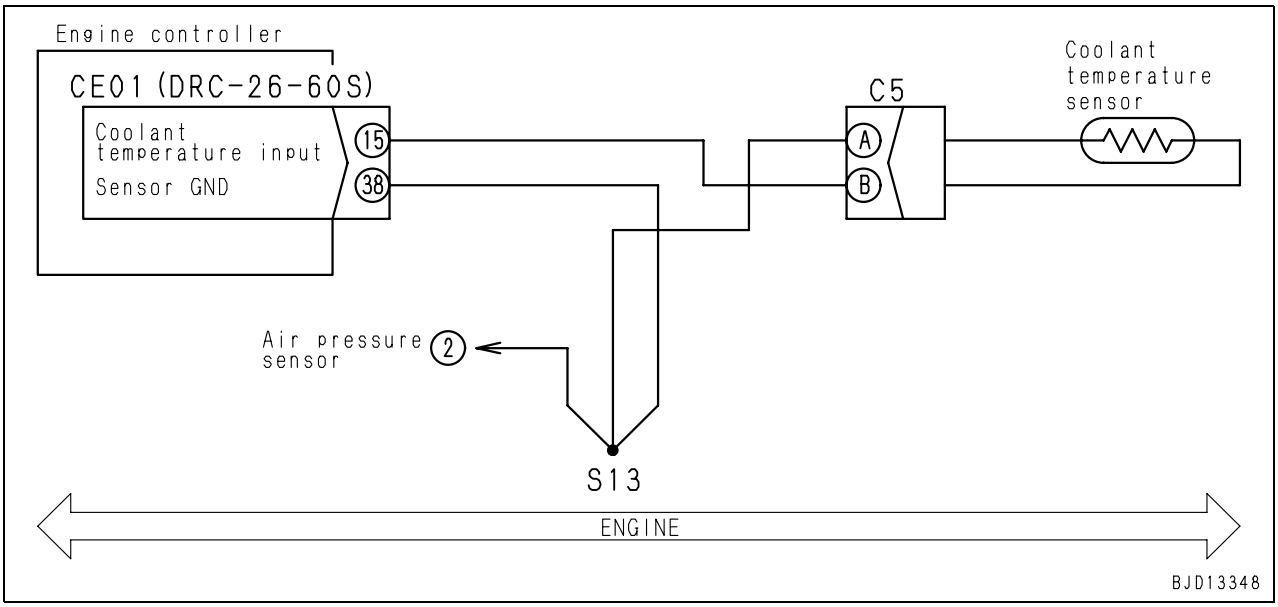
Possible causes and the standard values when normal		Cause	Standard value when normal and remarks for troubleshooting
	1	Engine coolant overheats (When system is normal)	It is suspected that the problem causing a detection of engine coolant overheat is currently occurring or occurred in the past. Investigate the cause and damage condition, and correct it.
	2	Defective engine coolant temperature caution lamp system	Carry out troubleshooting of engine coolant temperature caution lamp circuit in accordance with “While engine is running, emergency warning item flashes” in E-mode.

Failure code [B@CENS] Power train oil: Overheat

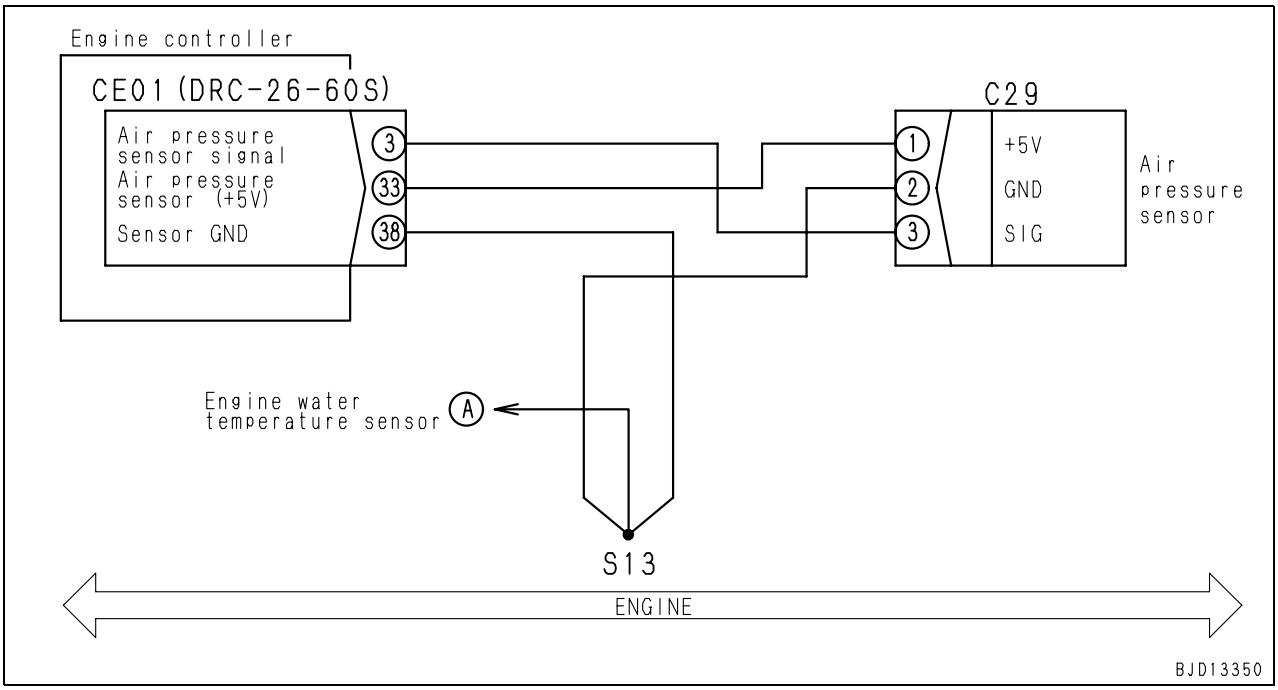
Action code	Failure code	Failure symptom	Power train oil: Overheat (Mechanical system)
—	**B@CENS**		
Failure content	• While engine is running, power train oil temperature caution lamp flashes.		
Controller's action	• Flashes warning lamp and turns on alarm buzzer. (Function of monitor panel)		
Symptoms that appears on machine	• If the machine is operated in the same condition, power train may be damaged.		
General information	• Duplication of failure code: Start the engine.		

Possible causes and the standard values when normal		Cause	Standard value when normal and remarks for troubleshooting
	1	Power train oil temperature overheat (When system is normal)	It is suspected that the problem causing a detection of power train oil overheat is currently occurring or occurred in the past. Investigate the cause and damage condition, and correct it.
	2	Defective caution lamp system for power train oil temperature	Carry out troubleshooting of power train oil temperature caution lamp system in accordance with, “While engine is running, emergency warning item flashes” in E-mode.

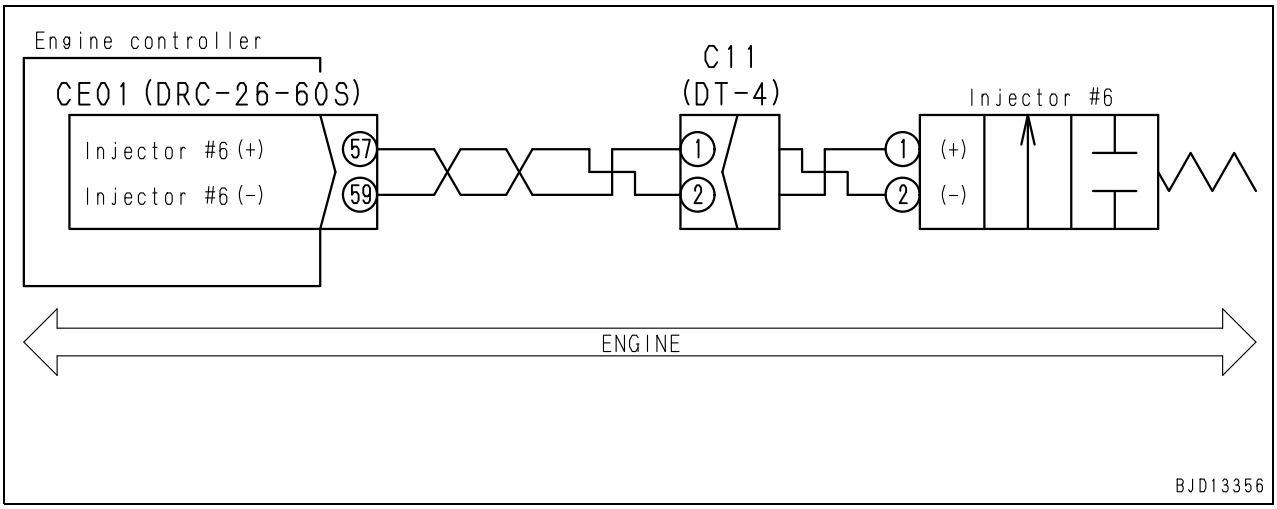
Circuit diagram related to coolant temperature sensor



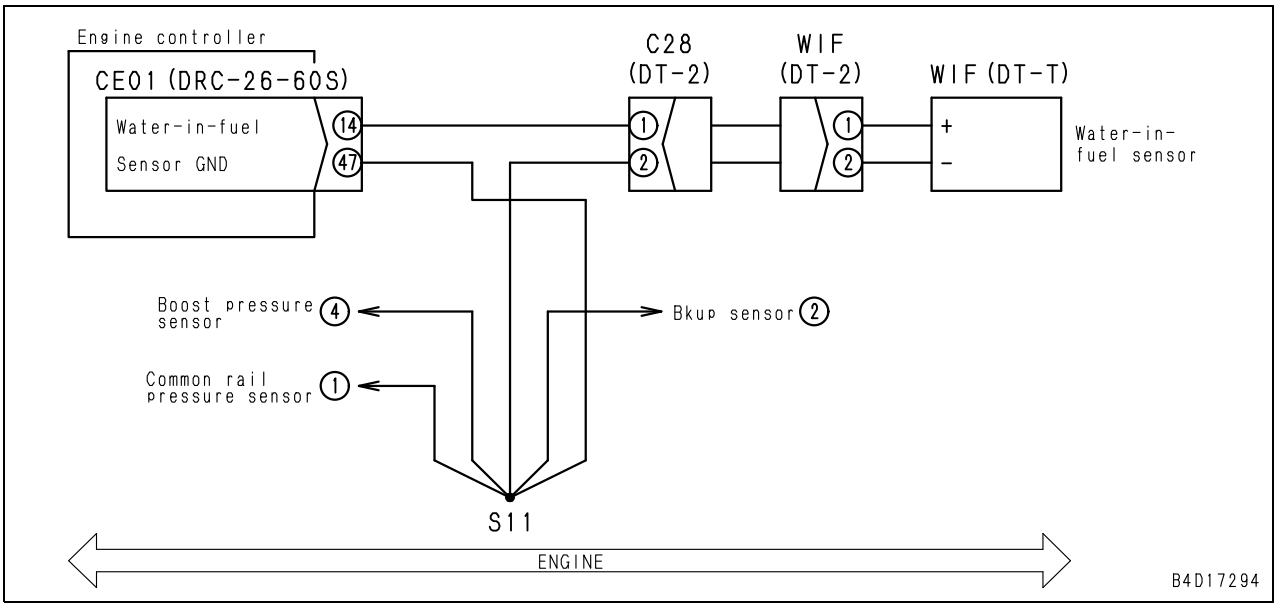
Circuit diagram related to atmospheric pressure sensor



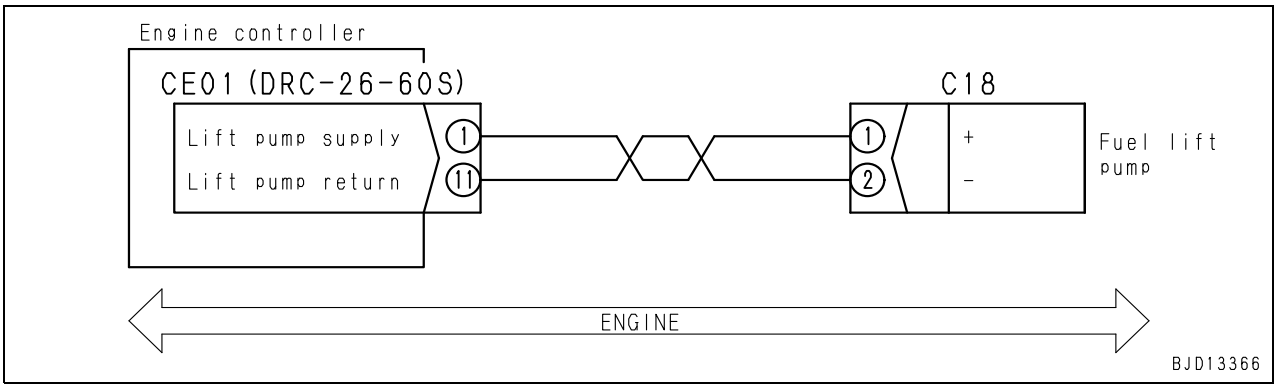
Circuit diagram related to injector No. 6



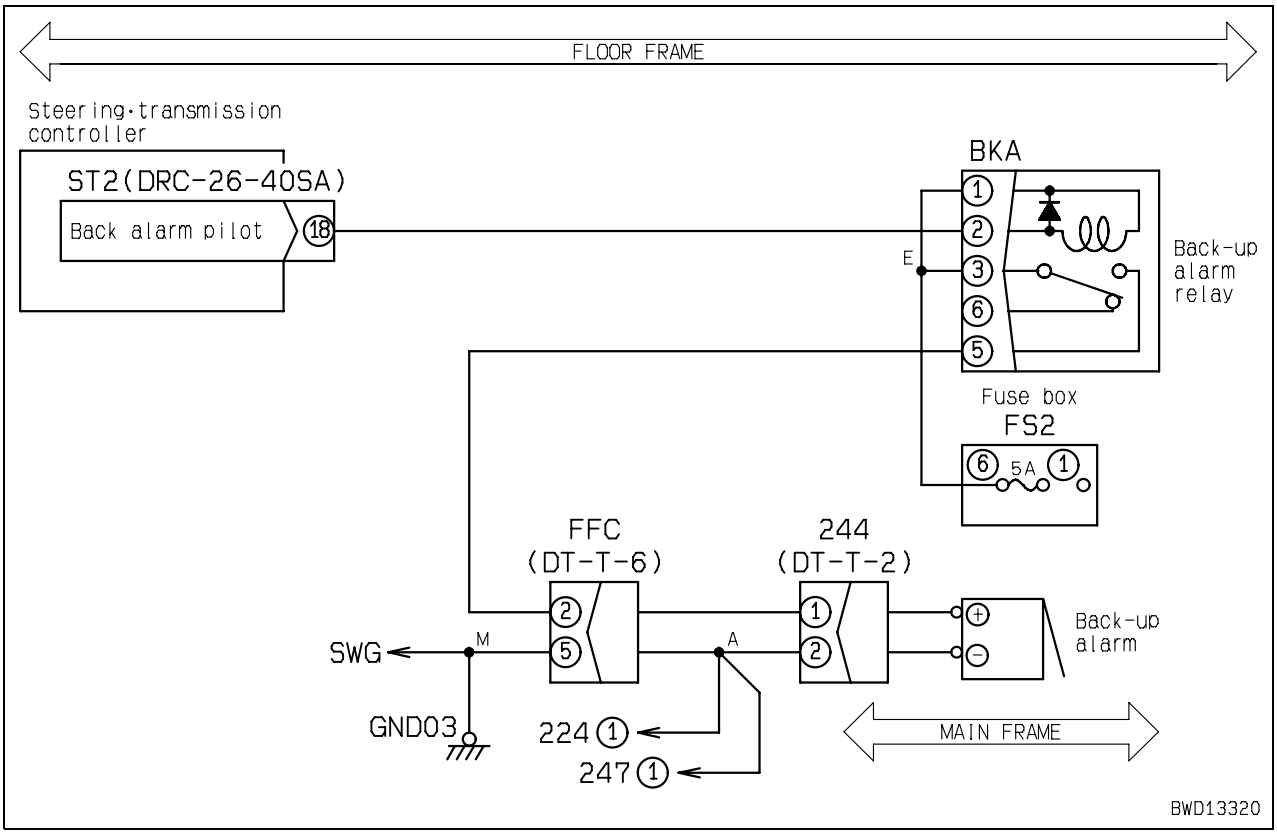
Circuit diagram related to fuel water sensor



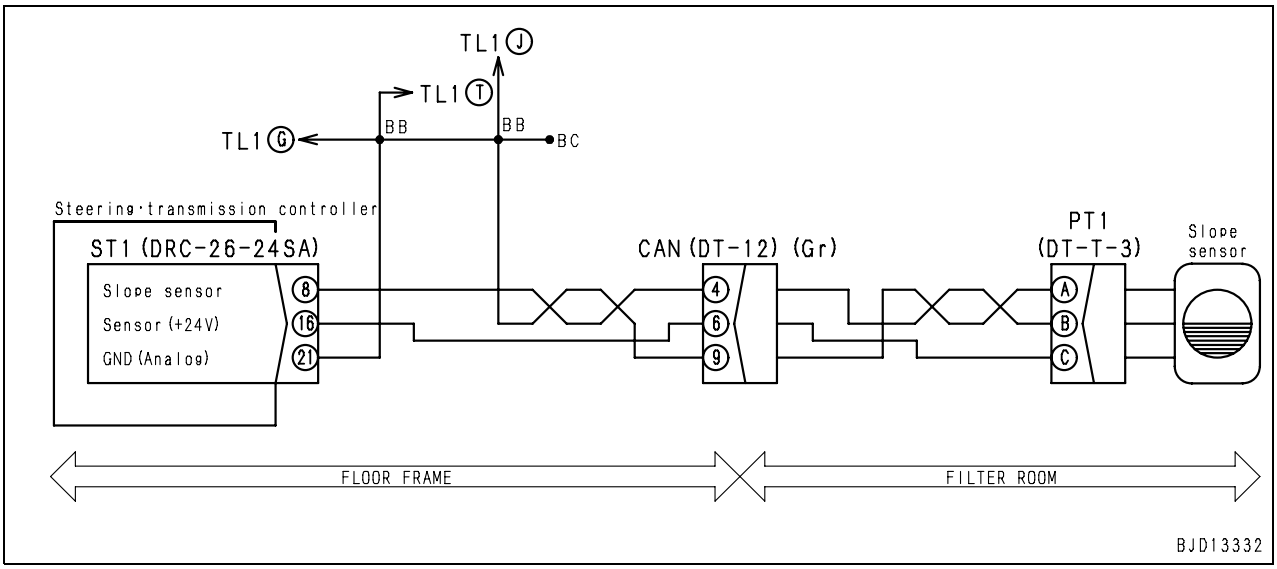
Circuit diagram related to electric lift pump actuator



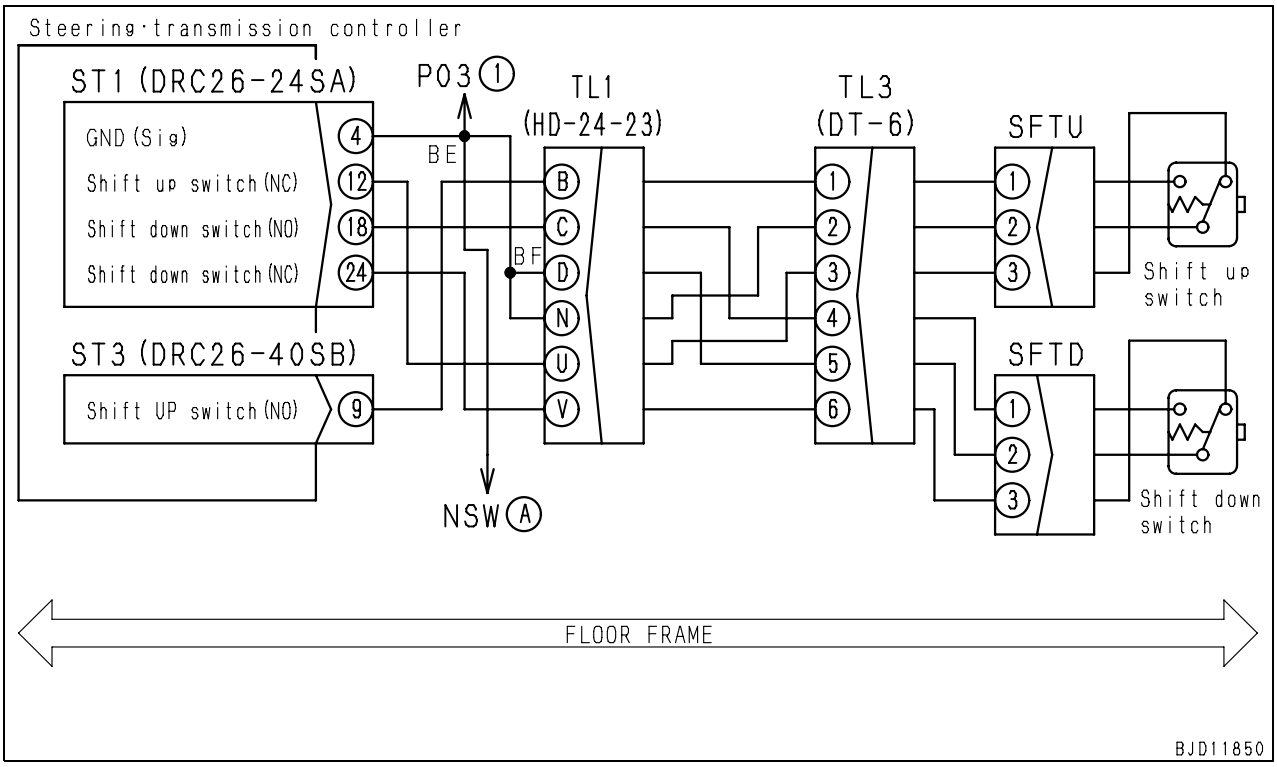
Circuit diagram related to back-up alarm relay



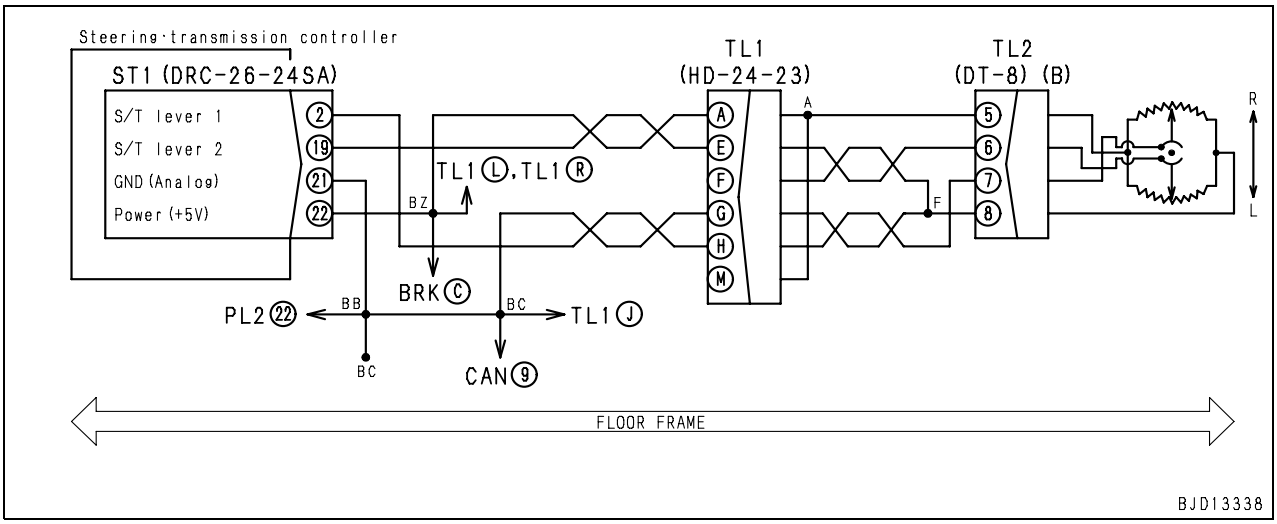
Circuit diagram related to steering and transmission controller sensor 24 V power source



Circuit diagram related to shift up and shift down switch



Circuit diagram related to steering potentiometer



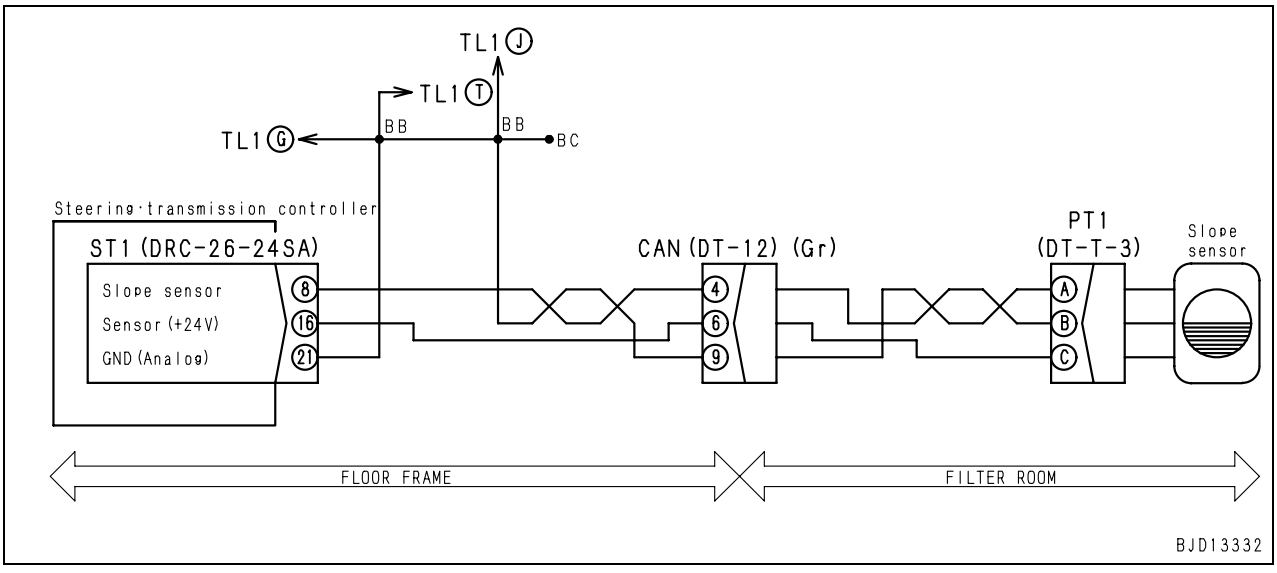
Troubleshooting by failure code (Display of code), Part 4

Failure code [DKH1KA] [DKH1KX] Pitch angle sensor: Short circuit

Action code	Failure code	Symptom of failure	Pitch angle sensor: Short circuit (Steering and transmission controller system)
CALL E03	**DKH1KA DKH1KX**		
Failure content	• Signal voltage of pitch angle sensor is above 4.85 V.		
Controller's action	• Flashes warning lamp and turns on alarm buzzer. • Cannot recognize pitch angle. • Limits operation of engine and transmission.		
Symptoms that appears on machine	• Excessive gear shift shock is felt on a slope. • Once machine is stopped, engine speed is limited to medium (half). • Once machine is stopped, travel is limited to F1 and R1.		
General information	• Both **DKH1KA** and **DKH1KX** are displayed • Input state (voltage) from pitch angle sensor can be checked in monitoring mode. (Code 60100: Voltage of pitch angle sensor) • Duplication of failure code: turn ON the starting switch.		

Possible causes and the standard values when normal		Cause	Standard value when normal and remarks for troubleshooting		
	1	Defective sensor 24 V power supply circuit	Check if failure code [**DAQ6KK**] or [**DB36KK**] is displayed. If it is displayed, carry out troubleshooting for it first.		
	2	Defective pitch angle sensor (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch ON.		
			PT1	Voltage	
			Between (B) – (A)	0.15 – 4.85 V	
	3	Hot short of wiring harness (a contact with 24 V circuit)	★ Prepare with starting switch OFF and diagnose with starting switch ON.		
			Between ground and wiring harness between ST1 (female) (8) – PT1 (female) (B)	Voltage	Max. 1 V
	4	Defective steering and transmission controller	★ Prepare with starting switch OFF and diagnose with starting switch ON.		
			ST1	Voltage	
			Between (8) – (21)	0.15 – 4.85 V	

Circuit diagram related to pitch angle sensor

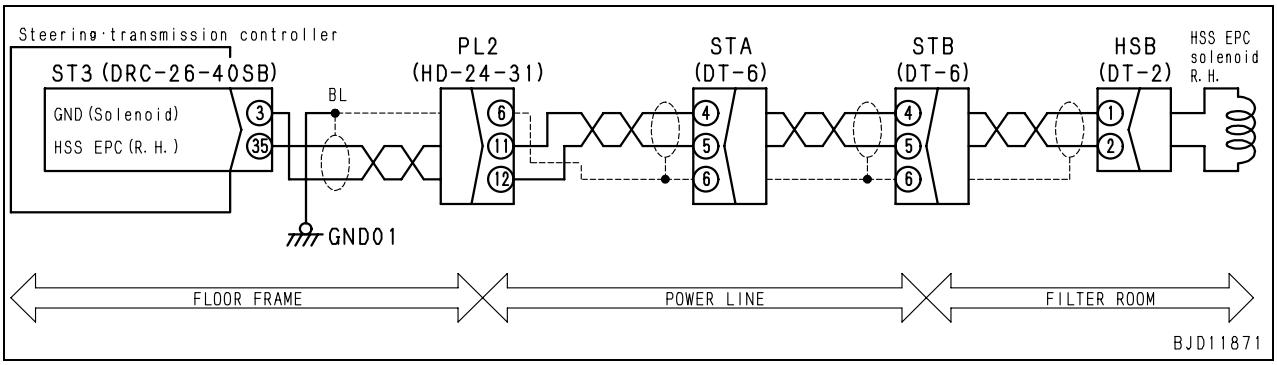


Failure code [DWN1KB] HSS EPC solenoid right: Short circuit

Action code	Failure code	Symptom of failure	HSS EPC solenoid right: Short circuit (Steering and transmission controller system)
CALL E03	**DWN1KB**		
Failure content	• Current flowed when power was output to HSS EPC solenoid right circuit.		
Controller's action	• Flashes warning lamp and turns on alarm buzzer. • Stops outputting to HSS EPC solenoid right circuit. • Limits operation of engine and transmission.		
Symptoms that appears on machine	• Can not turn to the right. • Once machine is stopped, engine speed is limited to medium (half). • Once machine is stopped, travel is limited to F1 and R1.		
General information	• Output state (current) to HSS EPS solenoid right can be checked in monitoring mode. (Code 50603: Right HSS solenoid output current value) • Duplication of failure code: Turn starting switch ON and operate PCCS lever (for steering to right).		

	Cause		Standard value when normal and remarks for troubleshooting			
Possible causes and the standard values when normal	1	Defective HSS EPC solenoid right (Internal short circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			HSB (male)	Resistance		
			Between (1) – (2)	5 – 15 Ω		
			Between (1) – chassis ground	Min. 1 MΩ		
	2	Defective harness grounding (Contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between ST3 (female) (35) – HSB (female) (1)	Resis-tance	Min. 1 MΩ	
	3	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harnesses between ST3 (female) (35) – HSB (female) (1) and between ST3 (female) (3) – HSB (female) (2)	Resis-tance	Min. 1 MΩ	
	4	Defective steering and transmission controller	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			ST3 (female)	Resistance		
			Between (35) – (3)	5 – 15 Ω		
			Between (35) – chassis ground	Min. 1 MΩ		

Circuit diagram related to HSS EPC solenoid right

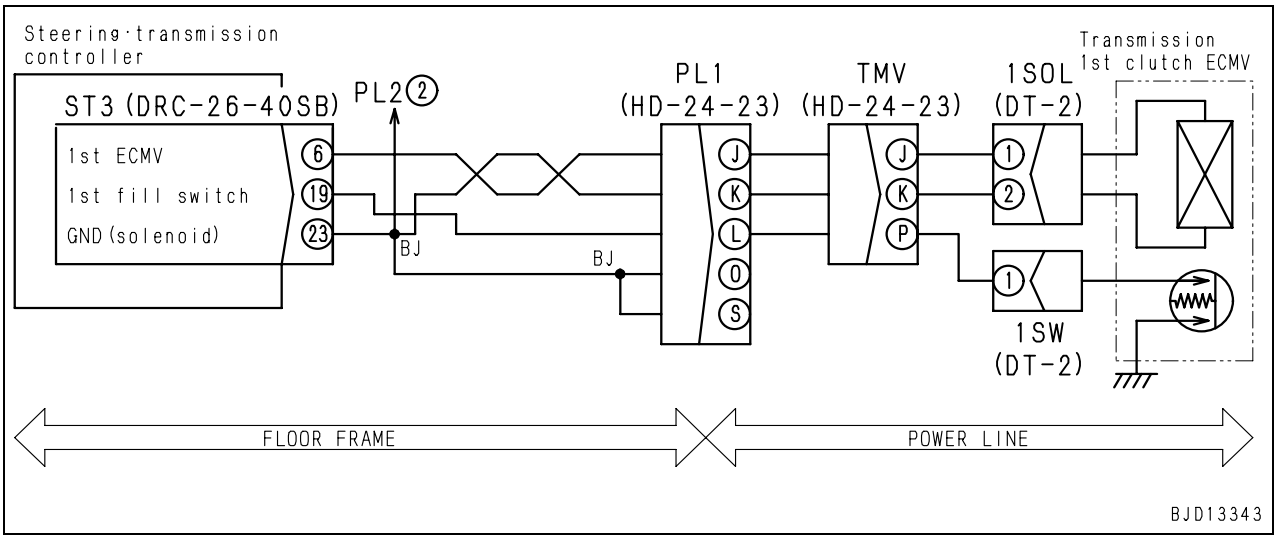


Failure code [DXH4KB] 1st clutch ECMV: Short circuit

Action code	Failure code	Symptom of failure	1st clutch ECMV: Short circuit (Steering and transmission controller system)
CALL E03	**DXH4KB**		
Failure content	• Abnormal current flowed when power was outputted to transmission 1st clutch solenoid circuit.		
Controller's action	• Flashes warning lamp and turns on alarm buzzer. • Stops outputting to transmission 1st clutch solenoid circuit. • Limits operation of engine and transmission.		
Symptoms that appears on machine	• The auto shift down function does not work. • Once machine is stopped, engine speed is limited to medium (half). • Once machine is stopped, travel is limited to F2 and R2.		
General information	• Output state (current) to 1st clutch solenoid can be checked in monitoring mode. (Code 31602, 31612: 1st clutch ECMV output current value) • Duplication of failure code: Engine start + F1 or R1 travel		

	Cause		Standard value when normal and remarks for troubleshooting		
Possible causes and the standard values when normal	1	Defective 1st clutch ECMV (internal short circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			1SOL (male)	Resistance	
			Between (1) – (2)	5 – 25 Ω	
			Between (1) – chassis ground	Min. 1 MΩ	
	2	Defective harness grounding (Contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Between ground and wiring harness between ST3 (female) (6) – 1SOL (female) (1)	Resis-tance	Min. 1 MΩ
	3	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Wiring harnesses between ST3 (female) (6) – 1SOL (female) (1) and between ST3 (female) (23) – 1SOL (female) (2)	Resis-tance	Min. 1 MΩ
	4	Defective steering and transmission controller	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			ST3 (female)	Resistance	
			Between (6) – (23)	5 – 25 Ω	
			Between (6) – chassis ground	Min. 1 MΩ	

Circuit diagram related to transmission 1st clutch ECMV

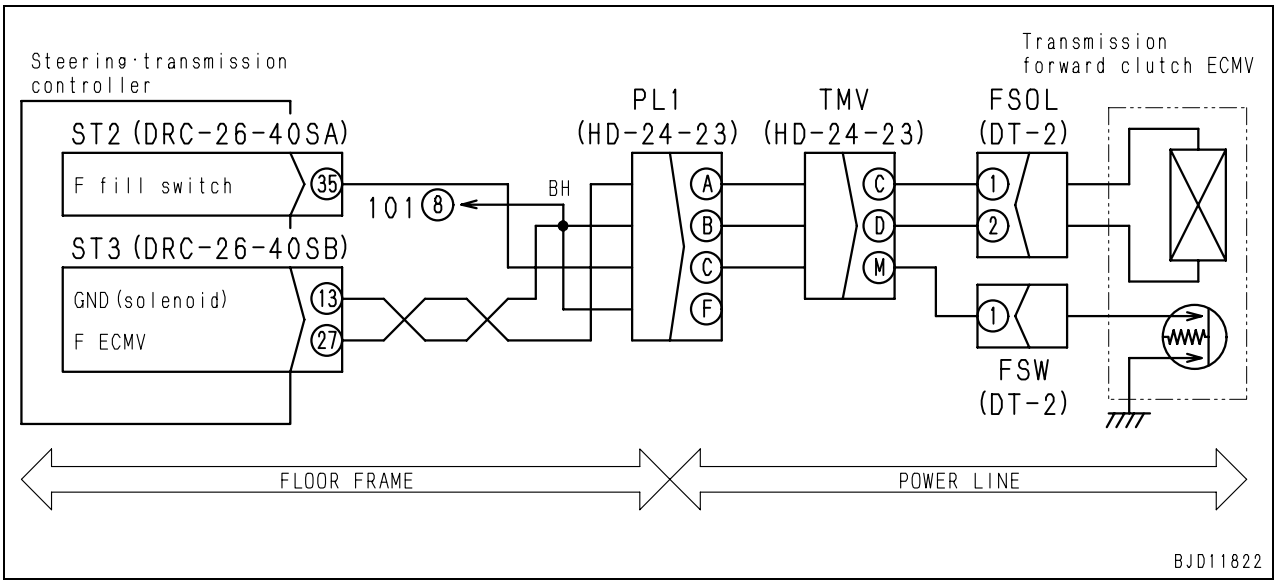


Failure code [DXH8KB] Forward clutch ECMV: Short circuit

Action code	Failure code	Symptom of failure	Forward clutch ECMV: Short circuit (Steering and transmission controller system)
CALL E03	**DXH8KB**		
Failure content	• Abnormal current flowed when power was output to transmission forward clutch solenoid circuit.		
Controller's action	• Flashes warning lamp and turns on alarm buzzer. • Stops outputting to transmission forward clutch solenoid circuit. • Limits operation of engine and transmission.		
Symptoms that appears on machine	• Once machine is stopped, engine speed is limited to medium (half). • Once machine is stopped, travel is limited to R1.		
General information	• Output state (current) to forward clutch solenoid can be checked in monitoring mode. (Code 31608, 31622: Output current of forward clutch ECMV) • Duplication of failure code: Engine start + Forward travel		

	Cause		Standard value when normal and remarks for troubleshooting		
Possible causes and the standard values when normal	1	Defective forward clutch ECMV (Internal short circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			FSOL (male)	Resistance	
			Between (1) – (2)	5 – 25 Ω	
			Between (1) – chassis ground	Min. 1 MΩ	
	2	Defective harness grounding (Contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Between ground and wiring harness between ST3 (female) (27) – FSOL (female) (1)	Resis-tance	Min. 1 MΩ
	3	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Wiring harnesses between ST3 (female) (27) – FSOL (female) (1) and between ST3 (female) (13) – FSOL (female) (2)	Resis-tance	Min. 1 MΩ
	4	Defective steering and transmission controller	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			ST3 (female)	Resistance	
			Between (27) – (13)	5 – 25 Ω	
			Between (27) – chassis ground	Min. 1 MΩ	

Circuit diagram related to transmission forward clutch ECMV



E-12 Gear speed and engine speed are not indicated properly.

Symptom of failure	• Gear speed and engine speed are not indicated properly.
General information	• Signals of gear speed and engine speed are sent and received through communication by steering and transmission controller and engine controller.

Possible causes and the standard values when normal	Cause		Standard value when normal and remarks for troubleshooting
	1	Defective monitor panel	Since this is an internal defect, it cannot be diagnosed.

E-13 The preset mode service meter does not indicate normally.

Symptom of failure	(1) During engine operation, the service meter does not advance.
General information	• The service meter measures time while the monitor panel is receiving engine drive signals (alternator signals). • The display data of the preset mode and service meter are sent and received through communication by the steering and transmission controller.

Possible causes and the standard values when normal	Cause		Standard value when normal and remarks for troubleshooting
	1	Defective alternator signals system	When the battery charge level caution lamp flashes during engine operation, carry out the troubleshooting of “E-5 While the engine is operating, battery charge level caution flashes”.
	2	Defective monitor panel (Gauge or lamp module)	Since this is an internal defect, it cannot be diagnosed.

Symptom of failure	(2) Shift mode and service meter are not displayed at all.
General information	• The display data are sent and received through communication by the steering and transmission controller.

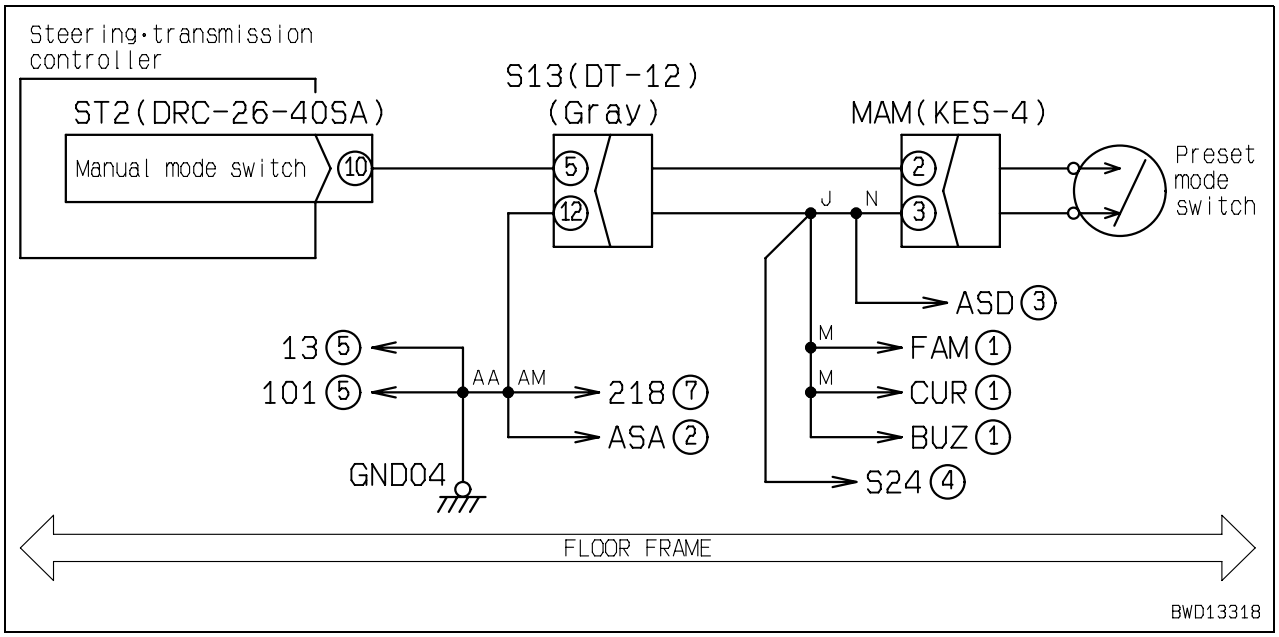
Possible causes and the standard values when normal	Cause		Standard value when normal and remarks for troubleshooting
	1	Defective monitor panel	Since this is an internal defect, it cannot be diagnosed.

E-14 The warning lamp does not flash or does not go out.

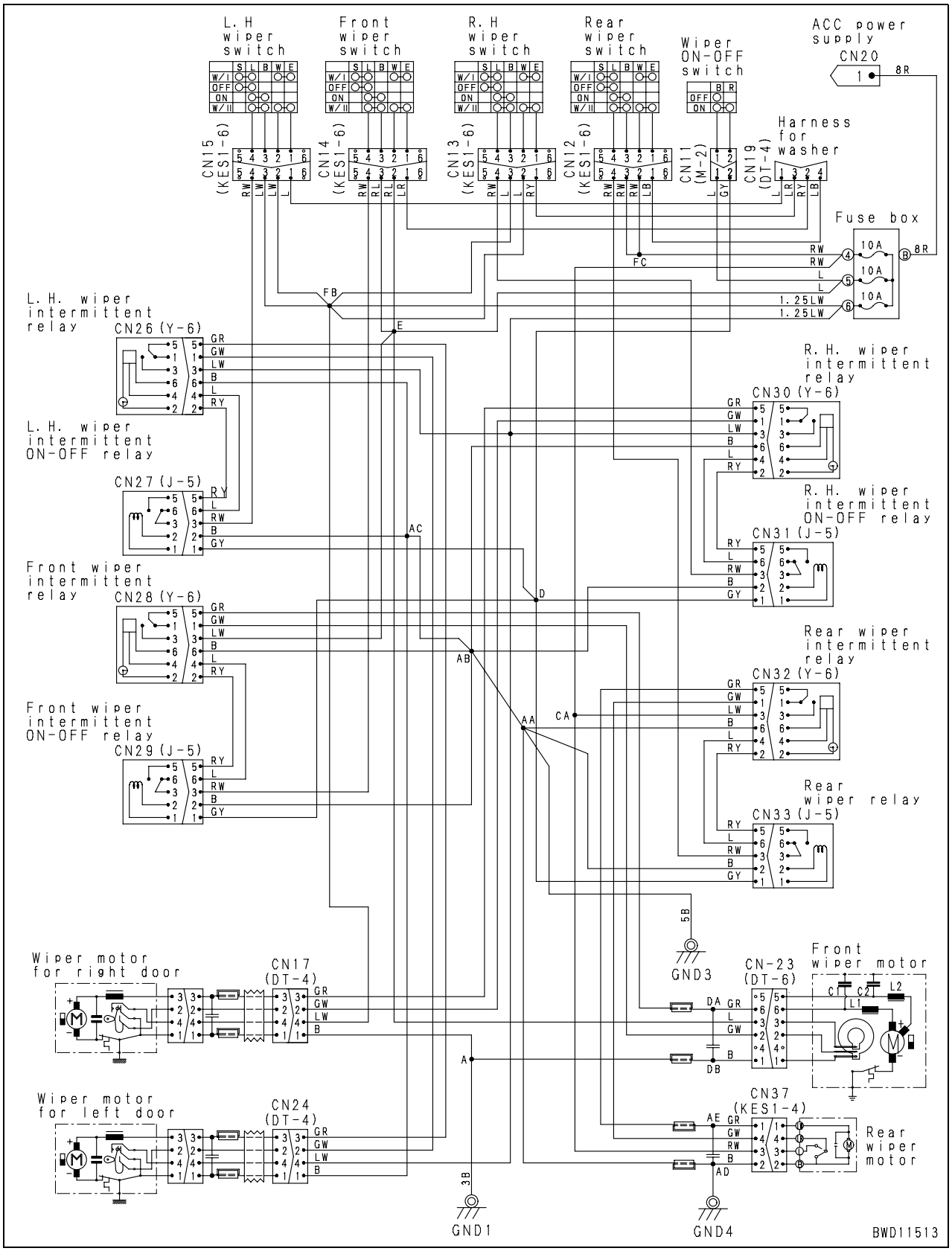
Symptom of failure	• The warning lamp does not flash or does not go out.
General information	

Possible causes and the standard values when normal	Cause		Standard value when normal and remarks for troubleshooting
	1	Defective monitor panel	Since this is an internal defect, it cannot be diagnosed.

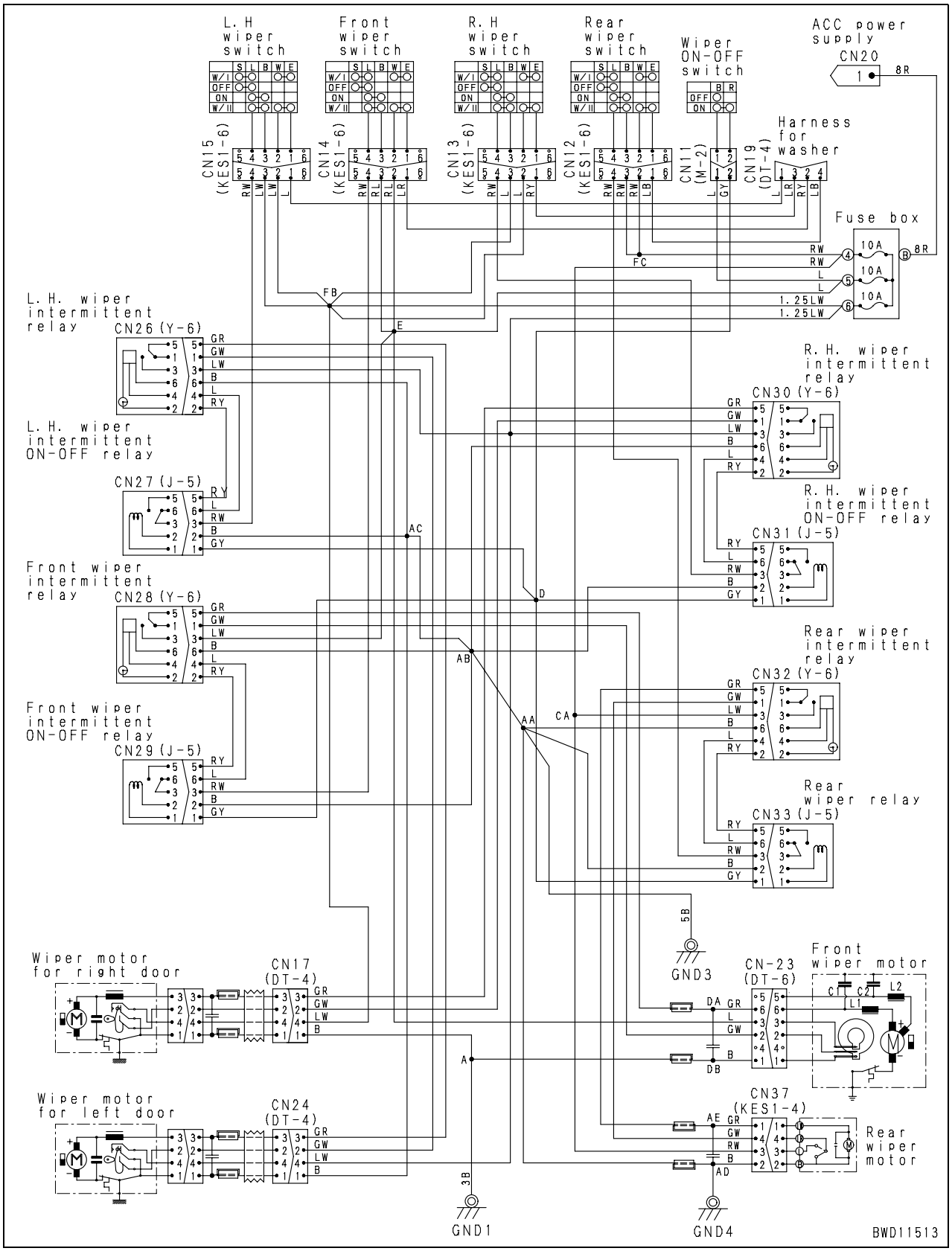
Circuit diagram related to preset mode



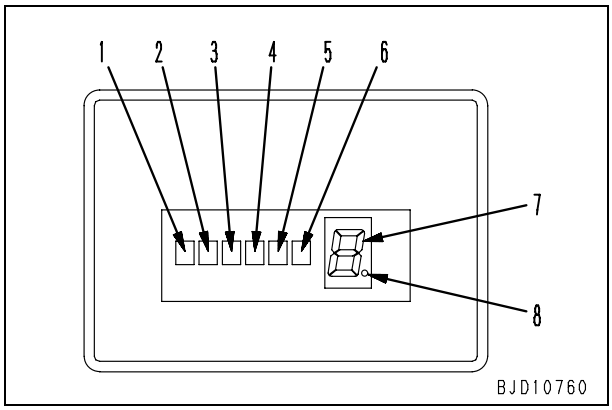
Circuit diagram related to wiper system



Circuit diagram related to wiper system



Lamp display section of KOMTRAX terminal



CPU LED

1. LED-C1 (R signal and ACC signal status)
2. LED-C2 (starting output status)
3. LED-C3 (S-NET, C signal status)
4. LED-C4 (CAN status)
5. LED-C5 (download writing condition)
6. LED-C6 (download writing condition)

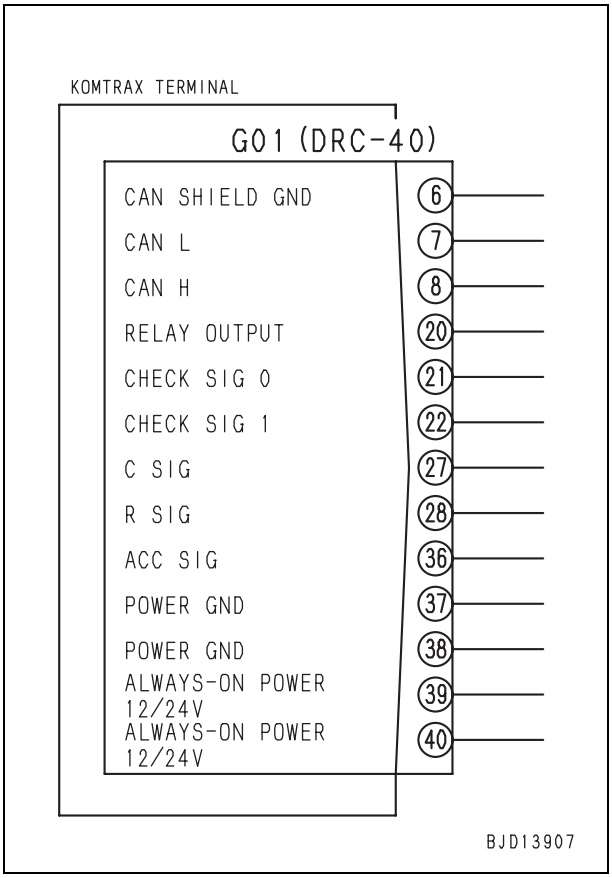
7-segment and dot for CPU

7. 7-segment (number of mails not yet sent)
8. Dot (GPS positioning in progress)

★ CPU LED and 7-segment and dot for CPU can be also checked by monitoring function of machine monitor.

★ See "Special functions of machine monitor (EMMS)" of Testing and adjusting, Part 2 for operation of monitoring functions.

G01 connector

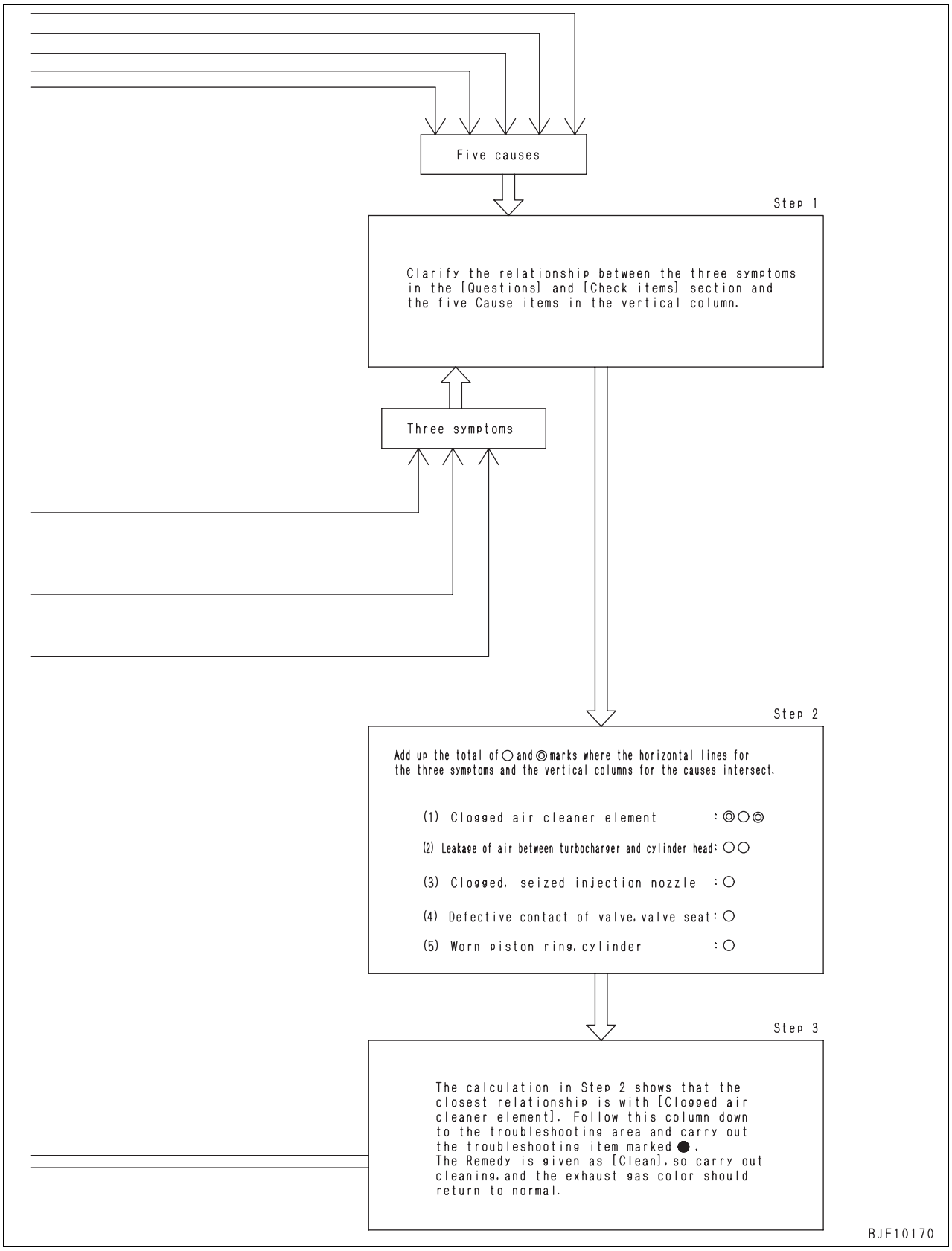


H-9 Overheat of power train oil

Symptom of failure	• The power train oil overheats.
General information	• Check that the power train oil level is normal before troubleshooting. • Check that the reading on the power train oil temperature gauge matches the actual oil temperature before troubleshooting. (If they do not match, carry out troubleshooting “Reading on power train oil temperature gauge is incorrect”. • Check that the transmission main relief pressure is normal before troubleshooting. (See H-1 "There is no travel power")

<table>
<tr><td rowspan="8">Possible causes and the standard values when normal</td><td colspan="2">Cause</td><td colspan="3">Standard value when normal and remarks for troubleshooting</td></tr>
<tr><td>1</td><td>Defective engine system</td><td colspan="3">The engine cooling system is assumed to be defective or the engine output is assumed to be increased; see the shop manual of engine volume.</td></tr>
<tr><td>2</td><td>Defective power train pump or residual air from suction circuit</td><td colspan="3">The power train pump is assumed to be defective or residual air from the suction circuit is assumed to remain; visually check it.</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Internally defective torque converter</td><td colspan="3">★ Prepare with the starting switch OFF, and then run the engine at high idle for troubleshooting.</td></tr>
<tr><td>PCCS lever</td><td>Torque converter inlet pressure</td><td>Torque converter outlet pressure</td></tr>
<tr><td>Full neutral</td><td>Max. 0.88 MPa {Max. 9 kg/cm^2}</td><td>0.39 – 0.69 MPa {4 – 7 kg/cm^2}</td></tr>
<tr><td>4</td><td>Defective operation of transmission clutch (Slip)</td><td colspan="3">The transmission clutch is assumed to be defective internally (slip); visually check it.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Defective operation of brake (Dragging)</td><td colspan="3">★ Start the engine to diagnose.</td></tr>
<tr><td colspan="3">1. Run the engine at low idle on a flat place (a hard road).
2. Set the gearshift lever in F2.
3. See if the machine moves (travels). If it does not move, brake dragging occurs.
(Carry out troubleshooting “H-8 Brake does not work”.)</td></tr>
</table>

If we look from these 3 symptoms to find the causes, we find that there is a relationship with 5 causes. Let us explain here the method of using this causal relationship to pinpoint the most probable cause.



S-10 Fuel consumption is excessive

General causes why fuel consumption is excessive

- Leakage of fuel
- Improper condition of fuel injection (injection pressure, injection timing)
- Excessive injection of fuel

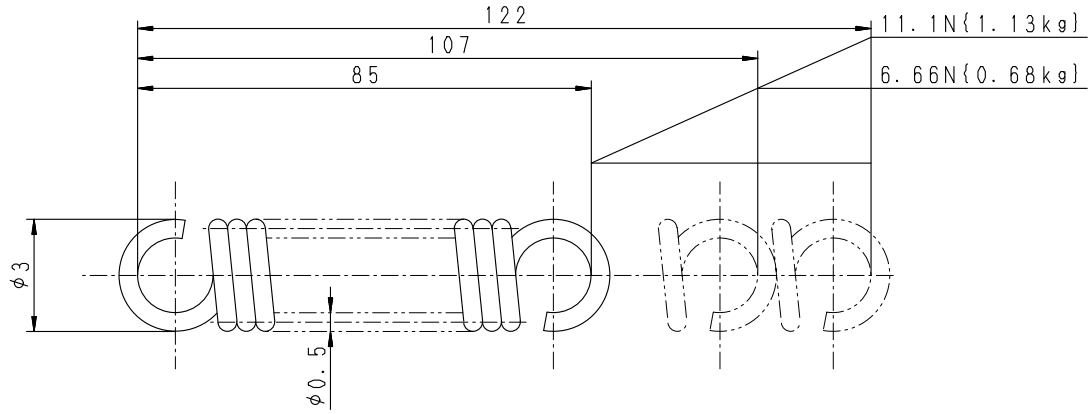
			Cause									
			Leakage of fuel inside head cover	External leakage from fuel piping, fuel filter	Defective fuel feed pump oil seal	Defective supply pump plunger	Defective common rail fuel pressure	Defective fuel injector spray	Defective actuation of fuel injector	Defective fuel injection timing	Defective coolant temperature sensor, defective wiring harness
Questions	Confirm recent repair history										
	Degree of use of machine	Operated for long period			△	△		△			
	Condition of fuel consumption	Is more than for other machines of same model					○		○	○	○
		Gradually increased				○		○			
		Suddenly increased	○	○							
Check items	There is external leakage of fuel from engine			◎							
	There is irregular combustion							◎			
	Engine oil level rises and smells of diesel fuel		◎		◎						
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low							◎			
	Low idle speed is high								○		
	Rotation speed of torque converter stall and pump relief is high								○		
	Color of exhaust gas	Black					○	○		○	○
		White	○								
Troubleshooting	Remove head cover and check directly		●								
	Check fuel feed pump oil seal directly				●						
	Carry out troubleshooting for code display “Supply pump pressure no signal (*1)”					●					
	Engine speed does not change when operation of certain cylinders is stopped in reduced cylinder mode							●			
	When flow of oil from fuel injector at spill return collection portion is measured, it is found to be excessive								●		
	Carry out troubleshooting for code display “Abnormality in coolant temperature sensor (*2)”										●
	Confirm with monitoring function						●			●	
		Action	Correct	Correct	Replace	Replace	Correct	Replace	Replace	Adjust	Replace

*1: Failure code of code display [CA559] and [CA2249]
*2: Failure code of code display [CA114] and [CA145]

Category	Komatsu code	Part number	Q'ty	Container	Main features and applications
Gasket sealant	LG-9 ThreeBond 1206D	790-129-9310	200 g	Tube	• Used for rough surfaces such as the circle gear top seal which does not need to be clamped, water resistance of the clearance at the welded area, etc. • Can be coated with paint.
	LG-10 ThreeBond 1206E	790-129-9320	200 g	Tube	• Used as lubricant/sealant when the radiator hoses are inserted. • Can be coated with paint.
	LG-11 ThreeBond 1121	790-129-9330	200 g	Tube	• Feature: Can be used together with gaskets. • Used for covers of the transmission case and steering case etc.
	ThreeBond 1211	790-129-9090	100 g	Tube	• Gasket sealant used to repair engine.
Molybdenum disulfide lubricant	LM-P	09940-00040	200 g	Tube	• Used to prevent scuffing and seizure of press-fitted portions, shrink-fitted portions, and threaded portions. • Used to lubricate linkages, bearings, etc.
	—	09995-00250	190 g	Can	• Spray type • Thin molybdenum disulphide films are made on metal surfaces to prevent the metals from scuffing each other. • Applicable for the drive shaft splines, needle bearings, pins and bolts of various links, etc.
Seizure prevention compound	LC-G NEVER-SEEZ	—	—	Can	• Feature: Seizure and scuffing prevention compound with metallic super-fine-grain, etc. • Used for the mounting bolt in the high temperature area of the exhaust manifold and the turbocharger, etc.
Grease	G2-LI G0-LI *: For cold district	SYG2-400LI SYG2-350LI SYG2-400LI-A SYG2-160LI SYGA-160CNLI SYG0-400LI-A (*) SYG0-160CNLI (*)	Various	Various	• Feature: Lithium grease with extreme pressure lubrication performance. • General purpose type.
	Molybdenum disulfide grease LM-G (G2-M)	SYG2-400M SYG2-400M-A SYGA-16CNM	400 g x 10 400 g x 20 16 kg	Bellows-type container Can	• Used for parts under heavy load. Caution: • Do not apply grease to rolling bearings like swing circle bearings, etc. and spline. • The grease should be applied to work equipment pins at their assembly only, not applied for greasing afterwards.
	Hyper White Grease G2-T, G0-T (*) *: For cold district	SYG2-400T-A SYG2-16CNT SYG0-400T-A (*) SYG0-16CNT (*)	400 g 16 kg	Bellows-type container Can	• Seizure resistance, heat resistance and water resistance higher than molybdenum disulfide grease. • Not conspicuous on machine since color is white.
	Biogrease G2-B, G2-BT (*) *: For use at high temperature and under high load	SYG2-400B SYGA-16CNB SYG2-400BT (*) SYGA-16CNBT (*)	400 g 16 kg	Bellows-type container Can	• Since this grease is decomposed by natural bacteria in short period, it has less effects on micro-organisms, animals, and plants.

Note: Komatsu cannot accept any responsibility for special tools manufactured according to these sketches.

R18, R19 Spring

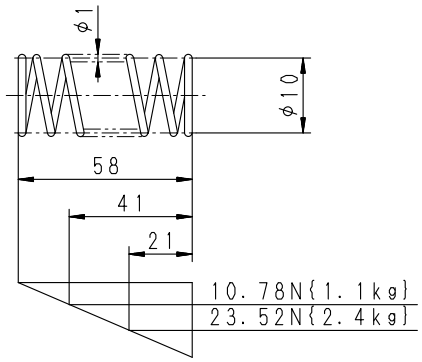


SPRING DETAIL		
BAR DIAMETER (mm)		0.5
MEAN COIL DIAMETER (mm)		2.5
NUMBER OF ACTIVE COILS		130
DIRECTION OF WINDING		RIGHT
FREE HEIGHT		85
INSTALLED	LOAD (N{kg})	6.6{0.67}
	HEIGHT (mm)	107
SPRING RATE (N{kg}/mm)		0.3{0.03}
UNDER MAX. LOAD	LOAD (N{kg})	11.1{1.13}
	HEIGHT (mm)	122

C4D17264

HEAT TREATMENT	MATERIAL
ANNEAL AT LOW TEMP	SWP-B
PART NAME	QTY
SPRING	1
791T-532-1180 △	

R18, R19 Spring



SPRING DETAIL		
BAR DIAMETER (mm)		1.0
MEAN COIL DIAMETER (mm)		10
NUMBER OF ACTIVE COILS		15
DIRECTION OF WINDING		RIGHT
FREE HEIGHT		58
INSTALLED	LOAD (N{kg})	10.88{1.11}
	HEIGHT (mm)	41
SPRING RATE (N{kg}/mm)		0.64{0.07}
UNDER MAX. LOAD	LOAD (N{kg})	23.68{2.41}
	HEIGHT (mm)	21

C4D17265

HEAT TREATMENT	MATERIAL
ANNEAL AT LOW TEMP	SWP-B
PART NAME	QTY
SPRING	1
791T-532-1190 △	

12. Disconnect wiring harness clamp (10).

13. Disconnect terminal HT/A (11) (black).
★ If the terminal cover is removed from the wiring harness, the label comes off. Accordingly, tape the label.

14. Disconnect terminals (12) (green) and (13) (black and thick).

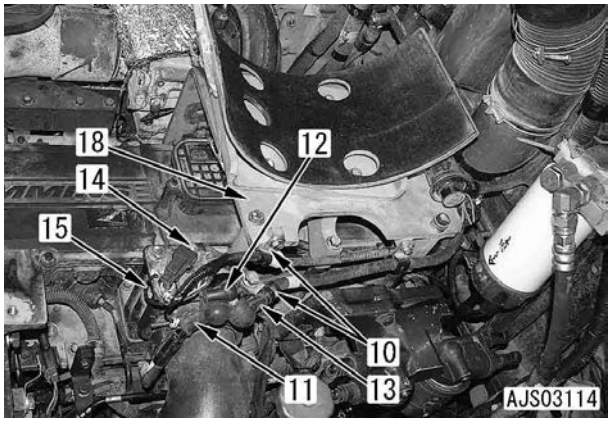
15. Disconnect connector mounting bolt (14).

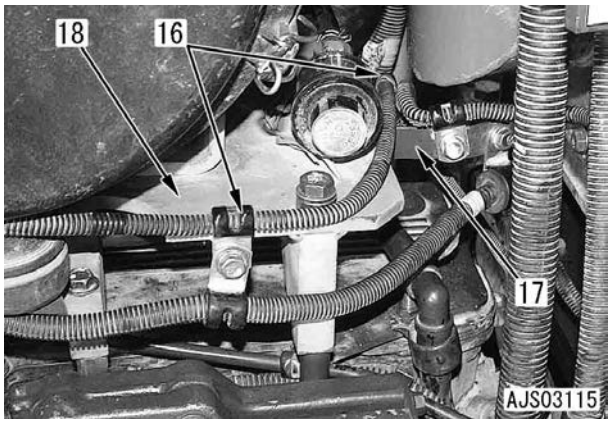
16. Disconnect ground terminal (15) (black).
★ If the terminal cover is removed from the wiring harness, the label comes off. Accordingly, tape the label. In particular, if the labels of terminals HT/A (11) and ground terminal (15) come off, you cannot say which is which, since both terminals HT/A (11) and ground terminal (15) are black and coming from the same wiring harness.

17. Disconnect wiring harness clamp (16).

18. Disconnect bracket (17).

19. Disconnect air cleaner bracket (18).





20. Disconnect coolant hose (19). [*4]
★ Check the connection end.

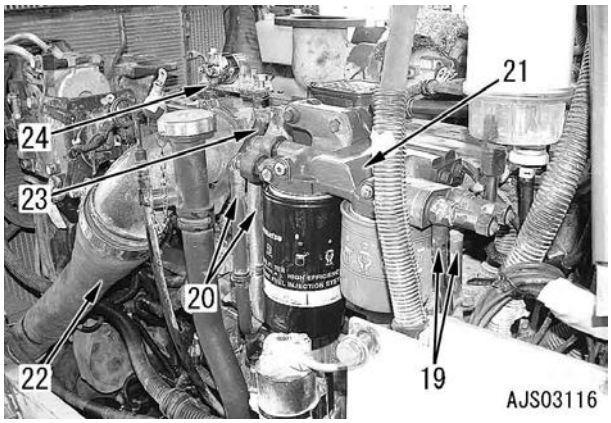
21. Press both sides of lock (L) of fuel tube (20) to disconnect. [*5]
★ Check the connection end.

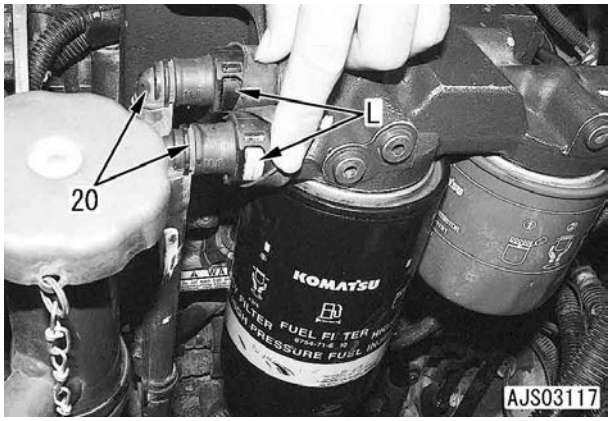
22. Remove filter and bracket assembly (21).

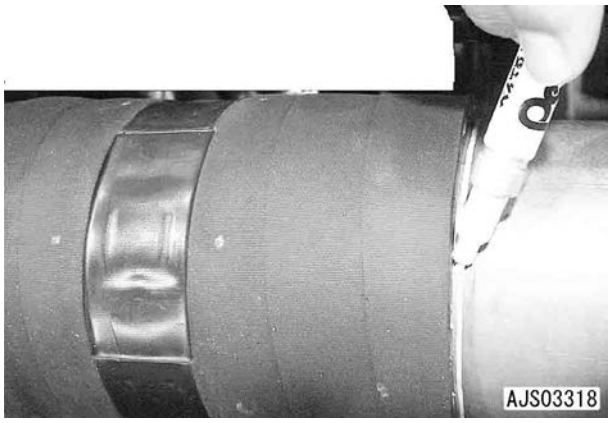
23. Disconnect air hose (22). [*6]
★ Make marks at the hose end tube to show the original position of the hose (See the figure below).

24. Disconnect bracket (23).

25. Remove heater relay and plate assembly (24).

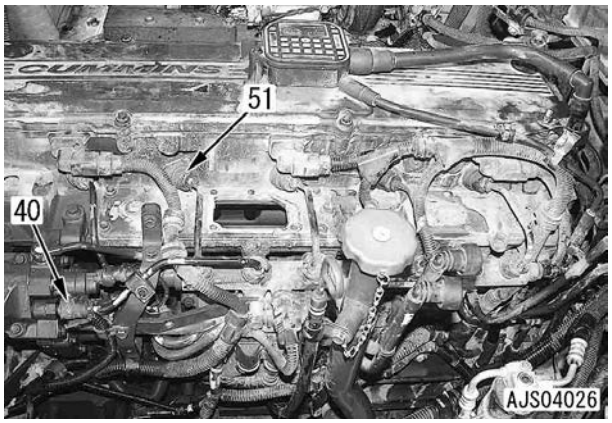






9. Install 12 bellows (51).

10. Install right and left bellows (40).
- ★ Install each bellows with the slits out and down.
- ★ The bellows are installed so that fuel will not spout over the hot parts of the engine and catch fire when it leaks for some reason.



- **Handling fuel pressure sensor and fuel pressure relief valve**

1. Fuel pressure sensor

Do not remove the sensor except for its replacement. The sensor removed from the common rail must be replaced with the new one.
1) Check the sensor connector for cracks, damages, broken seal. Also, check the pins for foreign matter, corrosion, bents, or breakage.
2) Install the new sensor.
   Apply clean gear oil (**#90**) to the threads.
   Tightening torque:
   70 ± 5 Nm {7.1 ± 0.5 kgm}
3) Connect the engine harness. At this time, pay attention to polarity of the connector.
4) Start the engine and check that there is no leakage.
   - ★ For the testing procedure, refer to "Testing and adjusting".

2. Fuel pressure relief valve
1) Do not reuse a fuel pressure relief valve whose leakage rate has exceeded the specified value.
2) Check that the high-pressure seal surfaces of the fuel pressure relief valve and rail are not damaged.
3) Install the fuel pressure relief valve.
   Apply clean gear oil (**#90**) to the threads.
   Tightening torque:
   100 ± 4 Nm {10.2 ± 0.4 kgm}
4) Start the engine and check that there is no leakage.
   - ★ For the testing procedure, refer to "Testing and adjusting".

[*9]
- Fuel hose (61)

⚠ **The internal parts of the adapter may be damaged when fuel tube (61) is removed. Accordingly, replace the adapter with new one.**

[*10]

Clamp of radiator hose (65):
8.8 ± 0.5 Nm {0.9 ± 0.05 kgm}

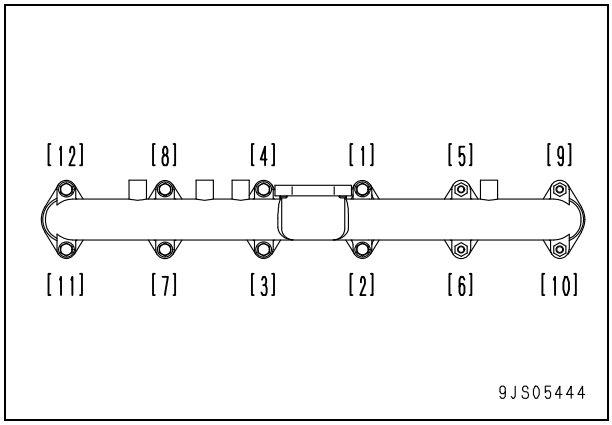
[*11]

Mounting nut of turbocharger lubrication hose (70): **35 ± 5 Nm {3.6 ± 0.5 kgm}**

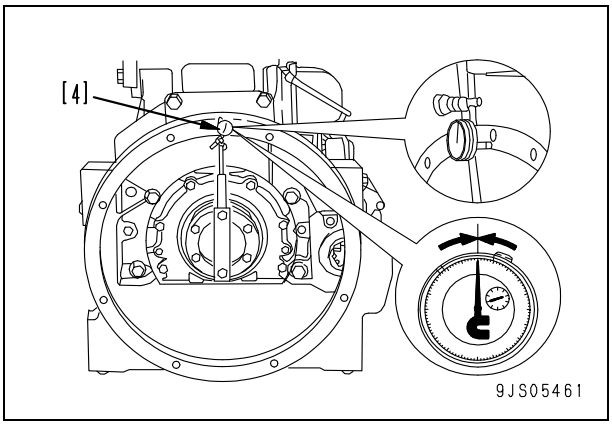
Mounting bolt of turbocharger lubrication tube (71): **24 ± 4 Nm {2.4 ± 0.4 kgm}**

[*12]
- **Exhaust manifold and turbocharger**

Tightening order of mounting bolts:
1) Tighten all the bolts to **24 ± 4 Nm {2.4 ± 0.4 kgm}** in the order of [1] – [12] in the figure.
2) Tighten only bolts [1] – [4] to **24 ± 4 Nm {2.4 ± 0.4 kgm}** in the order of [1] – [4] in the figure.
3) Tighten all the bolts to **43 ± 6 Nm {4.4 ± 0.6 kgm}** in the order of [1] – [12] in the figure.
4) Tighten only bolts [1] – [4] to **43 ± 6 Nm {4.4 ± 0.6 kgm}** in the order of [1] – [4] in the figure.



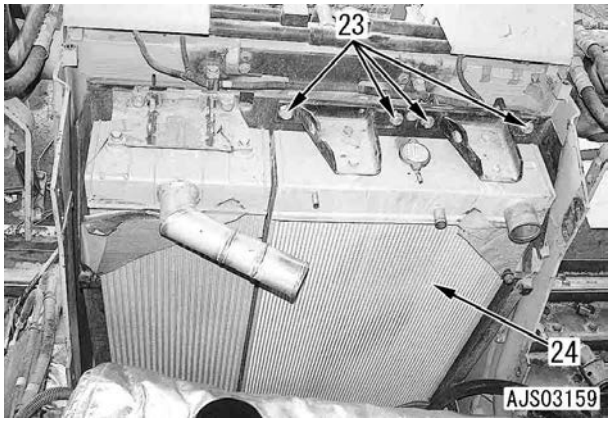
- Measuring facial runout
  1) Similarly to measurement of the radial runout, set the probe of the dial gauge perpendicular to end face of the flywheel.
     ★ When measuring, bring the crankshaft to the front or rear side so that an error will not be caused by the end play.
  2) Set the dial gauge to "0", rotate the crankshaft 1 turn, and measure the difference between the lowest and highest values.

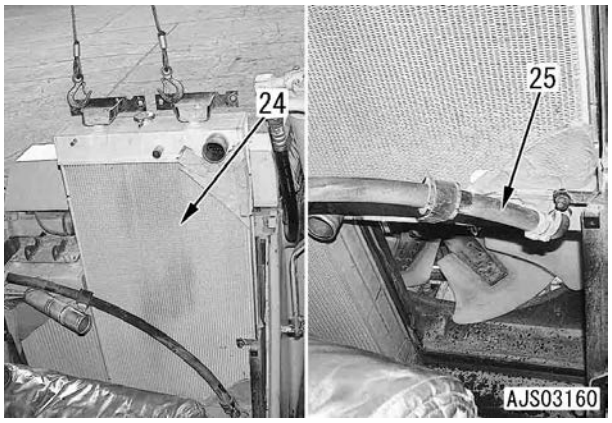


23. Remove mounting bolts (23) and lift off radiator assembly (24). [*4]

Radiator assembly: **25 kg**

24. Remove radiator hose (25).





Installation

- Carry out installation in the reverse order to removal.

[*1]

- Turbocharger side

Clamp: **7 ± 1.1 Nm {0.71 ± 0.11 kgm}**

- Air aftercooler side

Air hose clamp:
10.5 ± 0.5 Nm {1.07 ± 0.05 kgm}

Reference

If the MIKALOR clamp was removed, install new one carefully according to the following procedure.

★ Use a new MIKALOR clamp.
★ Set the hose to the original (marked) position. (Insertion depth of air hose: 60 mm)
★ Set the bridge (BR) so that its clamp bolt will be at the bottom and it will be lapped over band (BD) as follows.
Lapped over band dimension (b) : Min. 5 mm

Threads of clamp bolt: Lubricating oil
THREEBOND, PAND18B

★ Do not use an impact wrench.

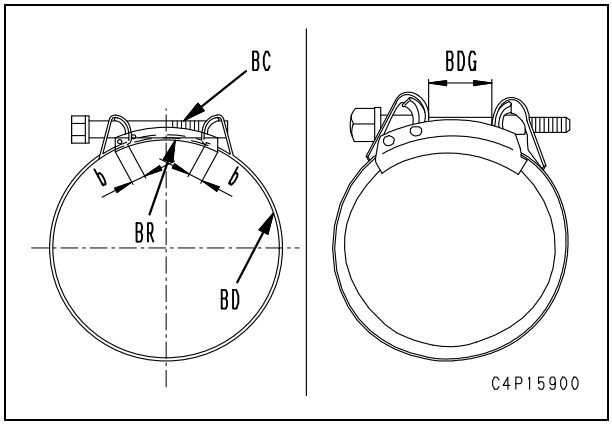
- **When reusing the hose**

★ Set the clamp to its original position.

MIKALOR clamp: **Min. 6 Nm (1.6 kgm)**

- **When using a new hose**

★ Tighten until band gap (BDG) is **17 – 20 mm**.

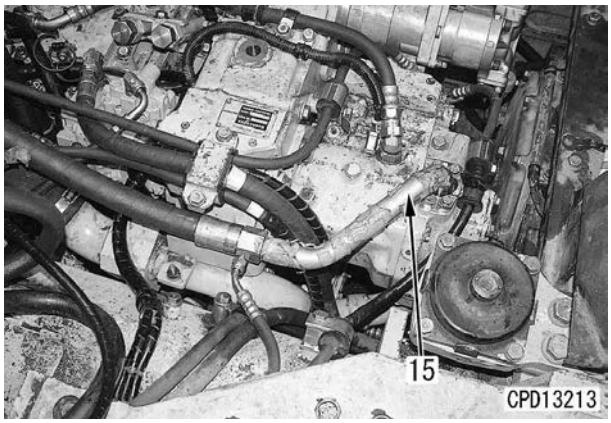


[*2], [*3]

Radiator hose clamp: Width across flats 8 mm

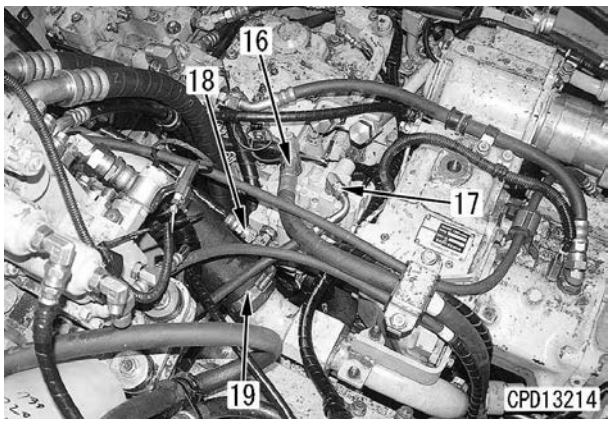
Radiator hose clamp:
8.8 ± 0.5 Nm {0.9 ± 0.05 kgm}

11. Disconnect tube (15) from the HSS pump assembly.

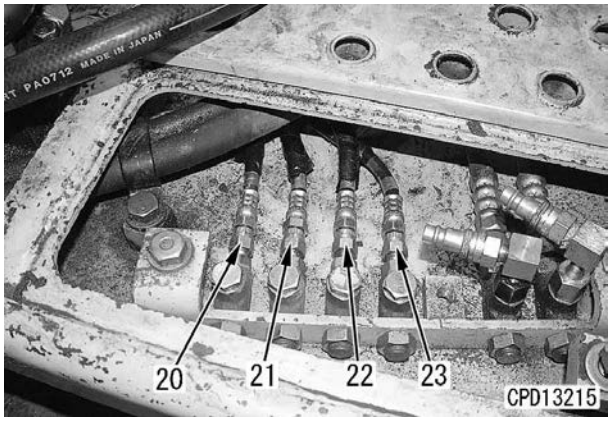


12. Disconnect hoses (16), (17), and (18) from the cooling fan pump.

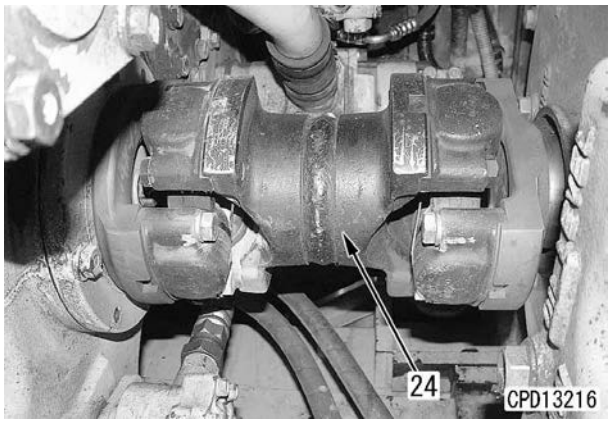
13. Disconnect the suction tube and hose (19) together from the rear. [*1]
Clamp of hose (19): Width across flats 8 mm



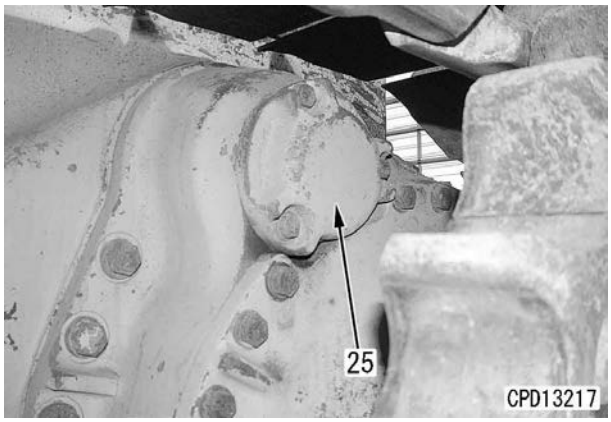
14. Remove the cover and disconnect hoses (20), (21), (22), and (23) from the pressure pickup ports.



15. Remove universal joint (24). [*2]
Mounting bolt of universal joint (24): Width across flats 19 mm

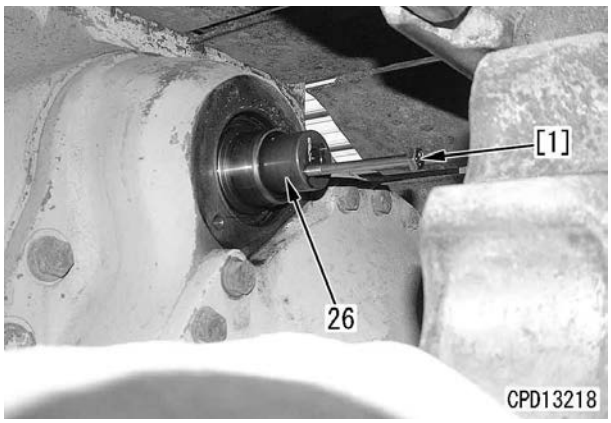


16. Remove right and left final drive shaft covers (25).



17. Using forcing screw [1], pull out right and left drive shafts (26) until the spline on the steering case side comes off.

★ If the shafts cannot be pulled out, raise the shoe grouser with a jack to a position where the shafts can be pulled out.

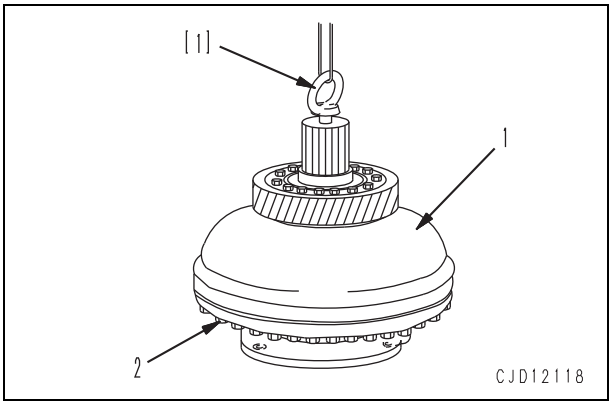


Disassembly and assembly of torque converter assembly

Disassembly

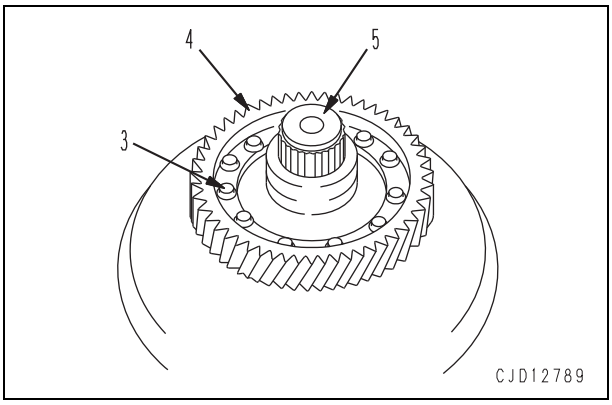
1. Case, turbine assembly

Remove 24 bolts from below, then use eyebolts [1], and remove case and turbine assembly (1).
Drain plug: Width across flats 6 mm
Bolt (2): Width across flats 17 mm

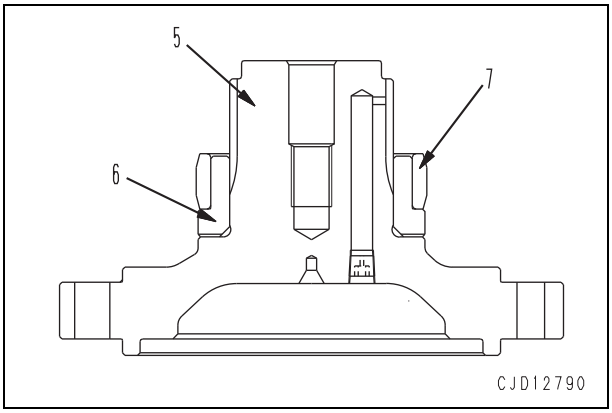


2. Gear and input shaft

1) Remove 14 bolts (3), then remove gear (4) and input shaft (5).
Bolt (3): Width across flats 17 mm

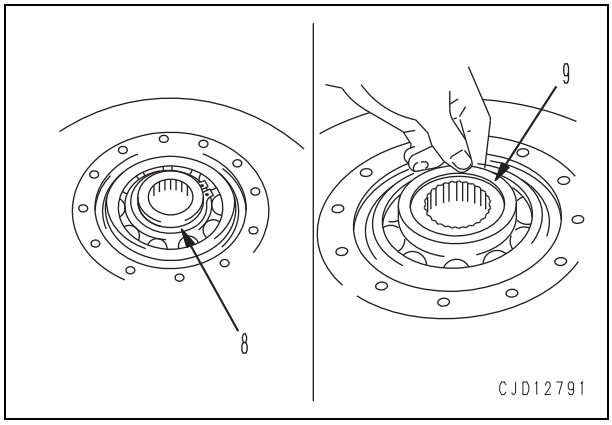


2) Remove collar (6) and inner race (7) from input shaft (5).

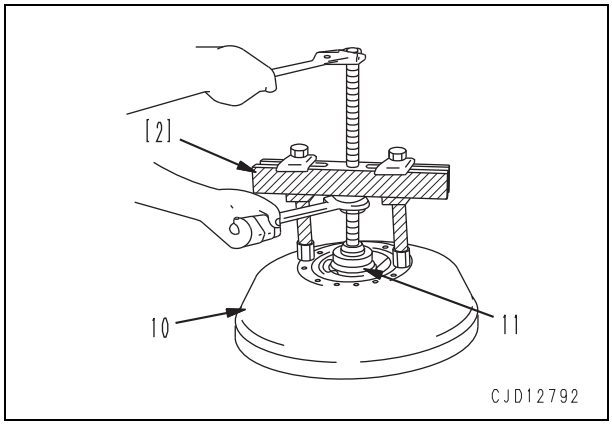


3. Case

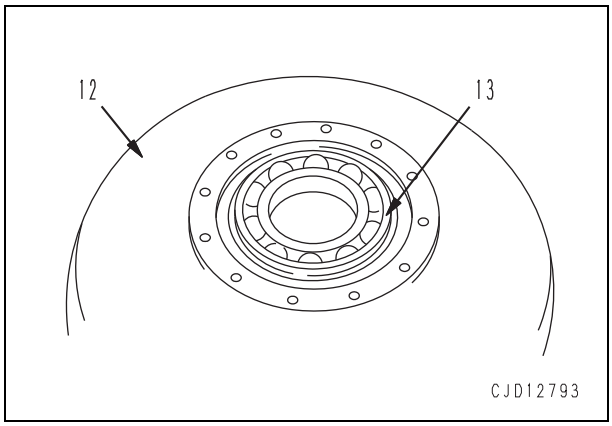
1) Remove snap ring (8).
2) Remove spacer (9).



3) Using puller [2], disconnect case assembly (10) and turbine (11).

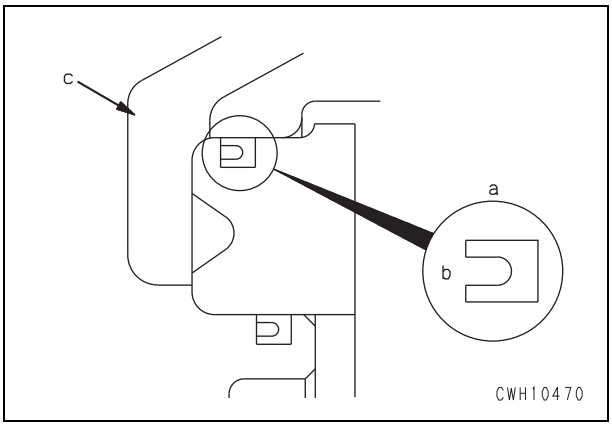


4) Remove bearing (13) from case (12).



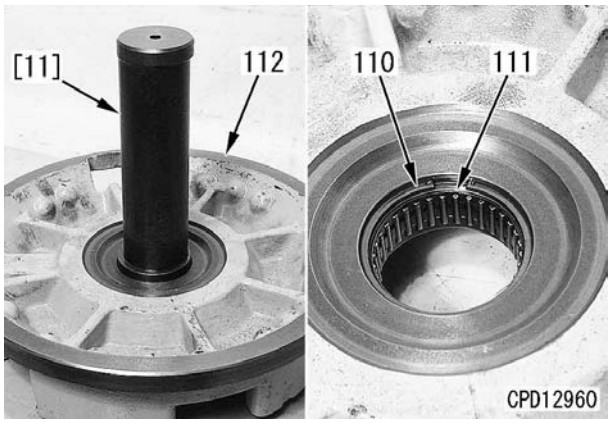
Assembly

- **Precautions for assembly**
  - ★ Clean the all parts and check them for dirt or damage before installing.
  - ★ Coat the sliding surfaces of each part with engine oil before installing.
  - ★ Install seal ring (a) for the piston and piston housing with power receiving side (b) to housing (c) as shown in the figure.
  - ★ Apply grease (G2-LI) to each seal ring and install it evenly.
  - ★ Before cooling the bearing in dry ice, etc. for expansion fit, drop about 6 cc of engine oil (EO10-CD or EO30-CD) onto it and revolve it 10 turns.



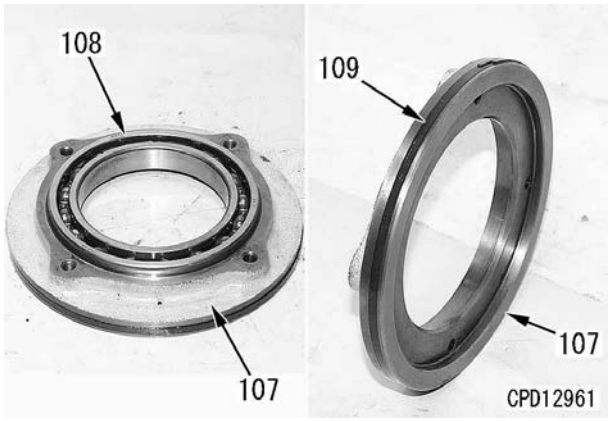
1. Output shaft bearing

1) Using push tool [11], install bearing (111) to housing (112).
2) Install snap ring (110).

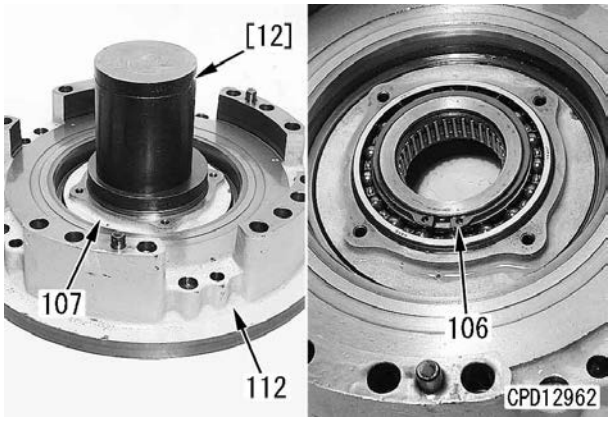


2. Cage (For fixing No. 5 carrier)

1) Install bearing (108) to cage (107) with the push tool.
2) Install seal ring (109) to cage (107).

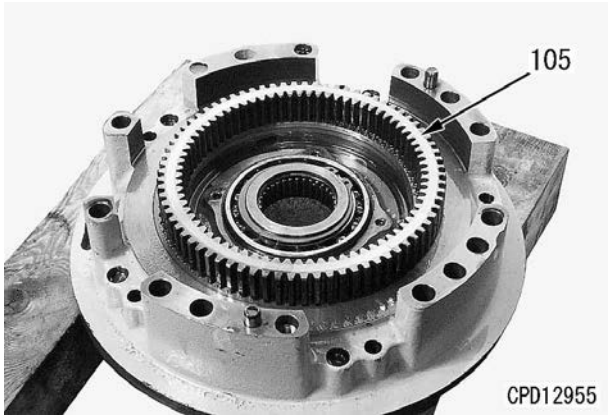


3) Install cage (107) to housing (112) with push tool [12].
   - ★ Press fit the inner race side of bearing (108).
4) Install snap ring (106).



3. No. 5 ring gear

Install No. 5 ring gear (105).



BULLDOZER

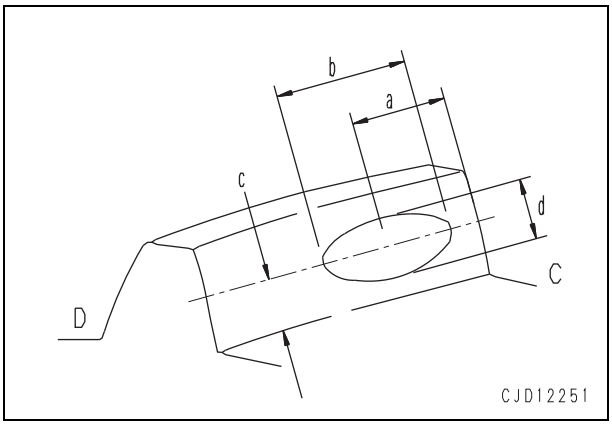
D65EX-15E0
D65PX-15E0
D65WX-15E0

Machine model	Serial number
D65EX-15E0	69001 and up
D65PX-15E0	69001 and up
D65WX-15E0	69001 and up

50 Disassembly and assembly

Power train, Part 2

★ If the level gear and bevel pinion are adjusted in this way, their teeth come in contact with each other correctly when they are loaded.

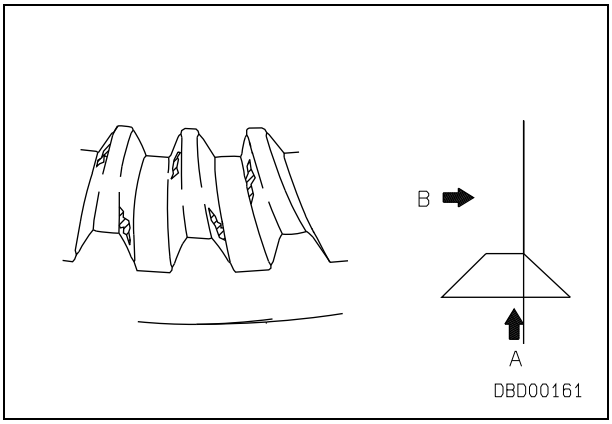


Adjusting

If the tooth contact pattern is not proper, adjust the tooth contact according to the following procedure.

i) If the bevel pinion is too far from the center line of the bevel gear, the contact is at the small end of the bevel gear tooth faces curved outward and at the large end of the bevel gear tooth faces curved inward.

- In this case, adjust the tooth contact according to the following procedure.
  Adjust the thickness of the shims on the bevel pinion side to move the bevel pinion in direction **A**. Move the bevel gear in direction **B**, then check the tooth contact pattern and backlash again.

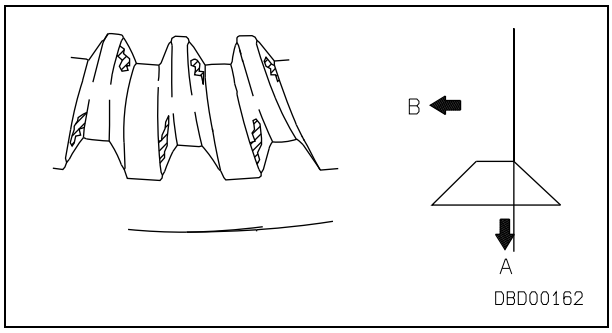


ii) If the bevel pinion is too close to the center line of the bevel gear, contact is at the large end of the bevel gear tooth faces curved outward and the small end of the bevel gear tooth faces curved inward.

- In this case, adjust the tooth contact according to the following procedure.
  Adjust the thickness of the shims on the bevel pinion side to move the bevel pinion in direction **A**. Move the bevel gear in direction **B**, then check the tooth contact pattern and backlash again.

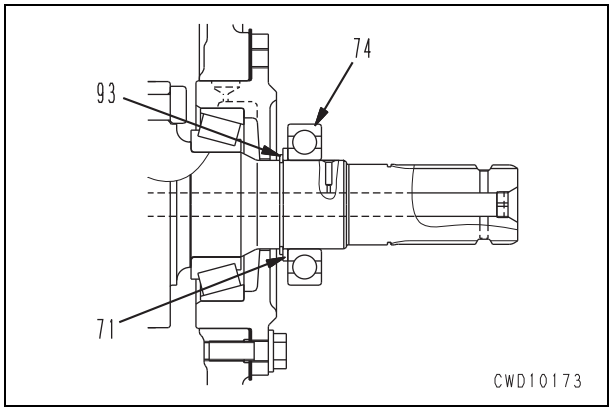
★ Do not change the total thickness of the shims on both sides.

iii) When adjustment is finished, tighten the mounting bolts of the cage and bevel pinion assembly to the specified torque.
Mounting bolts of cage and bevel pinion assembly:
Width across flats 19 mm
Mounting bolts of cage and bevel pinion assembly:
98 – 123 Nm {10 – 12.5 kgm}



5. Sun gear

1) Install snap ring (93) to the shaft.
   ★ Perform this work for only right side of the machine.
2) Install collar (71).
3) Install bearing (74) with the push tool.

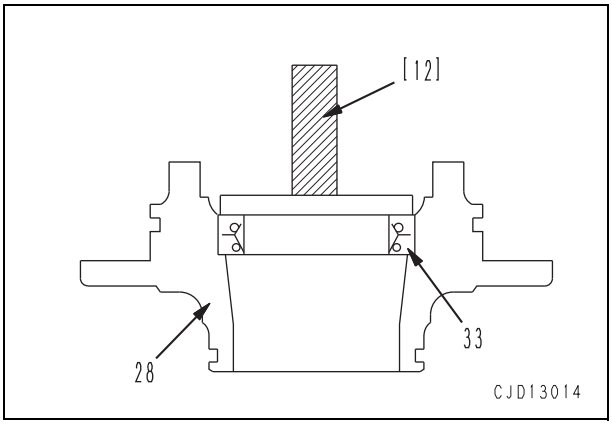


Assembly

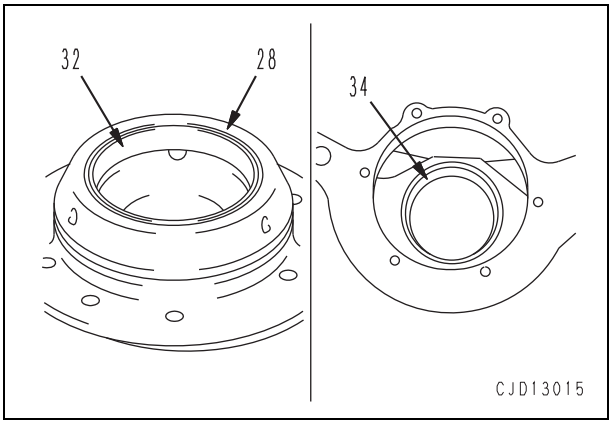
★ Clean all parts, and check for dirt or damage. Coat the sliding surfaces of all parts with engine oil before installing.

1. Pinion assembly

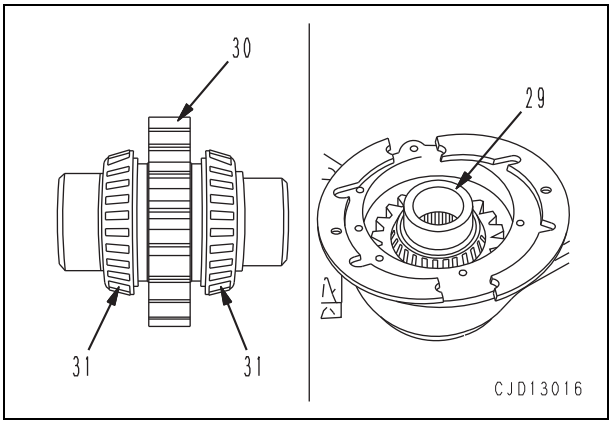
1) Using push tool [12], install oil seal (33) to cage (28).
   Lip of oil seal: **Grease (G2-LI)**



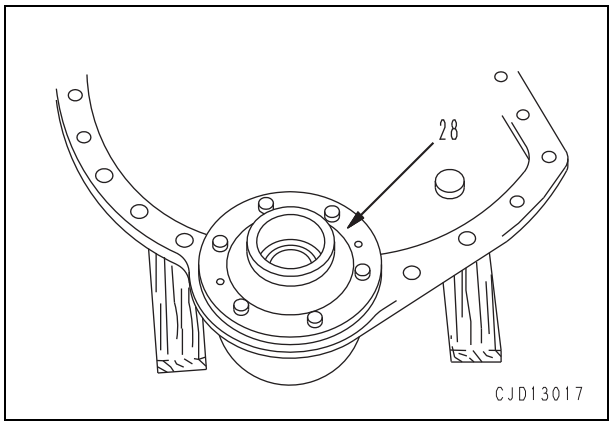
2) Install outer race (32) to cage (28).
3) Install outer race (34) to case.



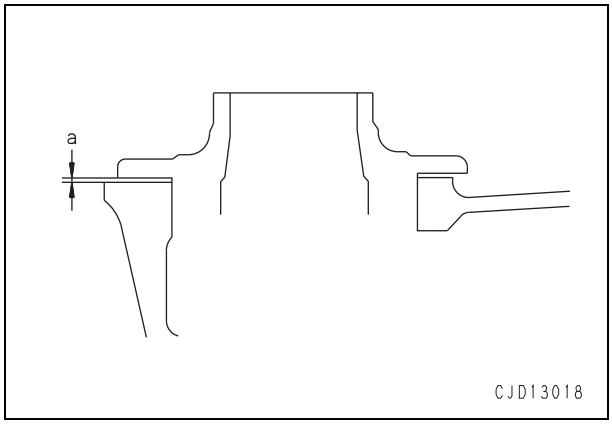
4) Install bearings (31) to pinion (30).
5) Install pinion assembly (29).
   ★ Install so that the part with the small outside diameter is facing the outside.



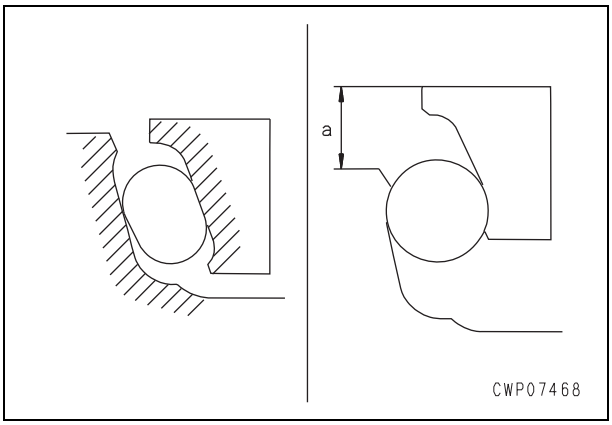
6) Assemble shim, then install cage (28).



★ Select the shim thickness to be assembled as follows.
   i) Install pinion without fitting O-ring to cage.
   ii) Hold cage down by hand, and use a thickness gauge to measure clearance between gauge and case at 2 places on the circumference.
   iii) Select shim to give a thickness of measured clearance (a) + 0 to 0.1 mm.
      ★ If the clearance is 0, check that the rotating torque of the pinion is at least 0.98 Nm {0.1 kgm}.

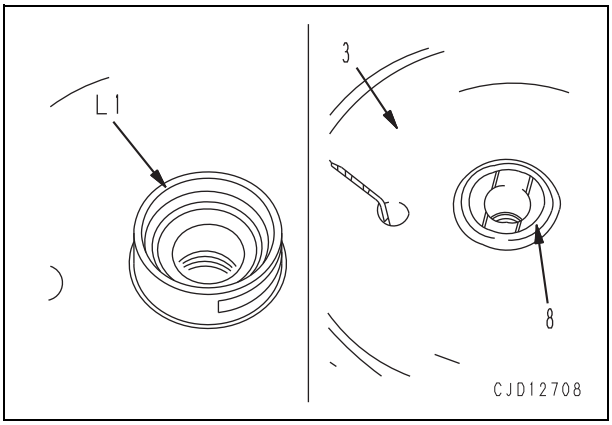


★ When installing floating seals, thoroughly clean, degrease, and dry the contact surfaces of the O-rings and floating seals (hatched parts). Take care that dirt will not stick to the floating seal contact surfaces.
★ After installing the floating seals, check that their slant is less than 1 mm and their projection (a) is 7 – 11 mm.

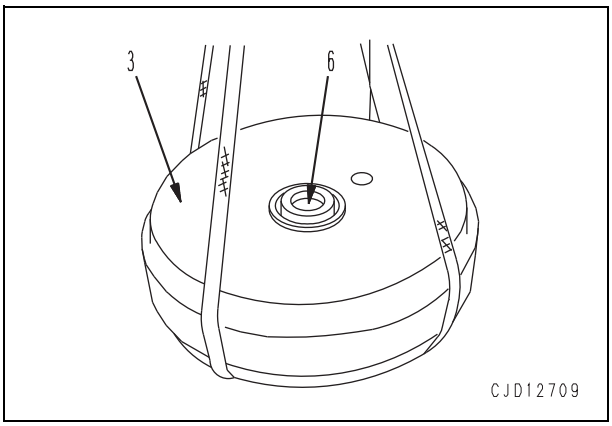


5. Fit the O-ring to the shaft.

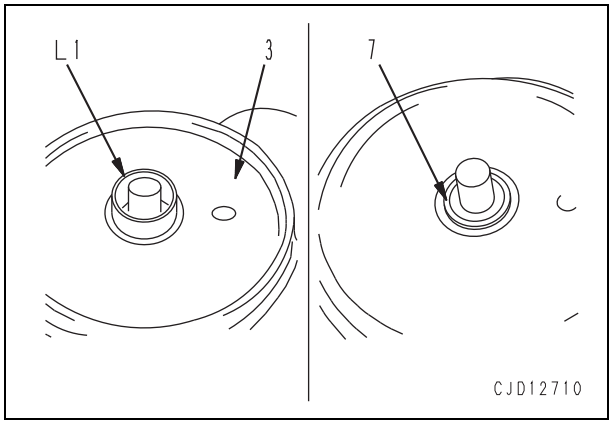
6. Using tool **L1**, install floating seal (8) to idler (3).
★ For the method of installation, see step 4.



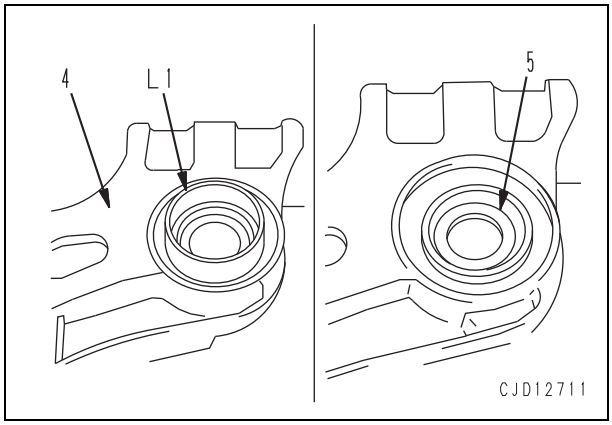
7. Sling and install idler (3) to shaft and support assembly (6).
★ Prevent the sling wires from opening with wires or ropes.



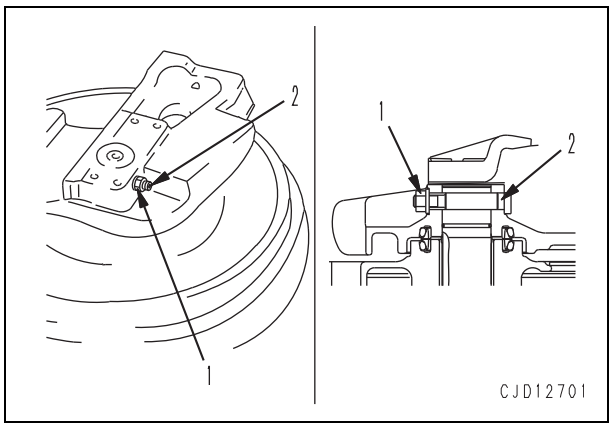
8. Using tool **L1**, install floating seal (7) to idler (3).
★ For the method of installation, see step 4.



9. Using tool **L1**, install floating seal (5) to support (4).
★ For the method of installation, see step 4.



10. Drive in bolt (2) and tighten nut (1).

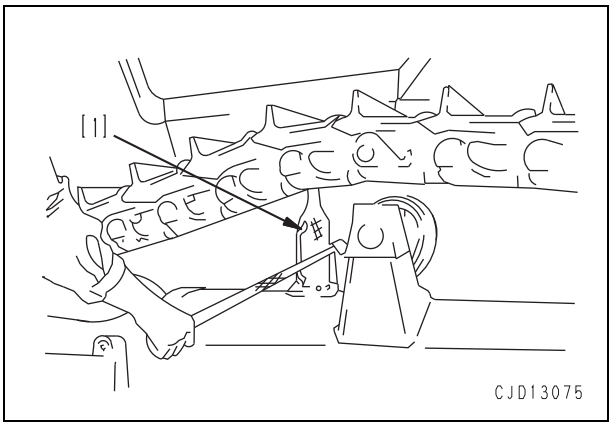


Removal and installation of carrier roller assembly

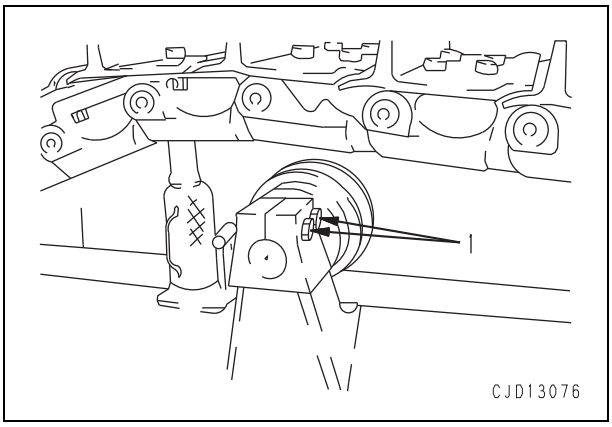
★ The figures in this section show D65EX-15E0.

Removal

1. Loosen the track shoe assembly. For details, see "Expansion and installation of track shoe assembly."
2. Using hydraulic jack [1], raise the track shoe.

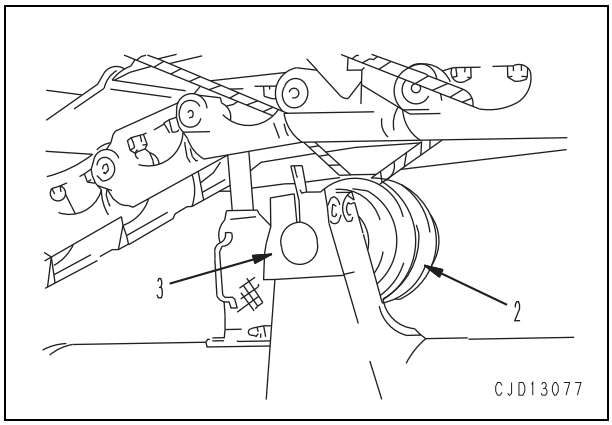


3. Remove mounting bolts (1) of the carrier roller assembly.



4. Sling carrier roller assembly (2) and pull and remove it out of support (3).

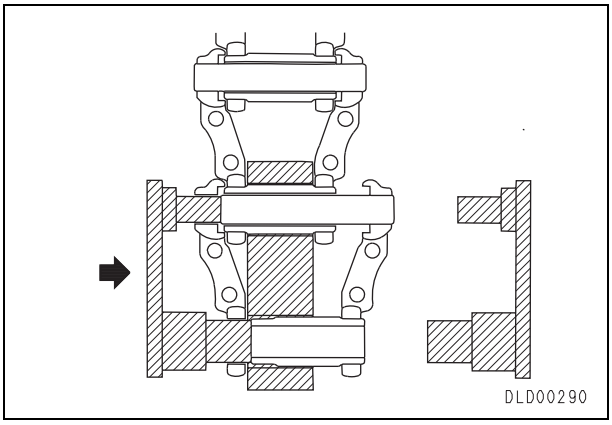
Carrier roller assembly: **30 kg**



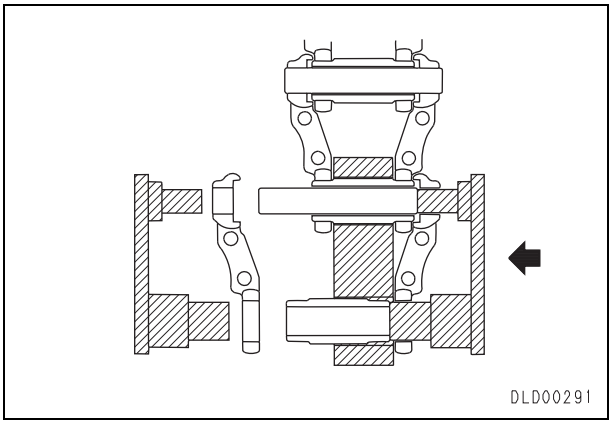
Installation

- Carry out installation in the reverse order to removal.
- Adjust the track shoe assembly tension. For details, see Testing and adjusting, "Adjusting track shoe assembly tension."

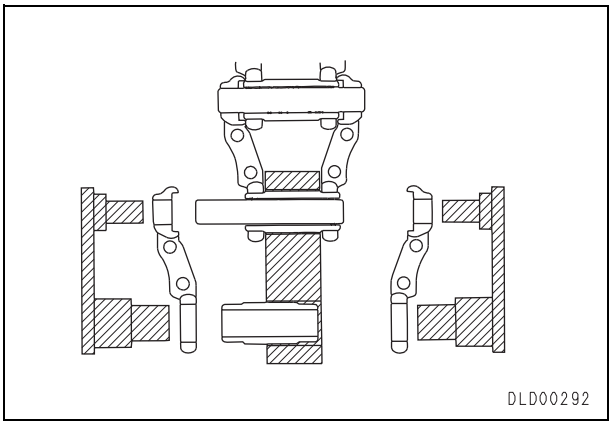
2) Operate the left cylinder to pull out the pin and bushing from the left link simultaneously.
   ★ Check the pulling out force of the pin and bushing to see if the necessary press fitting force for the pin and bushing can be obtained when reversed and assembled again.



3) Return the left cylinder and operate the right cylinder to pull out the pin and bushing from the right link simultaneously.



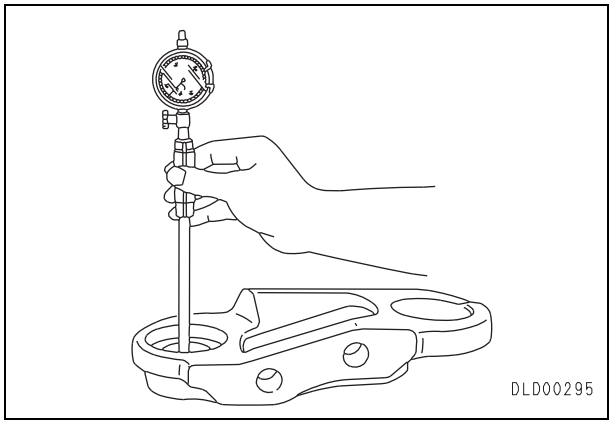
4) Return the right cylinder and take out the links, pins, bushings, and spacers on both sides and feed the next 1 set of the link assembly to the jaw.
   ★ If the bushing ends and sealing surfaces are damaged, oil will leak. Accordingly, handle them carefully.



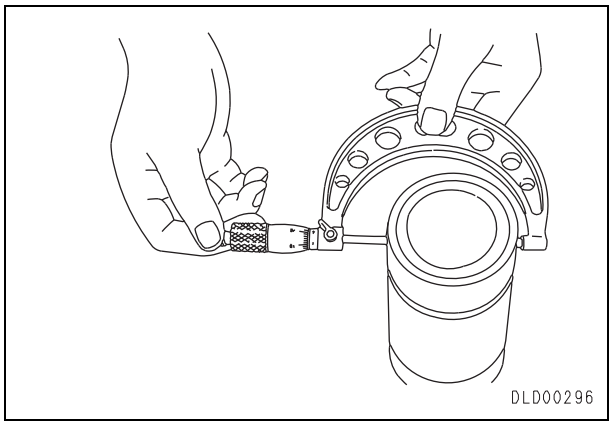
3. Inspection

Check the parts for the following items to see if they can be used for a lubricated track or a grease-filled track, then examine them generally and determine to use them for a lubricated track or grease-filled track.
   ★ For judgment of reuse of the parts, see “Guidance for reusable parts, Lubricated tracks”.

1) Check the parts visually for damage. If a part seems to be damaged, check it by dye penetrant test or magnaflux inspection. If it has any crack, it cannot be used again. Discard it.



2) Measure the outside diameter of the press fitting parts of the pin and bushing and the inside diameter of the pin and bushing fitting parts of the link with a micrometer and a cylinder gauge to see if the allowable fitting allowance is obtained. When using the pin, bushing, and link for a lubricated track, however, secure the standard fitting allowance between the pin and link.
   ★ If the allowable fitting allowance is not obtained, replace the parts with new ones.
   ★ For the dimensional criteria, see Structure, function and maintenance standard, "Track shoe."



Whole disassembly and whole assembly of track shoe assembly (PLUS type track shoe)

★ In this section, the points different from the conventional type track shoe are described.

Special tools

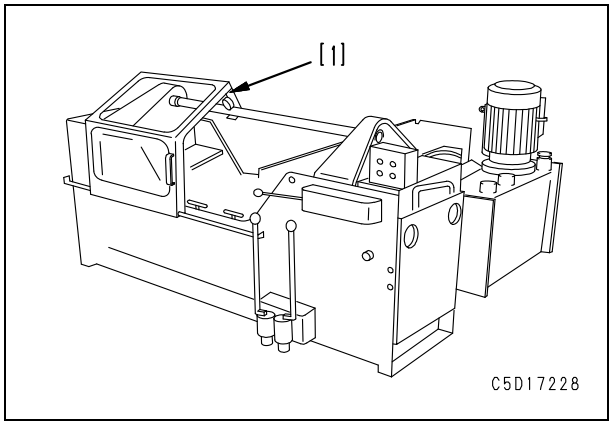
Symbol		Part number	Part name	Necessity	Q'ty	N/R	Sketch
R	4	791-931-1110	Push tool	■	1		
		791-646-7523	Bar	■	1		
		791-646-7590	Guide	■	1		
	5	790-701-3000	Checker	■	1		
	7	791-601-1000	Oil pump	■	1		
	18	791T-532-1100	Push tool assembly	■	1		○
		791T-532-1110	• Adapter	■	1		○
		791T-532-1130	• Ring	■	1		○
		791T-532-1140	• Plate	■	1		○
		791T-532-1150	• Ring	■	1		○
		791T-532-1160	• Push tool	■	1		○
		791T-532-1170	• Adapter	■	1		○
		791T-532-1180	• Spring	■	1		○
		791T-532-1190	• Spring	■	1		○
		791T-532-1210	• Bolt	■	1		○
		791T-632-5730	• Bar	■	1		○
		01580-11210	• Nut	■	1		
		01252-60610	• Bolt	■	4		
	19	791T-532-1200	Push tool assembly	■	1		○
		791T-532-1120	• Adapter	■	1		○
		791T-532-1130	• Ring	■	1		○
		791T-532-1140	• Plate	■	1		○
		791T-532-1150	• Ring	■	1		○
		791T-532-1160	• Push tool	■	1		○
		791T-532-1170	• Adapter	■	1		○
		791T-532-1180	• Spring	■	1		○
		791T-532-1190	• Spring	■	1		○
		791T-532-1220	• Bolt	■	1		○
		791T-632-5730	• Bar	■	1		○
		01580-11210	• Nut	■	1		
		01252-60610	• Bolt	■	4		
	20	791T-532-1300	Push tool assembly	■	2		○
		791T-532-1310	• Push tool	■	2		○
		791T-632-5730	• Bar	■	2		○
		01580-11210	• Nut	■	2		
	21	791T-432-1130	Push tool	■	1		○

Whole disassembly

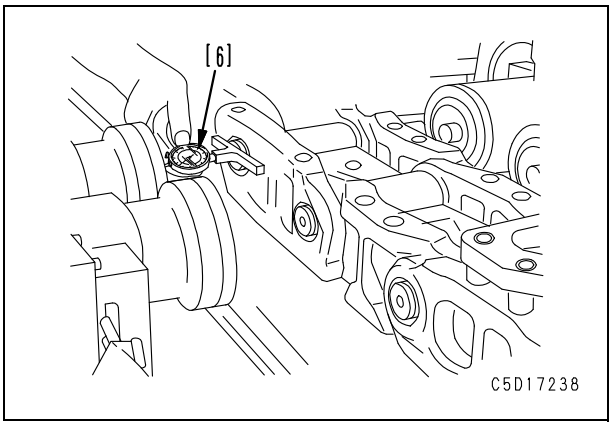
★ For details of general disassembly of the track shoe assembly, see "Whole disassembly and whole assembly of track shoe assembly (Conventional type track shoe)" which is also applicable to the track shoe assembly of the PLUS type track shoe.

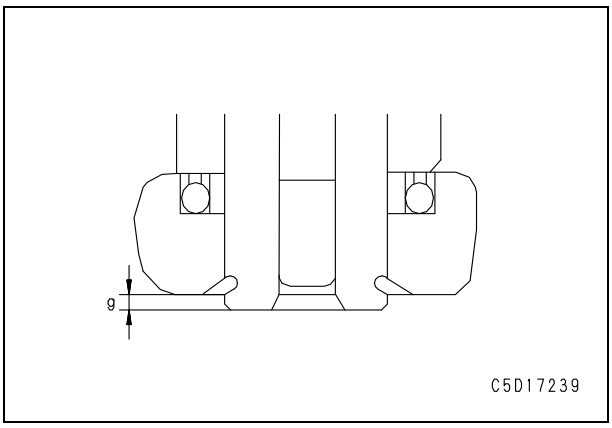
★ When disassembling, decide that each part should be reused or replaced, referring to the following material.
- Guidance for reusable parts, undercarriage, and oil lubricated track
- Guidance for reusable parts, undercarriage, and pin bushing reversal manual

⚠ **Use a track press having protective cover [1].**



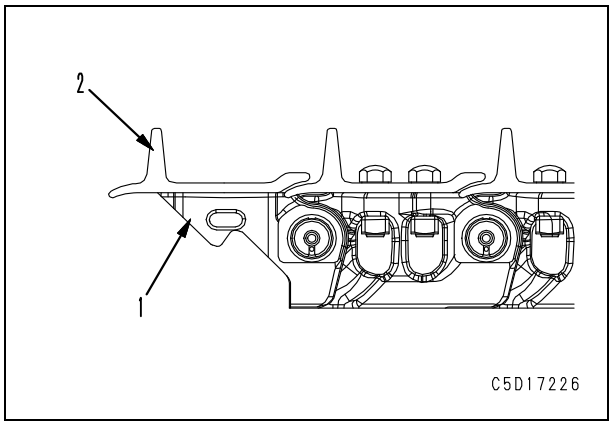
★ Using depth gauge [6], measure projection dimension (g) and adjust it to the following dimension while press fitting the pin.
Projection dimension (**g**):
4.7 ± 0.2 mm



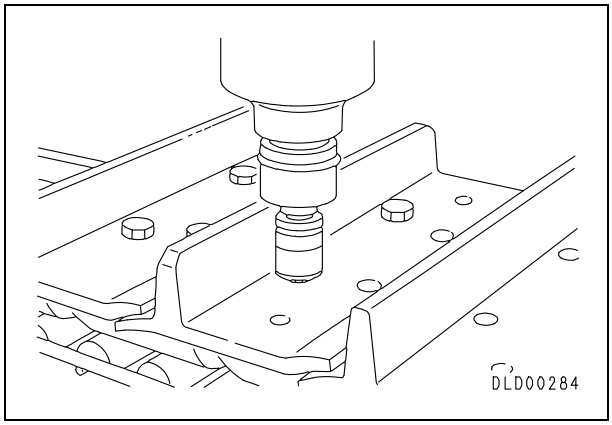


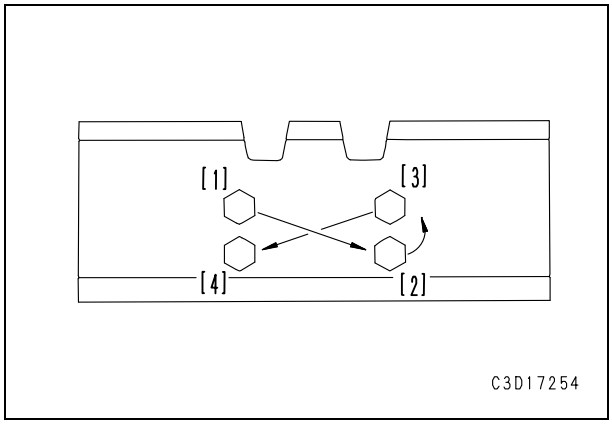
22) Perform steps 7) – 14) above.
23) Perform steps 15) – 19) above.
24) Assemble the master link on the roller tread side finally.
★ Ensure that the right and left master links are press fitted in parallel.

4. Installation of shoe
★ Set and install the shoe so that master link (1) and shoe grouser (2) on the shoe side will be positioned as shown below.

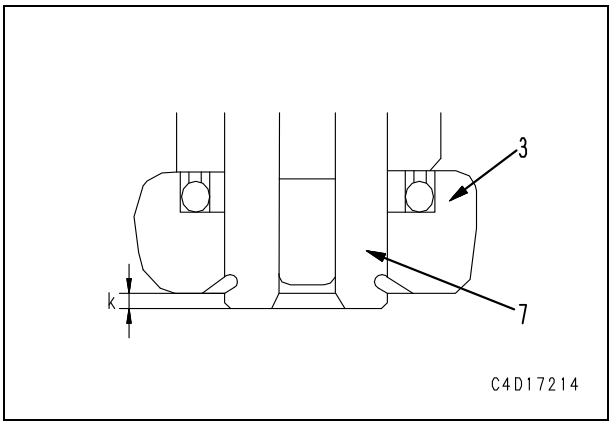


★ Set the link assembly on the link press bed and install the shoe with the shoe bolt impact wrench and torque wrench.
★ Tighten the shoe bolts in the following order.
Shoe bolt (Regular link):
Molybdenum disulfide lubricant (LM-P)
Shoe bolt (Regular link)
Initial torque: **343 ± 39 Nm {35 ± 4 kgm}**
Retightening angle: 120 ± 10 °

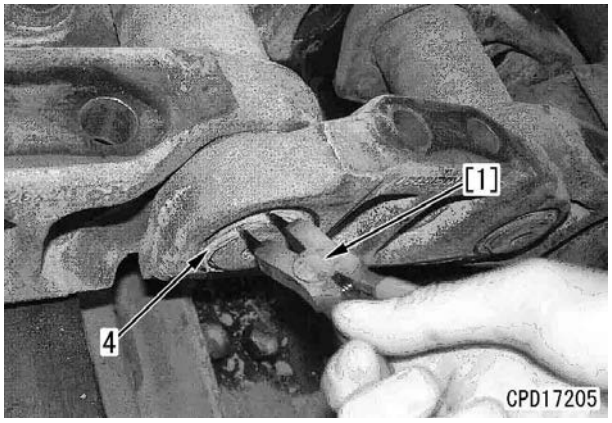




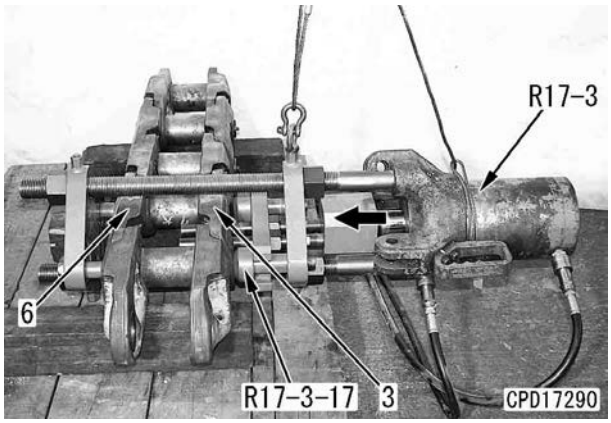
6) Using depth gauge [2], measure projection dimension (**k**) of the pin (7) end from outer link (3).
Standard projection dimension (**k**):
4.7 ± 0.2 mm



7) Using snap ring pliers [1], install wedge ring (4).
★ Install wedge ring (4) with its opening toward the shoe mounting face of the link.
★ Install the wedge ring so that its height above the side of the link will be even.



8) Sling tool **R17-3** and set it to the link.
9) While lifting tool **R17-3**, align it with the pin.
10) Operate tool **R17-1** (See the tool list) to press tool **R17-3-17** in the direction of the arrow with the following specified force and fit the pin to the wedge ring.
Specified force:
147 – 275 kN {15 – 28 ton}
11) Remove tool **R17-3**.



- Carry out the following assembly in the reverse order to disassembly.

4. Charging with oil
Charge the track with oil similarly to the ordinary oil lubricated track. For details, see “Whole disassembly and whole assembly of track shoe assembly (PLUS type track shoe)”.

Removal and installation of cooling fan pump assembly

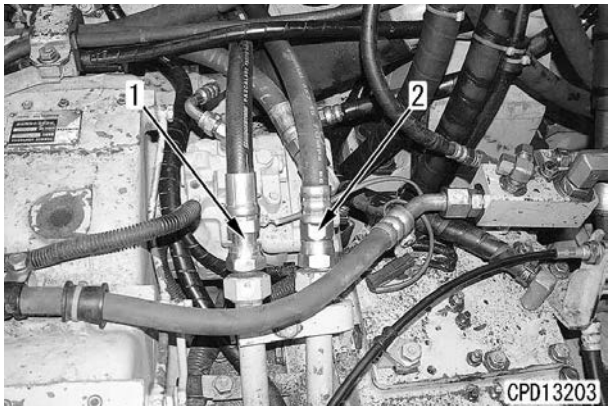
Removal

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

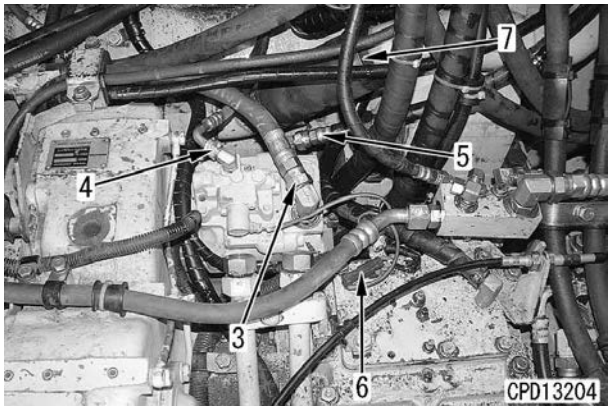
1. Drain the hydraulic oil.

   Hydraulic tank: **55 ℓ**

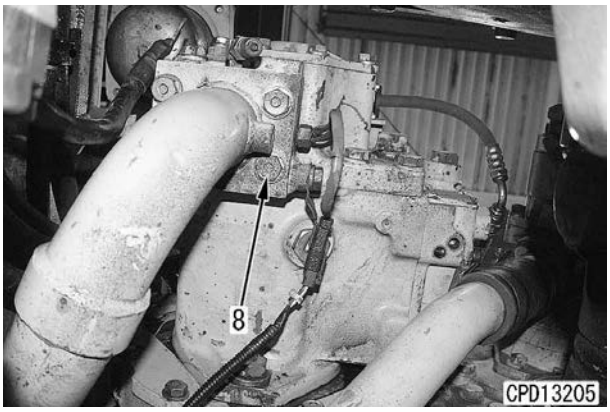
2. Remove the floor frame assembly. For details, see "Removal and installation of floor frame assembly."
3. Remove the undercover.
4. Disconnect hoses (1) and (2).



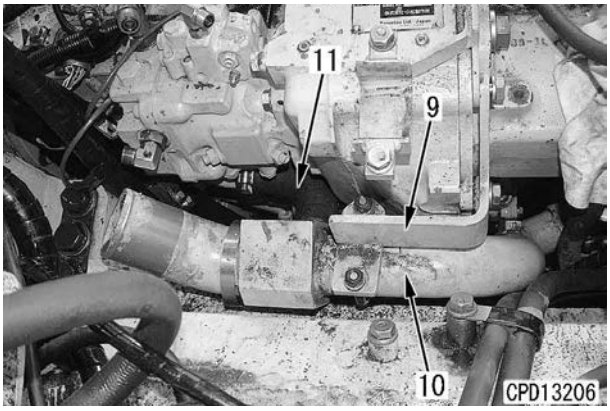
5. Disconnect hoses (3), (4), and (5).
6. Disconnect wiring connector **FAC** (6).
7. Disconnect hose and tube (7). [*1]



8. Remove 4 tube mounting bolts (8) under the HSS pump assembly.

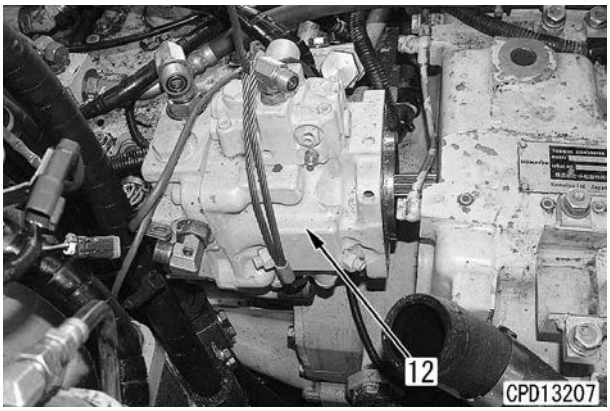


9. Remove bracket (9). While raising tube (10), disconnect hose (11).
   ★ Tube (10) cannot be removed completely.



10. Remove cooling fan pump assembly (12).

    Cooling fan pump assembly: **30 kg**



BULLDOZER

D65EX-15E0
D65PX-15E0
D65WX-15E0

Machine model	Serial number
D65EX-15E0	69001 and up
D65PX-15E0	69001 and up
D65WX-15E0	69001 and up

50 Disassembly and assembly

Work equipment