SEN03320-11

Shop Manual

BULLDOZER

D21A-8E0
D21P-8E0

SERIAL NUMBERS D21A-90001 and up
D21P-90001

KOMATSU

BULLDOZER

D21A-8E0
D21P-8E0

Machine model	Serial number
D21A-8E0	90001 and up
D21P-8E0	90001 and up

00 Index and foreword
200 Foreword and general information

Handling of electric equipment and hydraulic component

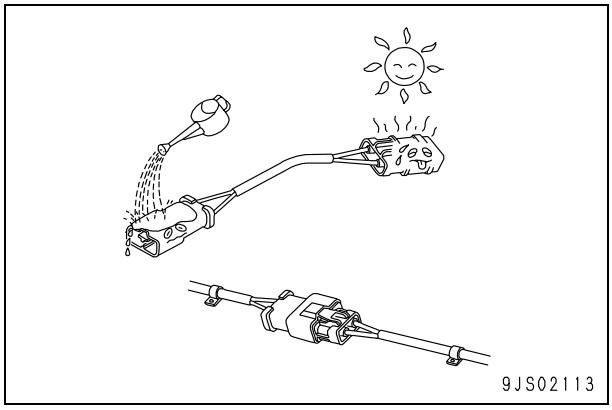
To maintain the performance of the machine over a long period, and to prevent failures or other troubles before they occur, correct “operation“, “maintenance and inspection“, “troubleshooting“, and “repairs” must be carried out. This section deals particularly with correct repair procedures for mechatronics and is aimed at improving the quality of repairs. For this purpose, it gives sections on “Handling electric equipment” and “Handling hydraulic equipment” (particularly gear oil and hydraulic oil).

Points to remember when handling electric equipment

1. Handling wiring harnesses and connectors

Wiring harnesses consist of wiring connecting one component to another component, connectors used for connecting and disconnecting one wire from another wire, and protectors or tubes used for protecting the wiring.

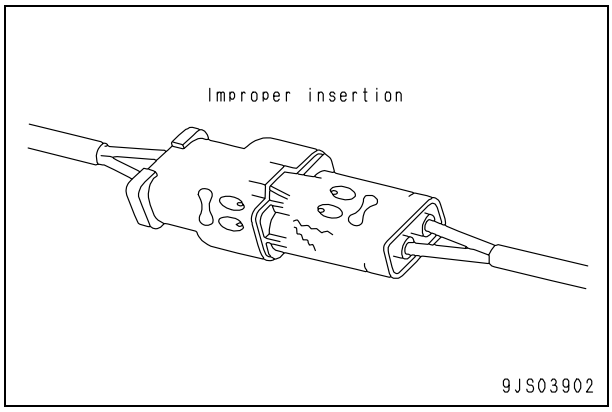
Compared with other electrical components fitted in boxes or cases, wiring harnesses are more likely to be affected by the direct effects of rain, water, heat, or vibration. Furthermore, during inspection and repair operations, they are frequently removed and installed again, so they are likely to suffer deformation or damage. For this reason, it is necessary to be extremely careful when handling wiring harnesses.



2. Main failures occurring in wiring harness

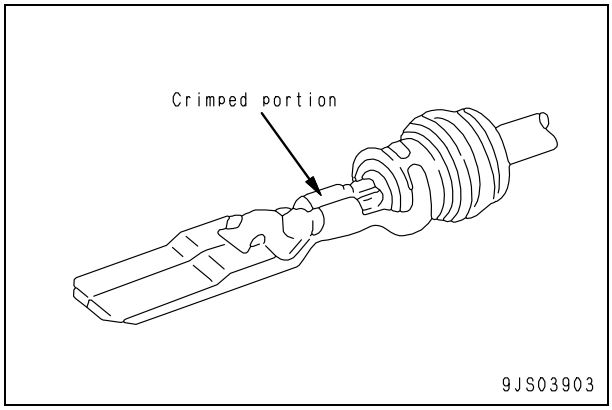
1) Defective contact of connectors (defective contact between male and female)

Problems with defective contact are likely to occur because the male connector is not properly inserted into the female connector, or because one or both of the connectors is deformed or the position is not correctly aligned, or because there is corrosion or oxidization of the contact surfaces. The corroded or oxidized contact surfaces may become shiny again (and contact may become normal) by connecting and disconnecting the connector about 10 times.



2) Defective crimping or soldering of connectors

The pins of the male and female connectors are in contact at the crimped terminal or soldered portion, but if there is excessive force brought to bear on the wiring, the plating at the joint will peel and cause improper connection or breakage.



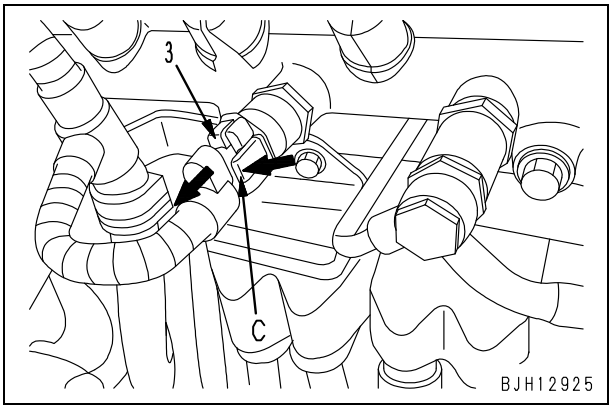
3. Push lock type

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

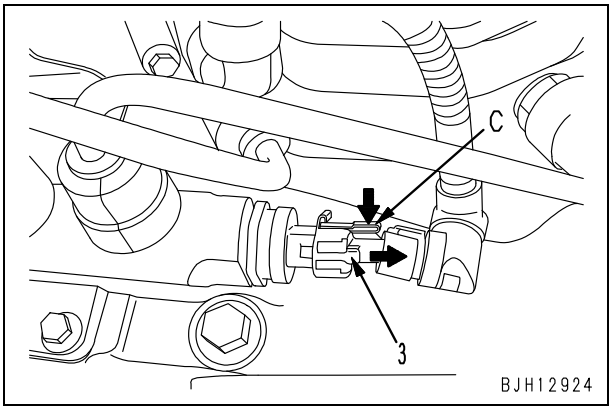
Disconnect connector (3) according to the following procedure.

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

- 114 engine

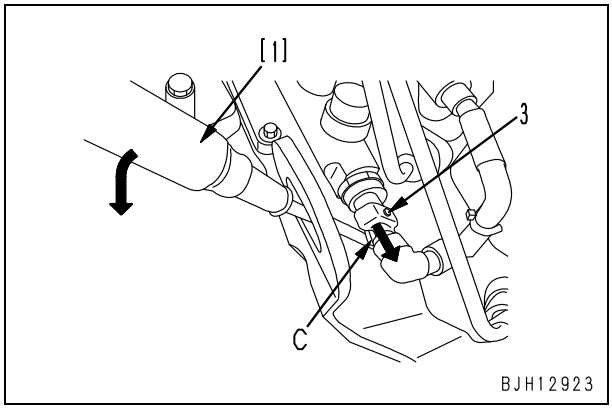


- 107 engine



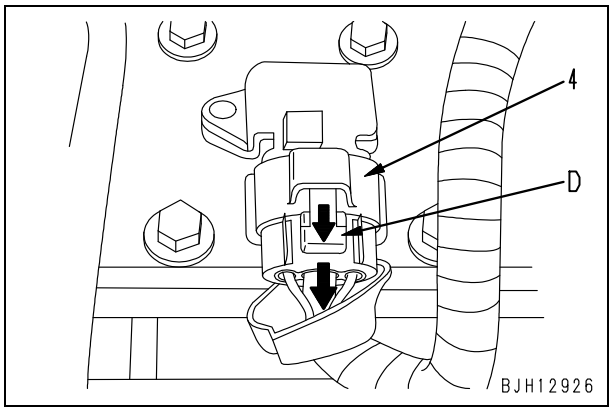
★ If the lock is on the underside, use flat-head screwdriver [1] since you cannot insert your fingers.

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**)

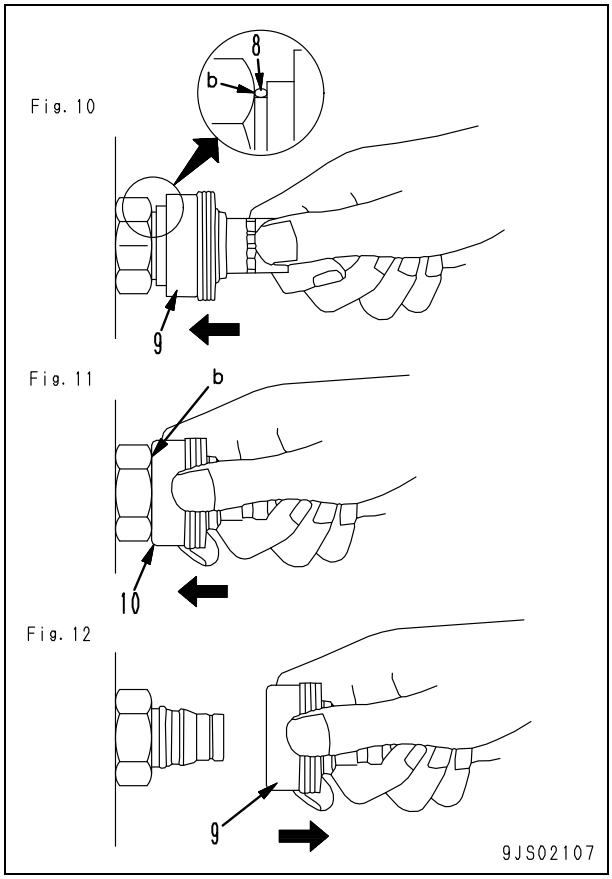
3) While pressing lock (D), pull out connector (4) in the direction of the arrow.



Type 3

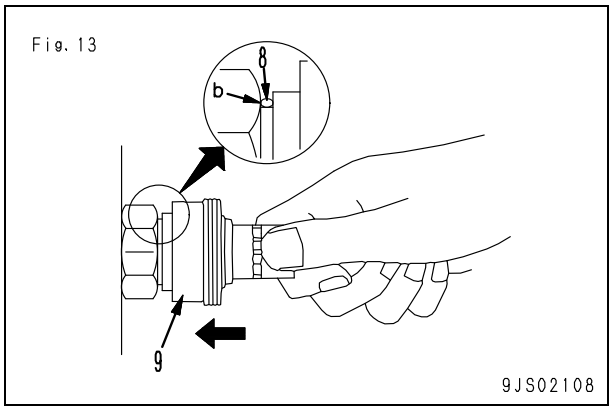
1. Disconnection

1) Hold the tightening portion and push body (9) straight until sliding prevention ring (8) contacts contact surface (b) of the hexagonal portion at the male end. (Fig. 10)
2) While holding the condition of Step 1), push cover (10) straight until it contacts contact surface (b) of the hexagonal portion at the male end. (Fig. 11)
3) While holding the condition of Steps 1) and 2), pull out whole body (9) to disconnect it. (Fig. 12)



2. Connection

- Hold the tightening portion and push body (9) straight until the sliding prevention ring contacts contact surface (b) of the hexagonal portion at the male end. (Fig. 13)



D21P-8E0	D21P-8E0 (Rubber crawler specification)
90001 and up	90001 and up
Gear type	Gear type
59	59
3-spool valve	3-spool valve
Double-acting piston type	
70	70
35	35
365	365
1,022	1,022
657	657
80	80
40	40
75	75
467	467
392	392
70	70
35	35
350	350
1,007	1,007
657	657
Box type (external control valve)	
Power angle, power tilt dozer	
Hydraulic cylinder type	Hydraulic cylinder type
850	850
325	325
280	280
25	25
2,560	2,560
590	590
59	59

BULLDOZER

D21A-8E0
D21P-8E0

Machine model	Serial number
D21A-8E0	90001 and up
D21P-8E0	90001 and up

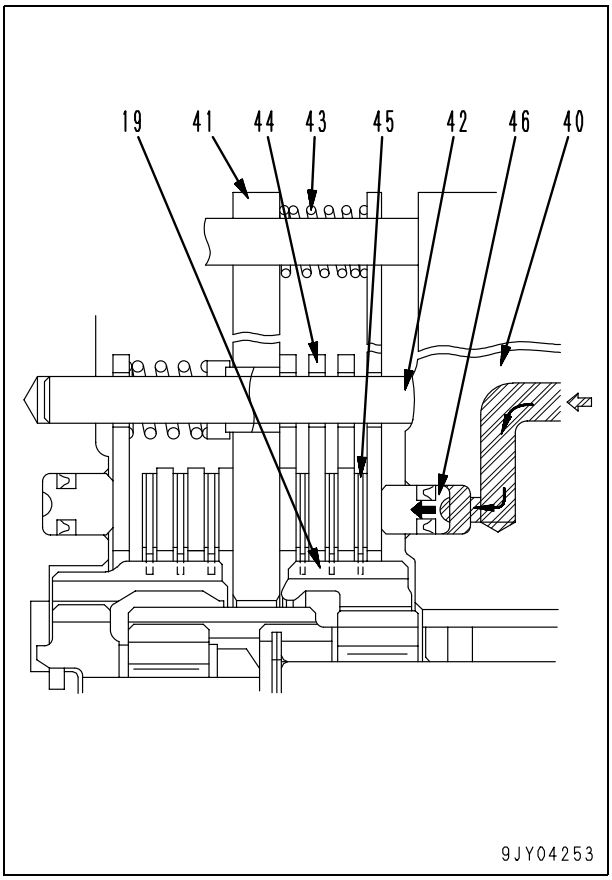
10 Structure, function and maintenance standard

210 Power train, Part 1

Outline

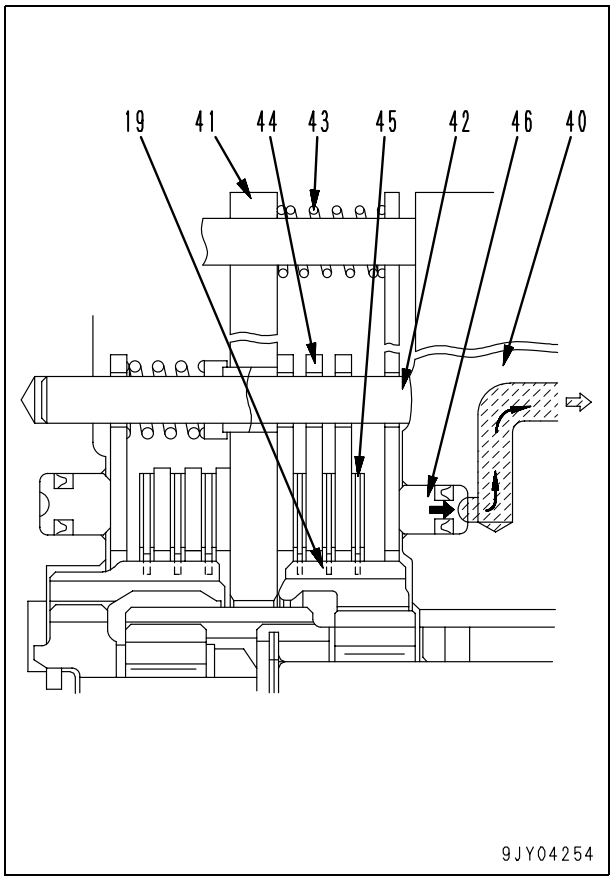
- Steering, directional and gear shift lever (1) in the operator's compartment is interconnected with each spool of the speed, directional and inching valve assembly (3) on top of the transmission case.
  Inching pedal (4) is also interconnected with the inching valve spool in the same way.
- When steering, directional and gear shift lever (1) is operated, the directional valve spool and the speed valve spool are actuated at the same time. A set of 2 clutches inside the transmission is engaged and the machine travels.
- When inching pedal (4) is operated, the inching valve spool is actuated, and the forward or reverse clutch inside the transmission is partially or fully disengaged to make fine adjustment of the travel speed or to make the machine stop.
- Turn lever (1) to the right or left and travel the machine forward or reverse. Then, the oil of the pump flows through steering PPC valve (5) to the right and left steering clutch pistons and right and left brake cylinders. As a result, the machine turns to the right or left.

Clutch is "engaged" (fixed)



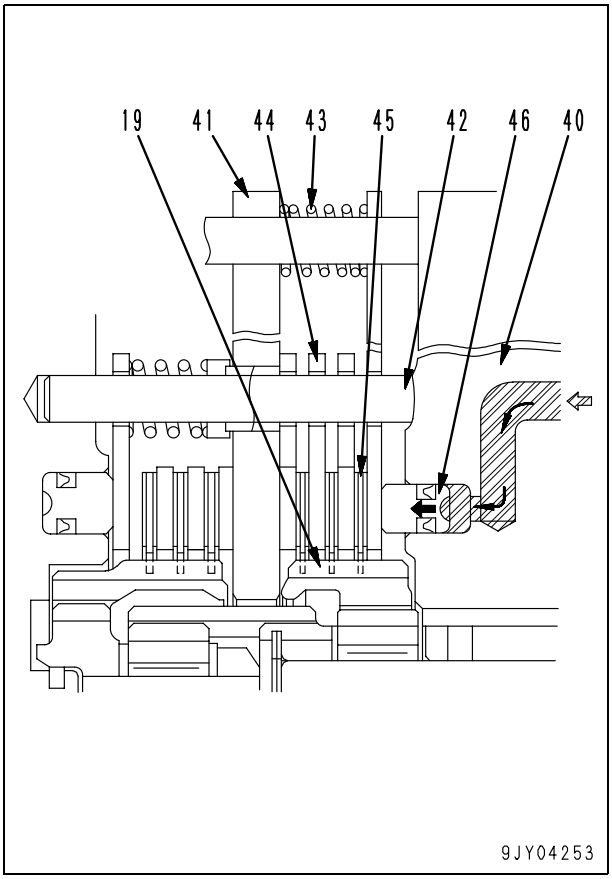
- Oil from the control valve flows under pressure through the port in housing (40) to the back of piston (46). The piston presses clutch plates (44) and clutch discs (45) together, and the frictional force developed stops clutch discs (45) revolution, thus ring gear (19) meshing with the disc's internal teeth locked.

Clutch is "disengaged" (released)



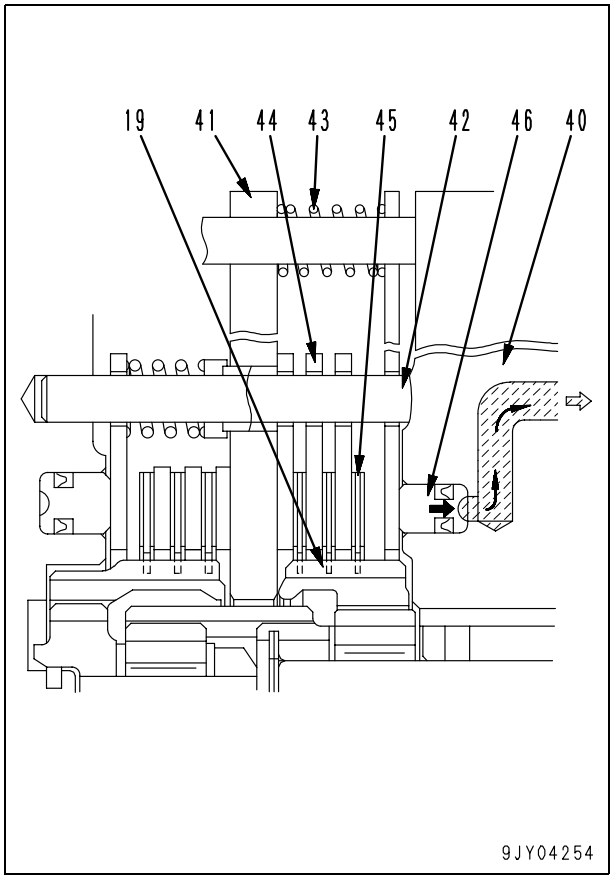
- When the supply of oil from the control valve is shut off, piston (46) returns to the initial position by the force of piston return spring (43), thus relieving the frictional force between plates (44) and discs (45), making ring gear (19) neutral.

Clutch is "engaged" (fixed)



- Oil from the control valve flows under pressure through the port in housing (40) to the back of piston (46). The piston presses clutch plates (44) and clutch discs (45) together, and the frictional force developed stops clutch discs (45) revolution, thus ring gear (19) meshing with the disc's internal teeth locked.

Clutch is "disengaged" (released)



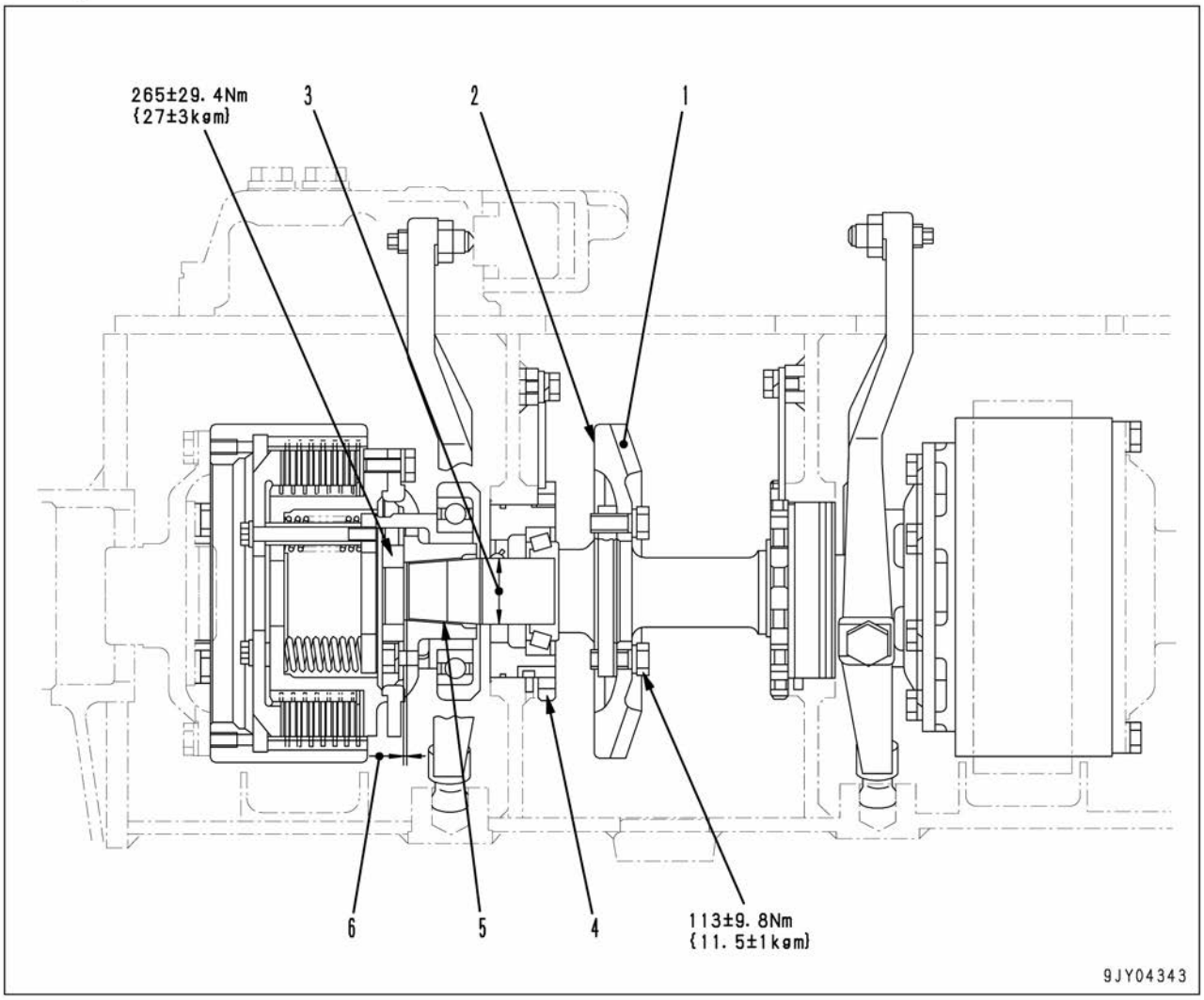
- When the supply of oil from the control valve is shut off, piston (46) returns to the initial position by the force of piston return spring (43), thus relieving the frictional force between plates (44) and discs (45), making ring gear (19) neutral.

Unit: mm

No.	Check item	Criteria					Remedy
1	Clearance between F-R and speed valve spool and body	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole			
		14.0	–0.020 –0.030	+0.011 0	0.020 – 0.041	0.06	
2	Clearance between inching spool and sleeve	14.0	0 –0.027	+0.027 0	0 – 0.054	0.07	
3	Clearance between inching valve and body	25.0	–0.035 –0.045	+0.013 0	0.035 – 0.058	0.08	
4	Clearance between inching valve and piston	10.0	–0.020 –0.030	+0.015 0	0.020 – 0.045	0.07	
5	Clearance between modulating load piston and body	26.0	–0.035 –0.045	+0.013 0	0.035 – 0.058	0.08	
6	Clearance between modulating valve and body	22.0	–0.035 –0.045	+0.013 0	0.035 – 0.058	0.08	
7	Clearance between modulating valve and piston	15.0	–0.020 –0.030	+0.018 0	0.020 – 0.048	0.07	
8	Clearance between quick return valve and body	25.0	–0.100 –0.200	+0.033 0	0.100 – 0.233	0.25	
9	Clearance between quick return valve and body	14.0	–0.035 –0.045	+0.011 0	0.035 – 0.056	0.08	
10	Inching valve spring	Standard size			Repair limit		
		Free length	Installation length	Installation load	Free length	Installation load	
		27.0	18.0	19.6 N {2.0 kg}	26.2	18.6 N {1.9 kg}	
11	Inching valve spring	34.3	20.0	46.4 N {4.73 kg}	33.3	44.1 N {4.5 kg}	
12	Piston spring	26.0	18.0	6.47 N {0.66 kg}	25.2	6.18 N {0.63 kg}	
13	Modulating valve spring (large)	62.0	(*1) 38.5	211 N {21.5 kg}	60.1	200 N {20.4 kg}	
14	Modulating valve spring (small)	52.4	(*1) 41.5	110 N {11.2 kg}	50.8	104 N {10.6 kg}	
15	Piston spring	26.0	19.0	5.69 N {0.58 kg}	25.2	5.39 N {0.55 kg}	
16	Thickness of shim for inching valve	1.0 (One shim of 0.5 mm will charge the pressure by 20.6 kPa {0.21 kg/cm²})					Adjust with shims
17	Thickness of shim for inching valve sleeve	1.0 (One shim of 0.5 mm will charge the pressure by 8.83 kPa {0.09 kg/cm²})					
18	Thickness of shim for modulating valve	1.0 (One shim of 0.5 mm will charge the pressure by 53.9 kPa {0.55 kg/cm²})					

*1: Normal height

Bevel gear shaft

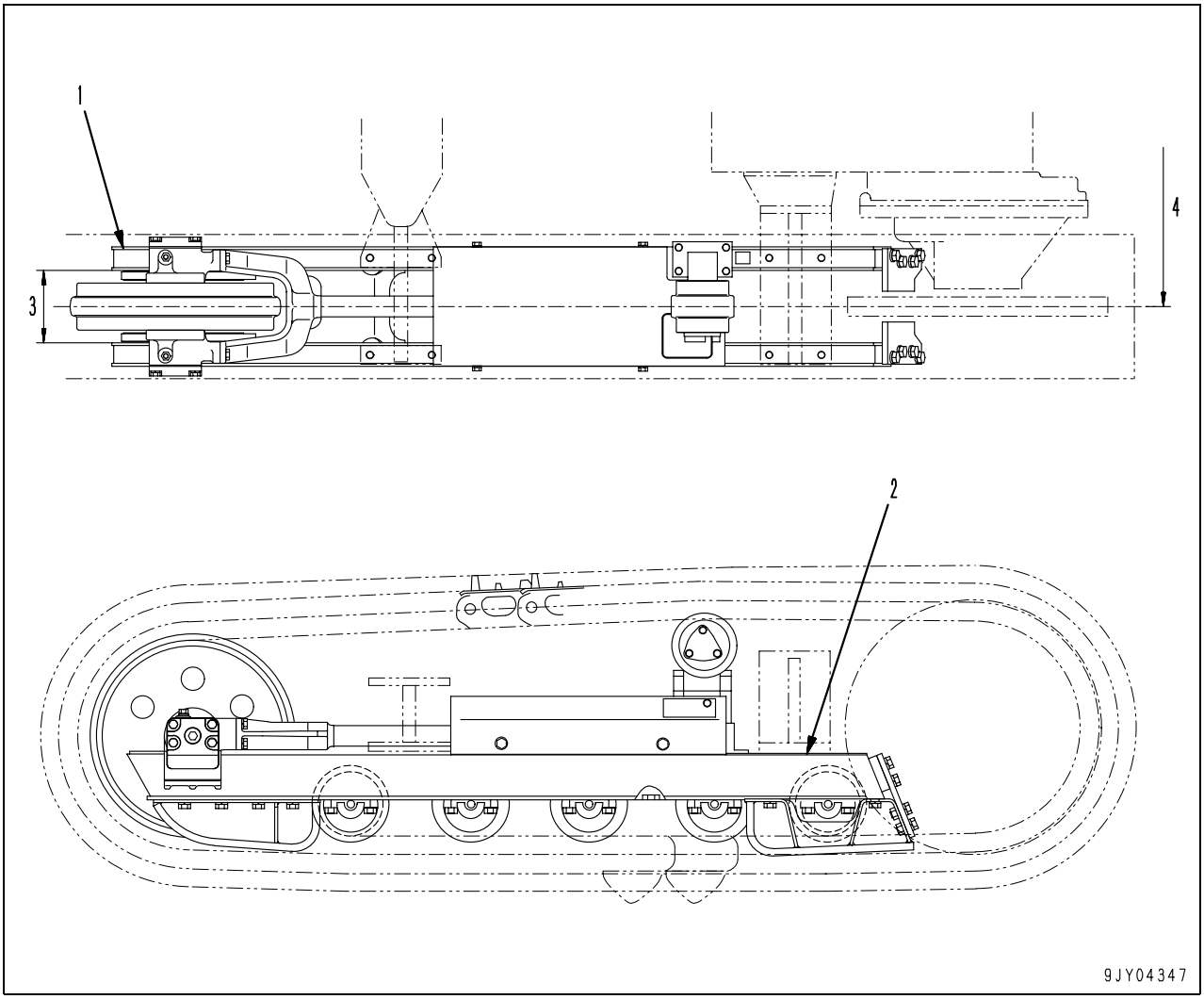


Unit: mm

No.	Check item	Criteria			Remedy
1	Backlash between bevel gear and pinion	Standard clearance		Clearance limit	Adjust
		0.15 – 0.20		—	
2	Face runout of back of bevel gear	Max. 0.07			
3	Outside diameter of oil seal contact surface on bevel gear shaft	Standard size	Tolerance	Repair limit	Repair by hard chrome plating or replace
		45	0 –0.062	44.9	
4	Preload of tapered roller bearing	Bevel gear shaft rotational torque: B + 2.0 to 5.5 Nm {B + 0.20 to 0.56 kgfm} B: Bevel gear shaft rotational torque when tightening torque of adjustment nut (above figure) is 27 to 34 Nm {2.8 to 3.5 kgfm} (Refer to "Disassembly and assembly".)			Adjust with nut
5	Fitting pressure of hub of bevel gear shaft	58,840 N {6 ton}			Adjust
6	Clearance between bevel gear shaft and hub	2 (+1.6/–0.4)			

Unit: mm

<table>
<tr><th>No.</th><th>Check item</th><th colspan="6">Criteria</th><th>Remedy</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Backlash between pinion and gear</td><td colspan="4">Standard clearance</td><td colspan="2">Clearance limit</td><td rowspan="3">Replace</td></tr>
<tr><td colspan="4">0.19 – 0.50</td><td colspan="2">—</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Interference between boss of sprocket shaft and reamer bolt</td><td rowspan="2">Standard size</td><td colspan="2">Tolerance</td><td rowspan="2">Standard interference</td><td rowspan="2">Interference limit</td></tr>
<tr><td>Shaft</td><td>Hole</td></tr>
<tr><td>14</td><td>+0.019
+0.001</td><td>+0.027
0</td><td>–0.019 –
0.026</td><td>64.9</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Outside diameter of oil seal contact surface on final drive flange</td><td colspan="2">Standard size</td><td colspan="2">Tolerance</td><td colspan="2">Repair limit</td><td rowspan="2">Repair by hard chrome plating or replace</td></tr>
<tr><td colspan="2">65</td><td colspan="2">0
–0.074</td><td colspan="2">64.9</td></tr>
<tr><td>4</td><td>End play of pinion shaft</td><td colspan="6">Min. 0.3</td><td rowspan="8">Adjust</td></tr>
<tr><td>5</td><td>Face runout of final drive flange</td><td colspan="6">0.3 [Datum point: Center of bevel gear shaft (at ø172)]</td></tr>
<tr><td>6</td><td>Radial runout of final drive flange</td><td colspan="6">0.4 (Datum point: Center of bevel gear shaft)</td></tr>
<tr><td>7</td><td>Fitting pressure of final drive flange</td><td colspan="6">98.07 kN {10 ton}</td></tr>
<tr><td>8</td><td>Clearance between final drive flange and pinion shaft</td><td colspan="6">2 (+1.6/–0.4)</td></tr>
<tr><td>9</td><td>Fitting pressure of sprocket shaft</td><td colspan="6">98.07 – 196.1 kN {10 – 20 ton}</td></tr>
<tr><td>10</td><td>Clearance between sprocket shaft and ring</td><td colspan="6">1.9 ± 0.5</td></tr>
<tr><td>11</td><td>Thickness of shim for ring</td><td colspan="6">2.0</td></tr>
<tr><td rowspan="2">12</td><td rowspan="2">Wear of tips of sprocket teeth</td><td colspan="4">Standard size</td><td colspan="2">Repair limit</td><td rowspan="5">Repair by build-up welding or replace</td></tr>
<tr><td colspan="4">554</td><td colspan="2">548</td></tr>
<tr><td>13</td><td>Wear of roots of sprocket teeth</td><td colspan="4">501.6</td><td colspan="2">485.5</td></tr>
<tr><td>14</td><td>Wear of teeth crest width of sprocket teeth</td><td colspan="4">30</td><td colspan="2">25</td></tr>
<tr><td>15</td><td>Wear of bottom land width of sprocket teeth</td><td colspan="4">40</td><td colspan="2">35</td></tr>
<tr><td>16</td><td>Thickness of sprocket teeth bottom</td><td colspan="4">14.3</td><td colspan="2">6.3</td></tr>
</table>



Unit: mm

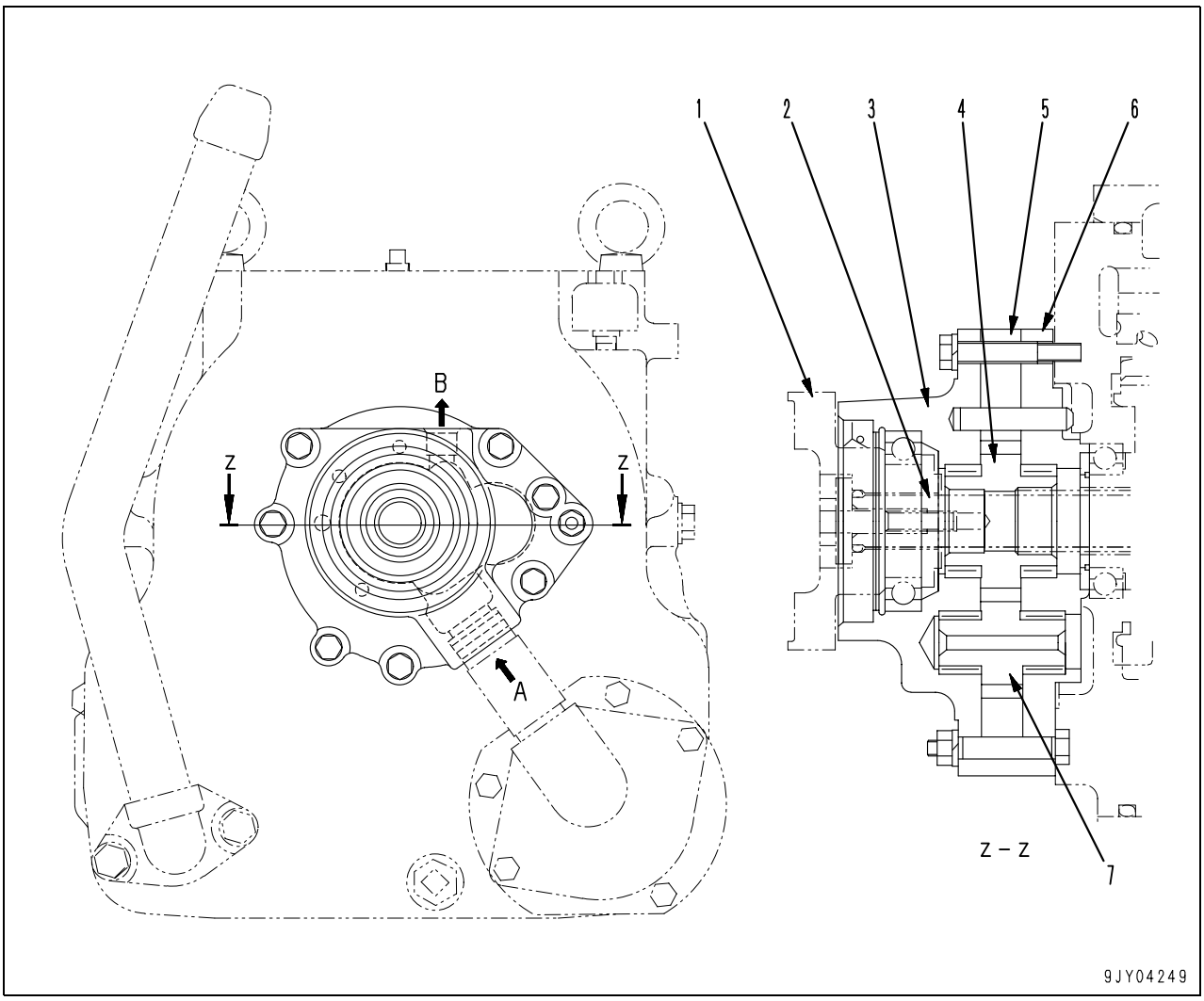
No.	Check item		Criteria		Remedy
			Standard size	Repair limit	
1	Bending of track frame		—	7 (in length of 3,000 mm)	Repair or replace
2	Torsion of track frame		—	3 (in length of level of 300 mm)	
3	Width of idler portion		153	158	
4	Distance between right and left track frame center	D21A-8E0	1,310	Difference of forward and rearward: Max. 6	
		D21P-8E0	1,310		

*1: Single grouser shoe
*2: Swamp shoe

Unit: mm

No.	Check item			Criteria					Remedy
1	Link pitch			Standard size: 135.25			Repair limit: 138.2		Turn or replace
2	Height of grouser	2a	D21A-8E0	38.5			15.0		Lug weld, repair by build-up welding, or replace
		2b	D21P-8E0	66.5			54.5		
3	Link height			75.0			68.0		Repair by build-up welding or replace
4	Outside diameter of bushing			41.2			36.2 (Normal loading) 38.2 (Hard loading)		Turn or replace
5	Interference between link and bushing			Standard size	Tolerance: Shaft	Tolerance: Hole	Standard interference	Interference limit	Replace
				41	+0.214 +0.174	+0.062 0	–0.112 – –0.214	0.1	
6	Interference between link and regular pin			24	+0.100 0	–0.148 –0.200	0.148 – 0.300	0.14	
7	Interference between link and master pin			24	–0.030 –0.070	–0.148 –0.200	0.078 – 0.170	0.078	
8	Clearance between bushing and regular pin			Standard size	Tolerance: Shaft	Tolerance: Hole	Standard clearance	Clearance limit	
				24	+0.100 0	+0.700 +0.200	0.100 – 0.700	—	
9	Clearance between bushing and master pin			24	–0.200 –0.400	+0.500 +0.100	0.300 – 0.900	—	
10	Protrusion of bushing			3.15					Adjust
11	Protrusion of pin			4.10					
12	Thickness of grouser	12a	D21A-8E0	45.5			22		Lug weld, repair by build-up welding, or replace
		12b	D21P-8E0	17			5		
13	Thickness of link (bushing fitting part)			20			13		Repair by build-up welding or replace
14	Thickness of bushing			8.7			6.2 (Normal loading) 7.2 (Hard loading)		Turn or replace
15	Tightening torque of shoe bolt			Initial: 68.6 ± 9.8 Nm {7 ± 1 kgm}, Retightening angle: 90 ± 10°					—

Power train and steering pump



1. Transmission input coupling
2. Transmission input shaft
3. Cover
4. Drive gear
5. Gear case
6. Bracket
7. Driven gear

A: From transmission case
B: To transmission control valve

Outline

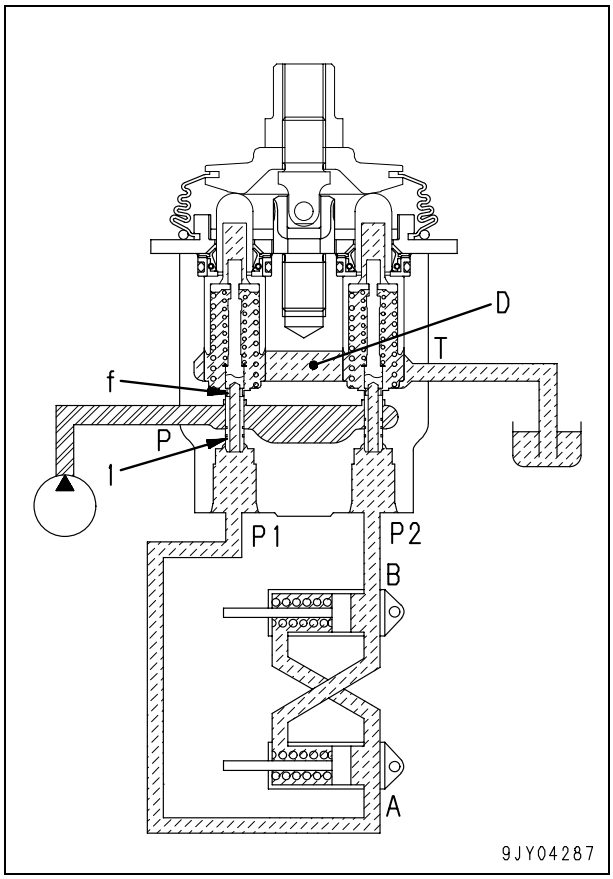
- The transmission pump is assembled to the transmission input shaft and operated by the power of input shaft.
- The oil in the transmission case passes through the strainer, is sucked into port (A) and discharged from port (B).
  It then flows to the transmission control valve and the PPC valve.

Operation

- When the blade control lever is moved to the "LOWER" position, the spool of lift valve (12) moves to the right.
  When this happens, pump port (P) and lift cylinder bottom port (A2), and tank port (T) and lift cylinder head port (B2) are connected.
- The pressurized oil from the pump passes through the spool of tilt valve (5) and pushes open check valve (11). It then goes from the lift valve and enters the bottom end of lift cylinder (13).
- When the hydraulic pressure in the circuit rises, the lift cylinder is extended and the blade is lowered.
  At the same time, the oil at the lift cylinder head is pushed out by the cylinder piston, returns to the spool of lift valve and is drained to hydraulic tank (1).
  When this happens, if the lift cylinder is extended suddenly because of the weight of the blade, there will be a shortage of oil from the pump and negative pressure is formed at the cylinder bottom end.
  Therefore, suction valve (14) opens, and oil is sucked in from the drain circuit to prevent the pressure in the circuit from becoming negative at the cylinder bottom end.
- When the lift cylinder reaches the end of its stroke, the hydraulic pressure in the circuit rises to the set pressure and the oil is relieved from main relief valve (3) and drained to hydraulic tank (1).

PPC valve for brake cylinder

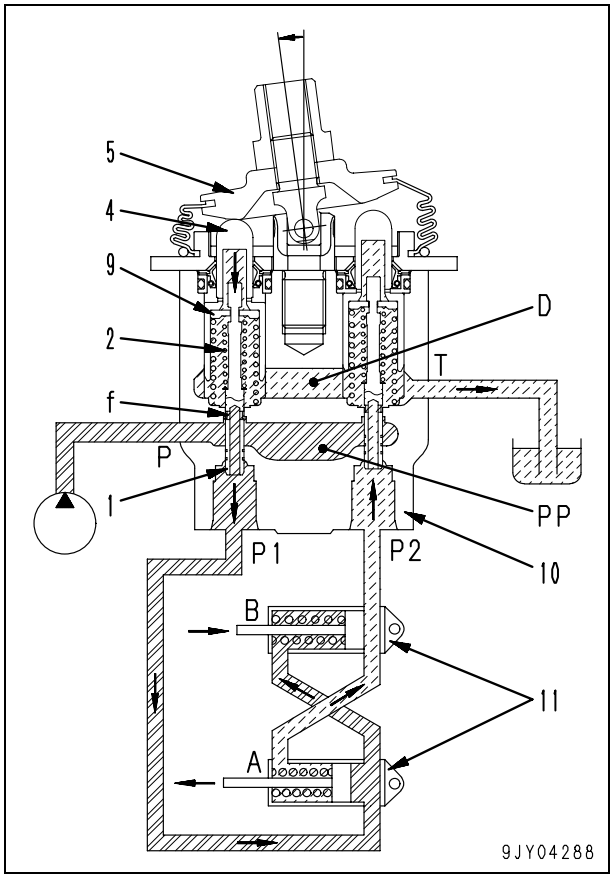
★ The output pressure for the brake cylinders is generated after the output pressure for the steering cylinder almost reaches 100% (after the clutch is disengaged completely). The brake cylinders move after the steering cylinder.



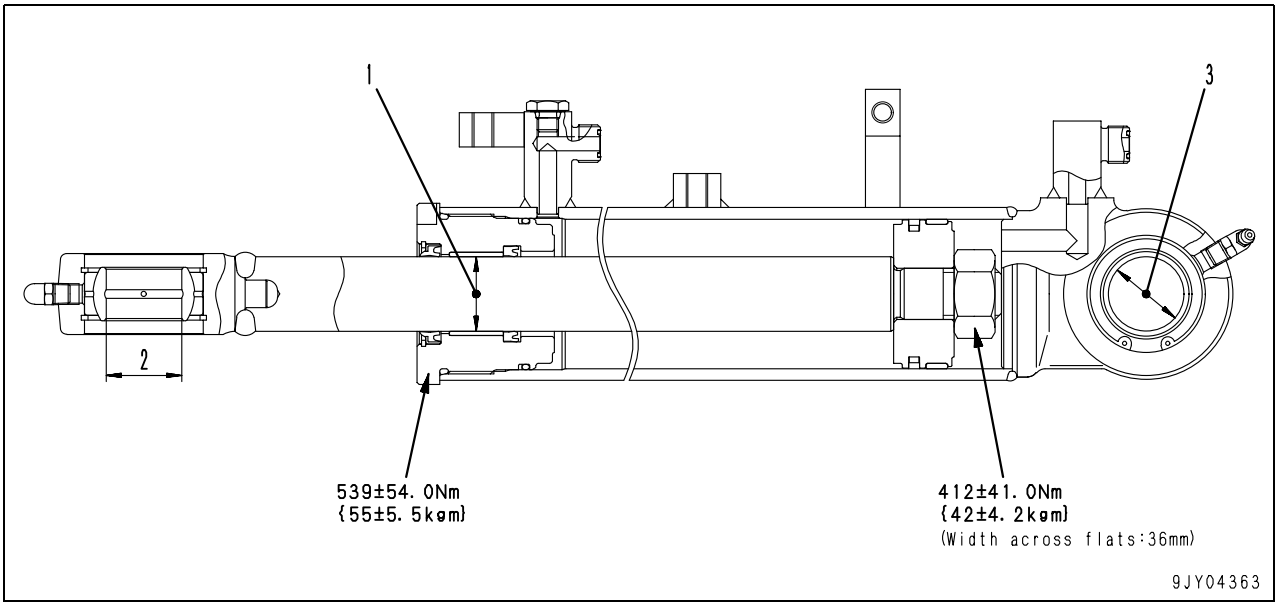
Operation

1. At neutral
   Ports (A) and (B) of brake cylinder (11) and ports (P1) and (P2) of the PPC valve are connected to drain chamber (D) through fine control hole (f) in spool (1).

2. During fine control (neutral → fine control)
   When piston (4) starts to be pushed by disc (5), retainer (9) is pushed; spool (1) is also pushed by metering spring (2), and moves down.
   When this happens, fine control hole (f) is shut off from drain chamber (D), and at almost the same time, it is connected to pump pressure chamber (PP), so pilot pressure oil from the control pump passes through fine control hole (f) and goes from port (P1) to port (A).
   When the pressure at port (P1) becomes higher, spool (1) is pushed back and fine control hole (f) is shut off from pump pressure chamber (PP).
   At almost the same time, it is connected to drain chamber (D) to release the pressure at port (P1).
   When this happens, spool (1) moves up or down so that the force of metering spring (2) is balanced with the pressure at port (P1). The relationship in the position of spool (1) and body (10) (fine control hole (f) is at a point midway between drain hole (D) and pump pressure chamber (PP)) does not change until retainer (9) contacts spool (1).
   Therefore, metering spring (2) is compressed proportionally to the amount of movement of the control lever, so the pressure at port (P1) also rises in proportion to the travel of the control lever. In this way, the piston of brake cylinder (11) moves to a position where the pressure in chamber (A) (the same as the pressure at port (P1)) and the force of the return spring are balanced.



Angle cylinder



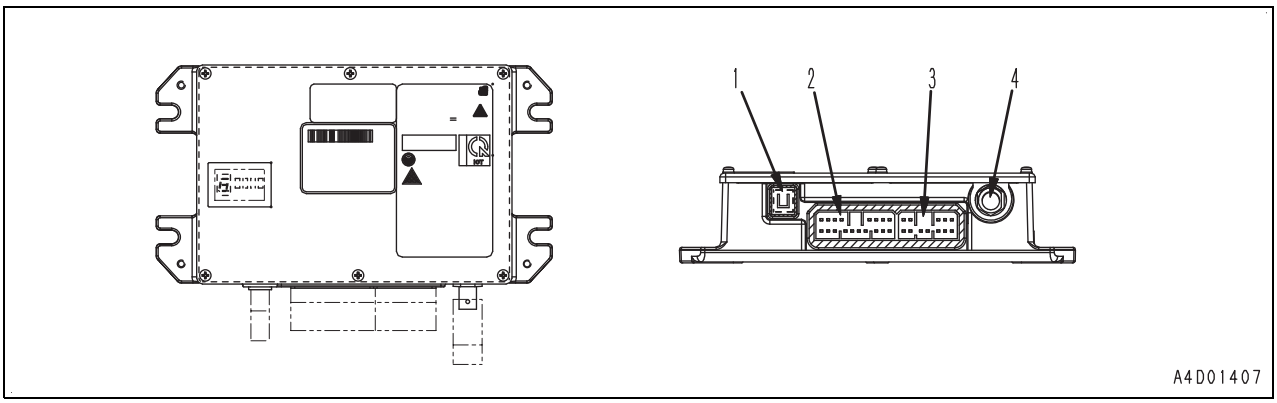
Unit: mm

No.	Check item		Criteria					Remedy
			Standard size	Tolerance		Standard clearance	Clearance limit	
				Shaft	Hole			
1	Clearance between piston rod and bushing	Lift	35	–0.080 –0.142	+0.132 +0.006	0.086 – 0.274	0.574	Replace bushing
		Tilt	40	–0.080 –0.142	+0.132 +0.006	0.086 – 0.274	0.574	
		Angle	35	–0.080 –0.142	+0.132 +0.006	0.086 – 0.274	0.574	
2	Clearance between piston rod supporting shaft and bushing	Lift	35	–0.025 –0.087	+0.142 +0.080	0.105 – 0.229	1.0	
		Tilt	35	–0.025 –0.087	0 –0.012	0.013 – 0.087	1.0	
		Angle	35	–0.025 –0.087	0 –0.012	0.013 – 0.087	1.0	
3	Clearance between cylinder bottom supporting shaft and bushing	Lift	40	–0.025 –0.087	+0.142 +0.080	0.105 – 0.229	1.0	
		Tilt	35	–0.025 –0.087	0 –0.012	0.013 – 0.087	1.0	
		Angle	35	–0.025 –0.087	0 –0.012	0.013 – 0.087	1.0	

KOMTRAX terminal

Model: TC530, TC630

- The KOMTRAX system uses mobile communication technology.



1. GPS antenna connection
2. Machine harness connection [AMP-18P]
3. Machine harness connection [AMP-12P]
4. Communication antenna connection

Input and output signals

AMP-18P [CN-K02]

Pin No.		Signal name	Input/ Output signal
A	1	NC (*)	—
	2	NC (*)	—
	3	NC (*)	—
	4	NC (*)	—
	5	NC (*)	—
	6	NC (*)	—
	7	DIS_L_2	Input
	8	DIS_L_1	Input
	9	NC (*)	—
	10	NC (*)	—
	11	NC (*)	—
	12	DIS_H_7	Input
	13	DIS_H_6	Input
	14	NC (*)	—
	15	NC (*)	—
	16	NC (*)	—
	17	NC (*)	—
	18	NC (*)	—

*: Never connect to NC, or malfunctions or failure will occur.

AMP-12P [CN-KOM]

Pin No.		Signal name	Input/ Output signal
B	1	GND	—
	2	GND	—
	3	PWR_CTR_KEY	Input
	4	AIS_V_0	Input
	5	AIS_V_1	Input
	6	PWR_IN_BATT	Input
	7	PWR_IN_BATT	Input
	8	DOS_L_0	Output
	9	DIS_L_CHK0	Input
	10	DIS_L_CHK1	Input
	11	DIS_H_0	Input
	12	AIS_V_2	Input

*: Never connect to NC, or malfunctions or failure will occur.

Outline

- This terminal sends various machine information based on the network signals and input signals in the machine, as well as GPS position data, via wireless communication.
  This terminal can send information via communication antenna.
- This terminal has LED lamps and 7-segment lamp indicator used for testing and troubleshooting on its display section.
- This terminal cannot be used in the countries or territories where it is not authorized by the law.

★ When starting to use the KOMTRAX system or changing the country where it is used, you are required to notify the country where it will be used in advance.

★ When using the KOMTRAX system in Japan, the terminal special to Japan must be mounted.

BULLDOZER

D21A-8E0
D21P-8E0

Machine model	Serial number
D21A-8E0	90001 and up
D21P-8E0	90001 and up

20 Standard value table
100 Standard service value table

Measuring engine speed

★ Tools for measuring engine speed.

Symbol	Part No.	Part name
A	799-205-1100	Tachometer kit

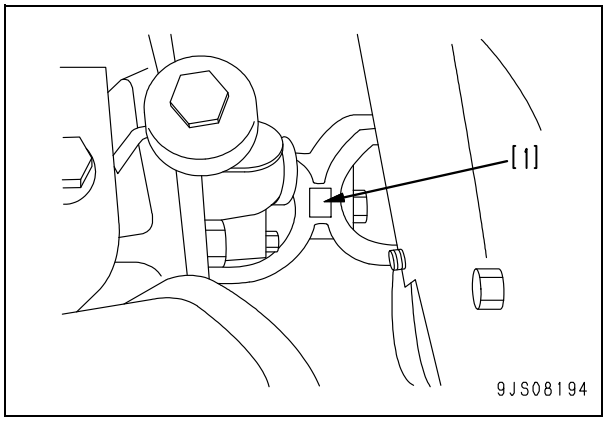
⚠ **Be careful not to touch any hot parts when installing or removing the measurement equipment.**

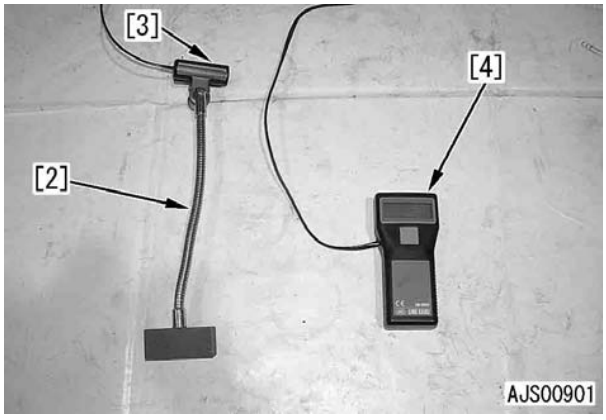
★ Measure the engine speed under the following conditions.
1) Coolant temperature: Within operating range
2) Power train oil temperature: 70 – 90°C
3) Hydraulic oil temperature: 45 – 55°C

1. Remove the floor plate from the foot of the operator's seat.

2. Stick reflection tape [1] of tachometer kit **A** to the universal joint.

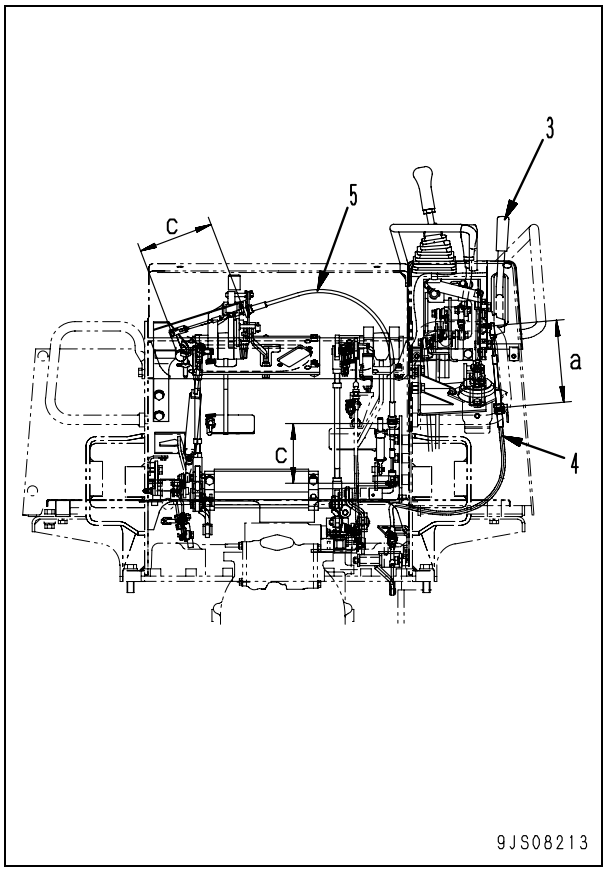
3. Set probe [3] with stand [2], matching it to reflection tape [1], and connect it to tachometer [4].

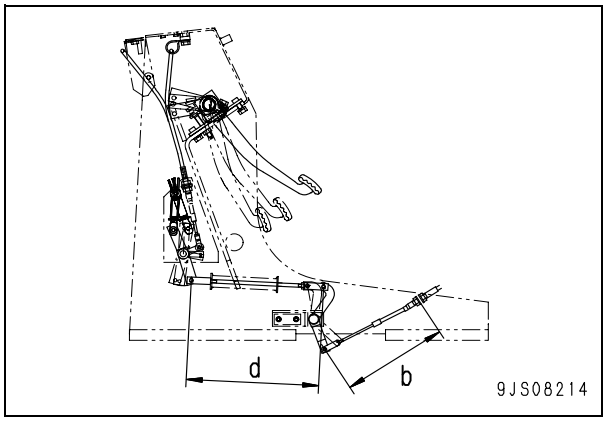


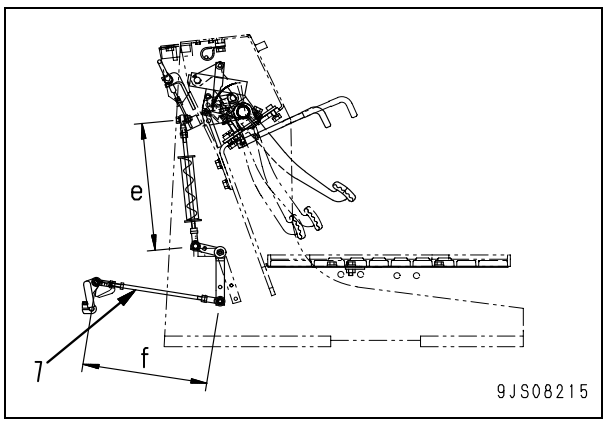


4. Start the engine and measure the engine speed at high idle and low idle.

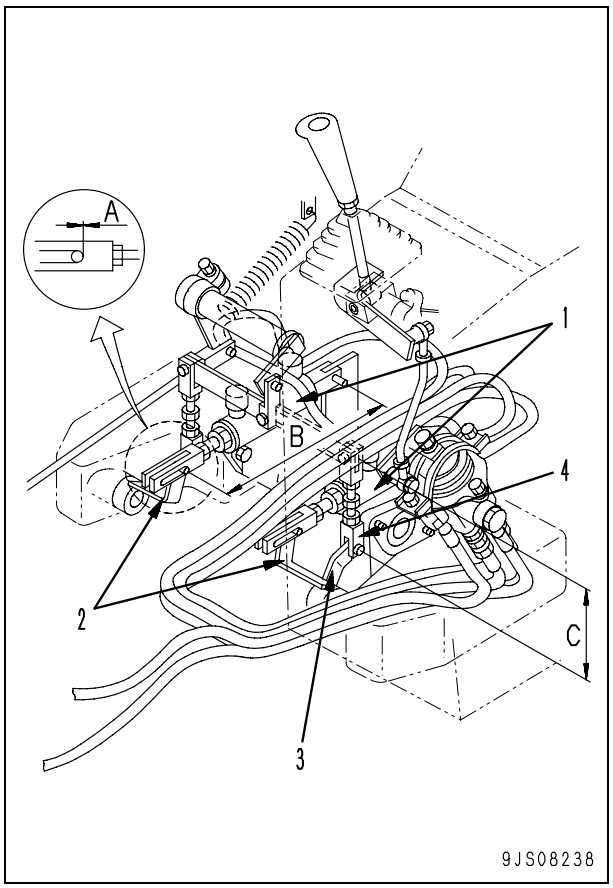
⚠ **Be careful not to touch any rotating parts when measuring the engine speed.**


3
5
c
a
c
4
9JS08213


d
b
9JS08214


e
7
f
9JS08215

Adjusting brake pedal, brake cylinder



⚠ Bend the cotter pin securely.

1. Connect brake cylinder (1) to lever (2).
- ★ Connect so that clearance (A) between the oblong hole in the yoke and the pin is 0 mm.
- ★ Standard length (B) (distance between pins): **258 mm**

2. Set brake lever (3) in a position where it does not move to the rear, then connect yoke (4).
- ★ Standard length (C) (distance between pins): **139.5 mm**

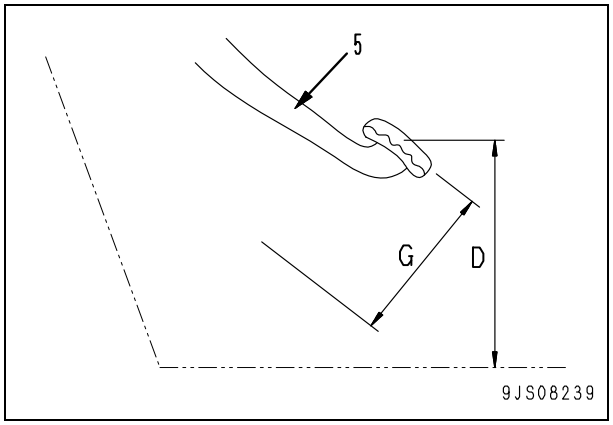
3. Adjust stopper bolt (6) so that distance of brake pedal (5) from the surface of the floor plate is standard dimension (D).
- ★ Standard dimension (D): 1**78 mm**

4. Connect rod (7).
- ★ Standard length (E) (distance between pins): **349.5 mm**

5. Connect rod (8).
- ★ Standard length (F) (distance between pins): **806.1 mm**

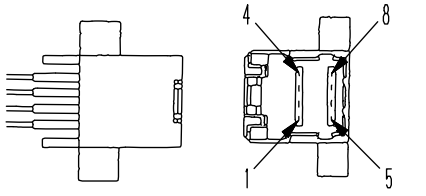
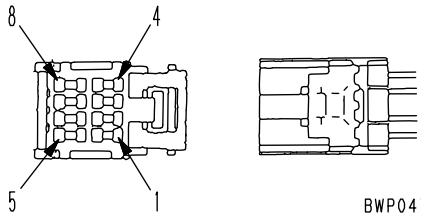
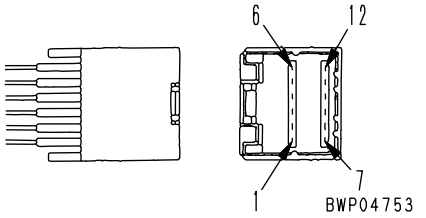
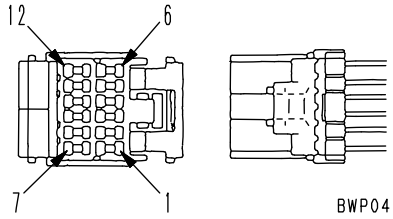
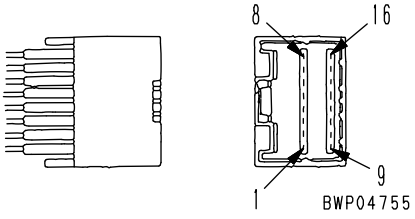
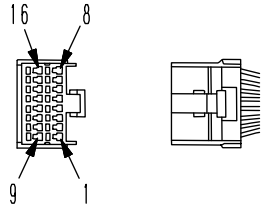
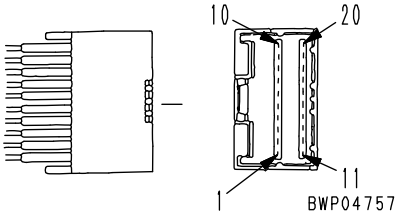
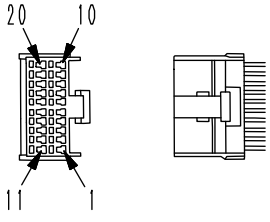
6. Adjust the brake lining clearance.
For details, see “Adjusting brake lining clearance”.

7. Check that the travel of brake pedal (5) is dimension (G).
- ★ Standard dimensions
  Dimension (G): **93 – 103 mm**
  (Depress force: 98 N {10 kg})
  Dimension (D): **178 mm**



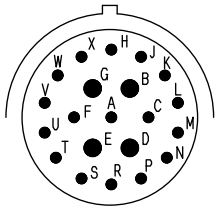
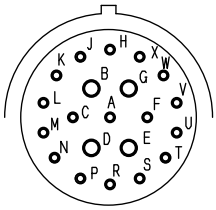
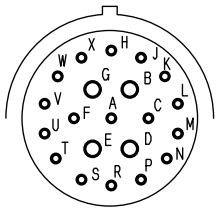
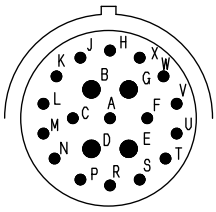
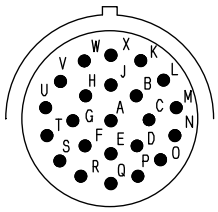
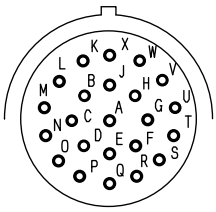
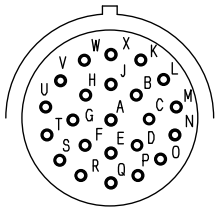
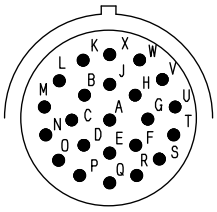
Types and locations of connectors

Connector No.	Type	Number of pins	Location
CN8	DT	2	Coolant temperature sensor
CN9	X	4	Safety relay
CN11	S	10	Intermediate connector
CN12	M	6	Intermediate connector
CN16	M	2	Intermediate connector
CN17	X	2	Service power supply
CN18	Terminal	1	Ground
CN20	KES	2	Horn
AC	PT	2	Intermediate connector (Air cleaner clogging sensor)
AC1	Terminal	1	Starting switch ACC
AC3	Terminal	1	Starting switch ACC
AC4	Terminal	1	Starting switch ACC
AL	M	2	Alternator terminals L and IG
ALB	Terminal	1	Alternator terminal B
ALP	M	1	Alternator terminal P
BO	Terminal	1	Ground
BB	X	2	Backup buzzer
BR	Terminal	1	Battery terminal (+)
BR1	Terminal	1	Starting switch terminal BR
BS	S	2	Backup buzzer
DY1	SWP	2	Diode
DY2	SWP	2	Diode
EN	DT	4	Intermediate connector (Engine stop solenoid, etc.)
FB	—	—	Fuse box
FS	DT	2	Fuel tank level sensor
FMW	YAZAKI	2	Night lighting (Fuel level gauge)
HE1	Terminal	1	Air heater relay (Contact outlet)
HE2	Connector	1	Air heater relay (Coil inlet)
HL	DT	2	Intermediate connector (Headlamp)
HL2	DT	2	Intermediate connector (Headlamp)
HLL	DT	3	Headlamp (Left)
HLR	DT	3	Headlamp (Right)

No. of pins	AMP040 type connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
8	 BWP04751	 BWP04752	799-601-7180 (T-adapter)
	—	Housing part No. : 79A-222-3430 (Q'ty:5)	
12	 BWP04753	 BWP04754	799-601-7190 (T-adapter)
	—	Housing part No. : 79A-222-3440 (Q'ty:5)	
16	 BWP04755	 BWP04756	799-601-7210 (T-adapter)
	—	Housing part No. : 79A-222-3450 (Q'ty:5)	
20	 BWP04757	 BWP04758	799-601-7220 (T-adapter)
	—	Housing part No. : 79A-222-3460 (Q'ty:5)	

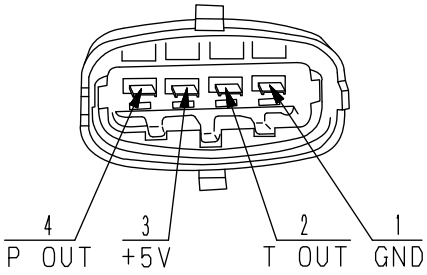
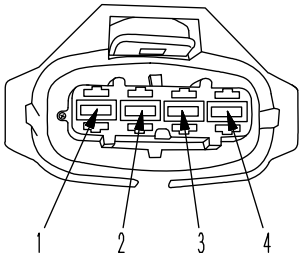
B4D18198

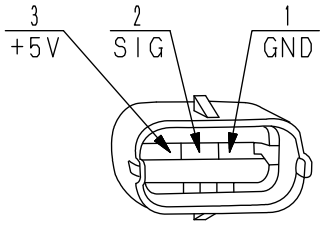
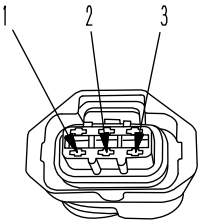
[The pin No. is also marked on the connector (electric wire insertion end)]

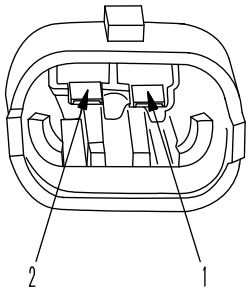
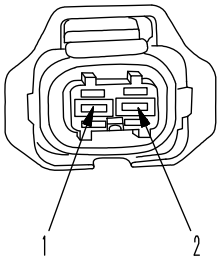
Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	Testing connection use special tool Part No.
24-21 (7)	Pin (male terminal)	Socket (female terminal)	799-601-9270 (T-adapter)
	 BWP05025	 BWP05026	
	Part No. :08191-71201, 08191-71202, 08191-71205, 08191-71206	Part No. :08191-74101, 08191-74102, 08191-74105, 08191-74106	
	Socket (female terminal)	Pin (male termial)	799-601-9270 (T-adapter)
	 BWP05027	 BWP05028	
	Part No. :08191-72201, 08191-72202, 08191-72205, 08191-72206	Part No. :08191-73101, 08191-73102, 08191-73105, 08191-73106	
24-23 (8)	Pin (male terminal)	Socket (female terminal)	799-601-9280 (T-adapter)
	 BWP05029	 BWP05030	
	Part No. :08191-81201, 08191-81202, 08191-81203, 08191-81204, 08191-81205, 08191-80206	Part No. :08191-84101, 08191-84102, 08191-84103, 08191-84104, 08191-84105, 08191-84106	
	Socket (female terminal)	Pin (male termial)	799-601-9280 (T-adapter)
	 BWP05031	 BWP05032	
	Part No. :08191-82201, 08191-82202, 08191-82203, 08191-82204, 08191-82205, 08191-82206	Part No. :08191-83101, 08191-83102, 08191-83103, 08191-83104, 08191-83105, 08191-83106	

B4D18408

BOSCH connector for engine

No. of pins	Boost (air intake) pressure and temperature sensor (95 engine)		Testing connection use special tool Part No.
	Sensor side (plug)	Harness side (receptacle)	
4			799-601-4380 (Socket)
	—	—	

No. of pins	Common rail (fuel) pressure sensor (95, 107, 114 engine)		
	Sensor side (plug)	Harness side (receptacle)	
3			799-601-4190 (Socket) (Kit:799-601-4101) (Kit:799-601-4201)
	—	—	

No. of pins	Fuel supply pump (95, 107 engine) and fuel injector (95 engine)		
	Valve side (plug)	Harness side (receptacle)	
2			799-601-4340 (Socket) (Kit:799-601-4101) (Kit:799-601-4201)
	—	—	

B4D18418

Part No.	Part name	Number of pins	Identification symbol	T-adapter kit													Out of kit
				799-601-2500	799-601-2700	799-601-2800	799-601-7000	799-601-7100	799-601-7400	799 - 601 - 7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	799-601-4101	799-601-4201	
795-799-5530*	Socket for engine (HPI-T2) Socket for engine (CRI-T3) Temperature sensor	2	C													●	●	
795-799-5540*	Socket for engine (HPI-T2) Socket for engine(CRI-T3) TIM	2	A													●	●	
795-799-5460	Cable for engine (HPI-T2)	3	—															●
795-799-5470	Cable for engine (HPI-T2)	3	—															●
795-799-5480	Cable for engine (HPI-T2)	3	—															●
799-601-4110	Adapter for engine (140-T3) PIM	4	ITT3N													●	●	
799-601-4130	Adapter for engine (CRI-T3) NE, CAM	3	FCIN													●	●	
799-601-4140	Adapter for engine (CRI-T3) Atomosphere pressure	3	FCIG													●	●	
799-601-4150	Adapter for engine (CRI-T3) POIL	3	FCIB													●	●	
799-601-4160	Adapter for engine (CRI-T3) Oil pressure switch	2	4160													●	●	
799-601-4180	Adapter for engine (CRI-T3) PEVA	3	4180													●	●	
799-601-4190*	Socket for engine (CRI-T3) Common rail pressure	3	1,2,3L													●	●	
799-601-4230*	Socket for engine (CRI-T3) Air intake pressure/temperature	4	1,2,3,4C													●	●	
799-601-4240*	Socket for engine (CRI-T3) PAMB	3	1,2,3A													●	●	
799-601-4250*	Socket for engine (CRI-T3) PIM	3	1,2,3B													●	●	
799-601-4330*	Socket for engine (CRI-T3) G	3	1,2,3,G													●	●	
799-601-4340*	Socket for engine (CRI-T3) Pump actuator	2	2,PA													●	●	
799-601-4380*	Socket for engine (CRI-T3)(95) Air intake pressure/temperature	4	1,2,3,4T															●
799-601-4260	Adapter for controller (ENG)	4	DTP4													●	●	
799-601-4211	Adapter for controller (ENG)	50	DRC50													●		
799-601-4220	Adapter for controller (ENG)	60	DRC60													●		
799-601-4390*	Socket for controller (95 ENG)	60	—															●
799-601-4280*	Box for controller (PUMP)	121	—															●
799-601-9720	Adapter for controller (HST)	16	HST16A															●
799-601-9710	Adapter for controller (HST)	16	HST16B															●
799-601-9730	Adapter for controller (HST)	26	HST26A															●
799-601-9890	Multi-adapter for DT2 – 4 and DTM2	2, 3, 4	—															●

"*" Shows not T-adapter but socket.

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	7	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect related connector or terminal. 3) Set safety lock switch (limit switch) in LOCK position.		
			Between fuse (5) – CN12 (3) – EN (1) – S01 (female) (2) or TMR (female) (4) or TMR (female) (4) or SR2 (female) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between S01 (female) (2) – S02 (1) – SR3 (female) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between wiring harness between TMR (female) (1) – SR1 (female) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between wiring harness between TMR (female) (2) – SR1 (female) (2) wiring harness and chassis ground	Resistance	Min. 1 MΩ

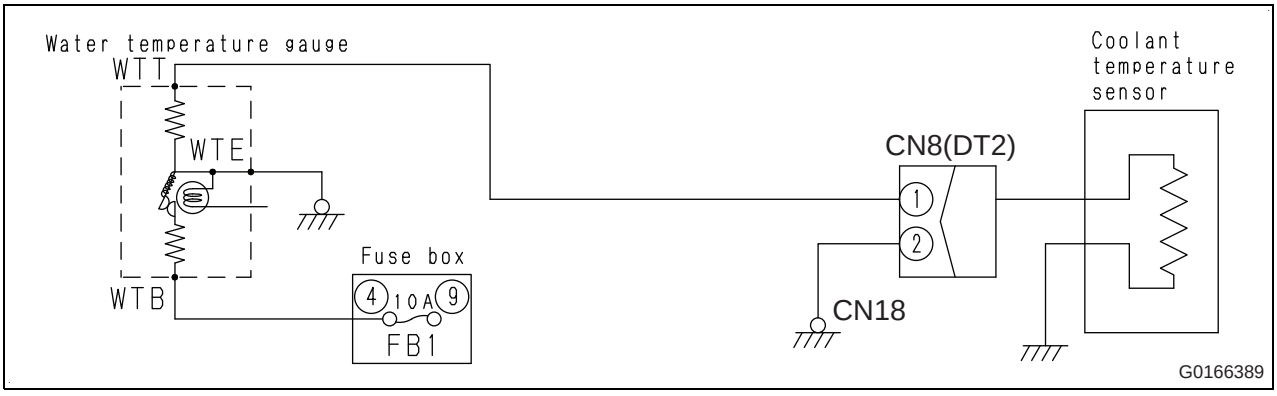
E-7 The coolant temperature gauge is abnormal (Applicable machine: 91564 and up)

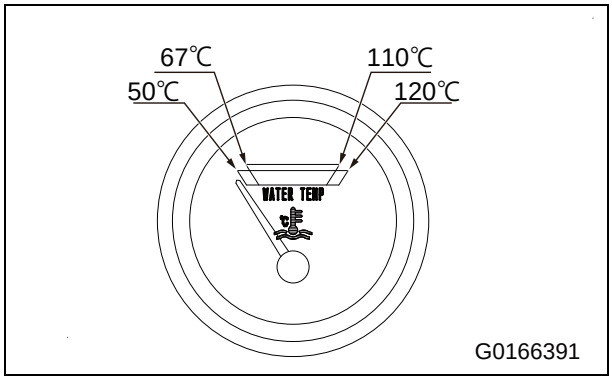
1) The point of the gauge does not move from “C” on the panel

Trouble	• When the starting switch is turned ON, the pointer of the gauge does not move from the “C” or “H” position on the panel or its indication is largely deviated from the actual temperature.
Related information	• Check that the coolant temperature is normal. • When the starting switch is turned OFF, the pointer of the gauge does not move from the “C” position. This does not indicate abnormality. • Refer to troubleshooting E-1, too.

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	1) Turn starting switch OFF. 2) Disconnect connectors CN8 and CN11. 3) Connect T-adapters to female side of CN8 and CN11 (female).		
			Wiring harness between CN8 (female) (1) – CN11 (male) (2)	Resistance	Max. 1 Ω
			Wiring harness between CN8 (female) (2) – chassis ground	Resistance	Max. 1 Ω
	2	Defective coolant temperature sensor	1) Turn starting switch OFF. 2) Disconnect connector CN8. 3) Connect T-adapter to male aside of CN8.		
			CN8 (male)	Temperature	Resistance
			Between (1) and (2)	50°C	305-456 Ω
				80°C	112-155 Ω
				100°C	62-85 Ω
				120°C	37-47 Ω
				150°C	18-23 Ω

Related circuit diagram





Example 3

Troubleshooting 1 → Abnormal
Troubleshooting 2 → Abnormal
Troubleshooting 3 → Normal

The chart for example 3 shows that the cause is (a), (c), or (e).

Continue to the next troubleshooting item.

Chart for example 3	Cause				
	a	b	c	d	e
Remedy / Problem	X	C	△ X	A	X
1	●	●	●	●	
2			●		●
3		⊘		⊘	
4	○			○	
5		○			○

Troubleshooting 4 → Normal
Troubleshooting 5 → Normal

The chart for example 3-1 shows that the cause is (c).

Chart for example 3 - 1	Cause				
	a	b	c	d	e
Remedy / Problem	X	C	△ X	A	X
1	●	●	●	●	
2			●		●
3		⊘		⊘	
4	⊘			⊘	
5		⊘			⊘

Example 4

Troubleshooting 1 → Abnormal
Troubleshooting 2 → Normal

The chart for example 4 shows that the cause is (a), (b), or (d).

Chart for example 4	Cause				
	a	b	c	d	e
Remedy / Problem	X	C	△ X	A	X
1	●	●	●	●	
2			⊘		⊘
3		○		○	
4	○			○	
5		○			○

Continue to the next troubleshooting item.

Troubleshooting 3 → Abnormal
Troubleshooting 4 → Abnormal
Troubleshooting 5 → Normal

The chart for example 4-1 shows that the cause is (a) or (d).

As the above examples show, it is not always necessary to carry out all the troubleshooting checks.

Even if one of the causes has several ●s, if it has only one ⊘, that cause can be removed from the list of possibilities.

Chart for example 4 - 1	Cause				
	a	b	c	d	e
Remedy / Problem	X	C	△ X	A	X
1	●	●	●	●	
2			⊘		⊘
3		●		●	
4	●			●	
5		⊘			⊘

H-14 Blade cannot be tilted

Ask the operator the following questions

- Did the problem start suddenly?
  Yes = Parts seized, broken
- Was any abnormal sound heard when this happened? Where did the sound come from?
  Yes = Parts broken
- Had there been any symptoms before (drop in speed, etc.)?
  Yes = Parts worn, spring deteriorated

Checks before troubleshooting

- Is oil level in hydraulic tank correct?
- Is stroke of work equipment control lever and control valve spool correct?

No.	Problems \ Remedy	Causes								
		Pump		Control valve			Cylinder	Solenoid valve	Electrical system	
		a	b	c	d	e	f	g	h	i
		Pump does not drive	Defective pump	Oil leakage from piping between pump and control valve	Drop in set pressure of main relief valve, aperture clogged, defective sealing	Oil leakage from piping between control valve and tilt cylinder	Defective tilt cylinder packing	Twisted solenoid valve spool	Short circuit in knob switch	Short circuit in wiring
		△ ×	×	△ ×	A C ×	△ ×	×	C ×	×	×
1	When plug is removed from pressure pickup port and engine is cranked, no oil comes out	○								
2	When engine is run at high idle, there is almost no rise in hydraulic pressure in the blade tilt circuit		○	○	○	○				
3	When engine is run at high idle and blade is raised to maximum height, there is almost no rise in relief pressure		○	○						
4	When engine is run at high idle and blade is raised to maximum height, relief pressure is normal				○	○				
5	When piping is removed from side of tilt cylinder to which tilting is impossible, and control lever is operated to side to which tilting is impossible with engine at low idle, oil comes out from side to which tilting is impossible but cylinder does not move					○				
6	When there is load, discharge amount of hydraulic pump is almost zero	○	○							
7	Tilt and angle do not work, but lift is normal							○		
8	Tilt does not work, but angle is normal							○	○	○

Troubleshooting tools	Hydraulic tester	
	Flowmeter kit	

×: Replace △: Repair
A: Adjust C : Clean

The basic method of using the troubleshooting chart is as follows.
Items listed for **[Questions]** and **[Check items]** that have a relationship with the Cause items are marked with ○, and of these, causes that have a high probability are marked with ◎.
Check each of the **[Questions]** and **[Check items]** in turn, and marked the ○ or ◎ in the chart for items where the problem appeared. The vertical column (Causes) that has the highest number of points is the most probable cause, so start troubleshooting for that item to make final confirmation of the cause.

*1. For **[Confirm recent repair history]** in the **[Questions]** Section, ask the user, and mark the Cause column with △ to use as reference for locating the cause of the failure. However, do not use this when making calculations to narrow down the causes."
*2. Use the △ in the Cause column as reference for **[Degree of use (Operated for long period)]** in the **[Questions]** section as reference. As a rule, do not use it when calculating the points for locating the cause, but it can be included if necessary to determine the order for troubleshooting.

			Causes						
			Seized turbocharger, interference	Clogged air cleaner element	Worn piston ring, cylinder	Clogged, seized injection nozzle	Improper injection timing	Defective injection pump (excessive injection)	
*1	Confirm recent repair history								
*2	Degree of use	Operated for long period		△	△	△			

S-6 Engine lacks output (no power)

General causes why engine lacks output

- Insufficient intake of air
- Insufficient supply of fuel
- Improper condition of fuel injection
- Use of improper fuel
  (if non-specified fuel is used, output drops)
- Lack of output due to overheating
  - ★ If there is overheating and insufficient output, carry out troubleshooting for overheating.

			Causes											
			Clogged air cleaner element	Worn piston ring, cylinder	Clogged fuel filter, strainer	Clogged feed pump gauze filter	Clogged injection nozzle, defective spray	Seized injection pump plunger	Improper valve clearance	Defective contact of valve, valve seat	Bent fuel lever linkage, defective adjustment	Clogged, leaking fuel piping	Clogged fuel tank air breather hole
Questions	Confirm recent repair history												
	Degree of use	Operated for long period	△	△	△	△				△			
	Power was lost	Suddenly											
		Gradually	○	○	○	○	○			○			
	Engine oil must be added more frequently			◎									
	Replacement of filters has not been carried out according to operation manual		◎		◎	◎							
	Non-specified fuel has been used				◎	◎	◎	◎					
	Dust indicator is red		◎										
Check items	Color of exhaust gas	Black	◎										
		Blue under light load		◎									
	Blow-by gas is excessive			◎									
	Engine pickup is poor and combustion is irregular						○					○	○
	High idle speed under no load is normal, but speed suddenly drops when load is applied				◎	◎							○
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low						◎	○					
	There is hunting from engine (rotation is irregular)				○	○						○	○
	Clanging sound is heard from around cylinder head								◎				
	High idle speed of engine is low							○			◎		
	Leakage from fuel piping											◎	
Troubleshooting	When air cleaner element is inspected directly, it is found to be clogged		●										
	When compression pressure is measured, it is found to be low			●						●			
	When fuel fitter, strainer are inspected directly, they are found to be clogged				●								
	When feed pump gauze filter is inspected directly, it is found to be clogged					●							
	Speed of some cylinders does not change when operating on reduced cylinders						●						
	When control rack is pushed, it is found to be heavy or does not return							●					
	When valve clearance is checked directly, it is found to be outside standard value								●				
	When lever is placed at FULL position, it does not contact stopper										●		
	When feed pump is operated, operation is too light or too heavy											●	
	When fuel cap is inspected directly, it is found to be clogged												●
		Remedy	Clean	Replace	Clean	Clean	Repair	Replace	Adjust	Replace	Adjust	Repair	Clean

S-16 Vibration is excessive

★ If there is abnormal noise together with the vibration, carry out troubleshooting for “Abnormal noise is made”.

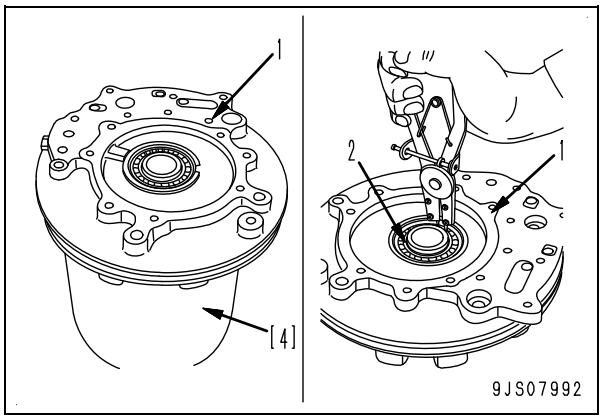
General causes why vibration is excessive
- Defective parts (abnormal wear, breakage)
- Improper alignment
- Abnormal combustion

			Causes									
			Worn connecting rod, main bearing	Worn balancer, cam bushing	Worn support pilot	Loose engine mounting bolts, broken cushion	Broken part inside output shaft (damper)	Misalignment between engine and power train	Improper gear train backlash	Valve system (valve, rocker lever, etc.) stuck	Defective injection pump (excessive injection)
Questions	Confirm recent repair history										
	Degree of use	Operated for long period	△	△	△	△					
	Condition of vibration	Suddenly increased					○			○	
		Gradually increased	○	○	○	○					
Check items	Non-specified fuel has been used		○	○							
	Metal particles are found in oil filter		◎	◎							
	Metal particles are found when oil is drained		◎	◎							
	Oil pressure is low at low idle		○	○							
	Vibration occurs at mid-range speed					○	○				
	Vibration follows engine speed				○	○	○	○	○		
	Exhaust gas is black									◎	○
	Seal on injection pump has come off										◎
Troubleshooting	Remove oil pan and check directly		●								
	Remove side cover and check directly			●							
	Check directly for worn support pilot, play				●						
	Check directly for loose engine mounting bolts, broken cushion					●					
	Check inside of output shaft (damper) directly						●				
	When radial runout, face runout are measured, they are found to be outside standard							●			
	Remove front cover and check directly								●		
	Remove head cover and check directly									●	
	Injection pump test shows that injection amount is incorrect										●
		Remedy	Replace	Replace	Replace	Replace	Replace	Repair	Repair	Replace	Adjust

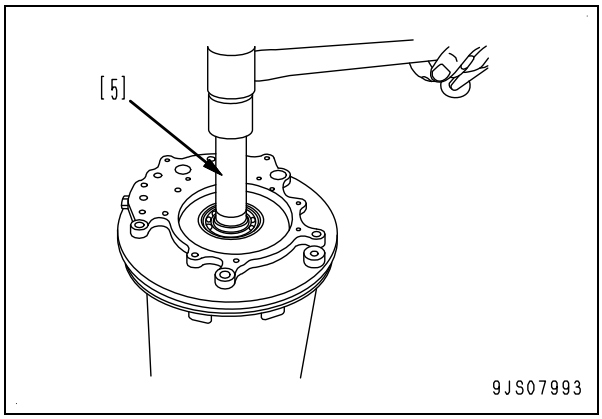
Disassembly of No.1 housing and carrier assembly

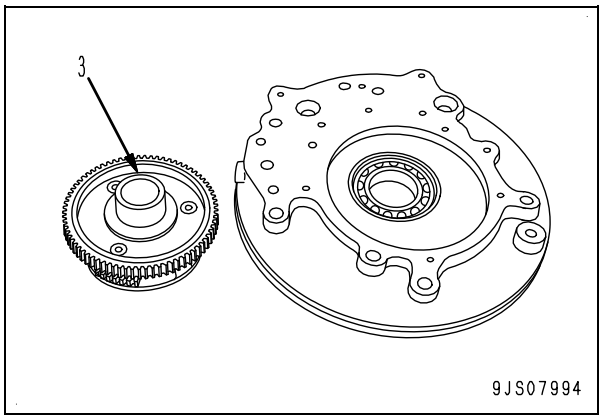
1. Set No.1 housing and carrier assembly (1) on block [4] (height: approx. 150 mm).

2. Remove snap ring (2).

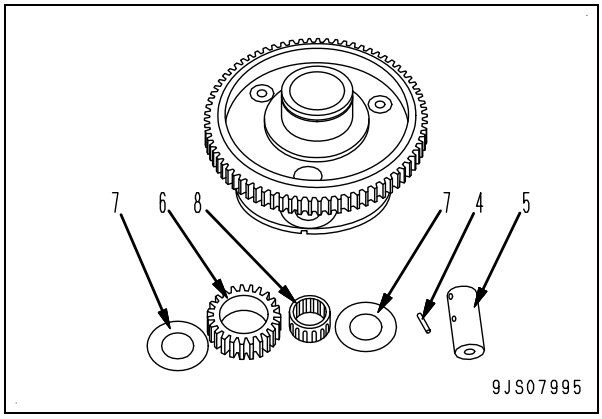


3. Using push tool [5] (outside diameter: 45 mm) pull out No.1 carrier assembly (3).



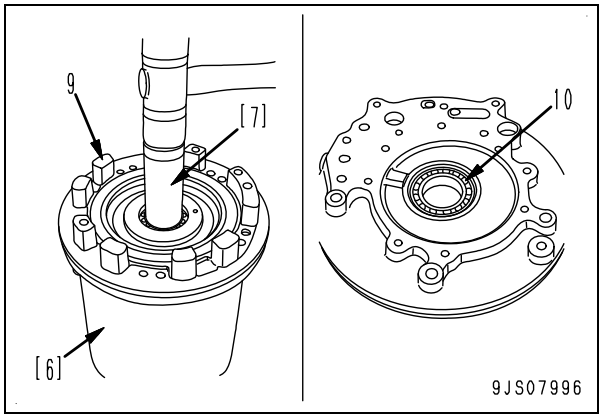


4. **Disassembly of No.1 carrier assembly**
   1) Pull out roll pin (4), and pull out shaft (5).
   2) Remove pinion gear (6) and thrust washer (7), then remove needle bearing (8) from gear.

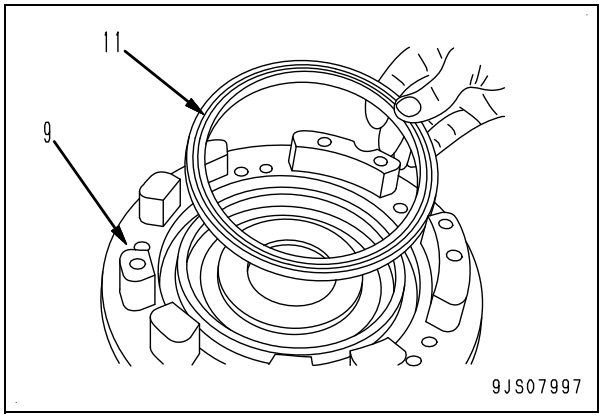


5. Turn over No.1 housing assembly (9) and set on block [6].

6. Using push tool [7] (outside diameter: 60 mm), pull out bearing (10).

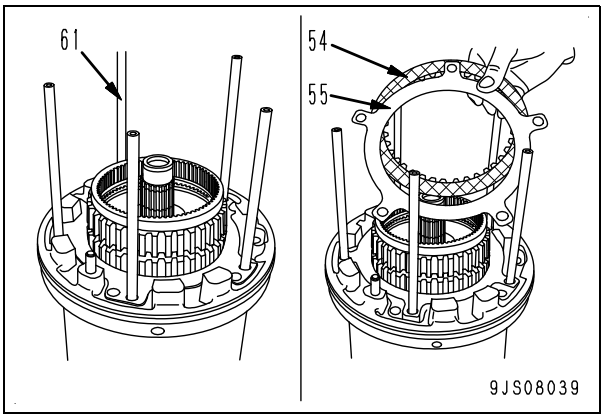


7. Remove No.1 piston (11) from No.1 housing assembly (9).



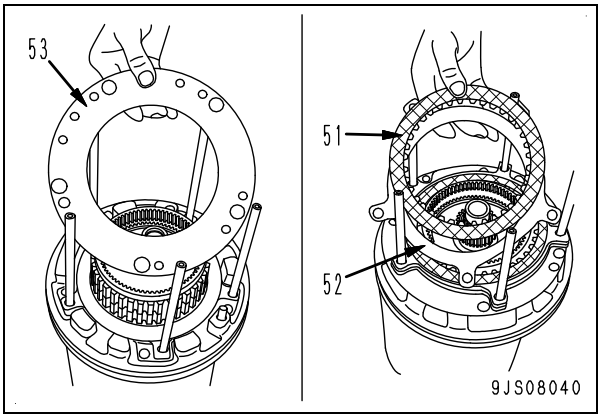
14. Install guide pin (61).

15. Install discs (54) and plates (55) in turn.
    - ★ Plates: 2
    - ★ Discs: 2

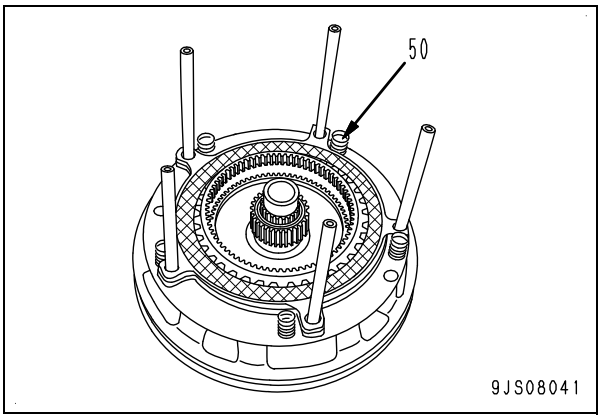


16. Install plate (53).

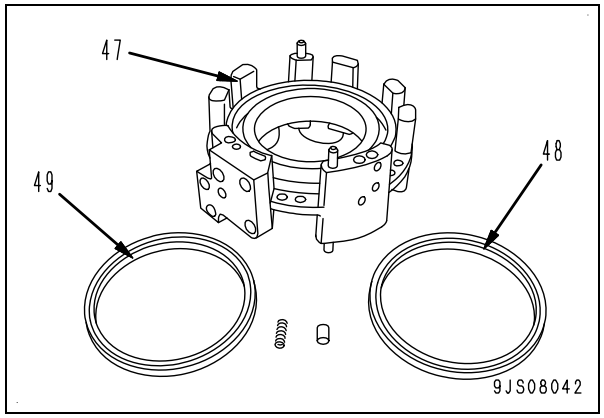
17. Install plates (52) and discs (51) in turn.
    - ★ Plates: 3
    - ★ Discs: 3



18. Install springs (50).
    - ★ Free height of spring: 59 mm (× 5)

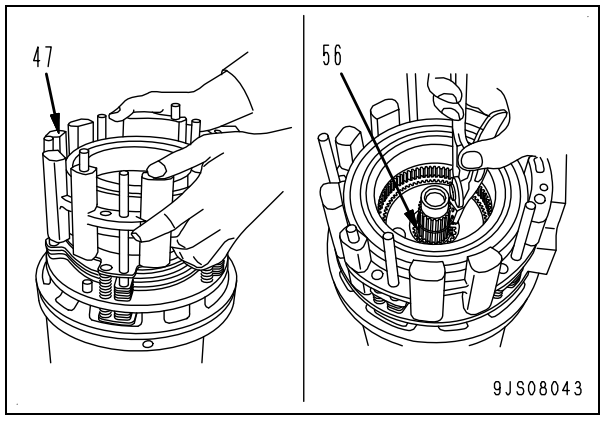


19. Install No.2 and 3 pistons (49) and (48) to No.2 and 3 housing assembly (47).



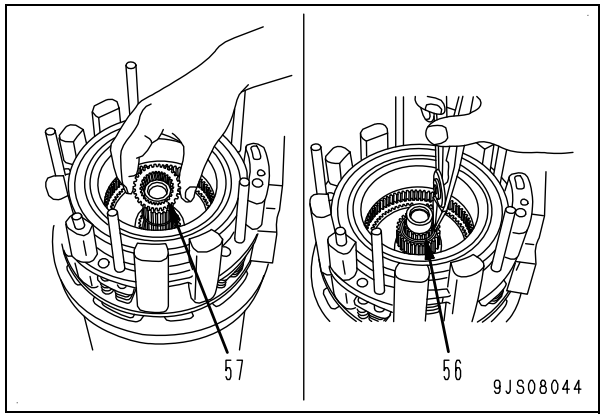
20. Install No.2 and 3 housing assembly (47).
    - ★ Check the direction of the sleeve mounting hole.
    - ★ Hit the dowel pin area with a plastic hammer until there is no clearance between No.4 housing and No.2 and 3 housing.

21. Install 2 snap rings (56).



22. Install sun gear (57).

23. Install snap ring (56).



BULLDOZER

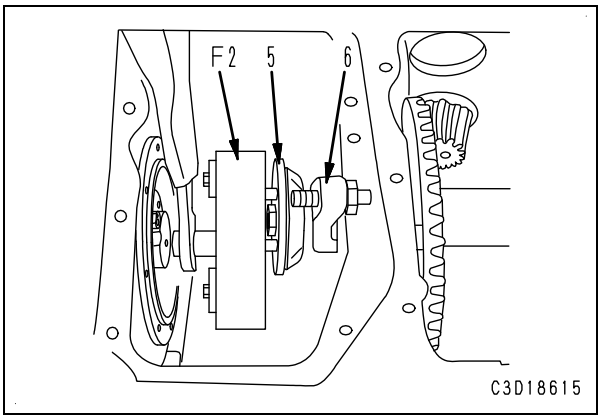
D21A-8E0
D21P-8E0

Machine model	Serial number
D21A-8E0	90001 and up
D21P-8E0	90001 and up

50 Disassembly and assembly
320 Power train, Part 2

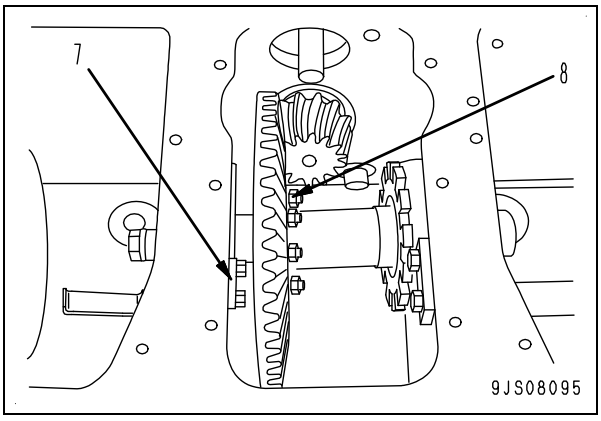
6. Using tool **F2,** pull out hub (5).

7. Remove release yoke (6).

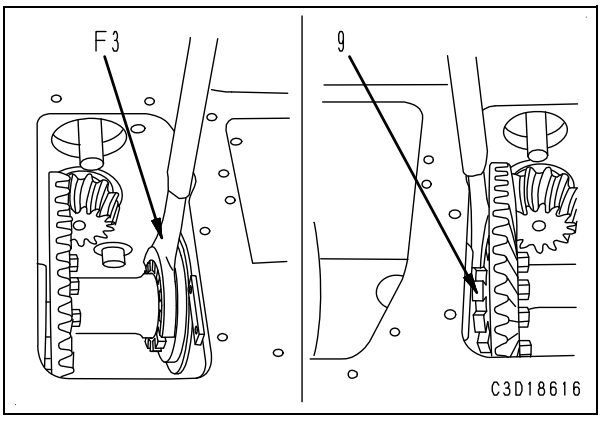


8. Remove lock plate (7) of adjustment nut.

9. Loosen bolt (8).
   ★ When removing the bevel gear, the nut is difficult to loosen, so loosen it at this point.

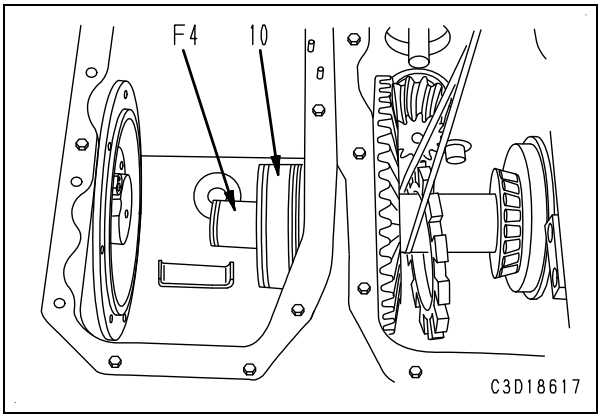


10. Using tool **F3**, remove left and right adjustment nuts (9).



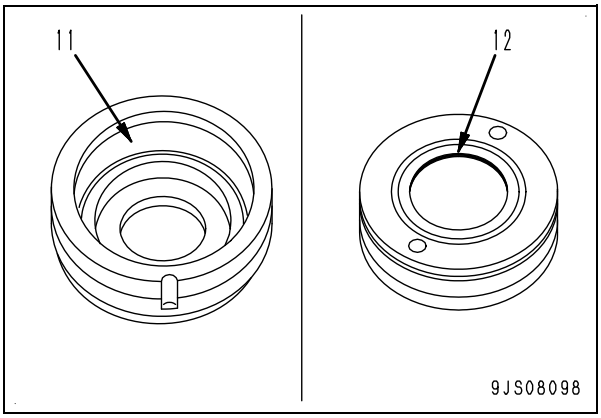
11. Sling bevel gear assembly, and set tool **F4** in position.

12. Screw bolts (Thread dia. = 8 mm, Pitch = 1.25 mm) into bearing cage (10), support with a bar, then hit with a hammer at the opposite end to knock out.

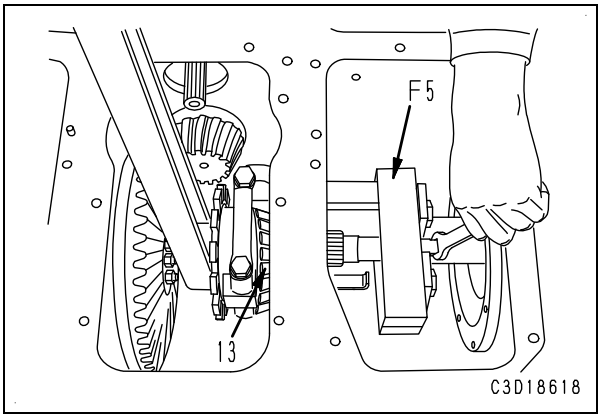


13. Pull out bearing outer race (11).

14. Pull out oil seal (12).

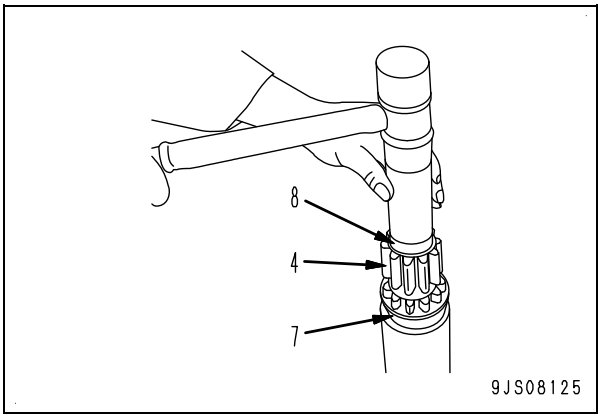


15. Using tool **F5**, pull out right bearing (13).
   ★ Be careful not to damage the oil seal contact surface of the shaft or the O-ring contact surface of the steering case.



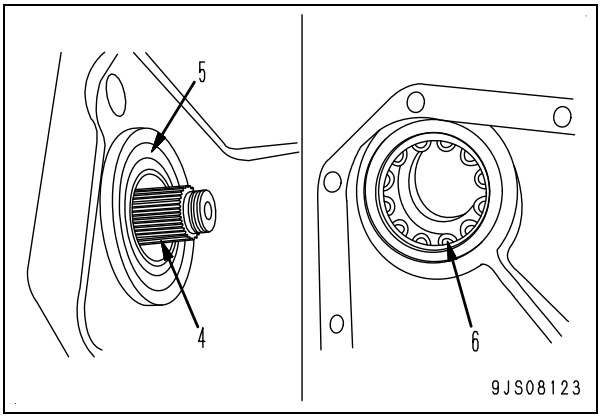
Installation

1. Press fit inner races (7) and (8) to pinion gear (4).
   ★ Inside diameter of inner race (8): **35 mm**
   ★ Inside diameter of inner race (7): **55 mm**



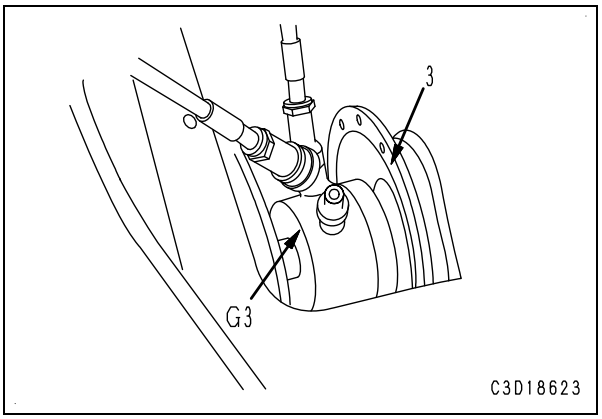
2. Press fit oil seal (5) and bearing (6) to case end.
   ★ Outside diameter of bearing: **120 mm**
   ★ Outside diameter of oil seal: **90 mm**
   Lip of oil seal: **Grease G2-LI)**

3. Install first pinion assembly (4).

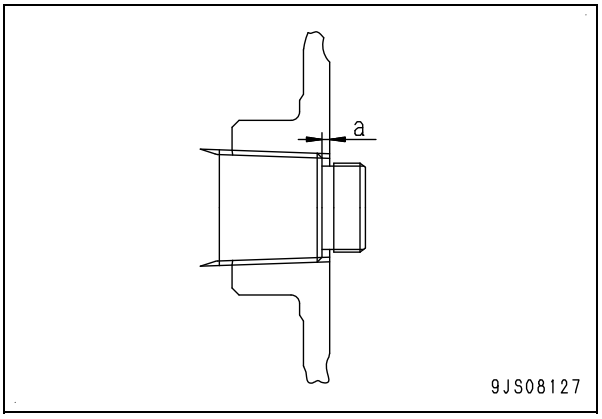


4. Install final drive assembly.
   For details, see “Removal and installation of final drive assembly”.

5. Press fit flange (3) with tool **G3**.
   ★ Flange press-fitting force:
   98.1 kN {10 tons}
   Serration:
   Molybdenum disulfide lubricant (LM-P)
   ★ Coat thinly with molybdenum disulfide lubricant.



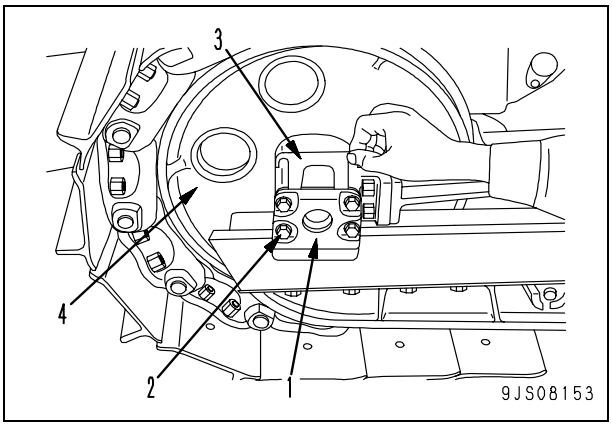
6. After press-fitting flange, measure dimension (a) of stepped portion of shaft and end face of flange.
   ★ Dimension (a): 2 (+1.6/-0.4) mm



Removal and installation of recoil spring assembly

Removal

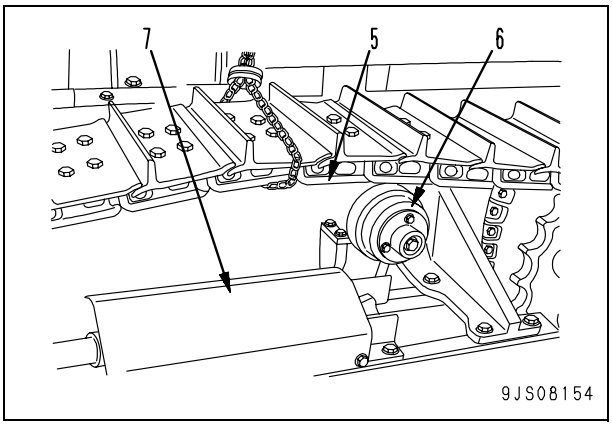
1. Loosen mounting bolts (2) of inside and outside guide plates (1), pull out adjustment shim (3), then tighten mounting bolts again to secure idler assembly (4). [*1]



2. Raise track shoe assembly (5) with lever block.

3. Remove carrier roller assembly (6). [*2]

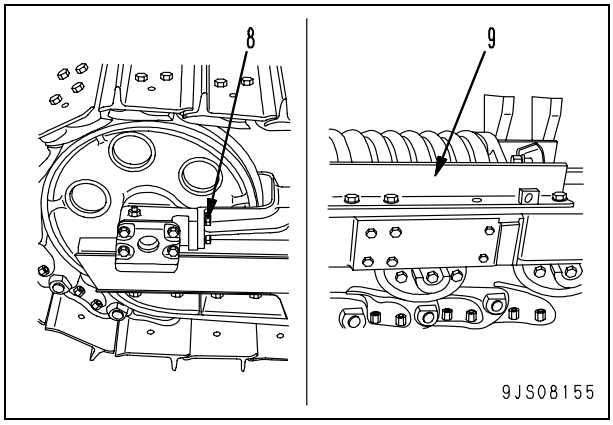
4. Remove cover (7). [*3]

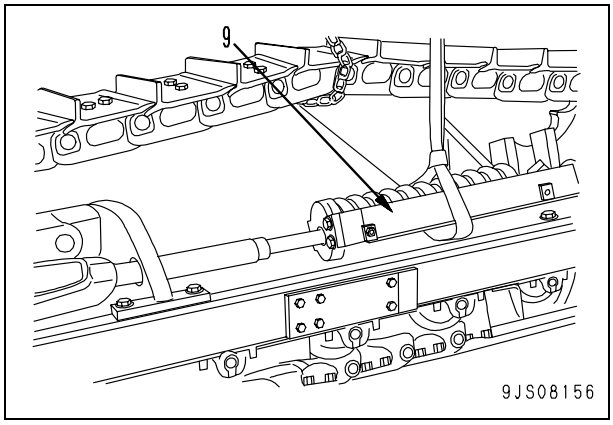


5. Remove yoke mounting bolts (8), raise with bar, then lift off recoil spring assembly (9). [*4]

★ Be careful not to damage the oil seal.

Recoil spring assembly: **40 kg**





Installation

- Carry out installation in the reverse order to removal.

[*1]

Plate mounting bolt thread portion: **Thread tightener (LT-2)**

★ Standard clearance between track frame and guide plate: **0 – 0.5 mm**

[*2]

Thread of mounting bolt for carrier roller: **Thread tightener (LT-2)**

[*3]

Thread of mounting bolt for cover: **Thread tightener (LT-2)**

[*4]

Oil seal: **Grease (G2-LI)**

★ When inserting the yoke rod, be careful not to damage the oil seal.

Thread of mounting bolt for recoil spring bracket: **Thread tightener (LT-2)**

BULLDOZER

D21A-8E0
D21P-8E0

Machine model	Serial number
D21A-8E0	90001 and up
D21P-8E0	90001 and up

50 Disassembly and assembly
600 Work equipment

Power train hydraulic circuit diagram

F2-R2 transmission