SEN06803-04

Shop Manual

COMPACT
HYDRAULIC
EXCAVATOR

PC18MR-5

SERIAL NUMBERS 30001 and up

KOMATSU

Symbols

Important safety and quality portions are marked with the following symbols so that shop manual is used effectively.

Symbol	Item	Remark
	Danger	This signal indicates an extremely hazardous situation which will result in death or serious injury if it is not avoided.
	Warning	This signal indicates a potentially hazardous situation which will result in death or serious injury if it is not avoided.
	Caution	This signal indicates a potentially hazardous situation which will result in injury or property damage around the machine if it is not avoided.
	Weight	This signal indicates the weight of parts and components, and items which requires great attention to a selection of wires and working posture for slinging work.
	Tightening torque	This signal indicates the tightening torque for portions which requires special care in assembling work.
	Coat	This signal indicates a place to be coated with adhesive, grease, etc. in assembling work.
	Oil and coolant	This signal indicates a place to supply oil, coolant, etc. and the quantity.
	Draining	This signal indicates a place to drain oil, coolant, etc. and the quantity.
	Safety	This symbol indicates the works which require special caution for the machine safety when assembling.

Signal word

Signal word for notice and remark describes the following.

Symbol	Item	Remark
NOTICE	Notice	If the precaution of this signal word is not observed, the machine damage or shortening of service life may occur.
REMARK	Remark	This signal word contains useful information to know.

Unit

International System of Units (SI) is used in this manual. For reference, units that have been used in the past are given in { }.

- When there are thatched houses, dry leaves or pieces of paper near the work site, set the system to disable the regeneration before starting work to prevent fire hazards due to highly heated exhaust gas caused by KDPF regeneration.
  See the Operation and Maintenance Manual for the setting procedure.

Explosion caused by lighting equipment

- When checking fuel, oil, battery electrolyte, or coolant, always use lighting equipment with anti-explosion specifications.
- When taking the electrical power for the lighting equipment from the machine, follow the instructions in the Operation and Maintenance Manual.

- Bend the cotter pins and lock plates securely.
- When applying adhesive, clean and degrease the surface to apply, and apply 2 to 3 drops of adhesive to the threaded portion.
- When applying liquid gasket, clean and degrease the surface, and apply it uniformly after making sure that the surface is free from dust or damage.
- Clean all of the parts. If there is any damage, dents, burrs, or rust found on them, repair it.
- Apply engine oil to the rotating parts and sliding surface.
- Apply molybdenum disulfide lubricant (LM-P) to the surfaces of the press-fitting parts.
- After installing the snap ring, check that the snap ring is settled in the ring groove completely.
- When connecting wiring harness connectors, clean the connectors to remove oil, dust, or water, then connect them securely.
- Use the eye bolts without fatigue and deformation and screw them in securely. Match the directions of the eyes and the hook.
- When installing split flanges, tighten the bolts uniformly and alternately to prevent uneven tightening.
- As a rule, apply liquid gasket (LG-5) or liquid sealant (LS-2) to the threaded portion of each taper male screws which receive pressure.

  REMARK

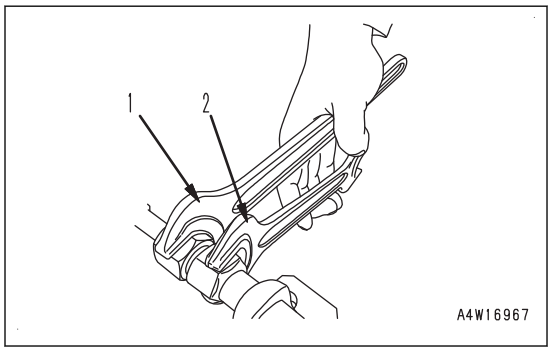
  If the threaded portion is difficult to degrease, you may use a seal tape.

  When winding a seal tape onto a right-handed taper male screw, start winding the screw clockwise from the third thread in the advancing direction of the threads seeing from the screw end.

  NOTICE

  If the seal tape is wound counterclockwise, it may become loose when screwed in, and it may come off. If the sealed tip is pushed outside, it may cause oil leakage.

- To connect the face seal type hose to the cylinder tube connected to the cylinder with the face joint seal, tighten it by gripping the two wrenches together, one is the wrench (1) on the hose side, and the other is the wrench (2) on the cylinder tube reaction force point as shown in the following figure. Use the grip strength only. Check after the hose is connected that the joint portion of the cylinder and the cylinder tube is tightened to the specified torque. Re-tighten it if the tightening torque is insufficient.



  NOTICE

  Cylinder tube is rotated due to the load applied to the reaction force point of the cylinder tube, and it is a cause of weakening of the tightening torque. It may lead to oil leakage.

NOTICE

When assembling the hydraulic equipment such as cylinders, pumps and pipings which are removed, be sure to bleed air from the hydraulic circuit before operating it for the first time according to the following procedure.

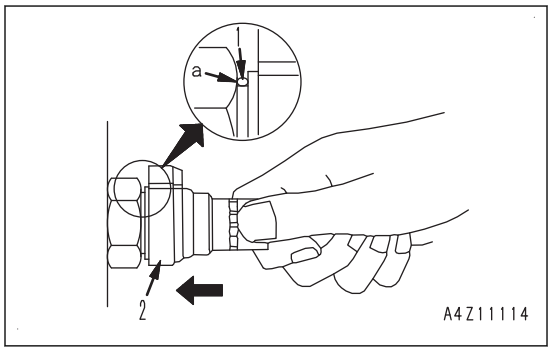
1. Start the engine, and run it at low idle.
2. Perform the operation to extend and retract each cylinder of the work equipment and stop it at approximately 100 mm before the stroke end for 4 or 5 times.
3. Perform the operation to extend and retract each cylinder of the work equipment and stop it at the stroke end for 3 or 4times.

NOTICE

After repair is finished, when operating the machine which has been stored for a long period, bleed air from the hydraulic circuit according to the same procedure.

Connection

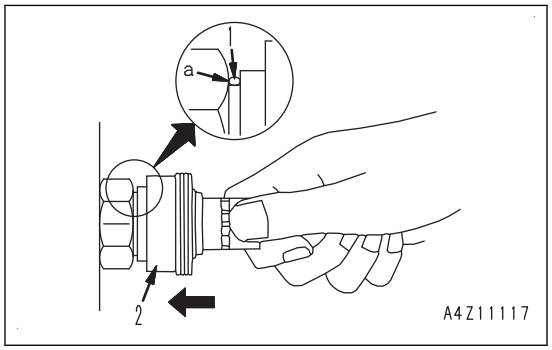
Hold the tightening adapter part, and push body (2) straight until sliding prevention ring (1) contacts contact surface (a) of the hexagonal part at the male end.



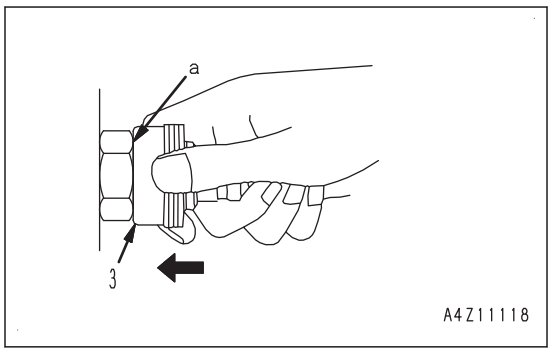
METHOD FOR DISCONNECTING AND CONNECTING TYPE 3 PUSH-PULL TYPE COUPLER

Disconnection

1. Hold the tightening adapter part and push body (2) straight until sliding prevention ring (1) contacts contact surface (a) of the hexagonal part at the male end.



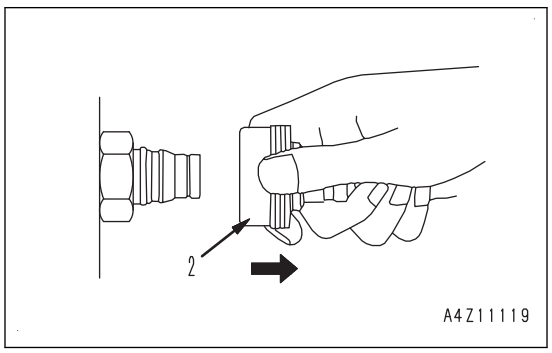
2. While keeping the condition of step 1, push cover (3) straight until it contacts contact surface (a) of the hexagonal portion on the male side.



3. While keeping the conditions of steps 1 and 2, pull out whole body (2) to disconnect it.

   REMARK

   Provide an container to receive a quantity of hydraulic oil which may flow out.

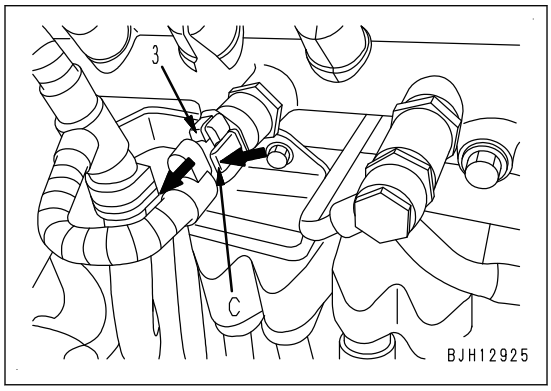


METHOD FOR DISCONNECTING AND CONNECTING CONNECTOR WITH LOCK TO PUSH

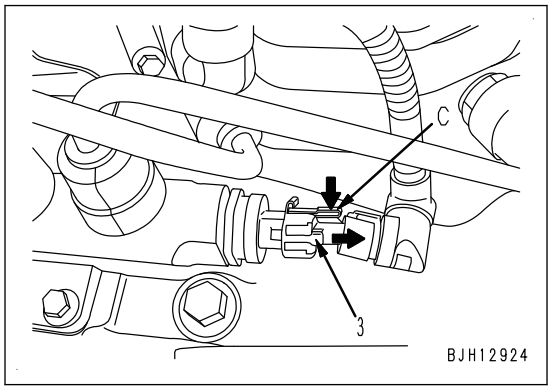
Method for disconnecting connector with lock to push (BOSCH-3)

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

- 114 series



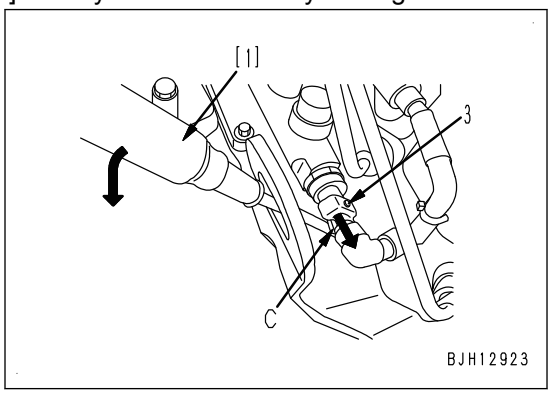
- 107 series



REMARK

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

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



Method for connecting connector with lock to push (BOSCH-3)

Insert it straight until it clicks.

CONVERSION TABLE

Method of using the conversion table

The conversion table is provided to enable simple conversion of the numerical numbers between the different units. For further details of the method of using the conversion table, see the examples given below.

Examples of using the conversion table to convert a unit from mm to in.

When converting 55 mm to in

1. Locate the number 50 in the leftmost column, take this as (A), and then draw a horizontal line from (A).
2. Locate the number 5 in the top row, take this as (B), then draw a vertical line down from (B).
3. Take the crossover point of the two lines as (C). This point (C) gives the value when converting the unit from mm to in. Accordingly, 55 mm = 2.165 in.

When converting 550 mm to in

1. The number 550 does not appear in the table. Divide it by 10 (move the decimal point one place to the left) to get 55 mm.
2. Convert 55 mm to 2.165 in according to the preceding procedure.
3. The original value (550 mm) has been divided by 10, so multiply 2.165 in by 10 (move the decimal point one place to the right) to restore the target value. This gives 550 mm = 21.65 in

mm to in

(B)

1 mm = 0.03937 in

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

(A)

mm to in

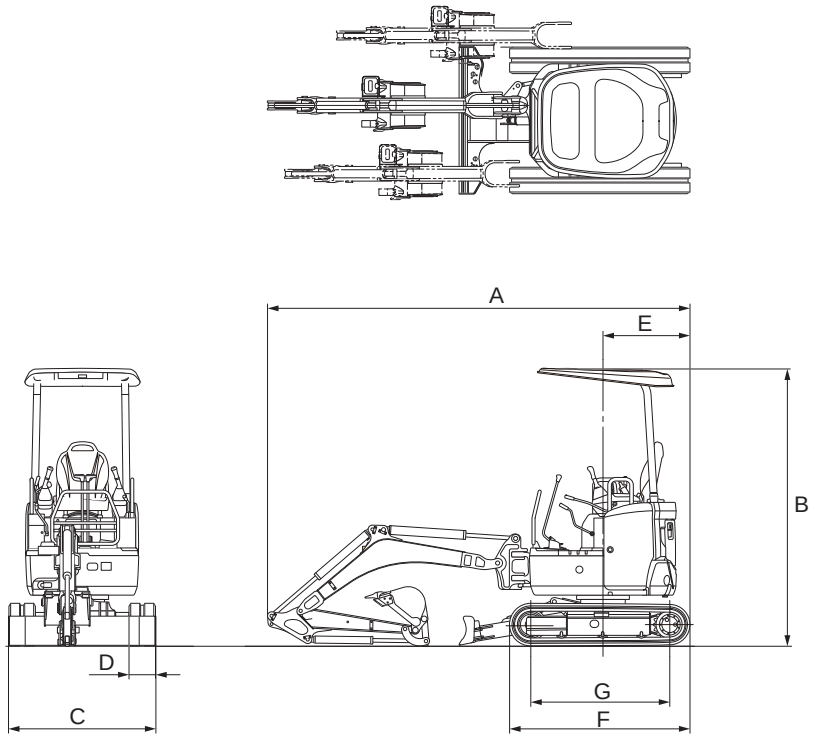
1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0	0	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323

SPECIFICATIONS

SPECIFICATION DRAWING

SPECIFICATION DRAWING: PC18MR-5



G0079333

	Item	Unit	PC18MR-5
	Machine weight Rubber shoe specification Steel shoe specification	kg	 1820 1910
	Bucket capacity	m^3	0.044
	Engine model	-	Komatsu 3D67E-2 diesel engine
	Engine rated horsepower • SAE J1995 (gross) • ISO 14396 • ISO 9249/SAE J1349 (net)	kW{HP}/ min^{-1}{rpm}	 11.8{15.8}/2600{2600} 11.8{15.8}/2600{2600} 11.4{15.3}/2600{2600}
A	Overall length	mm	3670
B	Overall height	mm	2410
C	Overall width (*1)	mm	1280(990)
D	Shoe width	mm	230
E	Tail swing radius	mm	715
F	Overall length of the track	mm	1570

FUEL, COOLANT, LUBRICANT

USE FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE

Reservoir	Fluid type	Recommended Komatsu Fluids	Ambient temperature °C {°F}	
			Min.	Max.
Engine oil pan	Engine oil	EO30-DH	0 {32}	40 {104}
		EO10W30-DH	-20 {-4}	40 {104}
		EO15W40-DH	-15 {5}	40 {104}
Final drive case	Power train oil	TO30	-20 {-4}	40 {104}
Hydraulic system	Power train oil	TO10	-30 {-22}	40 {104}
	Hydraulic oil	HO46-HM	-20 {-4}	40 {104}
	Biodegradable Hydraulic oil (Note 1)	BO46-G4	-20 {-4}	40 {104}
Grease fitting	Hyper grease (Note 2)	G0-T	-20 {-4}	40 {104}
		G2-T	-10 {14}	40 {104}
	Lithium EP grease	G0-LI	-20 {-4}	40 {104}
		G2-LI	-20 {-4}	40 {104}
		G2-LI-S	-30 {-22}	30 {86}
	Biodegradable grease (Note 1) (Note 3)	G2-BT	-20 {-4}	40 {104}
Cooling system	Non-Amine Engine Coolant (AF-NAC) (Note 4)	AF-NAC	-30 {-22}	40 {104}
Fuel tank	Diesel fuel	ASTM D975 No.1–D S15 or S500	-30 {-22}	20 {68}
		ASTM D975 No.2–D S15	0 {32}	40 {104}

Lubrication portion	Specified capacity (ℓ {US gal})	Refill capacity (ℓ {US gal})
Engine oil pan	3.6 {0.95}	3.3 {0.87}
Final drive case (each of right and left)	0.3 {0.08}	0.3 {0.08}
Hydraulic oil system	23.8 {6.29}	15.2 {4.02}
Cooling system	3.1 {0.82}	-
Fuel tank	19 {5.02}	-

REMARK

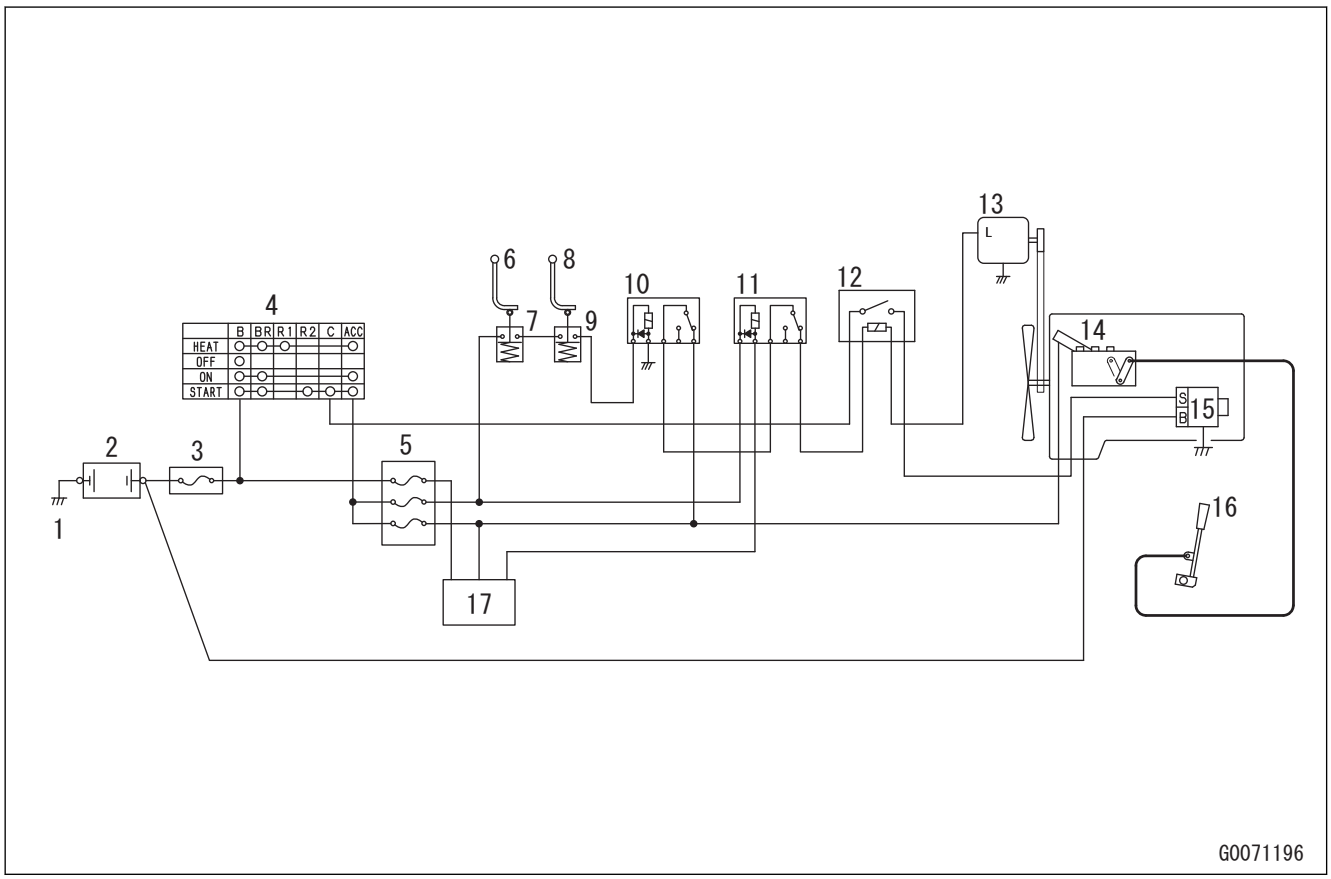
Specified capacity is the total quantity of fluid that includes the fluid in the tank and the piping. Refill capacity is the quantity of fluid needed to fill the system during inspection and maintenance.

Note 1: When environment preservation is important in river works, marine and shore works, forest works, etc., recommend use of bio hydraulic oil and bio-grease. If you use bio-hydraulic oil, the fuel economy decreases a little. When you use it, consult your Komatsu distributor.

Note 2: Hyper white grease (G0-T, G2-T) is high-performance white grease. We recommend use of G0-T or G2-T in the cases that follow.

ENGINE CONTROL SYSTEM

SYSTEM DIAGRAM OF ENGINE CONTROL



1: Ground cable of battery
2: Battery
3: Fusible link
4: Starting switch
5: Fuse box
6: Lock lever (left)
7: Lock switch (left)
8: Lock lever (right)
9: Lock switch (right)
10: Stating motor cut-off relay
11: Personal code relay
12: Engine safety relay
13: Alternator
14: Engine stop solenoid
15: Starting motor
16: Fuel adjustment lever
17: KOMTRAX terminal

OPERATION OF ENGINE CONTROL SYSTEM

Engine start operation

- In this system, when the starting switch (4) is turned to the "ON" position, the engine stop solenoid (14) moves the governor stop lever to the "DRIVE" side, and the engine stops if a trouble is found in the electrical system. This is a fail-safe mechanism.
- When the starting switch (4) is turned to the "START" position while the lock levers (6) and (8) are in the LOCK positions, the starting current is supplied to the starting motor (15) to start the engine.
  While the lock lever (6) or (8) is in the FREE position, the starting motor cut-off relay (10) activates to cut off the starting current to the starting motor (15) and the engine does not start. This is a neutral safety mechanism.

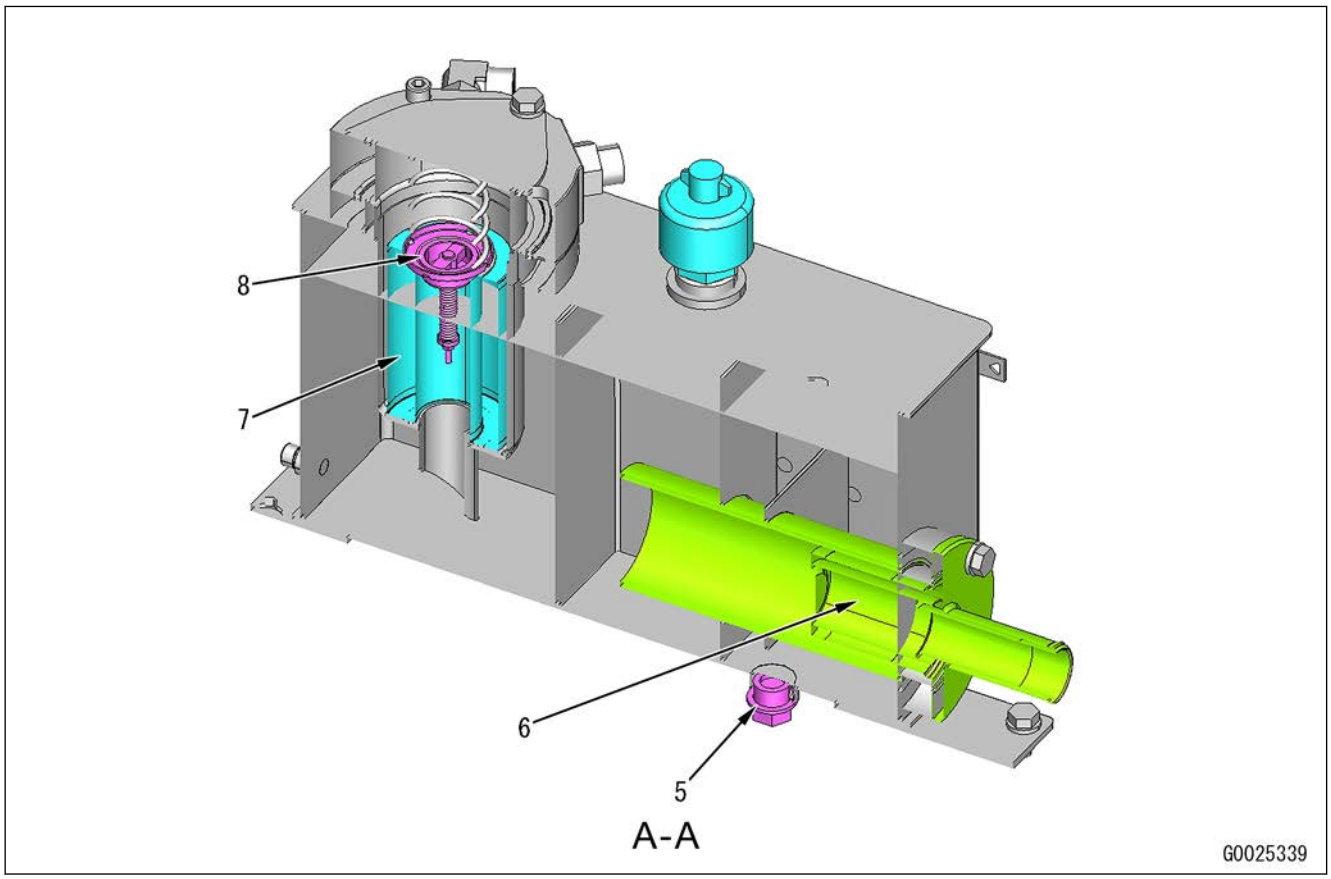
CAUTION LAMPS SHOWN ON MACHINE MONITOR

Symbol	Display item	Range for display	Method for display	Color	Light source
 G0006427	Electrical system	If a trouble is found in the system	If a trouble is found: Lit or flash	Red	LED
 G0000233	Engine oil pressure	Below specified pressure	If a trouble is found: Flash		
 G0000232	Charge level	When charging is not sufficient	If a trouble is found: Flash		
 G0006368	Seat belt	When seat belt is not fastened	Not fastened: Lit		

PILOT LAMPS SHOWN ON MACHINE MONITOR

Symbol	Display item	Range for display	Method for display	Color	Light source
 G0000246	Preheating	During preheating	During operation: Flash (18 seconds)	Green	LED
 G0025719	Travel speed increase	When travel speed increases	When increases: Lit	Orange	
 G0025718	Lock lever	When work equipment is locked	Locked: Lit	Red	

Sectional view



5: Drain plug
6: Strainer
7: Filter
8: Bypass valve

SPECIFICATIONS OF HYDRAULIC TANK

Hydraulic tank capacity: 17.6 ℓ

Hydraulic tank refill capacity: 14.3 ℓ

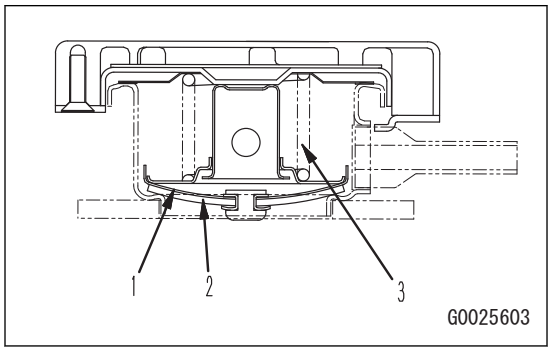
Bypass valve set pressure: 0.25±0.05 MPa {2.5±0.5 kg/cm^2}

HYDRAULIC TANK OIL FILLER CAP

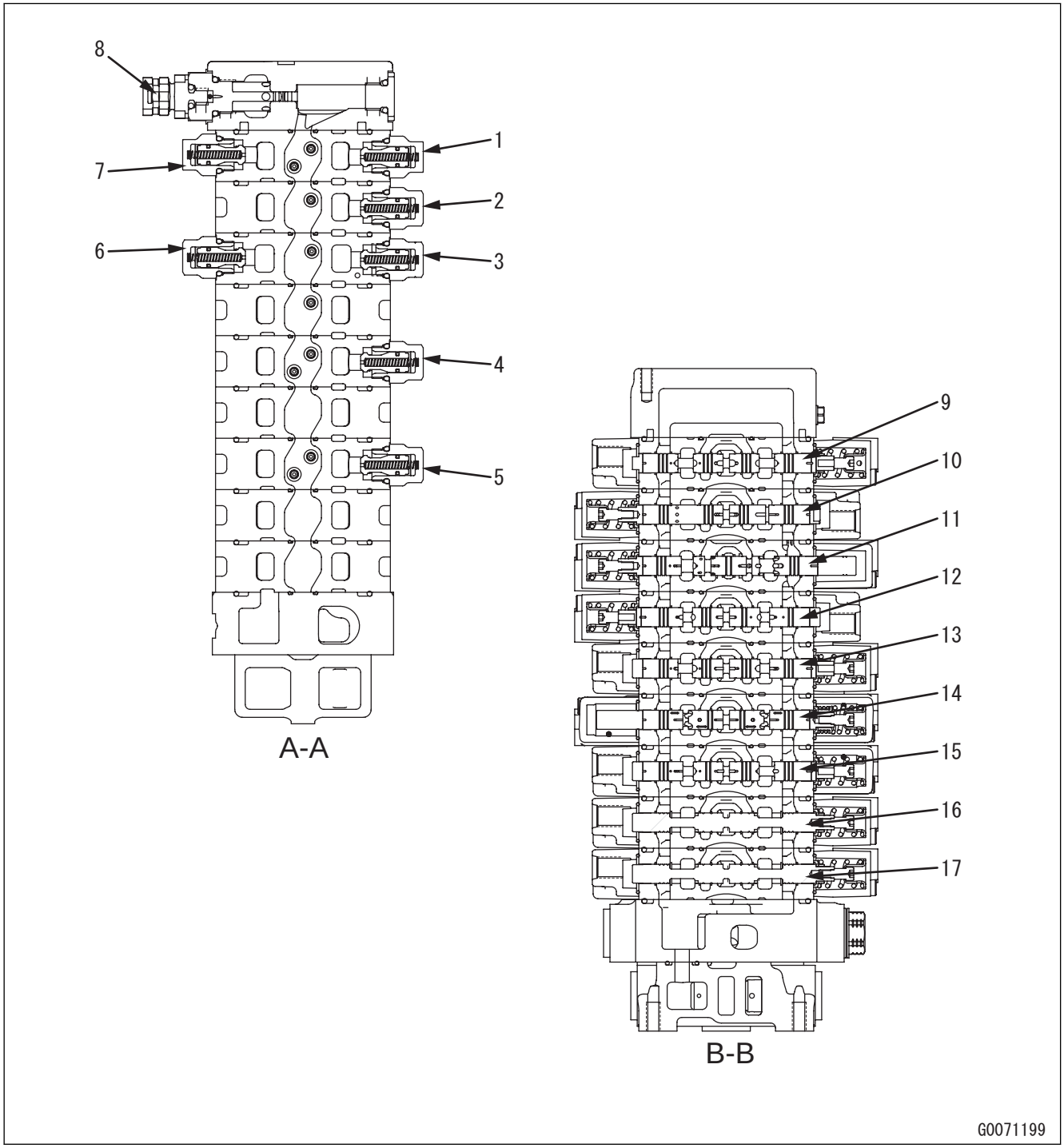
STRUCTURE OF OIL FILLER CAP OF HYDRAULIC TANK

Sectional view

1: Bottom plate
2: Gasket
3: Spring



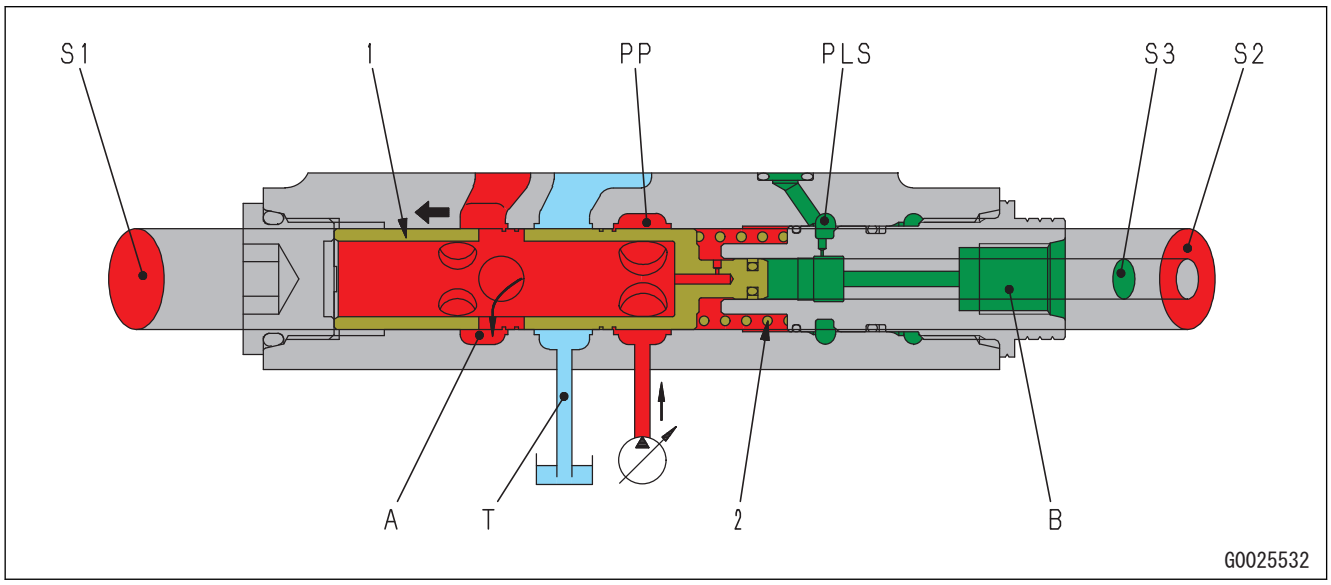
Sectional view (A-A, B-B)



1: Suction valve (attachment)
2: Suction valve (boom swing head)
3: Suction valve (boom bottom)
4: Suction valve (bucket head)
5: Suction valve (arm bottom)
6: Suction valve (boom head)
7: Suction valve (attachment)
8: Safety valve
9: Spool (attachment)
10: Spool (boom swing)
11: Spool (boom)
12: Spool (blade)
13: Spool (bucket)
14: Spool (swing)
15: Spool (arm)
16: Spool (right travel)
17: Spool (left travel)

3. The differential pressure between the pump discharged pressure (PP) and LS pressure (PLS) reaches the set pressure (1.76 MPa {18.0 kg/cm^2}) of the spring (2).
4. The spool (1) moves to the right, and the pump circuit (PP) is connected to the tank circuit (T).
5. The pump pressure (PP) is set to the set pressure of the spring (2) (1.76 MPa {18.0 kg/cm^2}) + LS pressure (PLS).
6. The LS differential pressure (△PLS) becomes the set pressure of the spring (2) (1.76 MPa {18.0 kg/cm^2}).

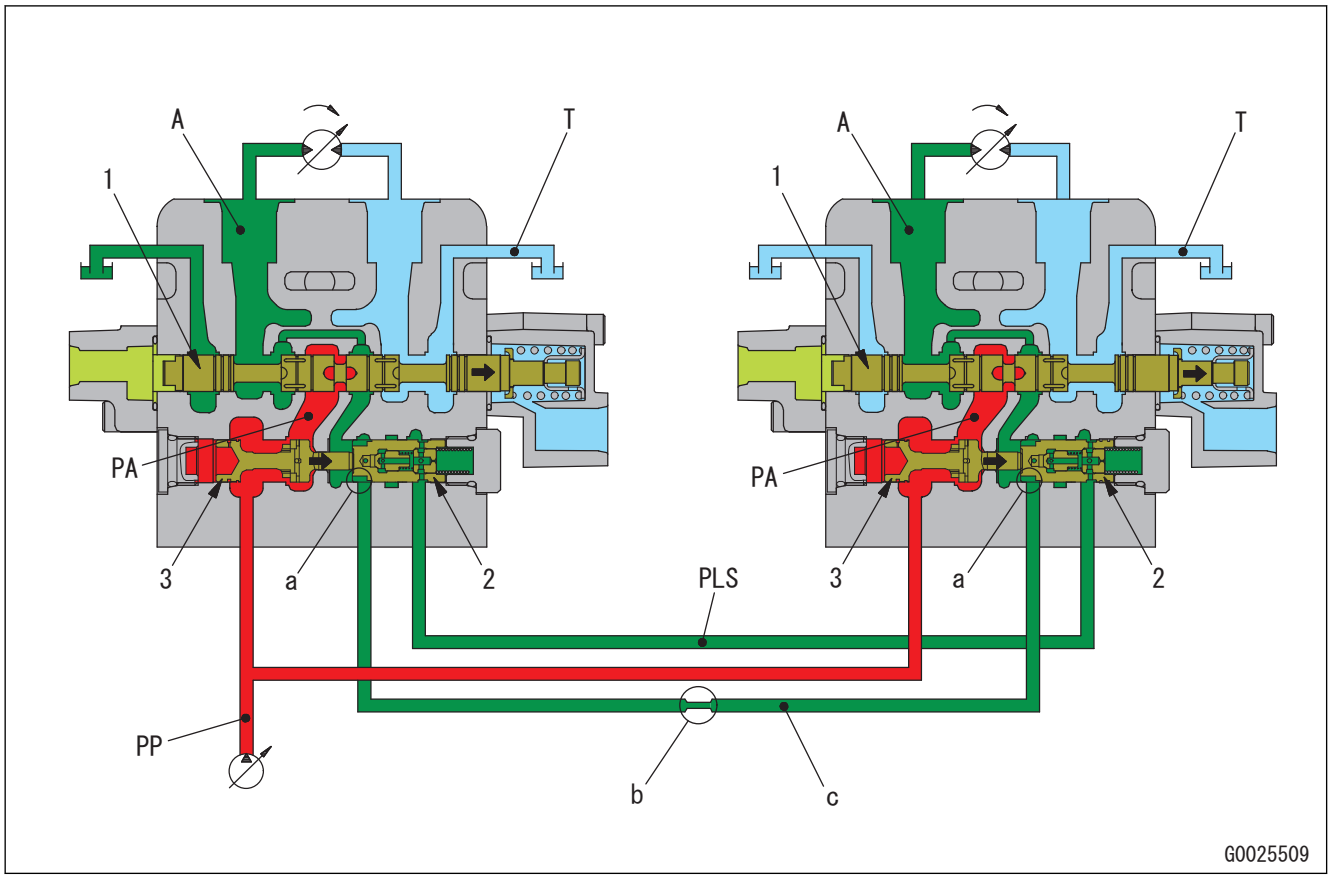
When control lever is operated



1. When the control lever is largely operated, the LS pressure (PLS) is generated, and it is applied on the right end surface (S3) of the spool (1).
2. The opening area of the control valve spool is large, and the differential pressure between the LS pressure (PLS) and pump discharged pressure (PP) becomes small.
3. The differential pressure between the pump discharged pressure (PP) and LS pressure (PLS) does not reach the set pressure of the spring (2).
4. The spool (1) is pushed to the left by the spring (2).
5. The pump pressure (PP) is disconnected from the tank circuit (T), and all the pump discharged volume (Q) flows to the actuator circuit.

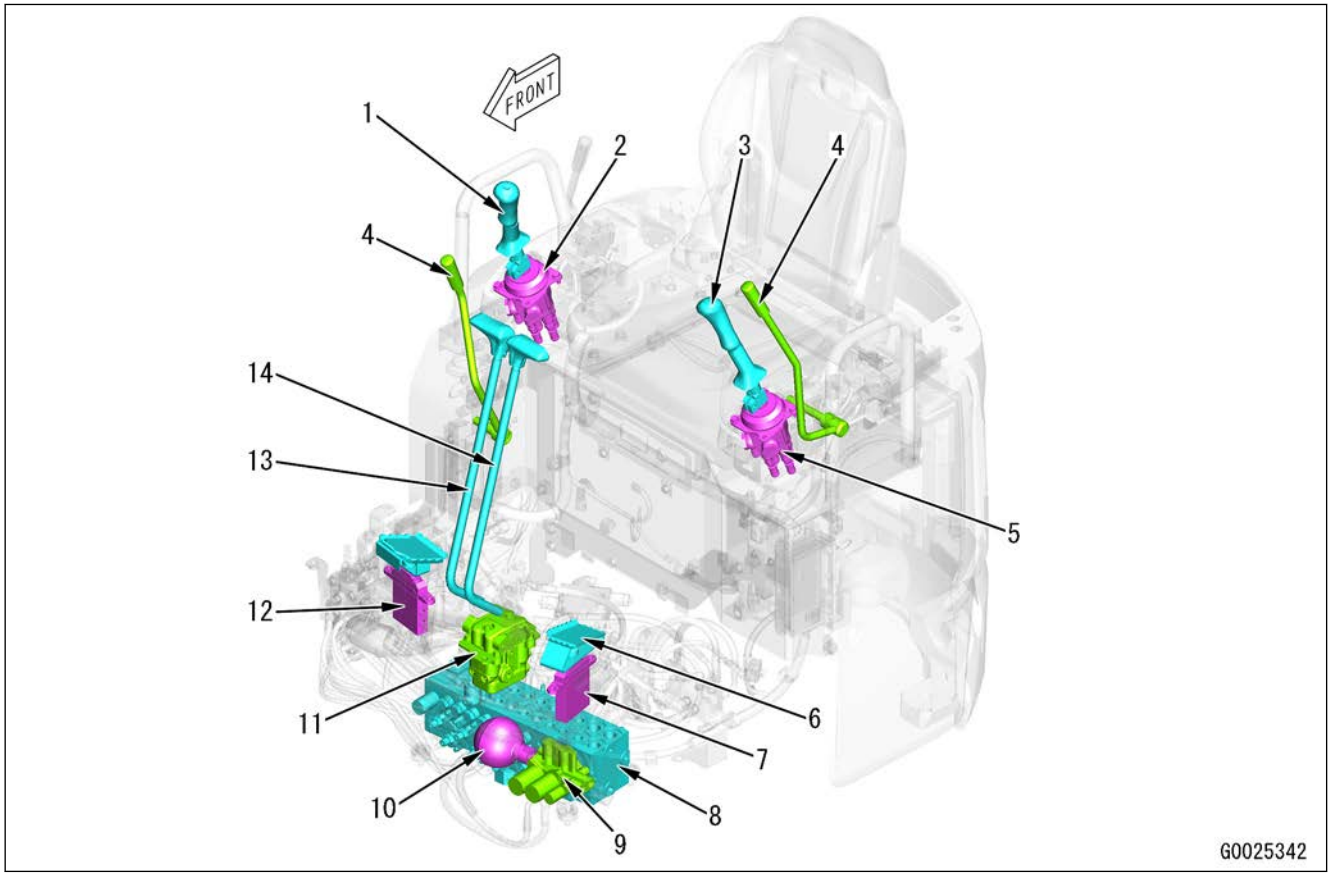
TRAVEL JUNCTION VALVE OF CONTROL VALVE

FUNCTION OF TRAVEL JUNCTION VALVE OF CONTROL VALVE



- The travel junction circuit is installed to correct the flow difference between the right and left travel circuits when the machine travels straight.
- This function makes the flows to the right and left travel motors almost equal to reduce the travel deviation when the machine travels straight.
- The pressure reducing valve in the travel valve inside the steering returns by the difference of the load pressure, and the opening area of the interconnection circuit becomes small when the steering is operated.

STRUCTURE OF VALVE CONTROL



1: R.H. work equipment control lever (for boom and bucket operation)
2: R.H. work equipment PPC valve
3: L.H. work equipment control lever (for arm and swing operation)
4: Lock lever
5: L.H. work equipment PPC valve
6. Attachment control pedal
7: Attachment PPC valve
8: Control valve
9: Bipartite solenoid valve
10: Pilot circuit accumulator
11: Travel PPC valve
12: Boom swing PPC valve
13: R.H. travel lever
14: L.H. travel lever

ATTACHMENT PPC VALVE

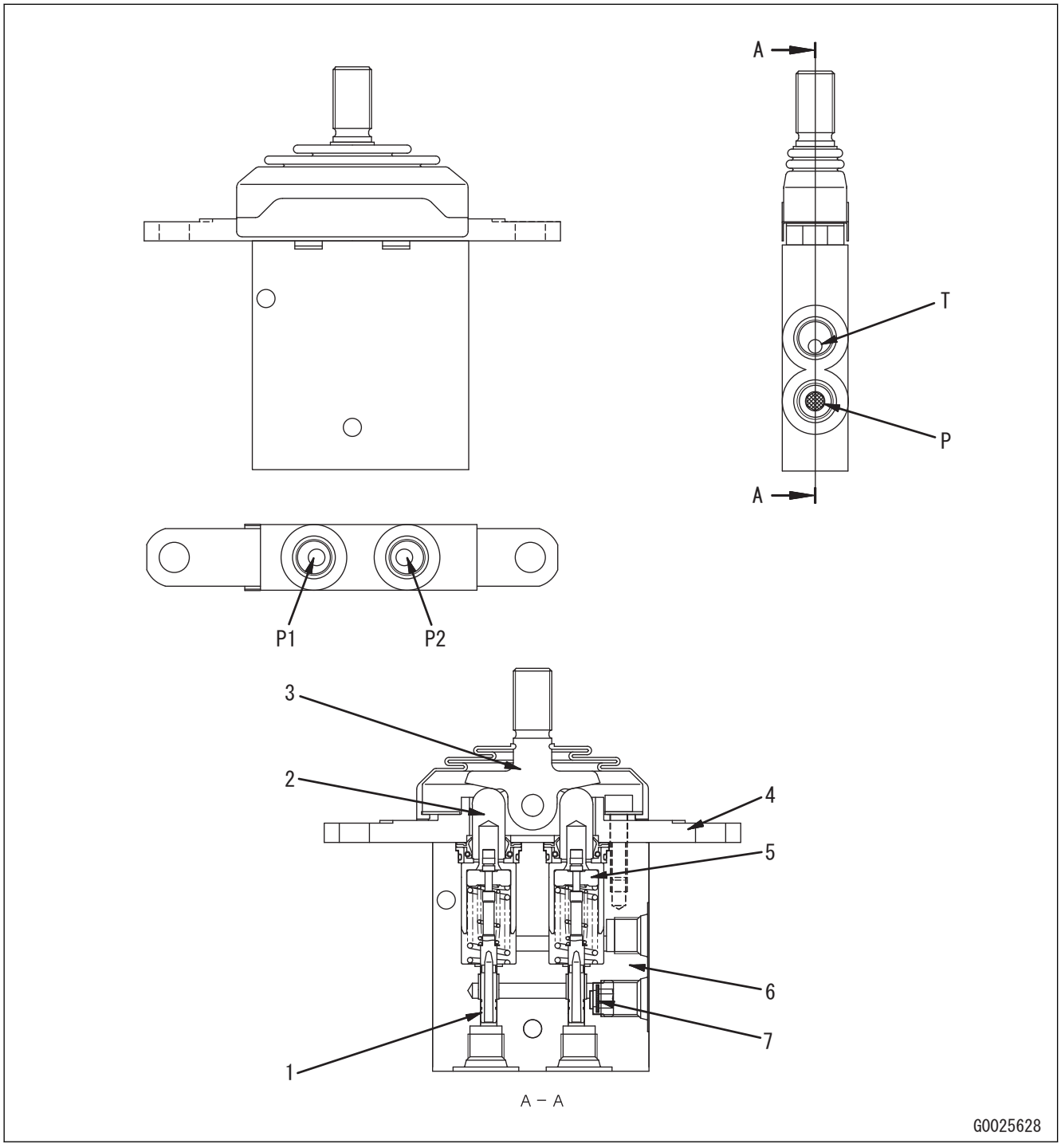
(Machines with attachment)

PPC

Abbreviation for Proportional Pressure Control

STRUCTURE OF ATTACHMENT PPC VALVE

General view and sectional view



P: From pilot pump

P1: To control valve (attachment port)

1: Spool

P2: To control valve (attachment port)

T: To hydraulic tank

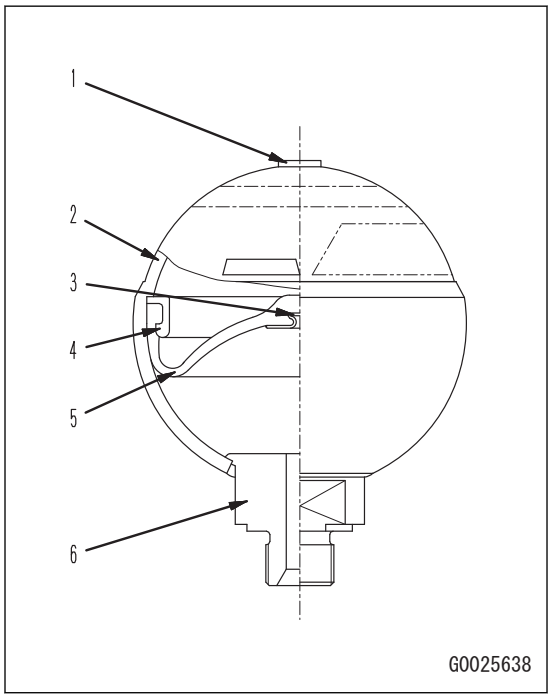
2: Piston

PILOT CIRCUIT ACCUMULATOR

STRUCTURE OF PILOT CIRCUIT ACCUMULATOR

General view and sectional view

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



SPECIFICATIONS OF PILOT CIRCUIT ACCUMULATOR

Gas used: Nitrogen gas

Quantity of gas: 300 cc

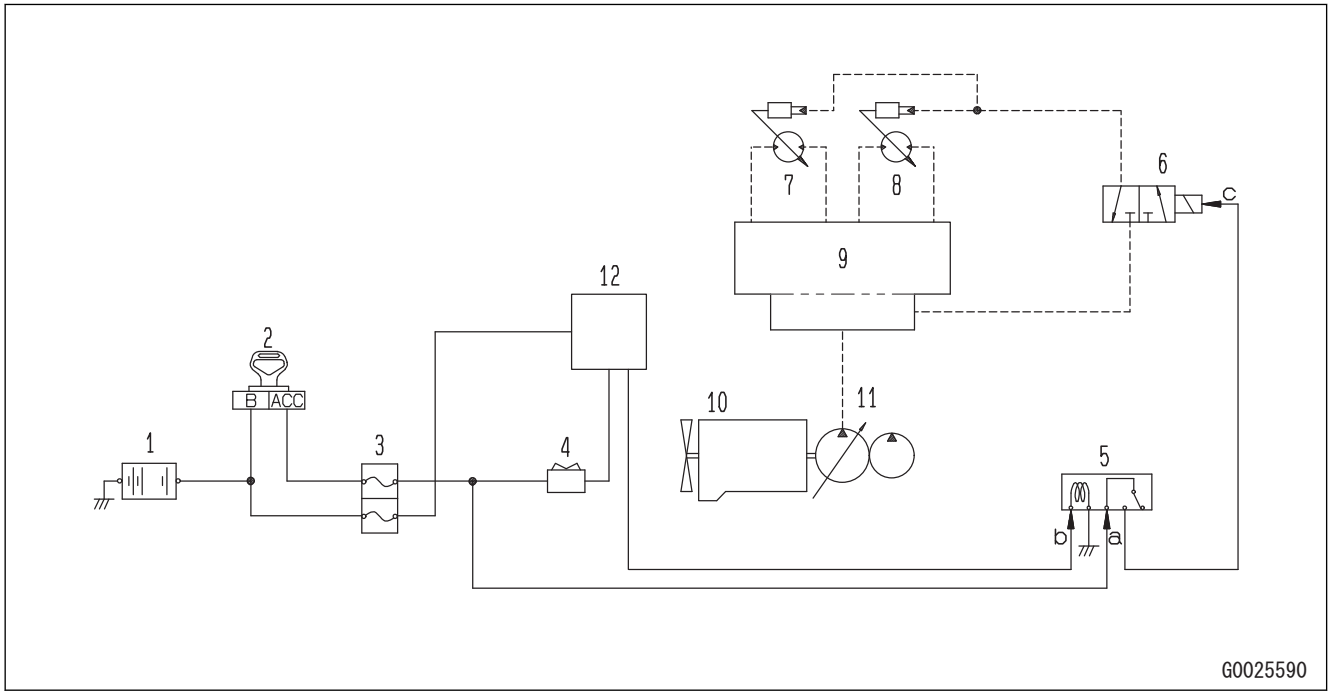
Filling gas pressure: 1.18 MPa {12 kgf/cm^2} (at 80 ˚C)

Maximum operating pressure: 6.87 MPa {70 kgf/cm^2}

FUNCTION OF PILOT CIRCUIT ACCUMULATOR

This accumulator (for pilot circuit) is installed to the solenoid valve. Even if the engine is stopped while the work equipment is raised, the pilot oil pressure continues to be transmitted to the work equipment control valve with the pressure of the compressed nitrogen gas in the accumulator. Thus when the spool is operated, the work equipment lowers by its own weight.

SYSTEM DIAGRAM OF TRAVEL CONTROL



Input and output signals

a: Solenoid power supply

b: 2nd travel speed selector signal

c: Solenoid valve drive signal

1: Battery

2: Starting switch

3: Fuse box

4: 2nd travel speed selector switch

5: 2nd travel speed selector solenoid relay

6: 2nd travel speed selector solenoid valve

7: L.H. travel motor

8: R.H. travel motor

9: Control valve

10: Engine

11: Main pump

12: Machine monitor

FUNCTION OF TRAVEL CONTROL SYSTEM

When travel speed selector switch of the blade control lever is operated, the motor capacity changes, and as a result the travel speed changes.

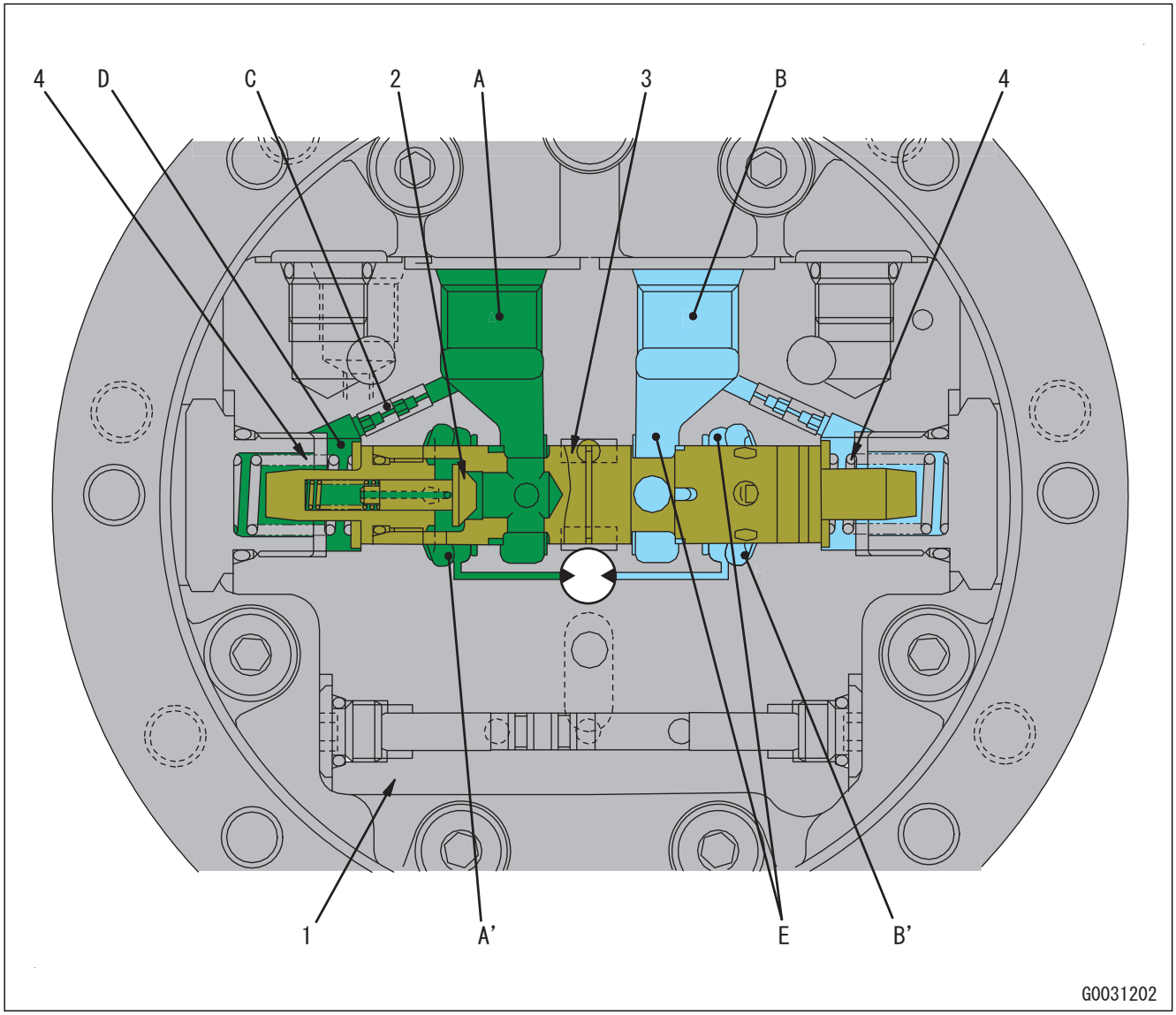
REMARK

The travel speed changes to low speed (Lo) automatically if the load increases on a soft ground or on a slope even when the machine travels at high speed (Hi).
At this time, the travel speed display on the machine monitor is at the high speed (Hi) position and stays there.

Travel speed selector switch	Lo (Low speed)	Hi (High speed)
2nd travel speed selector solenoid valve	OFF	ON
Motor capacity	12.4 cc/rev	6.2 cc/rev
Travel speed	2.2 km/h	4.1 km/h
Travel motor swash plate angle	Maximum	Minimum

COUNTERBALANCE VALVE AND CHECK VALVE OF TRAVEL MOTOR

OPERATION OF COUNTERBALANCE VALVE AND CHECK VALVE OF TRAVEL MOTOR

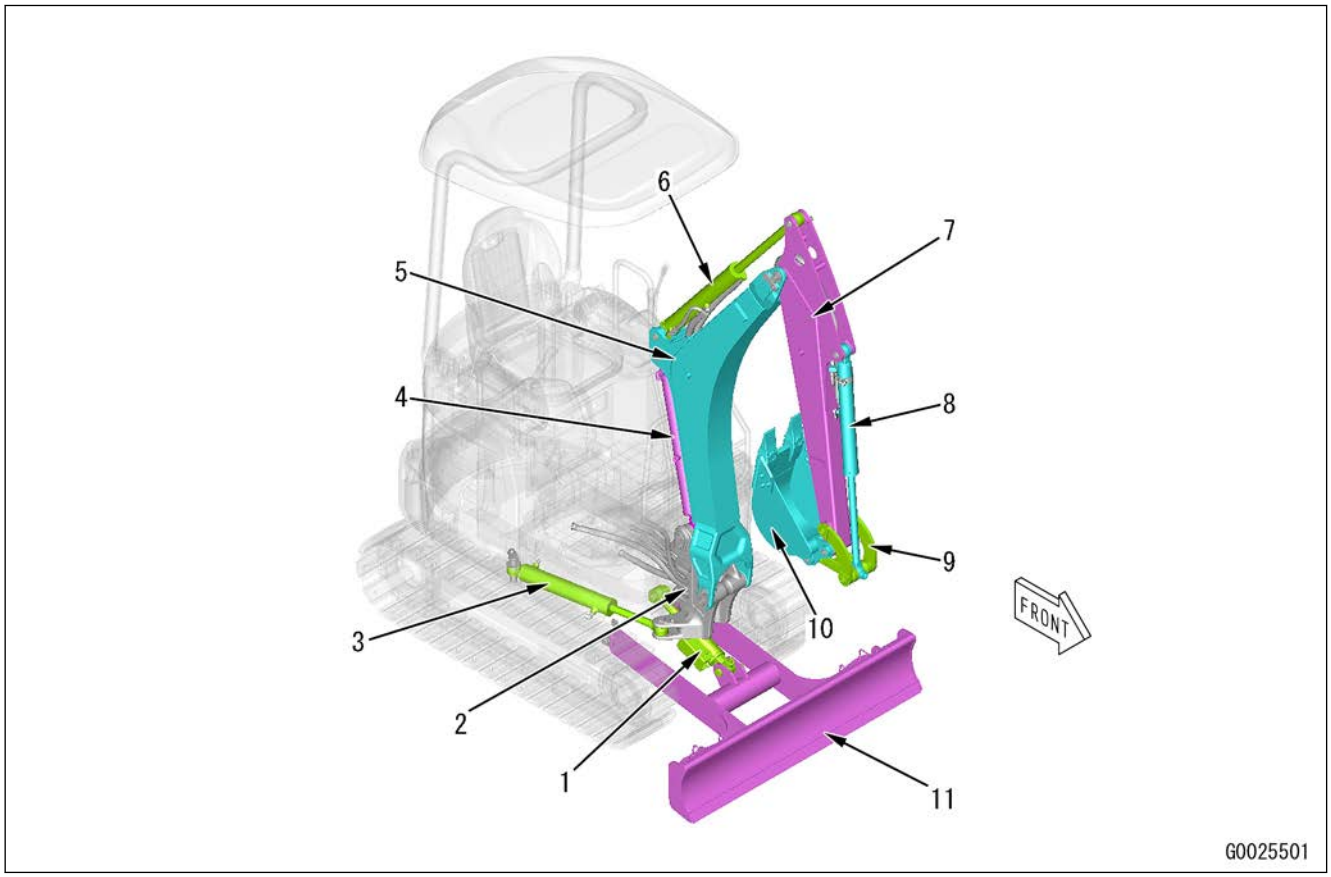


1. When the pressurized oil flows from the port (A), the oil pressure opens the check valve (2), and is transmitted to the port (A') on the inlet side of the hydraulic motor.
2. The pressurized oil flows through the choke (C) into the chamber (D), and the spool (3) moves to the right against the spring (4).
3. As a result, the oil at the return side of the hydraulic motor flows from the port (B'), goes back to the port (B) through the main unit (1) and the opening (E) of the spool (3), and it makes the hydraulic motor rotate.
4. When the pressurized oil flows from the port (B), each part operates in the opposite direction and the hydraulic motor rotates in reverse.
5. Then, when the pressurized oil in the port (A) is disconnected from the pressurization state, the spool (3) that was moved to the right goes back to the left by the force of the spring (4).
6. At that time, the oil in the chamber (D) controls the speed that the spool (3) goes back to the left by the throttle of the choke (C).
7. Even after the pressurized oil in port (A) is blocked, the hydraulic motor continues rotation by inertial force.
8. At this time, the return oil is controlled gradually by the change of the travel speed and the cut-out part of the spool (3), and the hydraulic motor stops smoothly.

WORK EQUIPMENT

STRUCTURE OF WORK EQUIPMENT

General view



1: Blade cylinder
2: Boom swing bracket
3: Boom swing cylinder
4: Boom cylinder
5: Boom
6: Arm cylinder
7: Arm
8: Bucket cylinder
9: Bucket link
10: Bucket
11: Blade

Work equipment, swing, boom swing, travel oil pressure

Item	Test condition		Unit	Standard value for new machine	Repair limit
Unload pressure	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position • All control levers, control pedals: NEUTRAL position		MPa {kg/cm^2}	2.5 to 3.48 {25 to 35}	2.5 to 3.48 {25 to 35}
Boom relief pressure	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position		MPa {kg/cm^2}	21.92 to 23.88 {224 to 244}	21.92 to 23.88 {224 to 244}
Arm relief pressure	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position		MPa {kg/cm^2}	21.92 to 23.88 {224 to 244}	21.92 to 23.88 {224 to 244}
Bucket relief pressure	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position		MPa {kg/cm^2}	21.92 to 23.88 {224 to 244}	21.92 to 23.88 {224 to 244}
Boom swing relief pressure	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position		MPa {kg/cm^2}	21.92 to 23.88 {224 to 244}	21.92 to 23.88 {224 to 244}
Swing relief pressure	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position		MPa {kg/cm^2}	18.33 to 20.78 {187 to 217}	18.33 to 20.78 {187 to 217}
Blade relief pressure	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position		MPa {kg/cm^2}	21.92 to 23.88 {224 to 244}	21.92 to 23.88 {224 to 244}
Travel relief pressure	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position		MPa {kg/cm^2}	21.92 to 23.88 {224 to 244}	21.92 to 23.88 {224 to 244}
Control circuit oil pressure	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position • All control levers, control pedals: NEUTRAL position		MPa {kg/cm^2}	3.62 to 4.11 {37 to 42}	3.62 to 4.11 {37 to 42}
LS differential pressure	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position • LS differential pressure = Pump discharge pressure - LS pressure	All control levers, control pedals: NEUTRAL position	MPa {kg/cm^2}	2.5 to 3.48 {25 to 35}	2.5 to 3.48 {25 to 35}
		Bucket control lever: Half stroke		1.47 to 1.67 {15 to 17}	1.47 to 1.67 {15 to 17}
Outlet pressure of solenoid valve	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position • Energized/De-energized conditions of solenoid: See TESTING AND ADJUSTING, “TEST OUTLET PRESSURE OF SOLENOID VALVE”	Solenoid: OFF (de-energized)	MPa {kg/cm^2}	0	0
		Solenoid: ON (energized)		3.04 to 3.53 {31 to 36}	3.04 to 3.53 {31 to 36}

Fig. 11

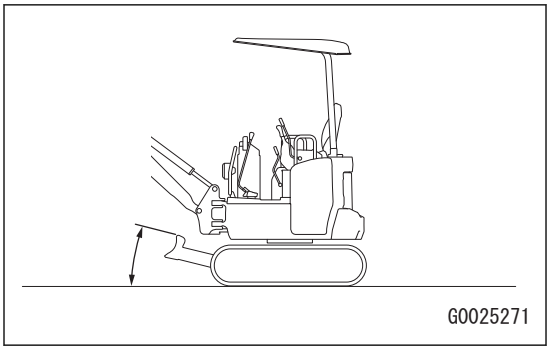


Fig. 12

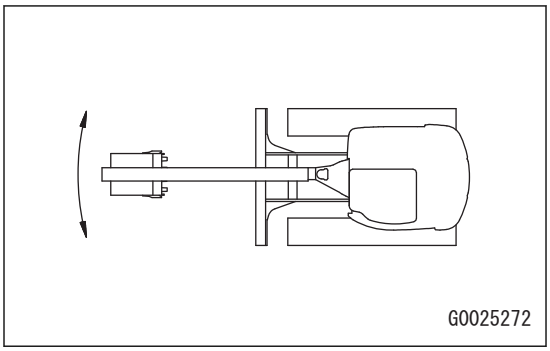


Fig. 13

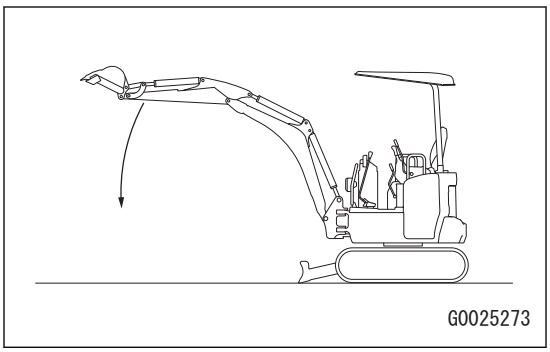


Fig. 14

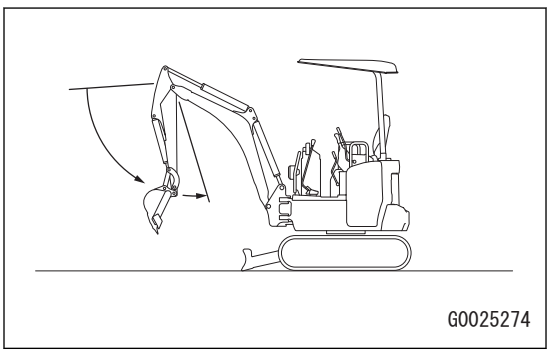
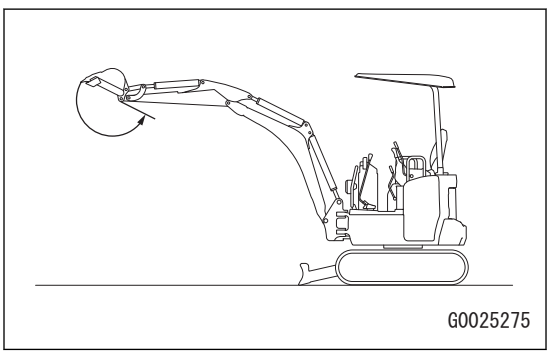
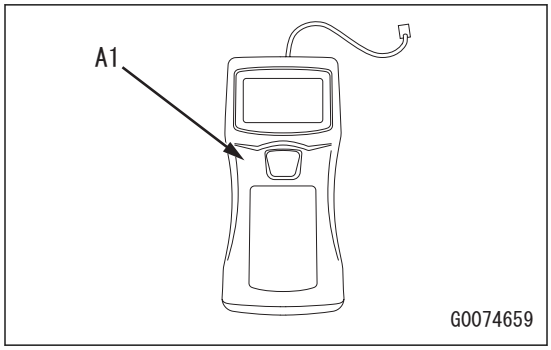


Fig. 15



4. Install the tachometer A1 to the probe A2.



Set the measurement condition

5. Start the engine.
6. Make sure that the engine coolant temperature and hydraulic oil temperature are in the measurement condition range.
   - Engine coolant temperature: In the operation range
   - Hydraulic oil temperature: 45 to 55°C
7. Turn the fuel control lever to the high idle position.

Do the testing

8. Test the fan speed when control levers and control pedals are in NEUTRAL position.
9. Calculate the engine speed.

   Engine speed = Fan speed/1.04

Restoration

10. Stop the engine.

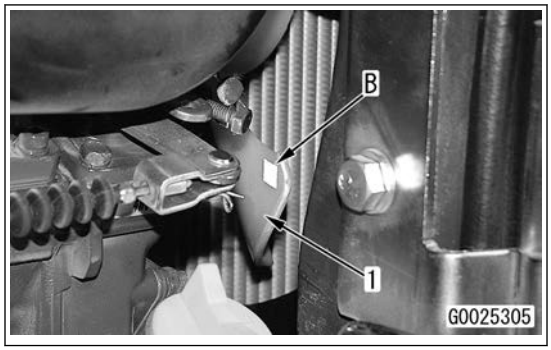
    ⚠ Immediately after the engine is stopped, the parts and oil are very hot and can cause burn injury. Wait for the temperature to go down, and then start the work.

11. remove the tachometer A1 from the probe A2.
12. Remove the probe A2 and stand A3.
13. Peel off the reflection tape B from the end surface of the fan (1). Close the engine rear cover.

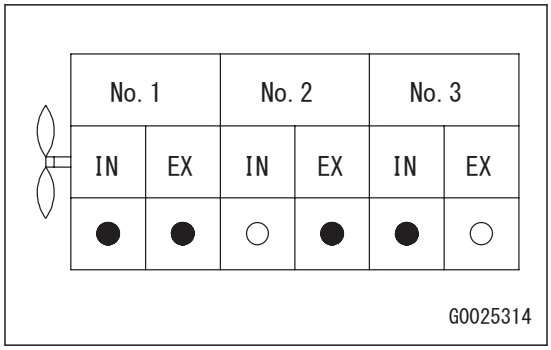
TEST ENGINE LOW IDLE SPEED

Set the device for testing

1. Open the engine rear cover.
2. Attach the reflection tape B to the end surface of the fan (1).



7. After completing the adjustment of the valves marked by ●, rotate the crankshaft forward. Then, align the “1.TC” stamp line (a) of the flywheel with the stamp line (b) inside of the housing or the internal protruding part of the inspection hole.
8. Adjust the valve clearance marked by ○ in the valve layout drawing at the position where the mark is aligned.
9. In response to “CHECK VALVE CLEARANCE”, check the valve clearance.



ADJUST FUEL INJECTION TIMING

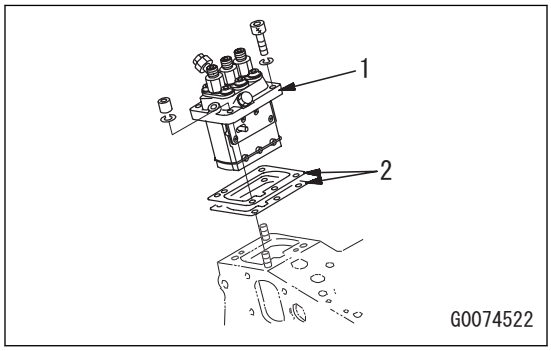
If the injection timing stamp line of the flywheel does not align with the stamp line inside the housing or the internal protruding part of the inspection hole, the fuel injection timing is incorrect. Obey the procedure that follows to adjust the timing.

Adjustment

1. Remove the fuel injection pump (1), and check the thickness of the shims (2).

   REMARK

   - Be careful not to drop the shims (2).
   - Record and store the installation position and number of shims (2).



2. Increase or decrease the thickness of the shims (2) to adjust the fuel injection timing.

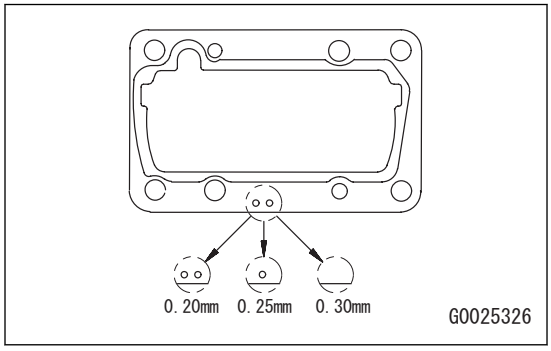
   REMARK

   - When the fuel injection timing is short, increase the thickness of the shims.
   - When the fuel injection timing is long, decrease the thickness of the shims.
   - When the shim thickness is increased or decreased by 0.20 mm, the fuel injection timing changes by approximately 2°.
   - The shim has the thickness depending on the presence and number of identification holes.

   0.20 mm shim: Two identification holes

   0.25 mm shim: One identification hole

   0.30 mm shim: No identification holes



3. Mount the selected shims (2), and install the fuel injection pump (1).
4. Bleed air from the fuel circuit. For details, see “BLEED AIR FROM FUEL SYSTEM”.
5. Run the engine, and check the fuel for leakage.

   Apply a thin layer of liquid gasket (ThreeBond 1215 or 1104) on the two surfaces of the shim.

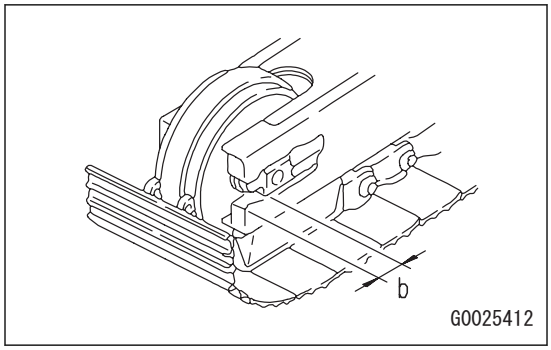
   Mounting bolt and nut of the fuel injection pump: 9.8 to 11.3 Nm {1.0 to 1.15 kgm}
6. After the adjustment, check that the fuel injection timing is normal.

   For details about how to check the timing, see “TEST FUEL INJECTION TIMING”.

For the steel shoe specification

REMARK

If the tension is loose even when you pump in the grease until the dimension (b) between the ends of the idler guide and the track frame becomes 0 mm, the worn quantities of the pin and the bushing are large. Turn 180 deg. or replace the pin and the bushing.



How to decrease the tension

Adjustment

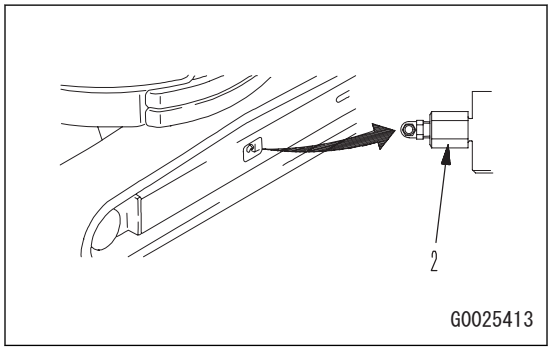
1. Loosen the valve (2), remove the grease, and tighten the valve (2).

   ⚠ **There is a danger of the valve jumping out by the high pressurized grease inside it. Do not loosen the valve one or more turns.**

2. Test the track shoe tension in response to “TEST TRAVEL DEVIATION”.

   REMARK

   If the track shoe tension is out of the standard value range, adjust it again.



2. Loosen the lock nut (4) with the adjustment screw (3) of the main relief valve (2) fixed.
3. Turn the adjustment screw (3) to adjust the oil pressure.

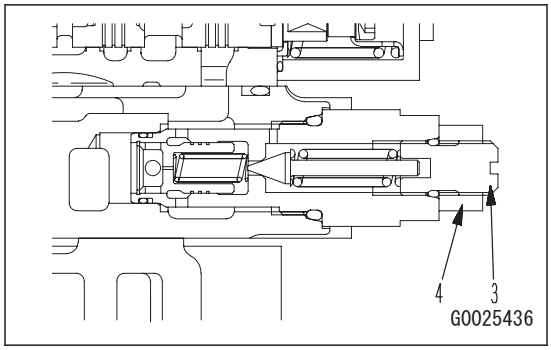
   Quantity of adjustment for each turn of the adjustment screw: 12.6 MPa {128 kg/cm^2}

   NOTICE

   Do not remove the lock nut (4) because internal parts might fall off.

   REMARK

   - Turn the adjustment screw (3) to the right, and the pressure is increased.
   - Turn the adjustment screw (3) to the left, and the pressure is decreased.



4. While the adjustment screw (3) is fixed, tighten the locknut (4).

   Lock nut (4): 59 to 79 Nm {6 to 8 kgm}

5. In response to “TEST AND ADJUST OIL PRESSURE IN WORK EQUIPMENT, TRAVEL, AND SWING CIRCUITS” , test the oil pressure in the work equipment and travel circuits.

ADJUST SWING RELIEF PRESSURE

Adjustment

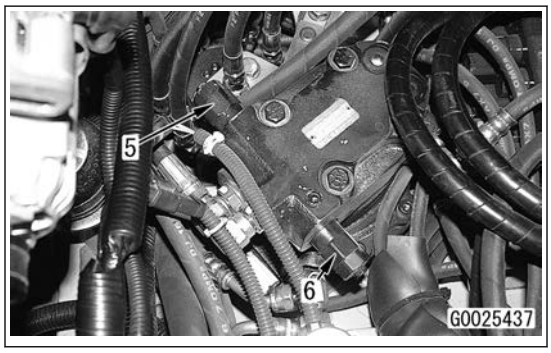
1. If the swing relief pressure is not normal, obey the procedure that follows to adjust the safety valves (5) and (6) of the swing motor.

   Safety valve (5): Right relief

   Safety valve (6): Left relief

   REMARK

   To adjust the main relief valve of the control valve, open the cover of the travel PPC lever. For details, see “TILT TRAVEL PPC LEVER”.



2. With the adjustment screw (7) of the safety valves (5) and (6) fixed, loosen the lock nut (8).
3. Turn the adjustment screw (7) to adjust the oil pressure.

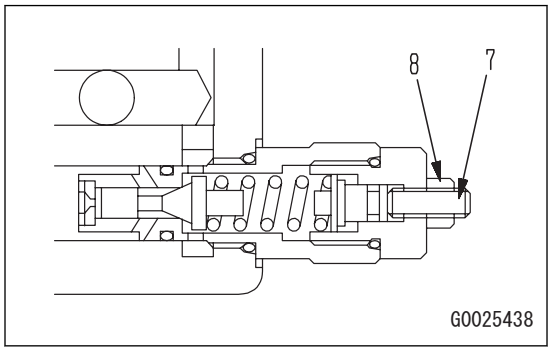
   Quantity of adjustment for each turn of the adjustment screw: Approximately 4.5 MPa {approximately 46 kg/cm^2}

   NOTICE

   Do not remove the lock nut (8) because internal parts might fall off.

   REMARK

   - Turn the adjustment screw to the right, and the pressure is increased.
   - Turn the adjustment screw to the left, and the pressure is decreased.



4. While the adjustment screw (7) is fixed, tighten the locknut (8).

   Lock nut (8): 3.92 Nm {0.4 kgm}

5. In response to “TEST AND ADJUST OIL PRESSURE IN WORK EQUIPMENT, TRAVEL, AND SWING CIRCUITS”, test the oil pressure in the swing circuit.

Hose (2): 34 to 54 Nm {3.5 to 5.5 kgm}

17. Install the floor cover in response to “TILT TRAVEL PPC LEVER”.
18. Pressurize the hydraulic tank. For details, see “PRESSURIZE HYDRAULIC TANK”.

REMARK

If the pressure in the accumulator becomes empty, run the engine for approximately 10 seconds for pressure accumulation.

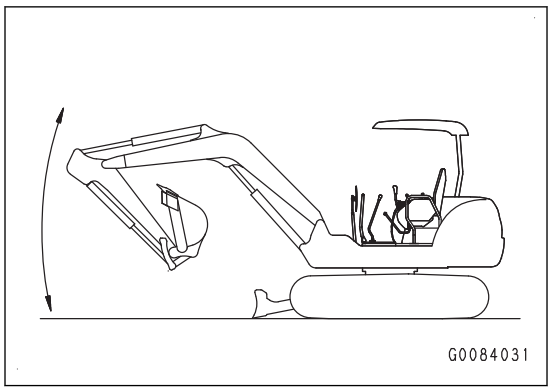
How to identify defects

When there is a difference between the LOCK position and the FREE position in the hydraulic drift: Defective PPC valve (internal defect)

NOTICE

Operate the lock lever with the starting switch set to the ON position.

5. Raise and lower the boom four or five times.



NOTICE

- **Make sure to stop the piston rod at 100 to 200 mm before each stroke end to prevent relief.**
- **When the pressure in the piston rod is at relief at the stroke end, damage to the seal of the cylinder might be caused.**

6. Set the fuel adjustment lever to the high idle position.
7. Raise and lower the boom four or five times.

NOTICE

Make sure to stop the piston rod at 100 to 200 mm before each stroke end to prevent relief.

8. Set the fuel adjustment lever to the low idle position.
9. Operate the piston rod to the stroke end to be at relief the pressure.
10. Close the oil filter cap.
11. In the same method, bleed air from the arm, bucket, blade, and boom swing cylinders.

NOTICE

Pressurize the hydraulic tank after bleeding air. For details, see "PRESSURIZE HYDRAULIC TANK".

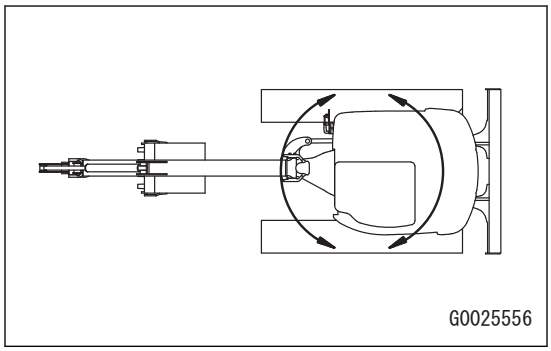
BLEED AIR FROM SWING MOTOR

NOTICE

When the swing motor is turned without bleeding air, damage to the bearing of the swing motor might be caused.

Bleed air from the swing motor only when the oil in the swing motor case is drained.

1. Start the engine.
2. Set the fuel adjustment lever to the low idle position.
3. Loosen the oil filler cap of the hydraulic tank.
4. Do the left and right swing operations three turns.
5. Close the oil filter cap.



BLEED AIR FROM TRAVEL MOTOR

Bleed air from the travel motor only when the oil in the travel motor case is drained.

1. Start the engine.
2. Set the fuel adjustment lever to the low idle position.
3. Use the work equipment to raise the left track shoe.

Date	
Name	

Terminal Replacement Sheet

To: KOMTRAX Support Center, KLTD
E-mail: JP00MB_register_gkom@global.komatsu

Machine	
Model	
Type	
Serial Number	

Faulty Terminal/Monitor		New Terminal/Monitor	
Part Number		Part Number	
Serial Number		Serial Number	

Reason for replacement :	
Date Terminal Replacement will be performed	
Country to use	
Name of distributor	

Note:
If the communication is not canceled for faulty terminal, the communication fee will be charged.

■Only for changing to Orbcomm terminal series(TC3**) :
1. After terminal replacement is completed in KBA, please click 'Apply' button in KBA.
2. KL TD will assign new terminal to the machine based on given terminal info in this form.

■ For changing to Mobile and Iridium communication terminal
1. Please completed terminal replacement in KBA.

■For changing to all KOMTRAX terminal changes (Mobile, Iridium, Orbcomm):
Please ensure to send this 'Terminal Replacement Sheet' to KOMTRAX Support Center, KLTD. because this "Terminal Replacement Sheet" is also used as a deactivation request.

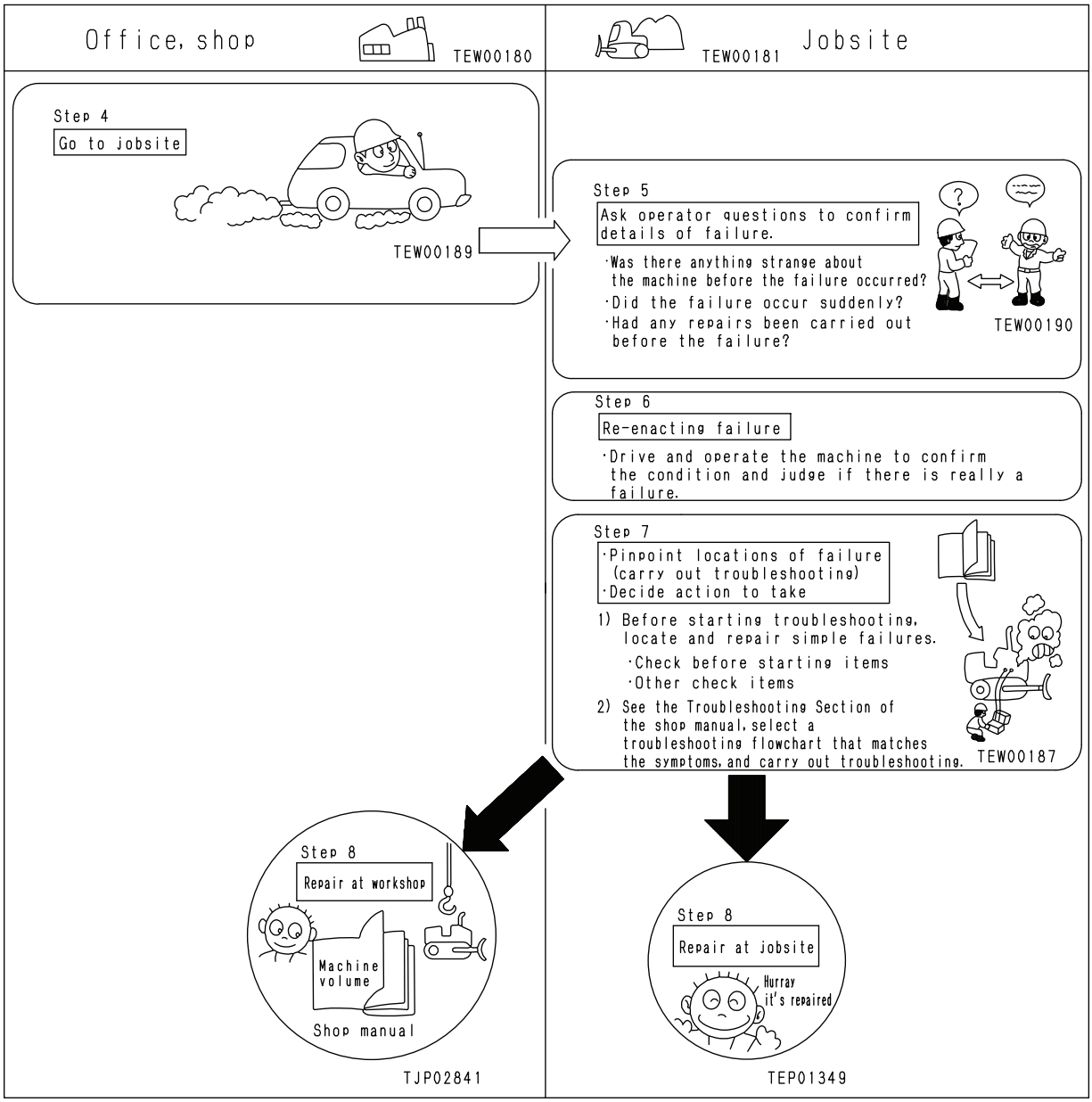
■ "Terminal Replacement Sheet' can be used when faulty terminal and faulty modem.

■For MH801/UM600:
Based on given monitor/K-Plus2 info in this form, KLTD will assign new monitor to the modem.

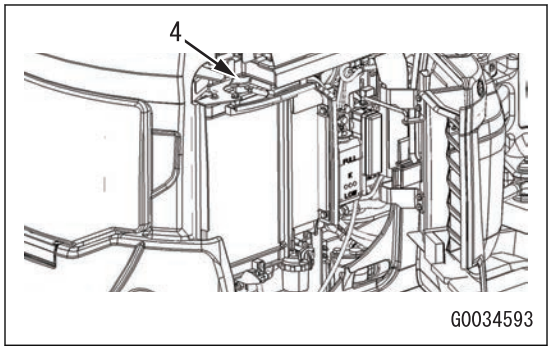
■New Komtrax terminal is unable to starting communication, unless activation is completed.
*KBA: KOMTRAX application (DFM)

G0078250

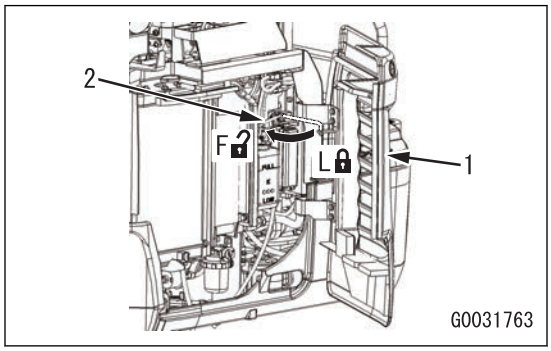
Item	Test condition	Unit	Standard value for new machine	Repair limit	Measured value	Good	No good
Bucket CURL	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position • Measurement range: Time required to move the bucket from bucket DUMP stroke end to bucket CURL stroke end • Measurement posture: “Fig. 10”, in STANDARD VALUE TABLE, “MACHINE POSTURE AND PROCEDURES TO MEASURE PERFORMANCE”.	second	2.0 to 2.4	Max. 2.6			
Bucket DUMP	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position • Measurement range: Time required to move the bucket from bucket DUMP stroke end to bucket CURL stroke end • Measurement posture: “Fig. 10”, in STANDARD VALUE TABLE, “MACHINE POSTURE AND PROCEDURES TO MEASURE PERFORMANCE”.	second	1.5 to 1.9	Max. 2.3			
Blade RAISE	• Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position • Time required to move the blade from ground to maximum RAISE • Measurement posture: “Fig. 11”, in STANDARD VALUE TABLE, “MACHINE POSTURE AND PROCEDURES TO MEASURE PERFORMANCE”.	second	0.7 to 1.3	Max. 1.6			


Office, shop
TEW00180
TEW00181
Jobsite
Step 4
Go to jobsite
TEW00189
Step 5
Ask operator questions to confirm details of failure.
·Was there anything strange about the machine before the failure occurred?
·Did the failure occur suddenly?
·Had any repairs been carried out before the failure?
TEW00190
Step 6
Re-enacting failure
·Drive and operate the machine to confirm the condition and judge if there is really a failure.
Step 7
·Pinpoint locations of failure (carry out troubleshooting)
·Decide action to take
1) Before starting troubleshooting, locate and repair simple failures.
·Check before starting items
·Other check items
2) See the Troubleshooting Section of the shop manual, select a troubleshooting flowchart that matches the symptoms, and carry out troubleshooting.
TEW00187
Step 8
Repair at workshop
Machine volume
Shop manual
TJP02841
Step 8
Repair at jobsite
Hurray it's repaired
TEP01349
G0026118

- When the coolant level is in the range between FULL and LOW, it is correct.
- If the coolant level is low, remove the water filler cap of the reservoir tank (3), and add the coolant up to FULL.
  1) Remove the water filler cap of the reservoir tank (3).
  2) Add coolant into the reservoir tank (3) up to FULL.
  3) Close the water filler cap of the reservoir tank (3).
- If the reservoir tank is empty, check and add the coolant in the procedure that follows.
  1) Check the coolant system for leakage.
     If a problem is found, repair it immediately.
  2) Make sure that the surface of the radiator cap (4) is cool enough to be touched by bare hand.
  3) While you push the cap (4), slowly turn it until it gets in contact with the stopper, and release the pressure.
  4) Remove the cap (4).
  5) Check the coolant level in the radiator.
     - When the coolant is filled up to the mouth of water filler port, the level is correct.
     - If the coolant level is low, add the coolant up to the mouth of water filler port.
  6) Tighten the cap.
  7) Remove the water filler cap of the reservoir tank (3).
  8) Add coolant into the reservoir tank (3) up to FULL.
  9) Close the water filler cap of the reservoir tank (3).



4. Set the rod (2) of the cooling cover (1) to the FREE position (F).
5. Close the cooling cover (1). Then, keep it pushed and lock it.



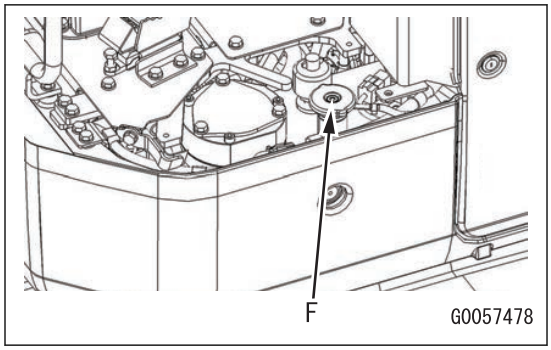
CHECK, CLEAN AND REPLACE AIR CLEANER

⚠ When you clean with the compressed air, dirt flies out, it can cause personal injury.
⚠ Wear protective eyeglasses, dust mask, or other protective equipment.

NOTICE

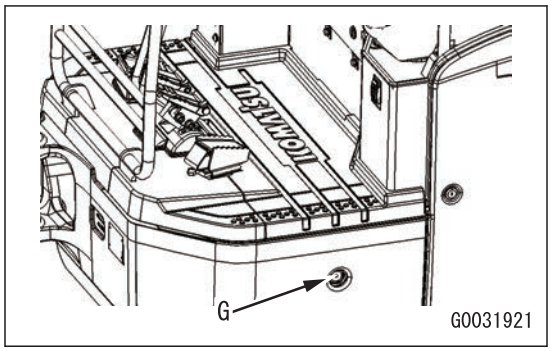
- **Do not clean the air cleaner element before the red piston is projected into the transparent part of dust indicator.**
  If you clean the element frequently, the true performance of the air cleaner is not reached and the filtration efficiency deteriorates.
- **If dirt enters the engine, it can damage the engine. Stop the engine before you clean or replace the air cleaner.**
  When you clean or replace the air cleaner, do not allow dirt attached to the element to fall off into the air cleaner body.
  Do not clean or replace the air cleaner in strong winds or in a dusty area.

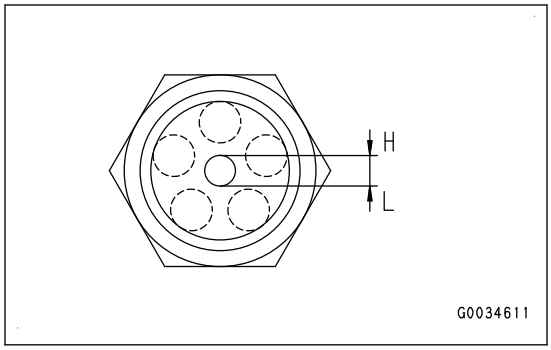
4) Loosen the cap of oil filler port (F) slowly to release the internal pressure in the hydraulic tank.



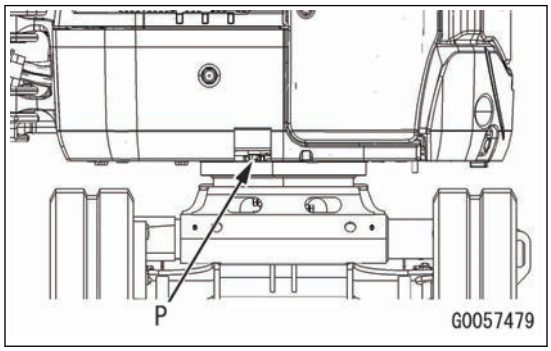
5) Add the oil from oil filler port (F) up to the level between H and L of sight gauge (G).

- When the oil level is above H of sight gauge (G), drain the oil in the procedure that follows.
  Items to be provided
  - Container to receive the drained oil
  - Handle for socket wrench

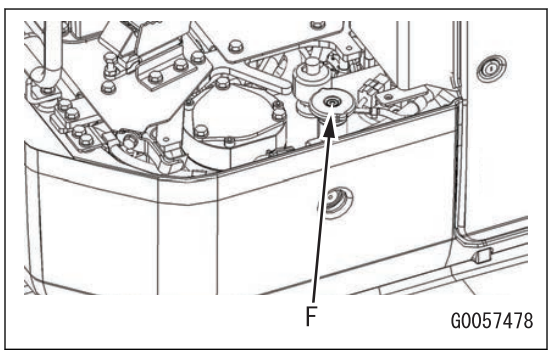




1) Swing the upper structure until drain plug (P) at the bottom of the hydraulic tank comes between the right and left tracks.
2) Stop the engine.



3) After the hydraulic oil becomes cool, loosen the cap of oil filler port (F) slowly to release the internal pressure in the hydraulic tank.
4) Put the container to receive the drained oil below the drain plug (P) on the bottom side of the machine.
5) Remove drain plug (P) by use of a handle for socket wrench, and drain the oil.
   Be careful not to get oil on yourself.
6) Install the drain plug (P).
   Tightening torque: 58.8 to 78.5Nm{6 to 8kgfm}

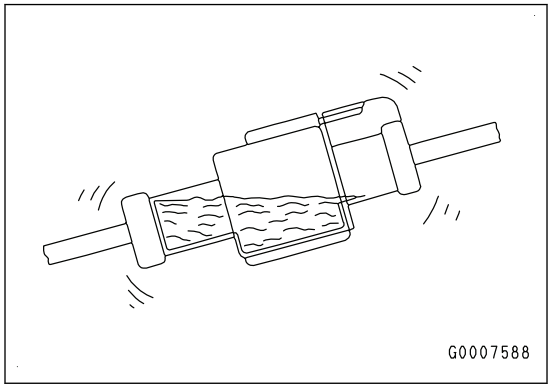


Check the connector for entry of water and foreign material

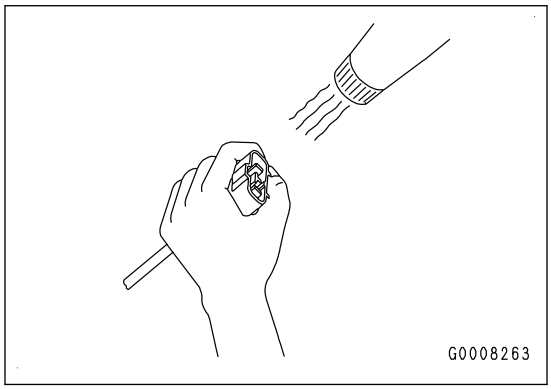
19. Disconnect the connectors, and check inside of the connector for entry of water or foreign materials.

    NOTICE

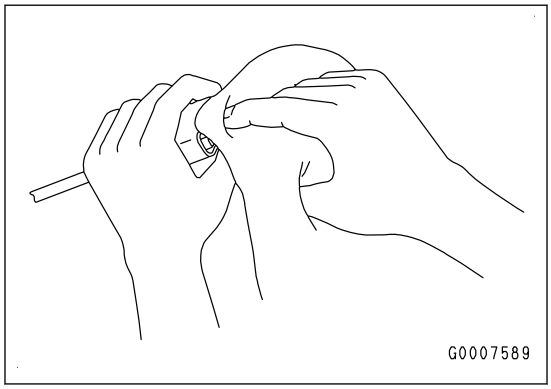
    If there is entry of water or foreign material into the connector, the seals can be defective. Check the seals for damage.



- If the seal is defective, repair or replace it.
- Dry the inside of the connector with a dryer.



- Wipe and remove any foreign material inside connector with a cloth or others, and blow the air to clean the connector.

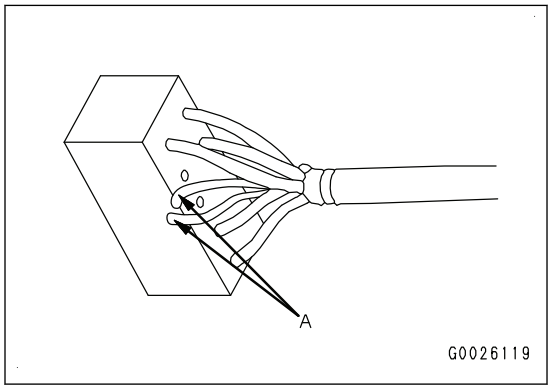


Check of wiring harness for open or short circuit

20. Check the connection (crimped part) between the connector pins and wiring harness.

    If there is a breakage as shown in (A), repair or replace the wiring harness or connectors.

21. Visually check the wiring harness covers for peel-off and the pins for contact with adjacent pins by a defective crimping.



Check of fuse for blow-out and corrosion

22. When you replace the fuse, make sure to turn off the power supply (turn the starting switch to the OFF position), and then disconnect the battery ground terminal.
    - A fusible link is a large-capacity fuse.

No.	Cause	Procedure, measuring location, criteria, and remarks
7	Defective controller	Precautions for troubleshooting (1) Connector number indication method and handling of T-adapter For troubleshooting, insert or connect T-adapters as follows unless otherwise specified. • When (male) or (female) is not indicated with a connector number, disconnect the connector, and insert T-adapters to both sides of male and female. • When (male) or (female) is indicated with a connector number, disconnect the connector, and connect T-adapter to the indicated side of connector. • “Male and female” means male and female of connector pins, not connector housings. • Male and female of connector pins and housing in DT series, etc, are opposite to those described in this manual. Take care. (2) Pin number description sequence and tester lead handling For troubleshooting, connect the positive (+) and negative (-) leads of a multimeter as shown below unless otherwise specified. • Connect the positive (+) lead to pin or wiring harness indicated first. • Connect the negative (-) lead to a pin or wiring harness indicated second.

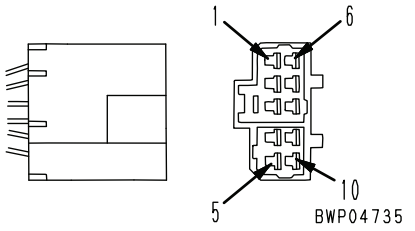
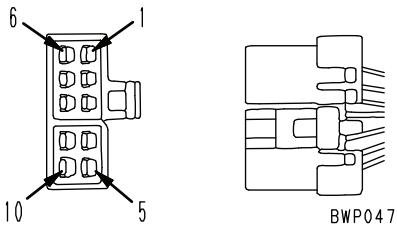
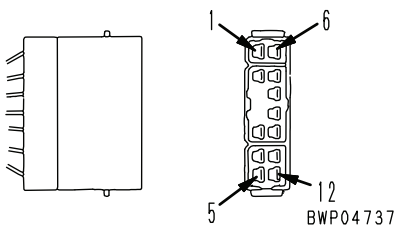
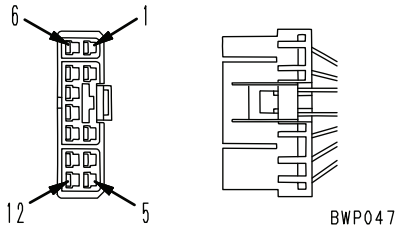
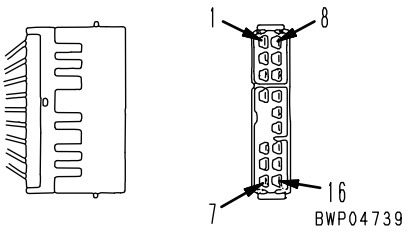
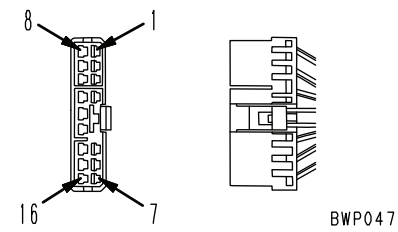
Related circuit diagram

This is the excerpted circuit diagram related to troubleshooting

- The circuit diagram contains the connector No., pin No., and connector color related to the failure.
- “/” is used in the connector No. in the following 2 cases.
  - Abbreviation (3 letters in many cases)
    Example) T/C: Abbreviation for Torque Converter
  - Male side and female side have different connector Nos.
    Example) BREAK OUT / E24
- The circuit diagram contains the destination or source of the branch line in a wiring harness.
- Arrow (↔): Approximate installation position on the machine

  NO: Normally Open

  NC: Normally Closed
- Signal names such as GND and 24 V are included in addition to connector numbers at junctions, etc. in circuit diagrams.
- Except for GND and 24 V, a signal name indicated at a junction, etc. shows that the wire is connected to another junction or controller at where the same signal name is indicated.

No. of pins	S type connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
10 (Blue)			—
	—	—	
12 (Blue)			799-601-7160 (T-adapter)
	Part No. : 08056-11272	Part No. : 08056-11282	
16 (Blue)			799-601-7170 (T-adapter)
	Part No. : 08056-11672	Part No. : 08056-11682	

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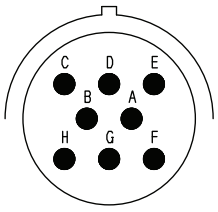
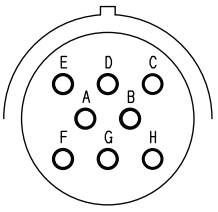
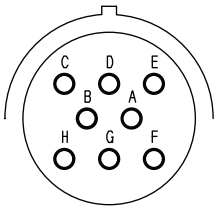
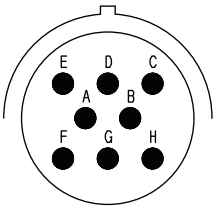
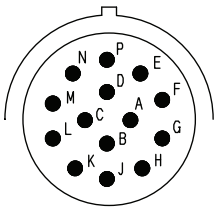
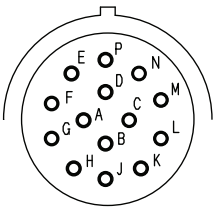
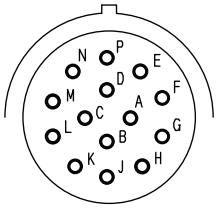
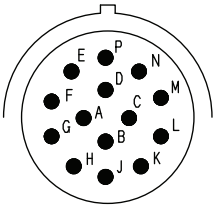
[The pin No. is also marked on the connector (electric wire insertion end)]

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	

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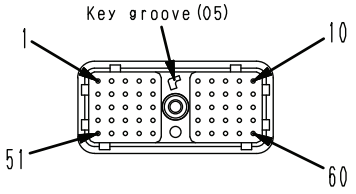
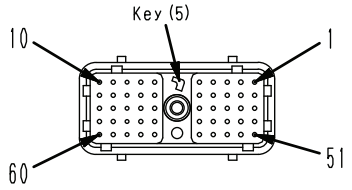
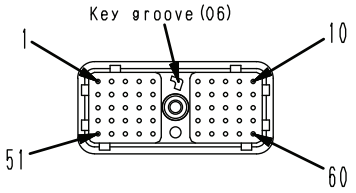
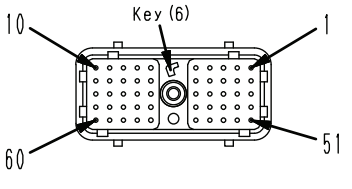
[The pin No. is also marked on the connector (electric wire insertion end)]

No. of pins	DRC26 Series connector		
	Male pin (female housing)	Female pin (male housing)	Testing connection use special tool Part No.
60 -05※	 BJD14063	 BJD14064	799-601-4220 (T-adapter) (Kit:799-601-4101)
	–	Part No. 08194-04104	
	※-05:Key position		
60 -06※			799-601-4390 (Socket)
	–	–	
	※-06:Key position		

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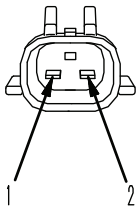
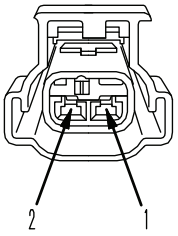
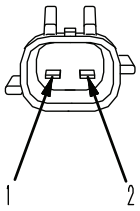
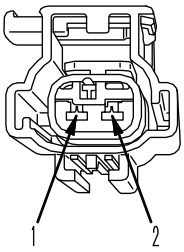
FRAMATOME connector for engine

No. of pins	Dosing fuel solenoid 1, 2 and fuel doser injector (125, 140 engine) KDOC inlet temperature sensor (TEMP1) (107, 114, 125, 140 engine)		Testing connection use special tool Part No.
	Sensor side (plug)	Harness side (receptacle)	
2			799-601-4640 (T-adapter) (Kit : 799-601-4101) (Kit : 799-601-4201)
	—	—	

No. of pins	KDOC outlet temperature sensor (TEMP2), KDPF outlet temperature sensor (TEMP3) (107, 114, 125, 140 engine) EGR orifice temperature sensor (107, 114 engine)		
	Sensor side (plug)	Harness side (receptacle)	
2			799-601-4630 (T-adapter) (Kit : 799-A65-4600)
	—	—	

G0026166

Part No.	Part name	Number of pins	ID marking	T-adapter kit													Non-kit part
				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	
799-601-9420	Adapter for engine (CRI-T2) Adapter PFUEL for engine (CRI-T3) Oil pressure sensor	3	A3													●	●	
799-601-9430*	Socket for engine (CRI-T2) Socket PCV for engine (CRI-T3)	2	P													●	●	
799-601-9440*	Socket for engine (CRI-T2)	3	1, 2, 3															●
795-799-5520*	Socket for engine (HPI-T2)	2	S															●
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 TIM for engine (CRI-T3)	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 PIM for engine (140-T3)	4	ITT3N													●	●	
799-601-4130	Adapter NE, CAM for engine (CRI-T3)	3	FCIN													●	●	
799-601-4140	Adapter for engine (CRI-T3) Ambient pressure	3	FCIG													●	●	
799-601-4150	Adapter POIL for engine (CRI-T3)	3	FCIB													●	●	
799-601-4160	Adapter for engine (CRI-T3) Oil pressure switch	2	4160													●	●	
799-601-4180	Adapter PEVA for engine (CRI-T3)	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) Intake pressure/temperature	4	1, 2, 3, 4C													●	●	
799-601-4240*	Socket PAMB for engine (CRI-T3)	3	1, 2, 3A													●	●	
799-601-4250*	Socket PIM for engine (CRI-T3)	3	1, 2, 3B													●	●	
799-601-4330*	Socket G for engine (CRI-T3)	3	1, 2, 3G													●	●	

TROUBLESHOOTING OF ELECTRICAL SYSTEM (E-MODE)

E-1 ENGINE DOES NOT START (ENGINE DOES NOT CRANK)

Detail of failure	The engine does not start (the engine does not crank).
Related information	Two types of start lock function are installed to the engine start circuit. Because a start lock is installed, the engine does not start unless the PPC lock lever is in the LOCK position. 1. Start lock by KOMTRAX signal 2. Start lock by lock lever **REMARK** The switch for PPC lock levers (to lock PPC) are installed on the right and left.

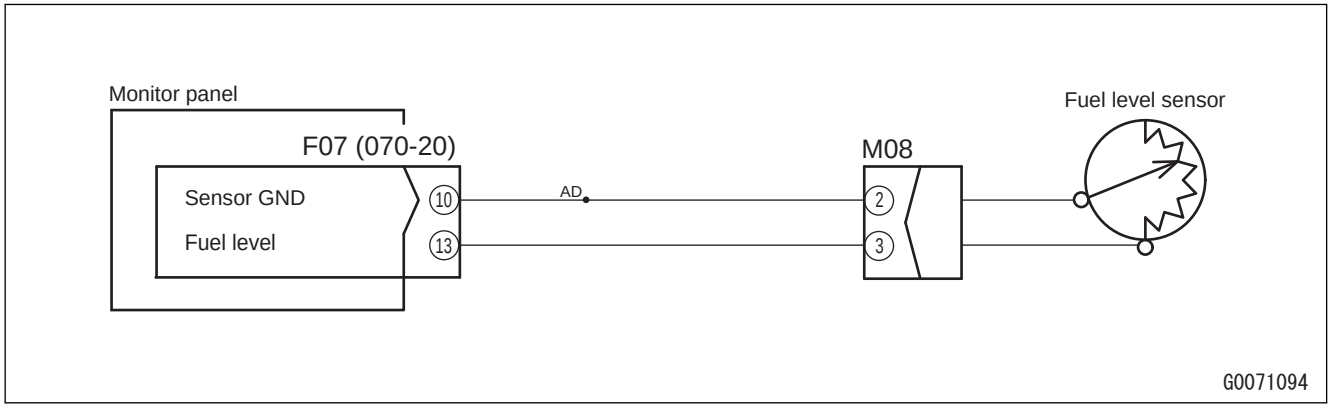
No.	Cause	Procedure, measurement location, criteria and remarks			
1	Loose terminal or open circuit at terminal	1. Turn the starting switch to the OFF position. 2. Check the terminals of starting motor, alternator, and ground terminal TM6, etc.			
2	Low battery capacity	Check the battery voltage and the specific gravity to do the troubleshooting.			
		Battery voltage		Min. 12 V	
		Specific gravity of battery electrolyte		Min. 1.26	
3	Defective fusible link	• If fusible link (M02) is burnt out, the circuit probably has a ground fault. In this case, do the troubleshooting for ground fault of wiring harness in cause 13 first. • Fusible link (M02) is connected to fuses No.1 and No.2 and has large scale of circuits connected. If no failure is found by check on cause 13, reproduce the phenomenon to find the position of the ground fault by unusual noise and burnt smell. You can resolve the trouble quicker with this.			
4	Defective fuse	If fuses No.3 and No.4 in fuse box FB1 are burnt out, the circuit probably has a ground fault. (See check on cause of wiring harness ground fault.)			
5	Defective starting switch	1. Turn the starting switch to the OFF position. 2. Disconnect the negative (-) terminal R of the battery. 3. Operate the starting switch to do the troubleshooting.			
		Resistance	Between TF1 and TF3	Starting switch: OFF	Min. 1MΩ
				Starting switch: ON	Max. 1Ω
			Between TF1 and TF4	Starting switch: OFF	Min. 1MΩ
				Starting switch: START	Max. 1Ω
6	Defective lock lever lock (PPC lock) switch (R.H.)	1. Turn the starting switch to the OFF position. 2. Disconnect the connector F02 and connect the T-adapter to the female side. 3. Operate the lock lever (R.H.) to do the troubleshooting.			
		Resistance	Between F02 (female) (A) and (C)	Lock lever: LOCK	Max. 1Ω
				Lock lever: FREE	Min. 1MΩ
			Between F02 (female) (A) and (B)	Lock lever: LOCK	Min. 1MΩ
				Lock lever: FREE	Max. 1Ω

E-4 WHEN YOU TURN STARTING SWITCH TO ON POSITION, ALL ITEMS OF MACHINE MONITOR DO NOT WORK, OR ONE OF ITEMS DO NOT WORK

Detail of failure	All items of machine monitor do not work, or there is item(s) which does not work.
Related information	**Pre-troubleshooting** Make sure that fusible link (M02) is not blown.

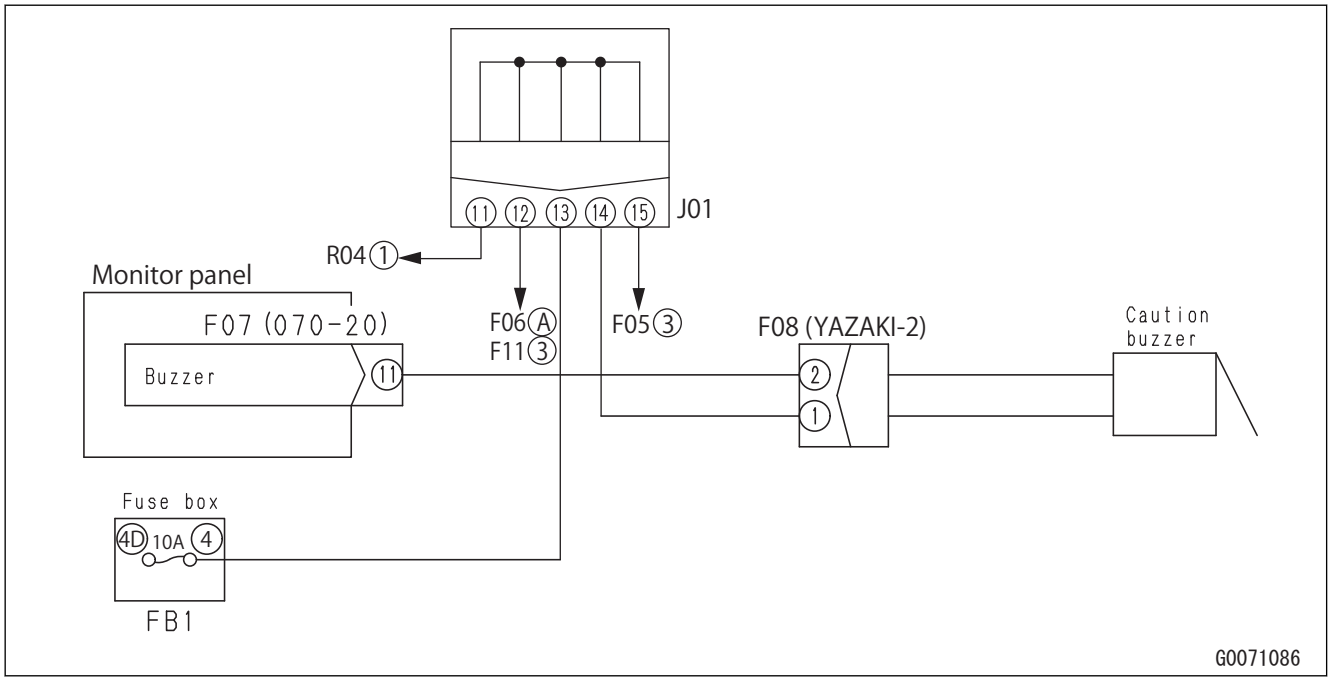
No.	Cause	Procedure, measurement location, criteria and remarks			
1	Low battery capacity	Check the battery voltage and the specific gravity to do the troubleshooting.			
		Battery voltage		Min. 12 V	
		Specific gravity of battery electrolyte		Min. 1.26	
2	Defective fusible link	• If fusible link (M02) is burnt out, the circuit probably has a ground fault. In this case, do the troubleshooting for ground fault of wiring harness in cause 13 first. • Fusible link (M02) is connected to fuses No.1 and No.2 and has large scale of circuits connected. If no failure is found by check on cause 13, reproduce the phenomenon to find the position of the ground fault by unusual noise and burnt smell. You can resolve the trouble quicker with this.			
3	Defective fuse	If fuses No.1 and No3 in fuse box FB1 are burnt out, the circuit probably has a ground fault. (See check on cause of wiring harness ground fault.)			
4	Defective starting switch	1. Turn the starting switch to the OFF position. 2. Disconnect the negative (-) terminal R of the battery. 3. Operate the starting switch to do the troubleshooting.			
		Resistance	Between TF1 (B) and TF3 (ACC)	Starting switch: OFF	Min. 1MΩ
				Starting switch: ON	Max. 1Ω

Circuit diagram of fuel level sensor



No.	Cause	Procedure, measurement location, criteria and remarks		
5	Defective alarm buzzer	1. Turn the starting switch to the OFF position. 2. Disconnect the negative (-) terminal R of the battery. 3. Disconnect the connector F07. 4. Insert the T-adapter into the connector F08. 5. Turn the starting switch to the ON position. Then, do the troubleshooting.		
		Buzzer sound	Connect the pin 2 of T-adapter box to the ground.	The alarm buzzer makes a sound only when it is connected.
		Voltage	Between F08 (1) and ground	10 to 15V
6	Defective machine monitor	1. Turn the starting switch to the OFF position. 2. Disconnect the negative (-) terminal R of the battery. 3. Disconnect the connector F07. Connect the T-adapter to the female side. 4. Turn the starting switch to the ON position. Then, do the troubleshooting.		
		Buzzer sound	Connect the pin 11 of T-adapter box to the ground.	The alarm buzzer makes a sound only when it is connected.

Circuit diagram of alarm buzzer



<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measurement location, criteria and remarks</th></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Defective PPC lock ready relay</td><td colspan="3">1. Turn the starting switch to the OFF position.
2. Disconnect the connector R03. Replace it with travel speed increase relay (R05).
3. Start the engine.
4. Set the lock lever to the FREE position.
5. Operate each control lever to do the troubleshooting.</td></tr>
<tr><td colspan="2">Operation of control levers</td><td>All work equipment, swing and travel operate.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Defective PPC lock cancel relay</td><td colspan="3">1. Turn the starting switch to the OFF position.
2. Disconnect the connector R02. Replace it with travel speed increase relay (R05).
3. Start the engine.
4. Set the lock lever to the FREE position.
5. Operate each control lever to do the troubleshooting.</td></tr>
<tr><td colspan="2">Operation of control levers</td><td>All work equipment, swing and travel operate.</td></tr>
<tr><td rowspan="3">6</td><td rowspan="3">PPC lock solenoid</td><td colspan="3">1. Turn the starting switch to the OFF position.
2. Disconnect the connector M09, and connect the T-adapter to male side to do the troubleshooting.</td></tr>
<tr><td rowspan="2">Resistance</td><td>Between M09 (male) (1) and (2)</td><td>10.5 to 12Ω</td></tr>
<tr><td>Between M09 (male) (1) and ground</td><td>Min. 1MΩ</td></tr>
<tr><td rowspan="5">7</td><td rowspan="5">Defective diode array (D01)</td><td colspan="3">1. Turn the starting switch to the OFF position.
2. Disconnect the connector D01, and connect the T-adapter to male side to do the troubleshooting.
REMARK
Measure it with diode range of multimeter.</td></tr>
<tr><td rowspan="4">Continuity</td><td>Between D01 (male) (6) and (2)</td><td>Continuity</td></tr>
<tr><td>Between D01 (male) (2) and (6)</td><td>No continuity</td></tr>
<tr><td>Between D01 (male) (7) and (3)</td><td>Continuity</td></tr>
<tr><td>Between D01 (male) (3) and (7)</td><td>No continuity</td></tr>
</table>

E-23 BLADE AND VARIABLE GAUGE SELECTOR SYSTEM DOES NOT OPERATE CORRECTLY (BLADE MOVES WHILE VARIABLE GAUGE IS SELECTED)

Failure	When the variable gauge is selected by the blade and variable gauge selector switch, the blade moves.
Related information	The blade and the variable gauge are operated when the blade control valve circuit is selected with the variable gauge selector solenoid valve.

No.	Cause	Procedure, measurement location, criteria and remarks			
1	Defective fuse	If fuse No.5 in fuse box FB1 is burnt out, the circuit probably has a ground fault. (See check on cause of wiring harness ground fault.)			
2	Defective blade and variable gauge selector switch	1. Turn the starting switch to the OFF position. 2. Disconnect the connector F1, and connect the T-adapter to male side to do the troubleshooting. 3. Operate the blade and variable gauge selector switch to do the troubleshooting.			
		Resistance	Between F01 (male) (2) and (3)	Blade and variable gauge selector switch: Blade	Min. 1MΩ
				Blade and variable gauge selector switch: Variable gauge	Max. 1Ω
3	Defective variable gauge selector solenoid valve	1. Turn the starting switch to the OFF position. 2. Disconnect the connector M15. Connect the T-adapter to the male side.			
		Resistance	Between M15 (male) (1) and (2)		5.5±0.4Ω
			Between M15 (male) (1) and ground		Min. 1MΩ
4	Defective diode	1. Turn the starting switch to the OFF position. 2. Disconnect the connector D01, and connect the T-adapter to male side to do the troubleshooting. **REMARK** Do the troubleshooting with the multimeter in continuity mode.			
		Continuity	Between D01 (male) (4) and (8)		No continuity
5	Open circuit in wiring harness	1. Turn the starting switch to the OFF position. 2. Disconnect the connectors F01, M15, D01, and J01. Connect the T-adapter to each female side to do the troubleshooting.			
		Resistance	Between F01 (female) (3) and J01 (female) (16)		Max. 1Ω
			Between F01 (female) (2) and M15 (female) (1)		Max. 1Ω
			Between M15 (female) (2) and ground (TM6)		Max. 1Ω

H-1 ALL WORK EQUIPMENT, TRAVEL, SWING, BLADE DO NOT OPERATE

Failure	All work equipment, travel, swing, blade do not operate.
Related information	• Make sure that the hydraulic tank oil level is correct. • Do the troubleshooting with the hydraulic oil temperature at 45 to 55℃. • Before you do the troubleshooting, check that the electrical system (solenoid circuit) is correct.

No.	Cause	Procedure, measurement location, criteria and remarks		
1	Malfunction of PPC lock solenoid valve	1. Be prepared with the engine stopped. 2. Start the engine. Then, do the troubleshooting with the engine at high idle.		
		Solenoid valve outlet pressure	Lock lever: LOCK	0MPa {0kg/cm^2}
			Lock lever: FREE	3.04 to 3.53MPa {31 to 36kg/cm^2}
2	Incorrect adjustment or malfunction of control relief valve	1. Be prepared with the engine stopped. 2. Start the engine. Then, do the troubleshooting with the engine at high idle.		
		Control circuit relief pressure	All control levers: NEUTRAL	3.62 to 4.11MPa {37 to 42kg/cm^2}
		If oil pressure is not correct even after adjustment, check the control relief valve because there is possibility of malfunction or internal defect.		
3	Clogged suction strainer or return filter	If no failure is found by the above checks, check the strainer or return filter because there is possibility of clogging in them.		
4	Defective pilot pump	If no failure is found by the above checks, pilot pump is possibly defective.		
5	Defective main pump, drive shaft or damper	Disconnect the discharge hose of the piston pump and crank the engine with starting motor. Then, check if the oil flows out from the discharge port. **REMARK** No-injection cranking is required. For details of procedure, see TESTING AND ADJUSTING, “TEST COMPRESSION PRESSURE”.		

H-10 ARM SPEED IS LOW OR POWER IS LOW

Failure	Arm speed is low or power is low.
Related information	• Make sure that the hydraulic tank oil level is correct. • Do the troubleshooting with the hydraulic oil temperature at 45 to 55℃.

No.	Cause	Procedure, measurement location, criteria and remarks		
1	Malfunction of L.H. PPC valve (arm circuit)	1. Be prepared with the engine stopped. 2. Start the engine. Then, do the troubleshooting with the engine at high idle.		
		PPC valve outlet pressure	L.H. work equipment control lever: NEUTRAL	0MPa {0kg/cm^2}
			L.H. work equipment control lever: Arm IN and Arm OUT	2.84 to 3.43MPa {29 to 35kg/cm^2}
2	Malfunction of arm control valve (spool)	1. Remove the pressure that remains in the hydraulic oil tank and piping. 2. Do the troubleshooting with the engine stopped.		
		• Check if arm spool is stuck or seized with control valve body. (It must be moved smoothly and must not be caught.) • Remove the arm spool from the valve body, and check it for damage and dirt. When you make the machine to be original state, be careful not to allow the dirt to enter.		
3	Malfunction of arm control valve (pressure compensation valve)	Check the pressure compensation valve of arm control valve because it is possibly defective.		
4	Malfunction of arm control valve (suction valve) or defective seal	Malfunction or defective seal of the suction valve of arm control valve (bottom side and head side) is thought. Check it.		
5	Malfunction of safety valve and suction valve or defective seal	Check the safety valve and suction valve of the control valve because there is a possibility of malfunction in them or defective seal.		
6	Defective arm cylinder	1. Be prepared with the engine stopped. 2. Start the engine. Then, do the troubleshooting with the engine at high idle.		
		Leakage from arm cylinder	Arm IN relief	Max. 10 mℓ/min

H-19 TIME LAG OF WORK EQUIPMENT IS LARGE

Failure	Time lag of the work equipment is large.
Related information	• Make sure that the hydraulic tank oil level is correct. • Do the troubleshooting with the hydraulic oil temperature at 45 to 55℃.

No.	Cause	Procedure, measurement location, criteria and remarks
1	Malfunction of boom control valve (suction valve)	Check the relief pressure of each part of the work equipment. If only relief pressure at boom head side is abnormal, there is a possibility of malfunction of the suction valve of the boom valve. **REMARK** You can replace suction valve with another one and check if failure symptom changes for judgment.
2	Malfunction of arm control valve (suction valve)	Check the relief pressure of each part of the work equipment. If only arm relief pressure is abnormal, there is a possibility of malfunction of the suction valve of the arm valve. **REMARK** You can replace suction valve with another one and check if failure symptom changes for judgment.
3	Malfunction of bucket valve (suction valve)	Check the relief pressure of each part of the work equipment. If only bucket relief pressure is abnormal, there is a possibility of malfunction of the suction valve of the bucket valve. **REMARK** You can replace suction valve with another one and check if failure symptom changes for judgment.
4	Malfunction of safety valve	Check the relief pressure of each part of the work equipment. If there are abnormalities on all the work equipment except blade RAISE, there is a possibility of malfunction of the safety valve.

H-26 TRAVEL SPEED DOES NOT CHANGE, OR TRAVEL SPEED IS TOO SLOW OR FAST

Failure	Travel speed does not change, or travel speed is too slow or fast.
Related information	• Make sure that the hydraulic tank oil level is correct. • Do the troubleshooting with the hydraulic oil temperature at 45 to 55℃.

<table>
<tr><th>No.</th><th>Cause</th><th colspan="4">Procedure, measurement location, criteria and remarks</th></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Defective travel speed solenoid valve</td><td colspan="4">1. Be prepared with the engine stopped.
2. Start the engine. Then, do the troubleshooting with the engine at high idle.</td></tr>
<tr><td rowspan="2">Solenoid valve outlet pressure</td><td>Travel speed: Lo</td><td>Travel lever: NEUTRAL</td><td>0MPa
{0kg/cm^2}</td></tr>
<tr><td>Travel speed: Hi</td><td>Travel lever: Fine control</td><td>3.04 to 3.53MPa
{31 to 36kg/cm^2}</td></tr>
<tr><td>2</td><td>Defective travel motor (travel speed selector part)</td><td colspan="4">If no failure is found by the check on the previous item, the travel speed selector part of travel motor can be defective.</td></tr>
</table>

H-34 THERE IS A LARGE UNUSUAL NOISE WHEN UPPER STRUCTURE STOPS SWING OPERATION

Failure	There is a large unusual noise when upper structure stops swing operation.
Related information	• Make sure that the hydraulic tank oil level is correct. • Do the troubleshooting with the hydraulic oil temperature at 45 to 55℃.

No.	Cause	Procedure, measurement location, criteria and remarks
1	Malfunction of back pressure check valve	Back pressure check valve in the control valve is possibly defective. Check the spool for prying, sticking and scratches, and the spring for fatigue.
2	Defective swing motor (safety valve)	• The operation of the safety valve of the swing motor can be defective. • If oil pressure is not correct even after adjustment, the safety valve can have an internal defect.
3	Defective seal of swing motor (suction valve)	Exchange the suction valves of the swing motor between the right and left. Check the change of phenomenon to judge the cause of failure, and check the valve for seizure, scratches, etc. when it is removed.

S-5 ENGINE DOES NOT PICK UP SMOOTHLY

Failure	The engine does not pick up smoothly.
Related information	-

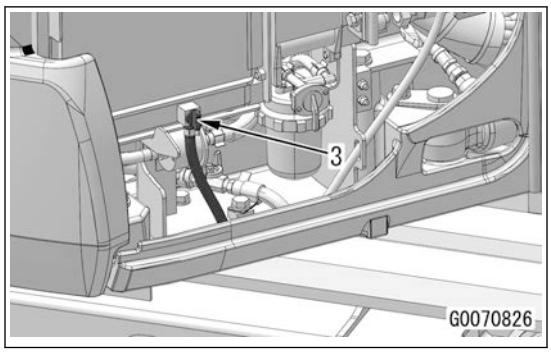
No.	Cause	Point to check, remarks	Remedy
1	Low fuel level	It is found by check that the fuel tank is empty.	Add fuel.
2	Clogged air bleeding hole of fuel tank cap	Air bleeding hole of the fuel tank cap is clogged.	Flush the air bleeding hole of fuel tank cap, and clean its circumference.
3	Clogged fuel filter element	Check the used hours of fuel filter element. If it is used over specified time, there is a possibility of clogged fuel filter element.	Replace the fuel filter element.
4	Mixing of foreign materials into fuel	When the fuel is drained from fuel tank, the rust or water comes out.	Replace the fuel.
5	Air mixed in fuel piping system	When air is bled from the fuel system, air comes out. (Reference: See TESTING AND ADJUSTING, “BLEED AIR FROM FUEL SYSTEM”.)	• Bleed air. • Repair or replace the fuel piping.
6	Leakage from fuel piping system	There is a fuel leakage from the fuel piping. (Reference: See TESTING AND ADJUSTING, “TEST FUEL SYSTEM FOR LEAKAGE”.)	Repair or replace the fuel piping circumference.
7	Defective fuel injection pump	Check the fuel injection pump. (Reference: See TESTING AND ADJUSTING, “TEST AND ADJUST FUEL INJECTION TIMING”.)	Adjust the fuel injection pump.
8	Defective fuel injection valve (clogged fuel injection valve, defective injection)	Check “fuel injection valve”. (Reference: See Engine Shop Manual.)	Adjust the fuel injection valve.
9	Defective valve clearance	• When engine is operated, unusual noise comes from around cylinder head. • Check the valve clearance. (Reference: See TESTING AND ADJUSTING, “CHECK AND ADJUST VALVE CLEARANCE”.)	Adjust the valve clearance.
10	Defective contact of valve and valve seat	• Measure the compression pressure. (See standard value table) (Reference: See TESTING AND ADJUSTING, “TEST COMPRESSION PRESSURE”.) • Check the valve clearance. (Reference: See TESTING AND ADJUSTING, “CHECK AND ADJUST VALVE CLEARANCE”.)	Repair the contact surface between valves and valve seats, or replace the valves.
11	Defective piston ring	• Check the color of exhaust gas. (Reference: For details, see TESTING AND ADJUSTING, “TEST EXHAUST GAS COLOR”.) • Measure the compression pressure. (See standard value table) (Reference: See TESTING AND ADJUSTING, “TEST COMPRESSION PRESSURE”.) • Check the piston ring and piston ring groove.	Replace the piston rings or pistons.

S-13 ENGINE OIL PRESSURE FALLS

Failure	Engine oil pressure falls.
Related information	Check if the machine is operated on slopes steeper than specified in the Operation and Maintenance Manual.

No.	Cause	Point to check, remarks	Remedy
1	Insufficient oil in oil pan	• The oil level in oil pan is not sufficient. • Oil pressure monitor shows low oil pressure on slopes.	Add oil.
2	Defective oil pressure sensor or wiring harness	Check the oil pressure sensor, wiring harness and connectors.	Replace the oil pressure sensor, wiring harness or connectors.
3	Mixing of fuel into oil	• Do the oil analysis, and check for mixing of oil. • Oil smells of diesel fuel.	If fuel is mixed into oil, do the troubleshooting for “FUEL MIXES INTO ENGINE OIL” in S-mode, and take corrective measures.
4	Mixing of water into oil	• Do the oil analysis, and check for mixing of water. • Oil is milky.	If water is mixed into oil, do the troubleshooting for “WATER MIXES INTO ENGINE OIL (MILKY)” in S-mode, and take corrective measures.
5	Clogged oil filter	• Check the oil filter. (Reference: Oil filter is used for more than specified period, oil is deteriorated significantly, etc.) • Oil filter can be blocked due to mixing of water.	Replace the oil filter.
6	Clogged oil strainer	Check the oil strainer.	Clean the oil strainer.
7	Flattened or clogged hydraulic piping	Hydraulic piping is flat or clogged.	Replace the hydraulic piping.
8	Defective oil pump	• Check the oil pump. (for wear or breakage of gear) • The oil pump rotates heavily or has a play.	Replace the oil pump.
9	Defective regulator valve	Check if the valve spring has deformation or damage.	Replace the regulator valve.
10	Defective oil pump relief valve	Valve and spring of oil pump relief valve have deformation or damage.	Replace the oil pump relief valve.
11	Crack in oil pump suction piping	Check around the suction piping of the oil pump. (Crack of piping)	Replace the oil pump suction piping.
12	Defective seal between oil pump and oil pump suction piping	Check the seal part.	Replace the seal.
13	Wear of main journal bearing	• Check the main journal bearings. • Oil drained from the oil pan contains metal powder.	Replace the main journal bearings.
14	Wear of pin journal bearing	• Check the pin journal bearings. • Oil drained from the oil pan contains metal powder.	Replace the pin journal bearings.

3. Loosen the drain valve (3), and drain coolant.



REMARK

- (For details of the drain quantity, see SPECIFICATIONS, “FUEL, COOLANT, LUBRICANT”.)
- Make sure that the coolant is drained fully, and then tighten the drain valve (3).

Tool: Coolant container

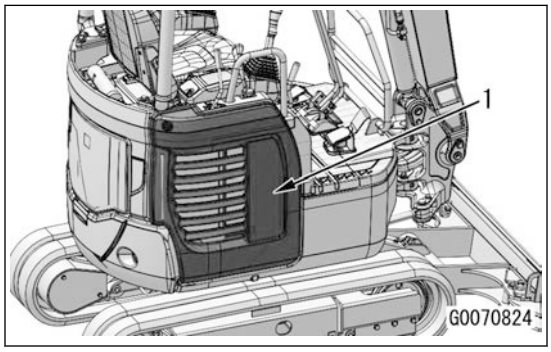
ADD COOLANT

1. Add coolant to the specified level through the coolant filler port. Run the engine to circulate the coolant, and then check the coolant level again.

REMARK

(For details of the supply quantity, see SPECIFICATIONS, “FUEL, COOLANT, LUBRICANT” and TROUBLESHOOTING, “TEST IN ACCORDANCE WITH TESTING PROCEDURE”, “CHECK COOLANT LEVEL (RESERVOIR TANK)”.)

2. Close the cover (1).



REMOVE AND INSTALL HYDRAULIC OIL COOLER ASSEMBLY

Standard tool list

The listed parts are for reference only. You can use the part that is not listed if it is applicable.

Symbol	Part name	Part No.	Specifications	Q'ty	Remarks
1	Socket wrench	Commercially available	13 mm	1	
2	Open-end wrench	Commercially available	32 mm	1	
3	Torque wrench (socket)	Commercially available	10 to 50 Nm {1.02 to 5.1 kgm}	1	
4	Torque wrench (open-end)	Commercially available	20 to 200 Nm {2.04 to 20.4 kgm}	1	

⚠ Place the machine on a level ground, and lower the work equipment to the ground in a stable posture.

⚠ Set the lock lever to the LOCK position.

⚠ Turn the starting switch to the OFF position to stop the engine.

⚠ Set the battery disconnect switch to the OFF position. (For details, see TESTING AND ADJUSTING, "BATTERY DISCONNECT SWITCH".)

REMARK

- Check the connector numbers and installed positions before you disconnect the wirings and hoses, and write them down.
- When you disconnect wirings and hoses, be careful not to deform or damage them.

REMOVE HYDRAULIC OIL COOLER ASSEMBLY

Drain hydraulic oil

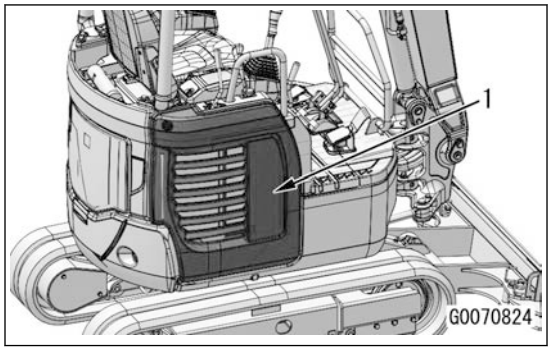
1. Drain the hydraulic oil. For details, see "DRAIN AND ADD HYDRAULIC OIL".

Hydraulic oil cooler assembly

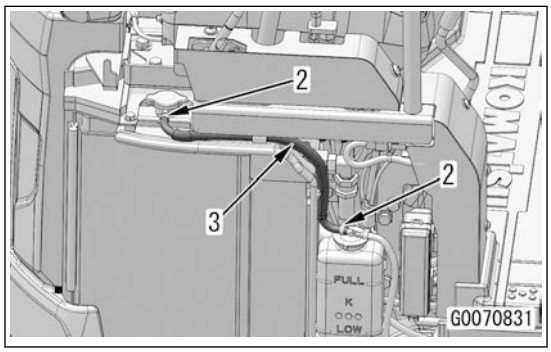
2. Open the cover (1).

   REMARK

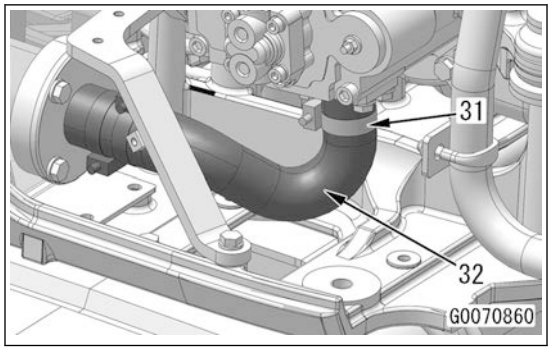
   Make sure that the lock bar is securely fixed.



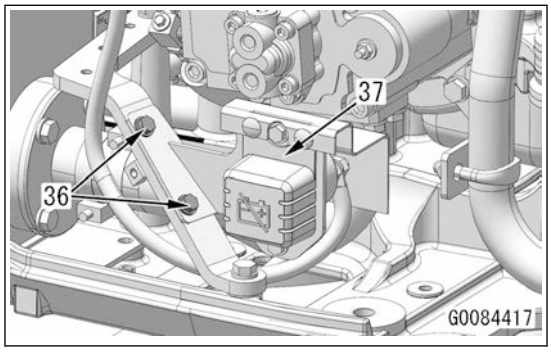
3. Remove the clamps (2) (2 pieces), and disconnect the hose (3).



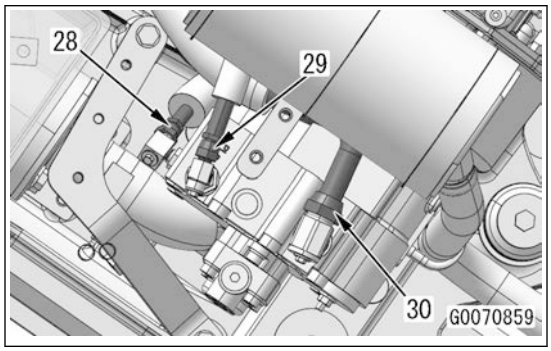
3. Connect the hose (32) with the clamp (31).
   Tool: Torque wrench (socket)
   Clamp (31): Width across flats 8 mm
   Clamp (31): 8.8±0.5 Nm {0.9±0.05 kgm}



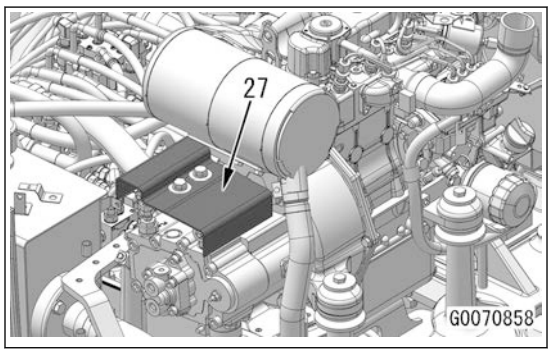
4. Install the disconnect switch assembly (37) with the bolts (36) (2 pieces).
   Tool: Torque wrench (socket)
   Bolt (36): Width across flats 13 mm, M8
   Bolt (36): 27 to 34 Nm {2.8 to 3.5 kgm}



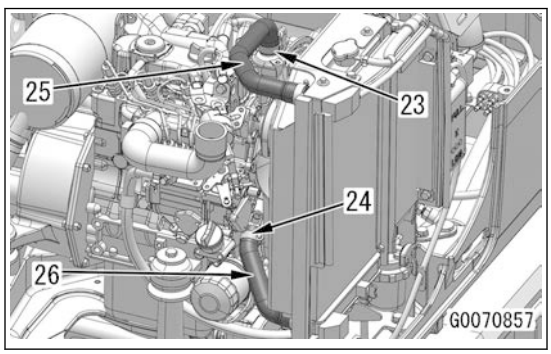
5. Connect the hoses (28), (29), and (30).
   Tool: Torque wrench (open-end)
   Hose (28), (29): Width across flats 19 mm, nominal 02
   Hose (30): Width across flats 32 mm, nominal 05
   Hose (28), (29): 34 to 54 Nm {3.5 to 5.5 kgm}
   Hose (30): 128 to 186 Nm {13.0 to 19.0 kgm}



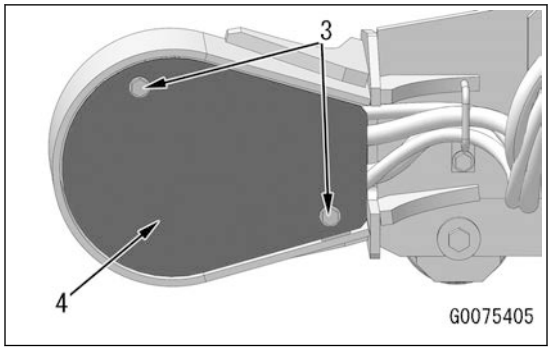
6. Install the rubber cover (27).



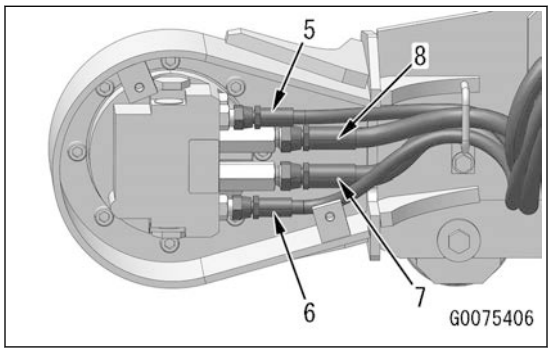
7. Connect the hoses (25) and (26) on the engine side with the clamps (23) and (24).
   Tool: Torque wrench (socket)
   Clamp (23), (24): Width across flats 7 mm
   Insertion portion of hoses (25) and (26): Liquid gasket (LG-10)
   Clamp (23), (24): 4.4±0.49 Nm {0.4±0.05 kgm}



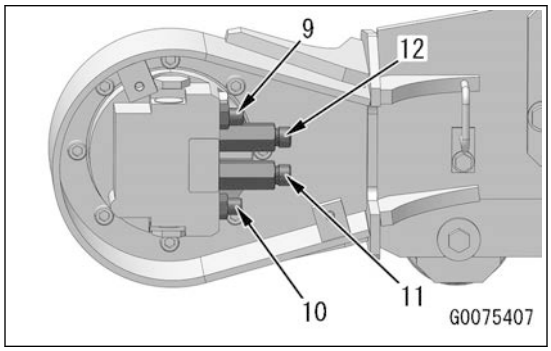
5. Remove the bolts (3) (2 pieces), and remove the cover (4).
   Tool: Socket wrench
   Bolt (3): Width across flats 13 mm, M8



6. Disconnect the hoses (5), (6), (7), and (8).
   Tool: Open-end wrench
   Hose (5), (6): Width across flats 19 mm, nominal 02
   Hose (7), (8): Width across flats 22 mm, nominal 03



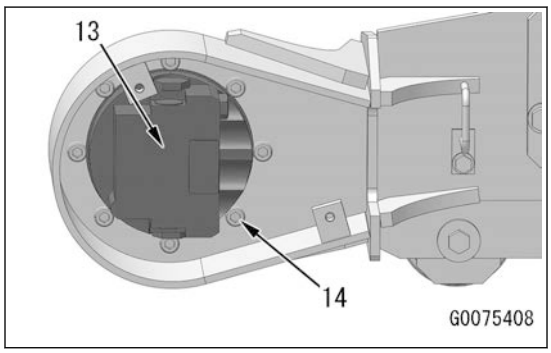
7. Remove the nipples (9), (10), (11), and (12).
   Tool: Open-end wrench
   Nipple (9), (10): Width across flats 19 mm
   Nipple (11), (12): Width across flats 22 mm

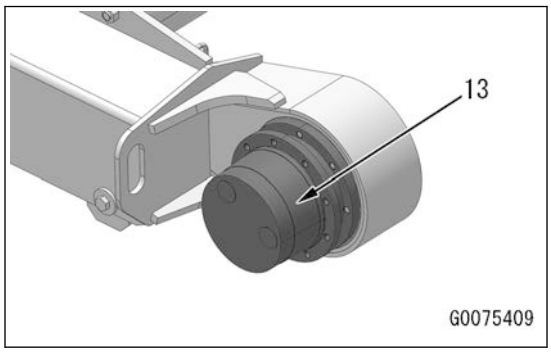


8. Lift the travel motor assembly (13), and hold it.

   Travel motor assembly (13): 20 kg

9. Remove the hexagonal socket head bolts (14) (8 pieces), lift the travel motor assembly (13), and remove it.
   Tool: Hexagonal wrench
   Hexagonal socket head bolt (14): Width across flats 8 mm, M10





INSTALL SWING CIRCLE ASSEMBLY

Swing circle assembly

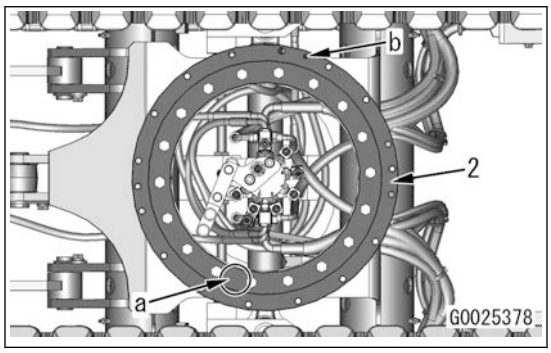
1. Lift the swing circle assembly (2), and set it to the installation position.

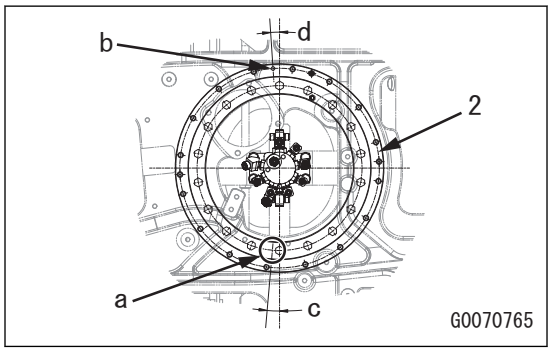
   REMARK

   Install the assembly with the angle of the inner race soft zone (a) “Mark S” and the angle of the outer race soft zone (b) are at (c) and (d) respectively as shown in the figure.
   Angle (c): 5°
   Angle (d): 3.75°

   Swing circle assembly (2): 20 kg

   Tooth surface of inner race: Grease (G2-LI)





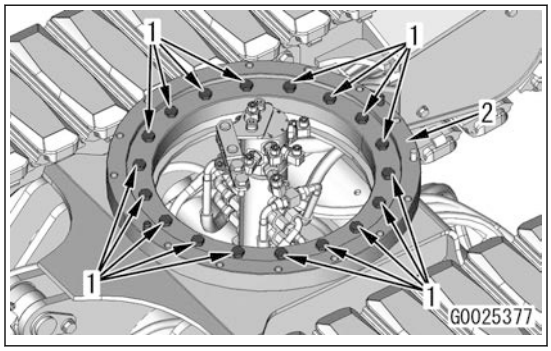
2. Install the bolts (1) (18 pieces).

   Tool: Torque wrench (socket)

   Bolt (1): Width across flats 17 mm, M10

   Bolt (1): Liquid adhesive (LT-2)

   Bolt (1): 59 to 74 Nm {6 to 7.5 kgm}



Revolving frame assembly

3. Install the revolving frame assembly. For details, see “REMOVE AND INSTALL REVOLVING FRAME ASSEMBLY”.

DISASSEMBLE AND ASSEMBLE TRACK ROLLER ASSEMBLY

Standard tool list

The listed parts are for reference only. You can use the part that is not listed if it is applicable.

No.	Part name	Part No.	Specifications	Q'ty	Remarks
1	Snap ring pliers	Commercially available		1	

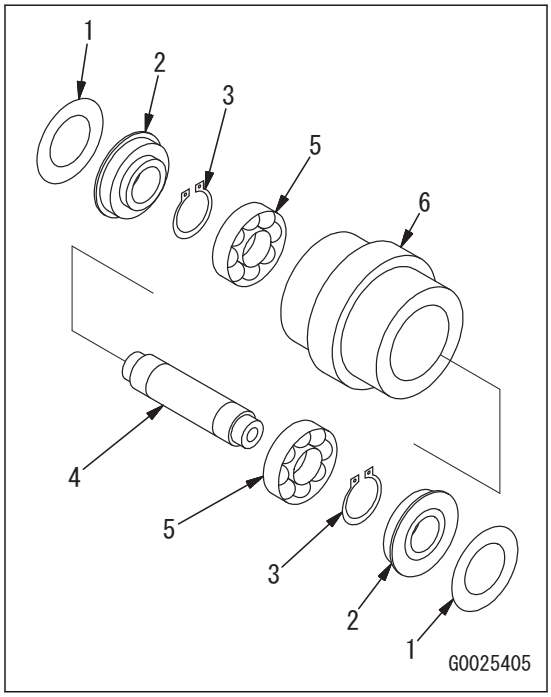
Special tools list

Symbol		Part name	Part No.	Specifications	Q'ty	Remarks
A		Push tool kit	790-101-5001		1	Installation of bearing
	1	Plate	790-101-5081		1	
	2	Grip	790-101-5021		1	
	3	Bolt	01010-50816		1	
B		Spacer	790-201-2710		1	Installation of oil seal

DISASSEMBLE TRACK ROLLER ASSEMBLY

Track roller assembly

1. Remove the plates (1) (2 pieces).
2. Remove the oil seals (2) (2 pieces).
3. Remove the snap rings (3) (2 pieces), and remove the shaft (4).
   Tool: Snap ring pliers
4. Remove the bearings (5) (2 pieces).

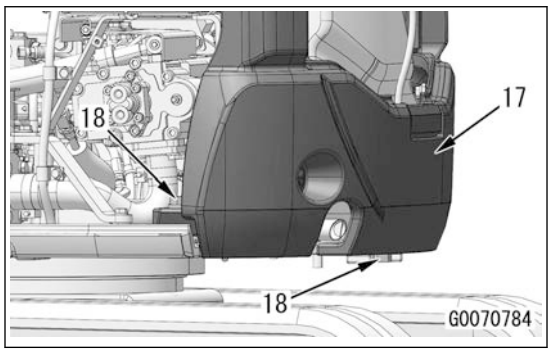


INSTALL COUNTERWEIGHT AND FUEL TANK ASSEMBLY

Counterweight and fuel tank assembly

1. Lift the counterweight and fuel tank assembly (17), and set it to the installation position.

   Counterweight and fuel tank assembly (17): 180 kg



2. Install the bolts (18) (2 pieces) and bolt (19).

   Tool: Torque wrench (socket)

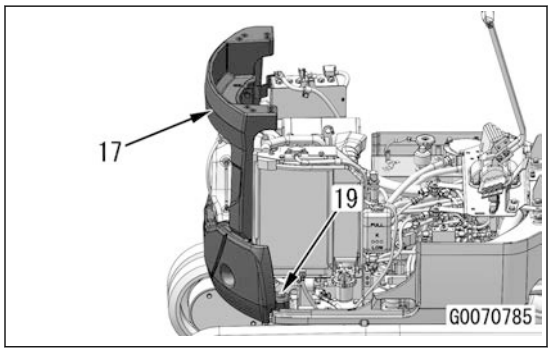
   Bolt (18): Width across flats 30 mm, M20

   Bolt (19): Width across flats 24 mm, M16

   Bolt (18), (19): Liquid adhesive (LT-2)

   Bolt (18): 455 to 565 Nm {46.5 to 58 kgm}

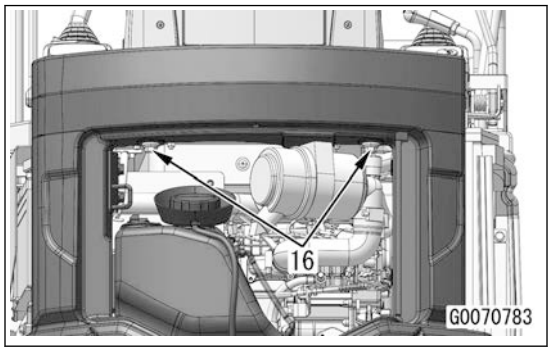
   Bolt (19): 235 to 285 Nm {23.5 to 29.5 kgm}



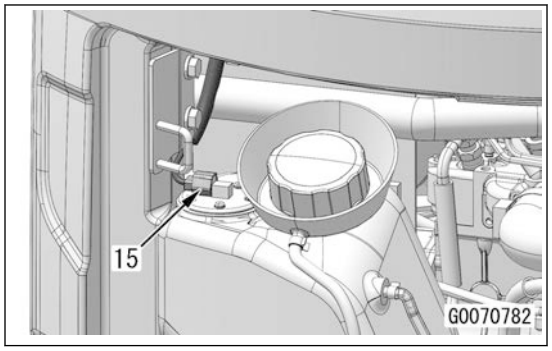
3. Install the bolts (16) (2 pieces).

   Tool: Torque wrench (socket)

   Bolt (16): Width across flats 19 mm, M12



4. Connect the connector M08 (15).



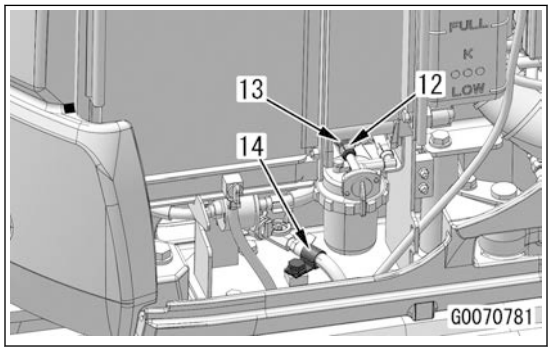
5. Install the clamp (14).

   Tool: Torque wrench (socket)

   Bolt for clamp (14): Width across flats 17 mm, M10

   Bolt for clamp (14): 59 to 74 Nm {6 to 7.5 kgm}

6. Connect the hose (13) with the clip (12).



REMOVE AND INSTALL HYDRAULIC TANK ASSEMBLY

Standard tool list

The listed parts are for reference only. You can use the part that is not listed if it is applicable.

Symbol	Part name	Part No.	Specifications	Q'ty	Remarks
1	Socket wrench	Commercially available	8 mm	1	
2	Socket wrench	Commercially available	17 mm	1	
3	Open-end wrench	Commercially available	19 mm	1	
4	Open-end wrench	Commercially available	22 mm	1	
5	Open-end wrench	Commercially available	32 mm	1	
6	Torque wrench (socket)	Commercially available	3 to 13 Nm {0.31 to 1.33 kgm}	1	
7	Torque wrench (socket)	Commercially available	20 to 100 Nm {2.04 to 10.2 kgm}	1	
8	Torque wrench (open-end)	Commercially available	27 to 135 Nm {2.75 to 13.8 kgm}	1	
9	Torque wrench (open-end)	Commercially available	40 to 200 Nm {4.08 to 20.4 kgm}	1	

⚠ Place the machine on a level ground, and lower the work equipment to the ground in a stable posture.

⚠ Set the lock lever to the LOCK position.

⚠ Turn the starting switch to the OFF position to stop the engine.

⚠ Set the battery disconnect switch to the OFF position. (For details, see TESTING AND ADJUSTING, "BATTERY DISCONNECT SWITCH".)

⚠ Release the remaining pressure in the hydraulic circuit. See TESTING AND ADJUSTING, RELEASE PRESSURE REMAINED IN HYDRAULIC CIRCUIT.

REMOVE HYDRAULIC TANK ASSEMBLY

Drain hydraulic oil

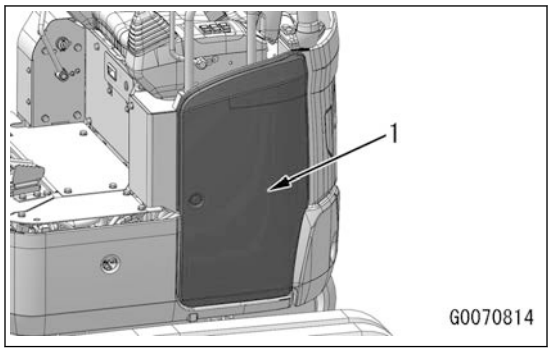
1. Drain the hydraulic oil. For details, see "DRAIN AND ADD HYDRAULIC OIL".

Hydraulic tank assembly

2. Open the cover (1).

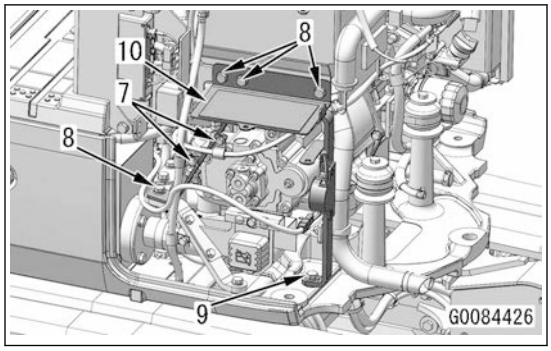
   REMARK

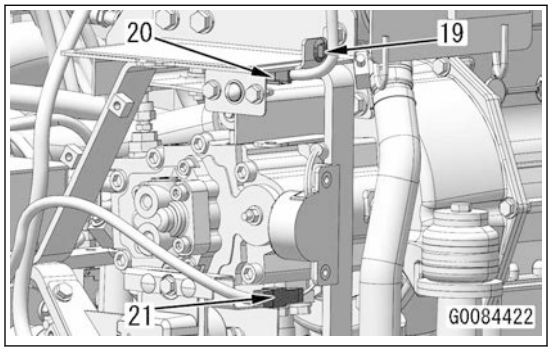
   Make sure that the lock bar is securely fixed.



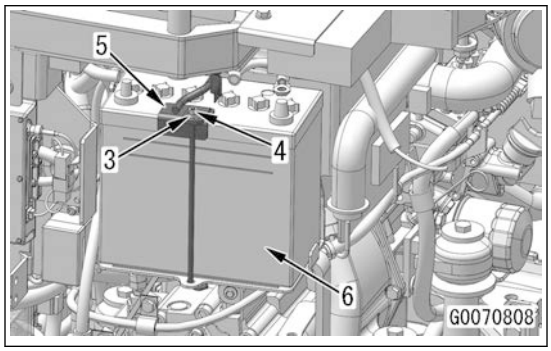
3. Open the cover of the travel PPC lever. For details, see TESTING AND ADJUSTING, "TILT OF COVER OF TRAVEL PPC LEVER".

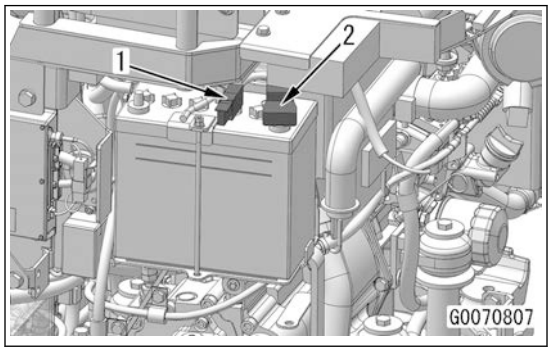
7. Install the battery stand (10) with the bolts (8) (4 pieces) and (9).
   Tool: Torque wrench (socket)
   Bolt (8): Width across flats 17 mm, M10
   Bolt (9): Width across flats 19 mm, M12
   Bolt (8): 59 to 74 Nm {6 to 7.5 kgm}
   Bolt (9): 98 to 123 Nm {10 to 12.5 kgm}
8. Install the clamps (7) (2 pieces).
   Tool: Torque wrench (socket)
   Bolt for clamp (7): Width across flats 13 mm, M8
   Bolt for clamp (7): 27 to 34 Nm {2.8 to 3.5 kgm}
9. Connect the connector M17 (20) and connector A05 (21), and install the clip (19).





10. Install the battery (5).
11. Install the bracket (5) with the nut (3).
    Tool: Torque wrench (socket)
    Nut (3): Width across flats 10 mm
    Nut (3): 1.47 to 1.96 Nm {0.15 to 0.22 kgm}
12. Install the nut (4) while you hold the nut (3).
    Tool: Open-end wrench, torque wrench (socket)
    Nut (3), (4): Width across flats 10 mm
    Nut (4): 2.9 to 4.9 Nm {0.3 to 0.5 kgm}
13. Connect the battery (+) terminal (2).
14. Install the connector M02 (1) to the clip.





Counterweight and fuel tank assembly

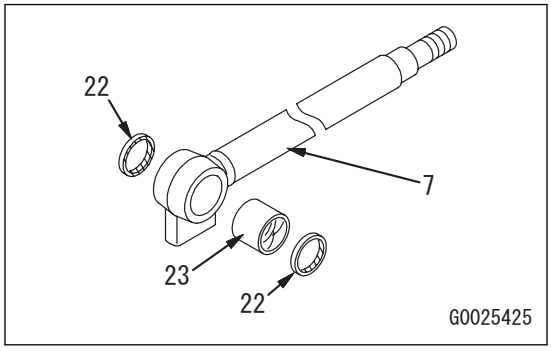
15. Install the counterweight and fuel tank assembly. For details, see REMOVE AND INSTALL COUNTERWEIGHT AND FUEL TANK ASSEMBLY.

Bleed air from hydraulic circuit

16. Bleed air from the hydraulic circuit. For details, see TESTING AND ADJUSTING, “BLEED AIR FROM HYDRAULIC SYSTEM”.

Piston rod assembly

12. Remove the dust seals (22) (2 pieces).
13. Remove the bushing (23).

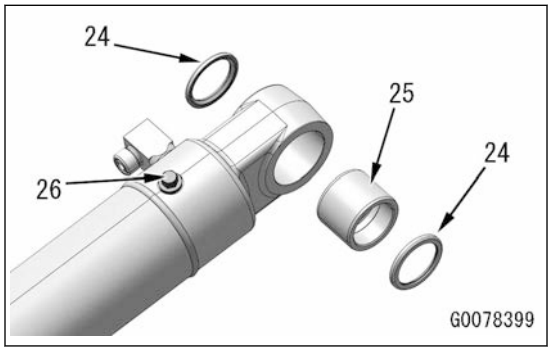


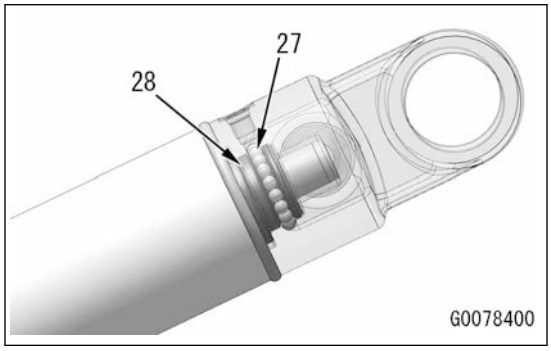
Cylinder assembly

14. Remove the dust seals (24) (2 pieces).
15. Remove the bushing (25).
16. Remove the plug (26).
    Tool: Socket wrench
    Plug (26): Width across flats 10 mm, M10
17. Remove the balls (27) (18 pieces).
18. Remove the collar (28).

    REMARK

    When you remove it, be careful not to damage the inner perimeter of the cylinder tube.





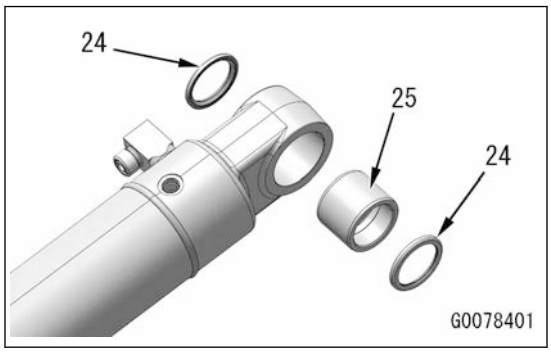
ASSEMBLE WORK EQUIPMENT CYLINDER ASSEMBLY

NOTICE

- **Apply engine oil on the sliding surface of each part, assemble them carefully not to damage the packing, dust seal, and O-ring.**
- **Wash each part and cover the piping ports and pin insertion parts to prevent entry of dirt.**
- **Do not insert the backup ring by force. Warm it in hot water at 50 to 60 °C before you insert it.**

Cylinder assembly

1. Install the bushing (25).
2. Install the dust seals (24) (2 pieces).



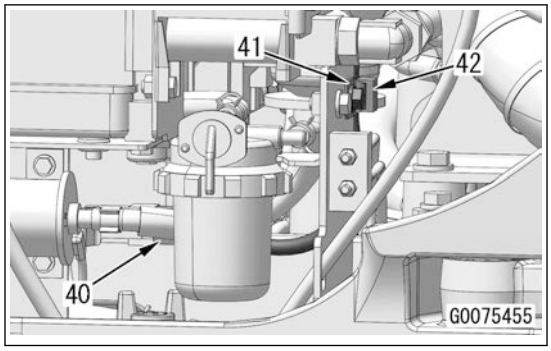
25. Disconnect the connector M05 (40).
26. Remove the clip (41) and clamp (42) together.

    REMARK

    Move the removed clip to its original position not to lose it.

    Tool: Socket wrench

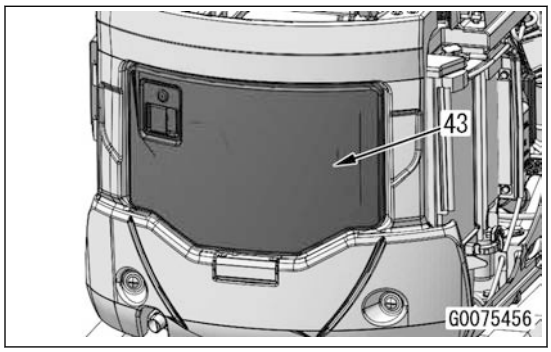
    Bolt for clip (41): Width across flats 13 mm, M8



27. Open the cover (43).

    REMARK

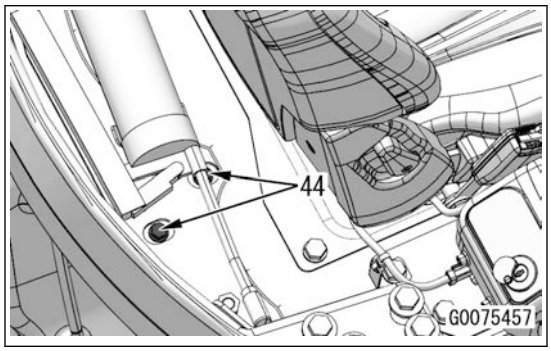
    Make sure that the lock bar is securely fixed.



28. Remove the bolts (44) (2 pieces).

    Tool: Socket wrench

    Bolt (44): Width across flats 13 mm, M8

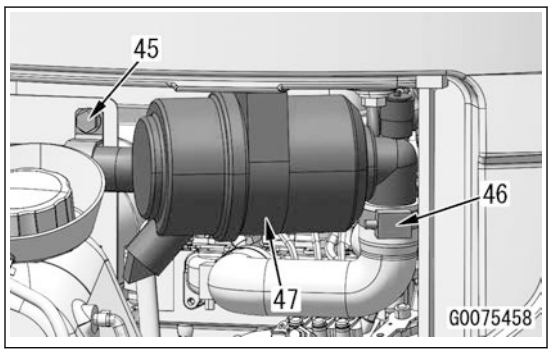


29. Remove the clamps (45) and (46), and move the air cleaner (47) to the safe place where it does not interfere with the work.

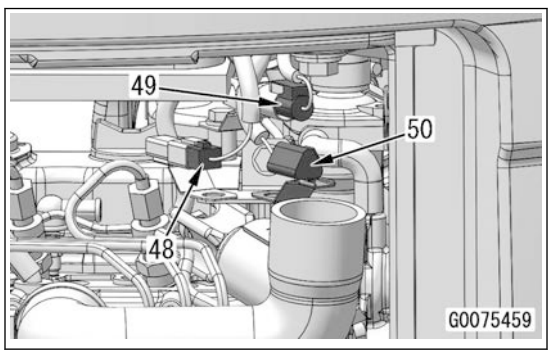
    Tool: Socket wrench

    Bolt for clamp (45): Width across flats 17 mm, M10

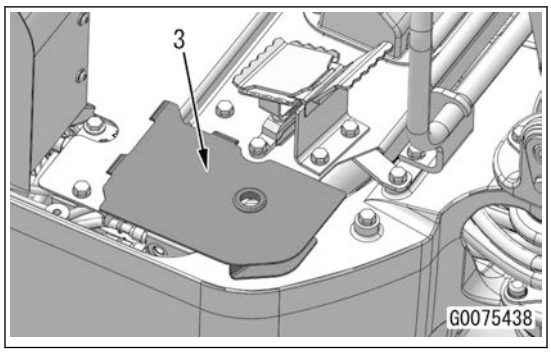
    Clamp (46): Width across flats 8 mm



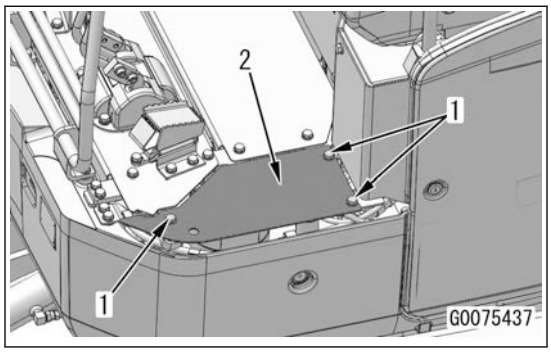
30. Disconnect the connectors M06 (48) and M16 (49).
31. Remove the connector M04 (50) from the clip.



40. Install the cover (3).



41. Install the cover (2) with the bolts (1) (3 pieces).
    Tool: Torque wrench (socket)
    Bolt (1): Width across flats 17 mm, M10
    Bolt (1): 59 to 74 Nm {6 to 7.5 kgm}



42. Install the floor mat. For details, see TESTING AND ADJUSTING, “TILT OF COVER OF TRAVEL PPC LEVER”.

Bleed air from hydraulic circuit

43. Bleed air from the hydraulic circuit. For details, see TESTING AND ADJUSTING, “BLEED AIR FROM HYDRAULIC SYSTEM”.

REMOVE AND INSTALL KOMTRAX TERMINAL ASSEMBLY

Standard tool list

The listed parts are for reference only. You can use the part that is not listed if it is applicable.

Symbol	Part name	Part No.	Specifications	Q'ty	Remarks
1	Socket wrench	Commercially available	10 mm	1	
2	Socket wrench	Commercially available	17 mm	1	
3	Torque wrench (socket)	Commercially available	3 to 17 Nm {0.31 to 1.73 kgm}	1	
4	Torque wrench (socket)	Commercially available	20 to 100 Nm {2.04 to 10.2 kgm}	1	

⚠ Place the machine on a level ground, and lower the work equipment to the ground in a stable posture.

⚠ Set the lock lever to the LOCK position.

⚠ Turn the starting switch to the OFF position to stop the engine.

⚠ Set the battery disconnect switch to the OFF position. (For details, see TESTING AND ADJUSTING, "BATTERY DISCONNECT SWITCH".)

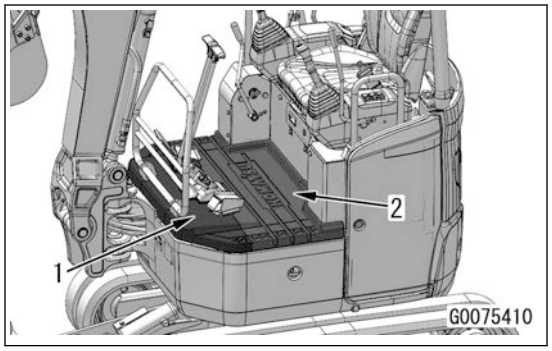
REMOVE KOMTRAX TERMINAL ASSEMBLY

KOMTRAX terminal assembly

1. Remove the floor mats (1) and (2).

   REMARK

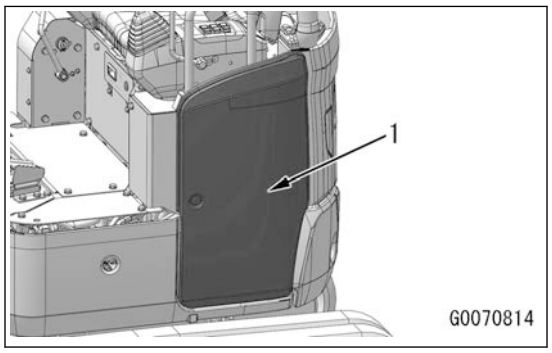
   Remove the floor mat. For details, see TESTING AND ADJUSTING, "TILT OF COVER OF TRAVEL PPC LEVER".



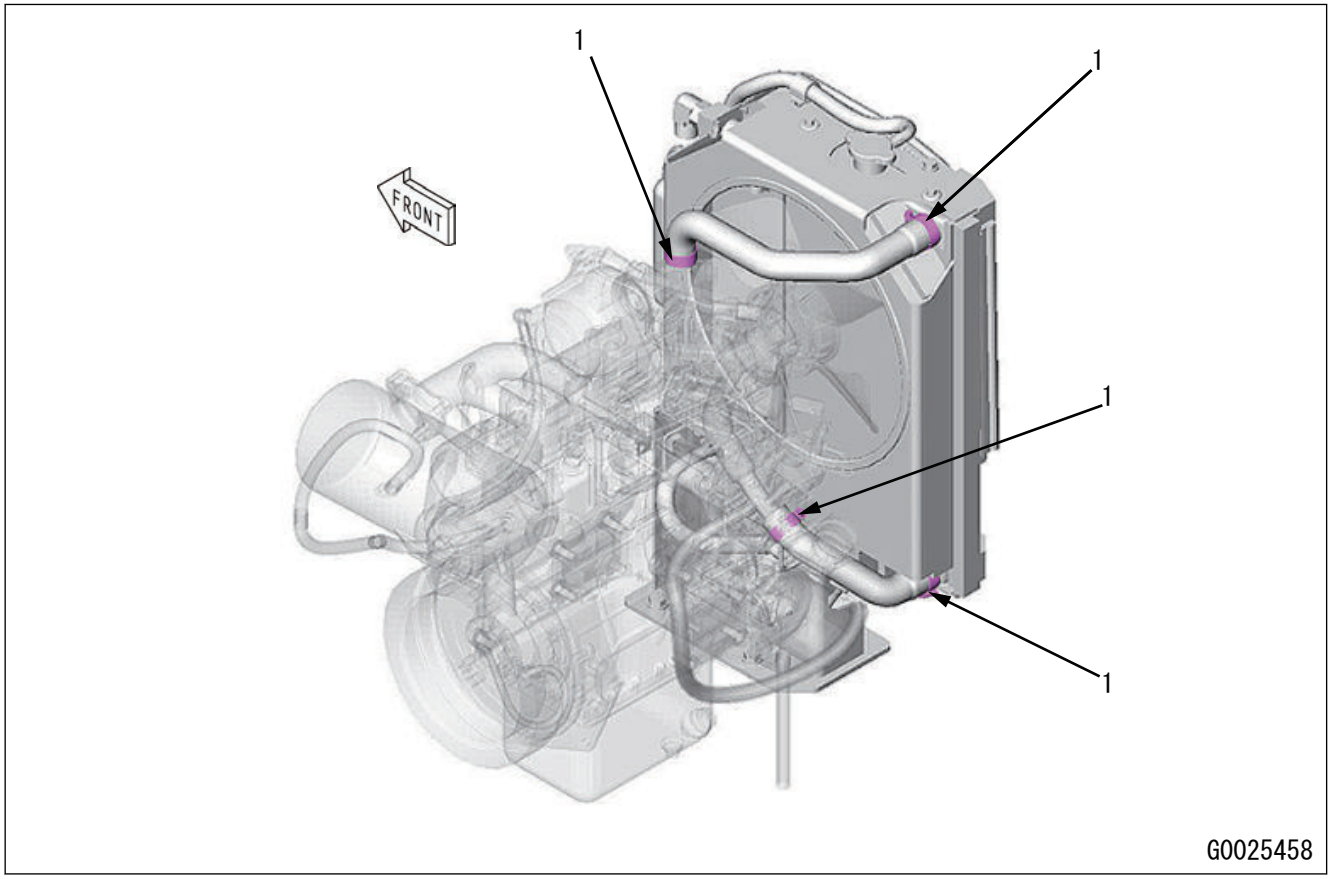
2. Open the cover (3).

   REMARK

   Make sure that the lock bar is securely fixed.



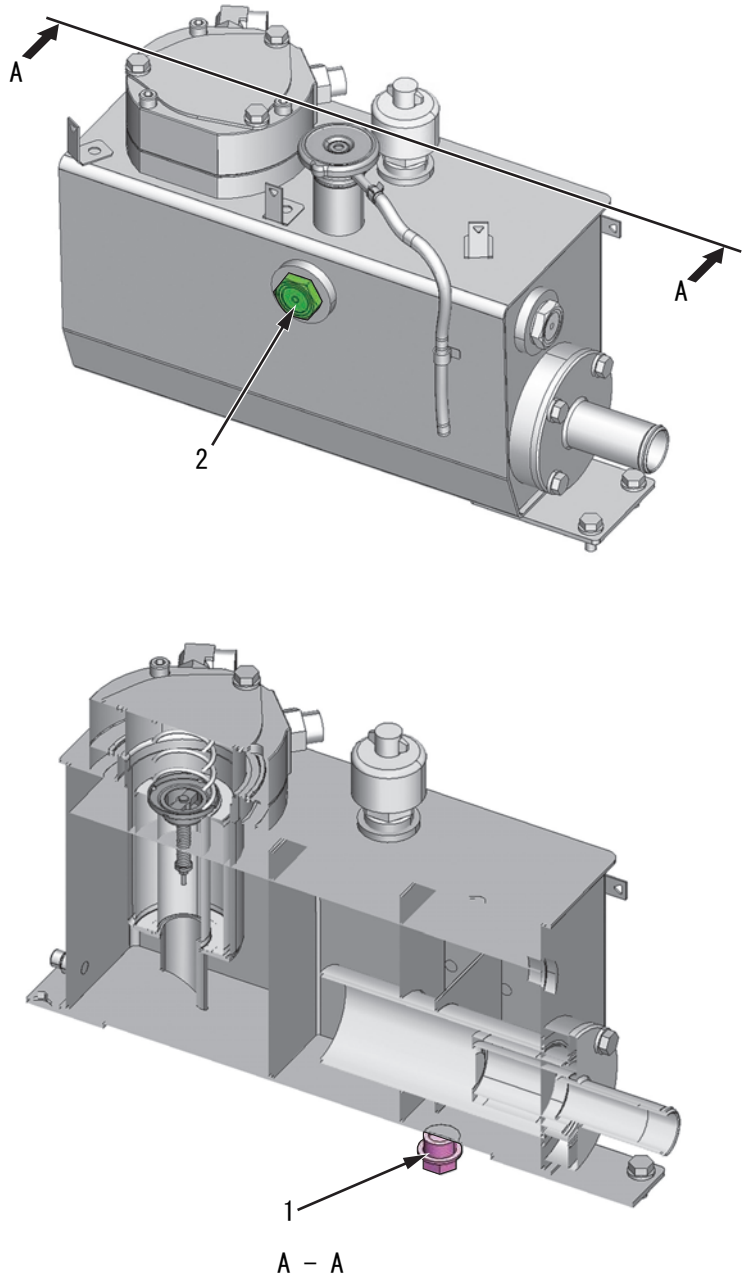
MAINTENANCE STANDARD OF COOLING SYSTEM



No.	Item	Judgment criteria	Remedy
1	Tightening torque of clamp	4.4±0.49 Nm {0.4±0.05 kgm}	Retighten

HYDRAULIC SYSTEM

MAINTENANCE STANDARD OF HYDRAULIC TANK



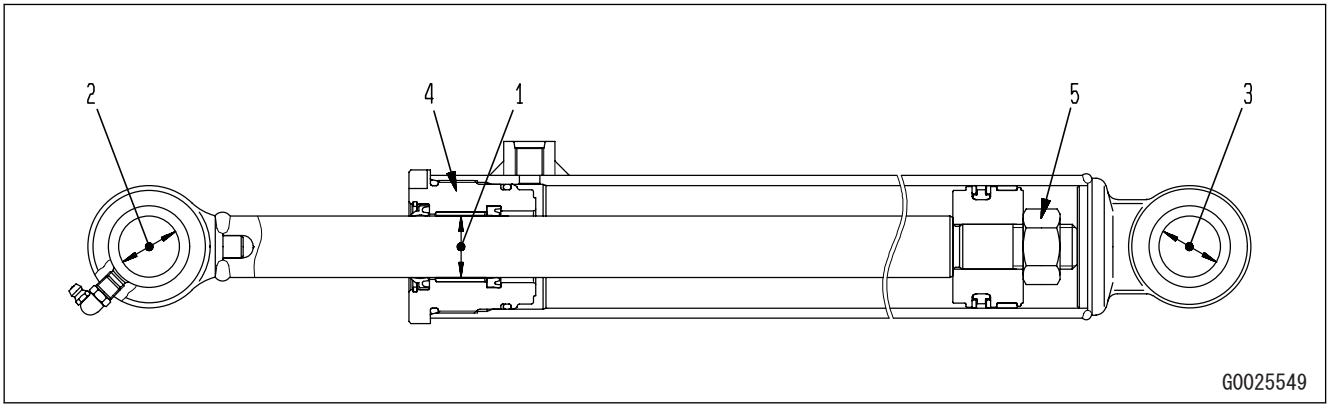
No.	Item	Judgment criteria	Remedy
1	Tightening torque of plug	58.8 to 78.5 Nm {6.0 to 8.0 kgm}	Retighten
2	Tightening torque of sight gauge	14.7 to 24.5 Nm {1.5 to 2.5 kgm}	Retighten

No.	Item	Judgment criteria					Remedy
1	Pressure compensation valve spring (Boom swing, blade, bucket, boom, arm)	Standard dimensions			Repair limit		Replace the spring if it is damaged or deformed.
		Free height x outside diameter	Installed height	Load at installed height	Free height	Load at installed height	
		16.4 x 9.4 mm	14.5 mm	7.67 N {0.78 kg}	-	6.08 N {0.62 kg}	
2	Pressure compensation valve spring (Right travel, left travel)	22.51 x 8.4 mm	18.2 mm	0.98 N {1 kg}	-	0.79 N {0.8 kg}	
3	Pressure compensation valve spring (Attachment, swing)	20 x 8.4 mm	15 mm	4.3 N {0.44 kg}	-	3.43 N {0.35 kg}	
4	Unload valve spring	29.1 x 18.7 mm	18 mm	82.7 N {8.4 kg}	-	65.9 N {6.72 kg}	
5	Cooler bypass valve spring	27.2 x 13.2 mm	21 mm	78.8 N {8.04 kg}	-	63.1 N {6.43 kg}	
6	Back pressure check valve spring	29 x 13.3 mm	21 mm	15.3 N {1.56 kg}	-	12.3 N {1.25 kg}	
7	Check valve spring	21.9 x 5 mm	15.8 mm	1.96 N {0.2 kg}	-	1.57 N {0.16 kg}	
8	Check valve spring	16.4 x 7.5 mm	9.8 mm	1.96 N {0.20 kg}	-	1.57 N {0.16 kg}	
9	Tightening torque of orifice	1.3 to 1.7 Nm {0.13 to 0.17 kgm}					Retighten
10	Tightening torque of orifice	1.3 to 1.7 Nm {0.13 to 0.17 kgm}					
11	Tightening torque of LS bypass plug	117.7 to 161.8 Nm {12 to 16.5 kgm}					
12	Tightening torque of plug	47.1 to 58.8 Nm {4.8 to 6 kgm}					
13	Tightening torque of plug	117.7 to 161.8 Nm {12 to 16.5 kgm}					
14	Tightening torque of bolt	15.7 to 20.6 Nm {1.6 to 2.1 kgm}					
15	Tightening torque of relief valve	49 to 58.8 Nm {5 to 6 kgm}					

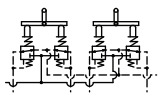
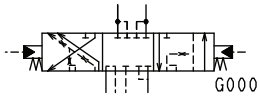
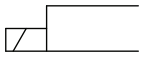
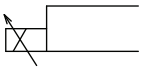
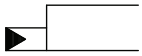
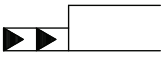
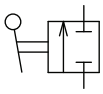
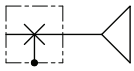
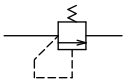
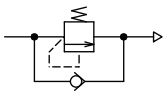
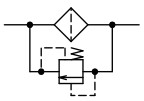
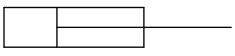
No.	Item	Judgment criteria	Remedy
3	Tightening torque of bolt	11.76 to 14.7 Nm {1.2 to 1.5 kgfm}	Retighten

No.	Item	Judgment criteria					Remedy
		Standard dimen-sions	Tolerance		Standard clearance	Allowable clearance	
			Shaft	Hole			
15	Clearance between mounting pin and bushing of links	30 mm	-0.090 mm -0.130 mm	+0.059 mm +0.019 mm	0.109 to 0.189 mm	1.0 mm	Replace the pin and bushing.
16	Clearance between mounting pin and bushing of track frame and blade	30 mm	-0.010 mm -0.050 mm	+0.087 mm +0.034 mm	0.044 to 0.137 mm	1.0 mm	Replace the pin and bushing.

MAINTENANCE STANDARD OF BOOM SWING CYLINDER

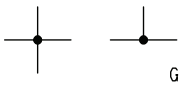
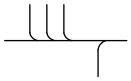
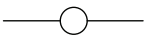
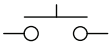
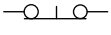
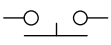
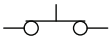


No.	Item	Judgment criteria					Remedy
1	Clearance between piston rod and bushing	Standard dimensions	Tolerance		Standard clearance	Allowable clearance	Replace the bushing.
			Shaft	Hole			
		30 mm	-0.020 mm -0.053 mm	+0.133 mm -0.007 mm	0.013 to 0.186 mm	0.486 mm	
2	Clearance between piston rod support shaft and bushing	30 mm	-0.010 mm -0.050 mm	+0.111 mm +0.036 mm	0.046 to 0.161 mm	1.0 mm	Replace the pin and bushing.
3	Clearance between cylinder bottom support shaft and bushing	30 mm	-0.010 mm -0.050 mm	+0.111 mm +0.036 mm	0.046 to 0.161 mm	1.0 mm	
4	Tightening torque of cylinder head	814±81.5 Nm {83±8.3 kgm}					Retighten
5	Tightening torque of piston fixing nut	343±34.0 Nm {35±3.5 kgm} (width across flats: 32 mm)					

Symbol	Content
 G0009610	PPC valve
 G0009611	Control valve
 G0009612	Solenoid valve
 G0009613	EPC solenoid valve
 G0009614	Pilot valve
 G0009615	2-Stage pilot valve
 G0009616	Lock valve
 G0009617	Drain valve
 G0009618	Pressure regulating valve, safety valve, relief valve
 G0009619	Pressure regulating valve, safety valve, relief valve (when the air pressure is discharged into the atmosphere)
 G0009620	Bypass valve
 G0009621	Accumulator
 G0009622	Cylinder

ELECTRICAL CIRCUIT DIAGRAM

SYMBOLS USED IN ELECTRIC CIRCUIT DIAGRAM

Symbol	Content
G0009586	Conductive wire
 G0009625	Conductive wire (crossings not connected)
 G0009590	Conductive wire (crossings connected)
 G0009626	Binding wire
 G0009627	Terminal
 G0009628	Chassis ground
 G0009629	Terminal ground
 G0009630	Contact, switch
 G0009631	Push button switch (NO type) NO: Normally Open
 G0009632	Push button switch (NC type) NC: Normally Close
 G0009633	Pull button switch (NO type) NO: Normally Open
 G0009634	Pull button switch (NC type) NC: Normally Close