WENBM00330

Shop Manual

COMPACT HYDRAULIC EXCAVATOR

PC18MR-5 SERIAL NUMBERS F10001 and up

KOMATSU

50 Disassembly and Assembly

This section describes the special tools, work procedures, and safety precautions necessary for removal, installation, disassembly, and assembly of the components and parts. In addition, tightening torques, quantity, and weight of the coating materials, lubricants, and coolant necessary to these works are shown.

60 Maintenance Standard

This section describes the maintenance standard value of each component. The maintenance standard shows the criteria and remedies for disassembly and assembly.

80 Others

This section describes the structure and function, testing and adjusting, and troubleshooting for all of the other components or equipment which cannot be separately classified in the appendix.

90 Circuit Diagrams

This section describes hydraulic circuit diagrams and electrical circuit diagrams.

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 symbol shows the weight of parts and components. Refer to this symbol when you handle heavy object for selection of the required equipment such as crane and lifting tools, and for what kind of working posture to take.
	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 Light

- 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

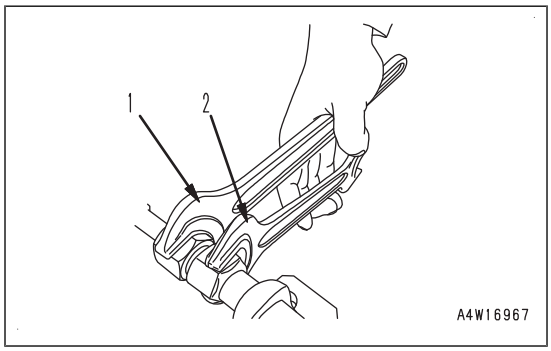
  If the threaded portion is difficult to degrease, you may use a seal tape.

  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.

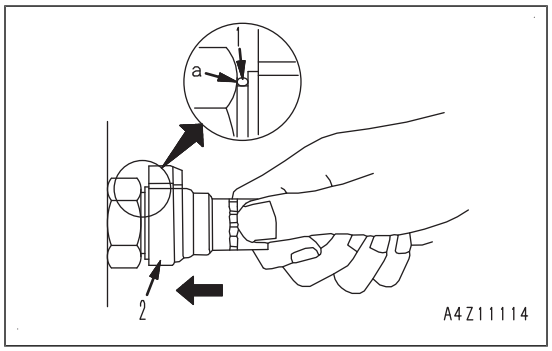
1. Start the engine, and run it at low idle.
2. Perform the operation to extend and retract each cylinder of the work equipment and stop it at approximately 100 mm before the stroke end for 4 or 5 times.
3. Perform the operation to extend and retract each cylinder of the work equipment and stop it at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

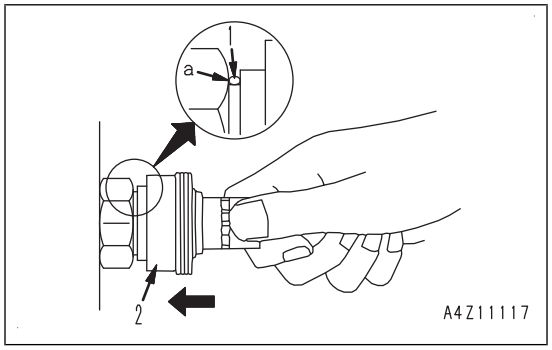
Hold the tightening adapter part, and push body (2) straight until sliding prevention ring (1) contacts contact surface (a) of the hexagonal part at the male end.



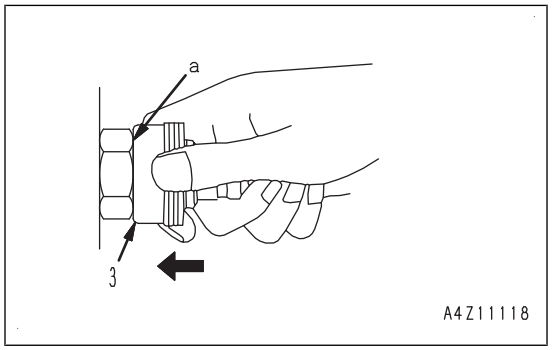
How to Disconnect and Connect Type 3 Push-Pull Type Coupler

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.



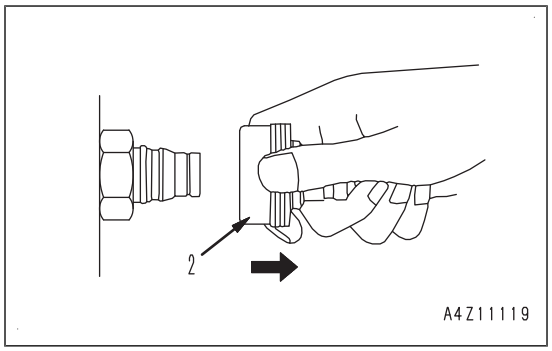
2. While keeping the condition of step 1, push cover (3) straight until it contacts contact surface (a) of the hexagonal portion on the male side.



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.

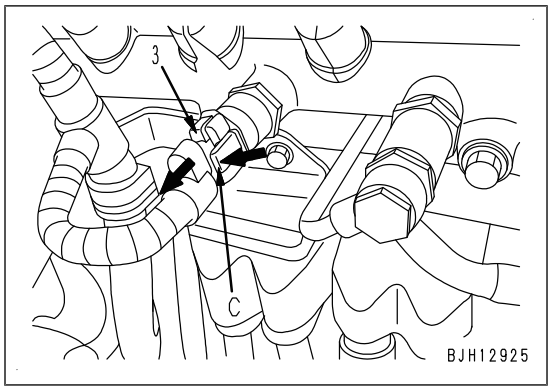


How to Disconnect and Connect Connector with Lock to Push

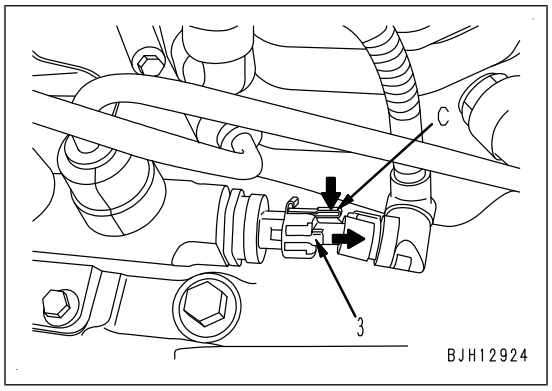
How to Disconnect Connector with Lock to Push (BOSCH-3)

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

- 114 series



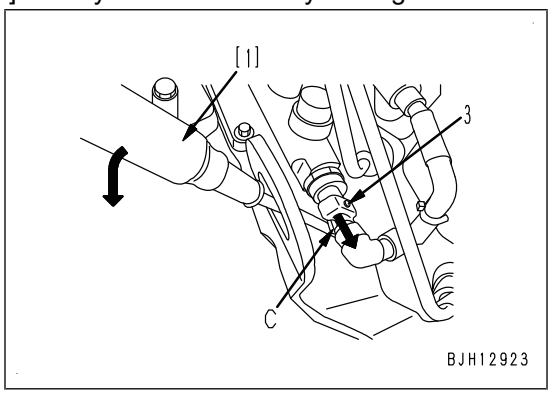
- 107 series



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.



How to Connect Connector with Lock to Push (BOSCH-3)

Insert it straight until it clicks.

Conversion Table

How to Use 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 to Use the Conversion Table to Change 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

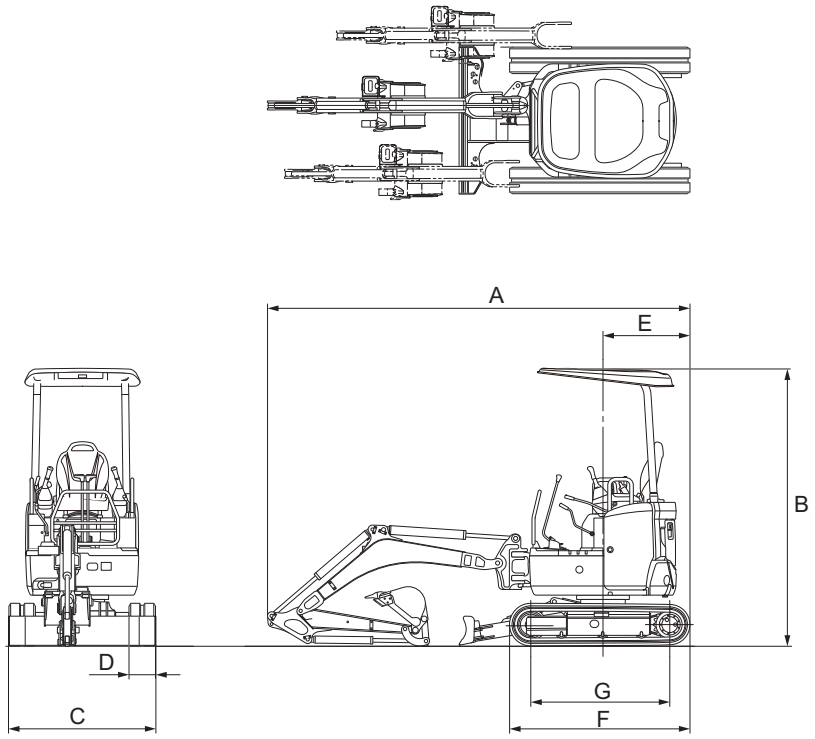
1 mm = 0.03937 in

	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	 1900 1990
	Bucket capacity	m^3	0.044
	Engine model	-	Komatsu 3D67E-2A 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

How to Use Fuel, Coolant and Lubricants by Ambient Temperature

Reservoir	Fluid type	Recommended Komatsu Fluids	Ambient temperature °C	
			Min.	Max.
Engine oil pan	Engine oil	EO30-DH	0	40
		EO10W30-DH	-20	40
		EO15W40-DH	-15	40
Final drive case	Power train oil	TO30	-20	40
Hydraulic system	Power train oil	TO10	-30	40
	Hydraulic oil	HO46-HM	-20	40
	Biodegradable Hydraulic oil (Note 1)	BO46-G4	-20	40
Grease fitting	Hyper grease (Note 2)	G0-T	-20	40
		G2-T	-10	40
	Lithium EP grease	G0-LI	-20	40
		G2-LI	-20	40
		G2-LI-S	-30	30
	Biodegradable grease (Note 1) (Note 3)	G2-BT	-20	40
Cooling system	Non-Amine Engine Coolant (AF-NAC) (Note 4)	AF-NAC	-30	40
Fuel tank	Diesel fuel	EN590 (Class2)	-30	20
		EN590 (Grade D)	0	40

Lubrication portion	Specified capacity (ℓ)	Refill capacity (ℓ)
Engine oil pan	3.6	3.3
Final drive case (each of right and left)	0.3	0.3
Hydraulic oil system	23.8	15.2
Cooling system	3.1	-
Fuel tank	19	-

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.

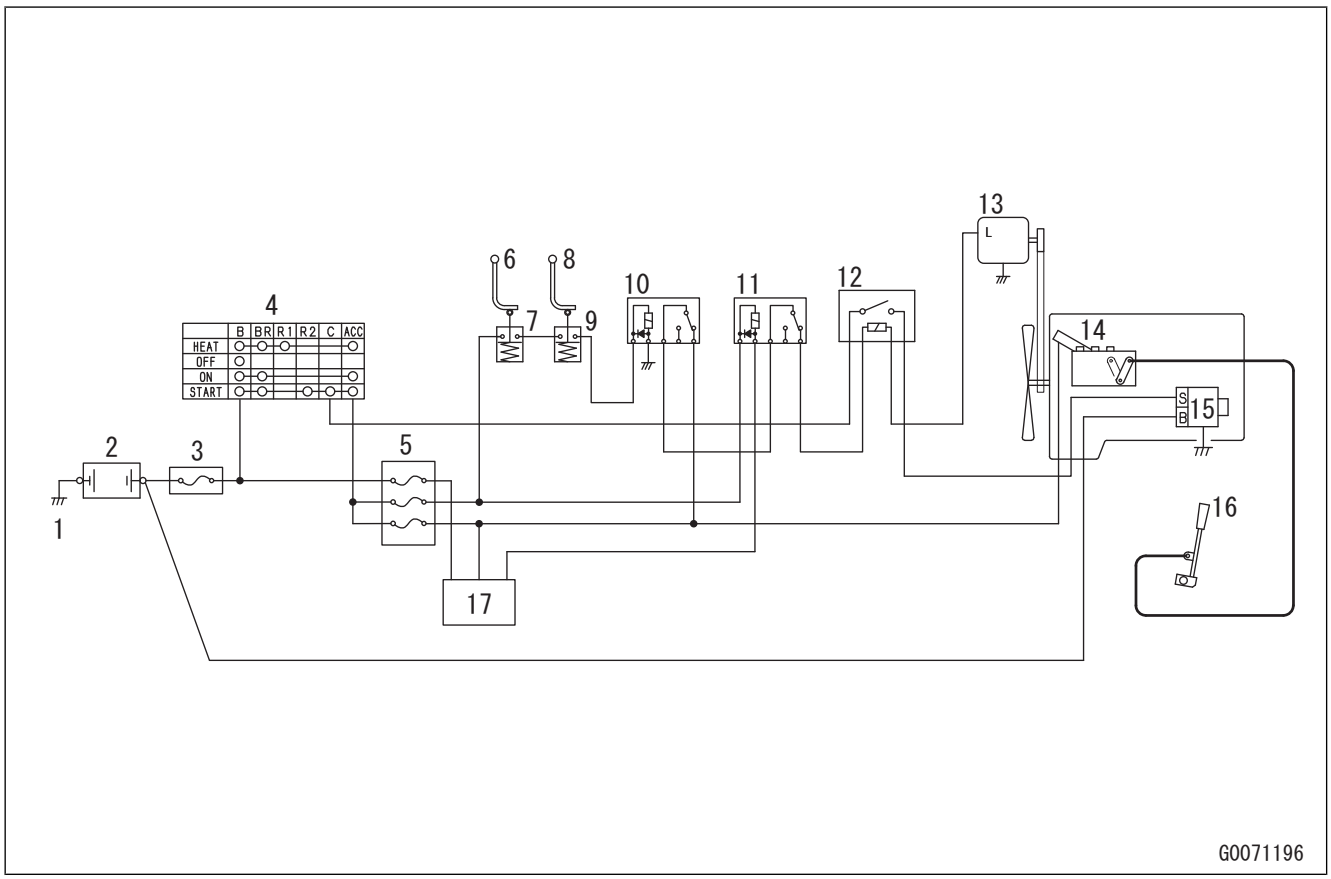
Note 2: Hyper white grease (G0-T, G2-T) is high-performance white grease. We recommend use of G0-T or G2-T in the cases that follow.

- When it is necessary to improve the lubricating ability of grease to prevent creaks of pins and bushings.
- When it is necessary to prevent outside staining with black grease.

Note 3: Do not use bio-grease for rolling bearings such as the swing bearing.

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

Operation at Engine Start

- 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.

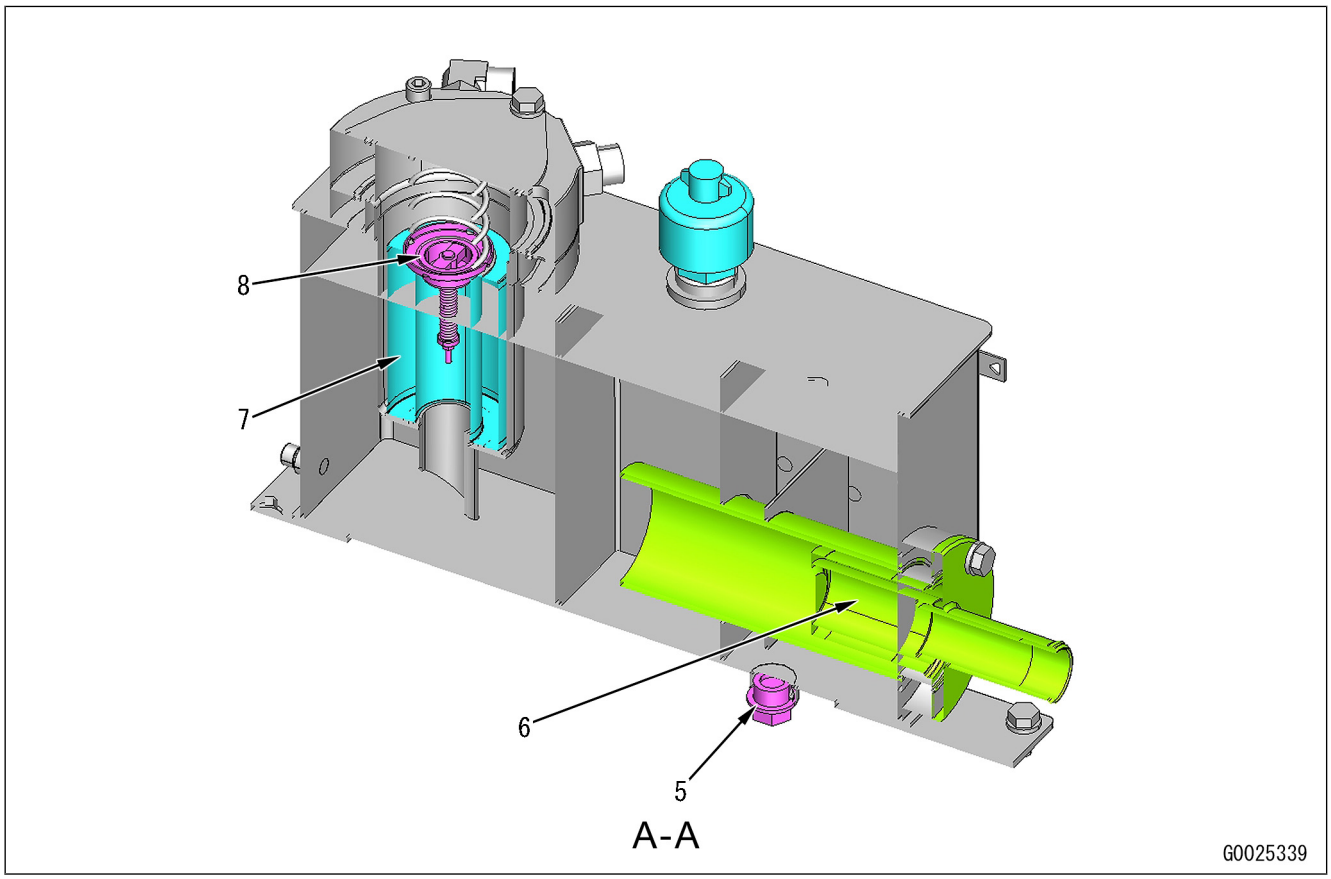
Caution Lamps Shown on Machine Monitor

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

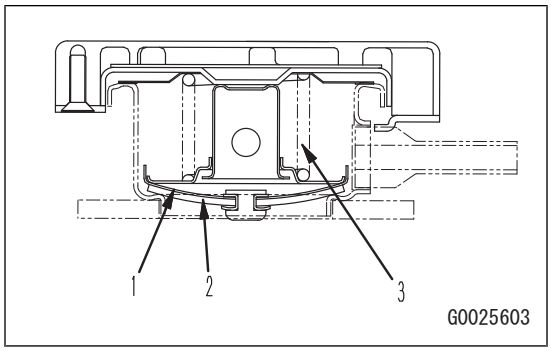
Bypass valve set pressure: 0.25±0.05 MPa {2.5±0.5 kg/cm^2}

Hydraulic Tank Oil Filler Cap

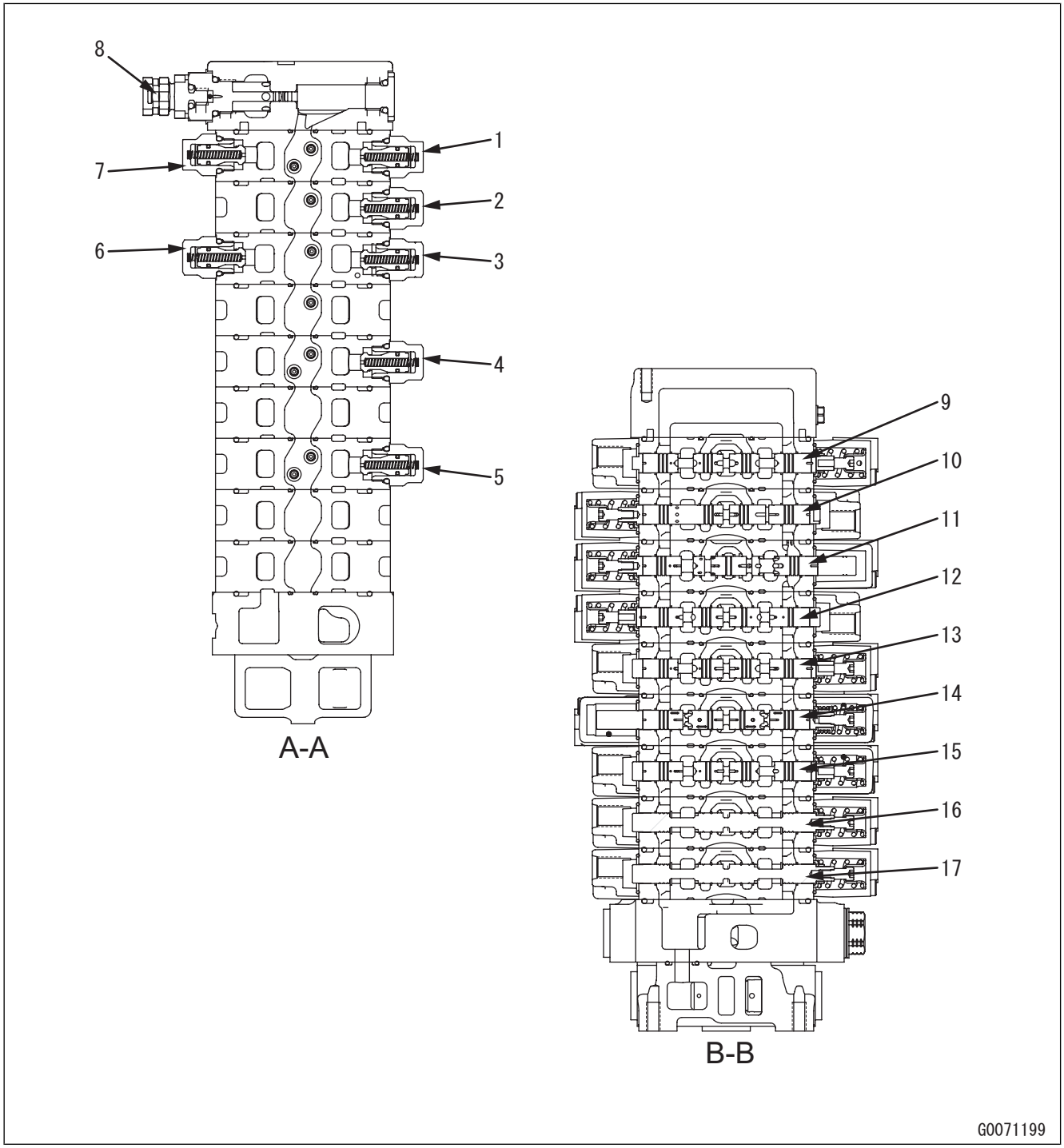
Structure of Hydraulic Tank Oil Filler Cap

Sectional View

1: Bottom plate
2: Gasket
3: Spring



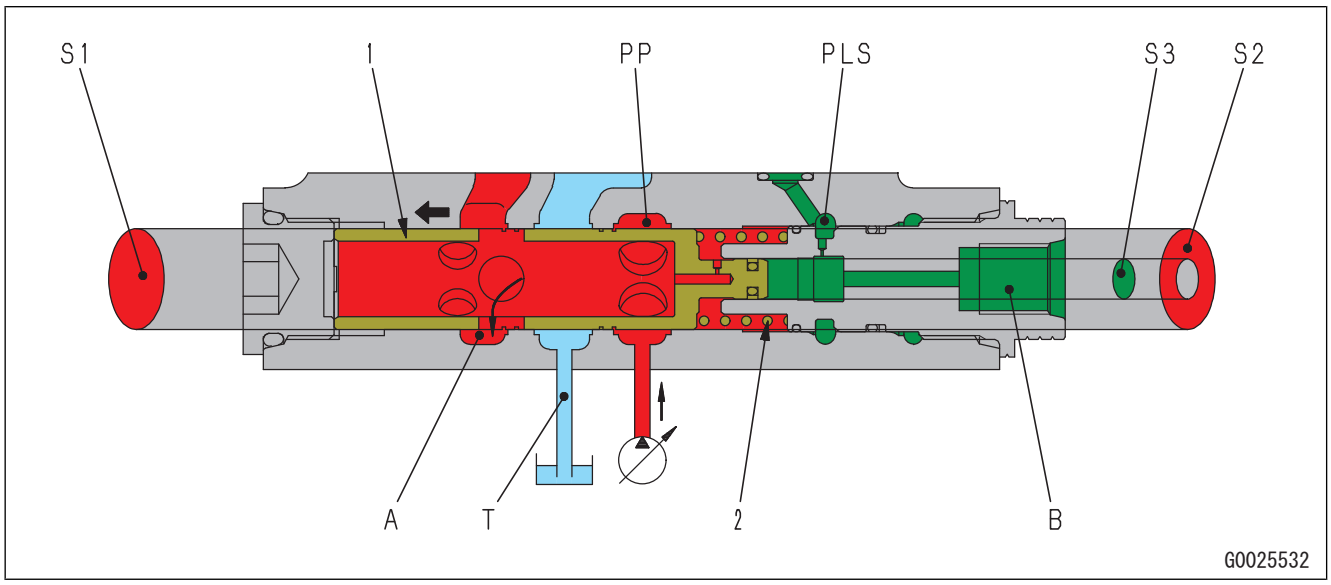
Sectional Views (A-A, B-B)



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}).

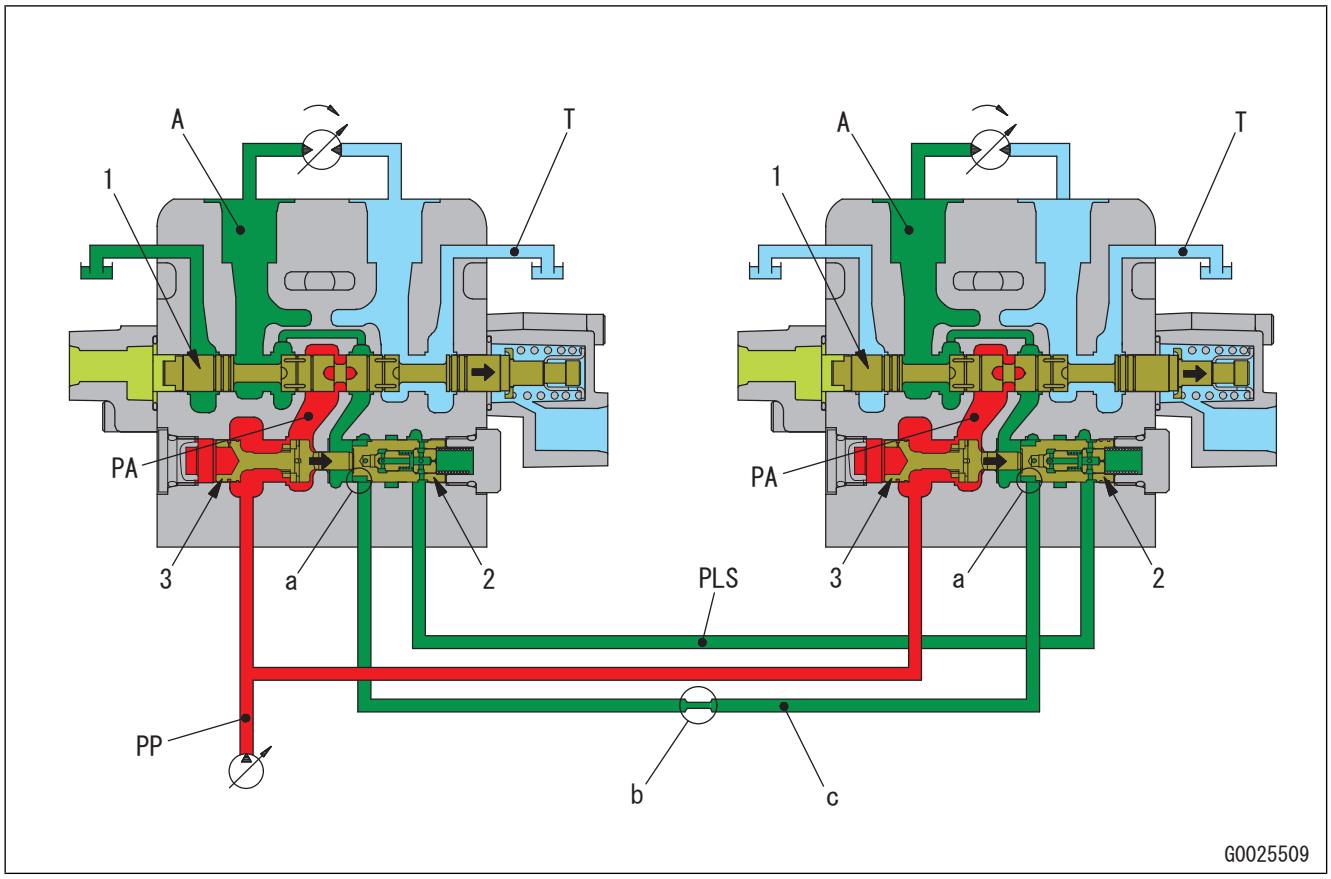
When Control Lever is Operated



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.

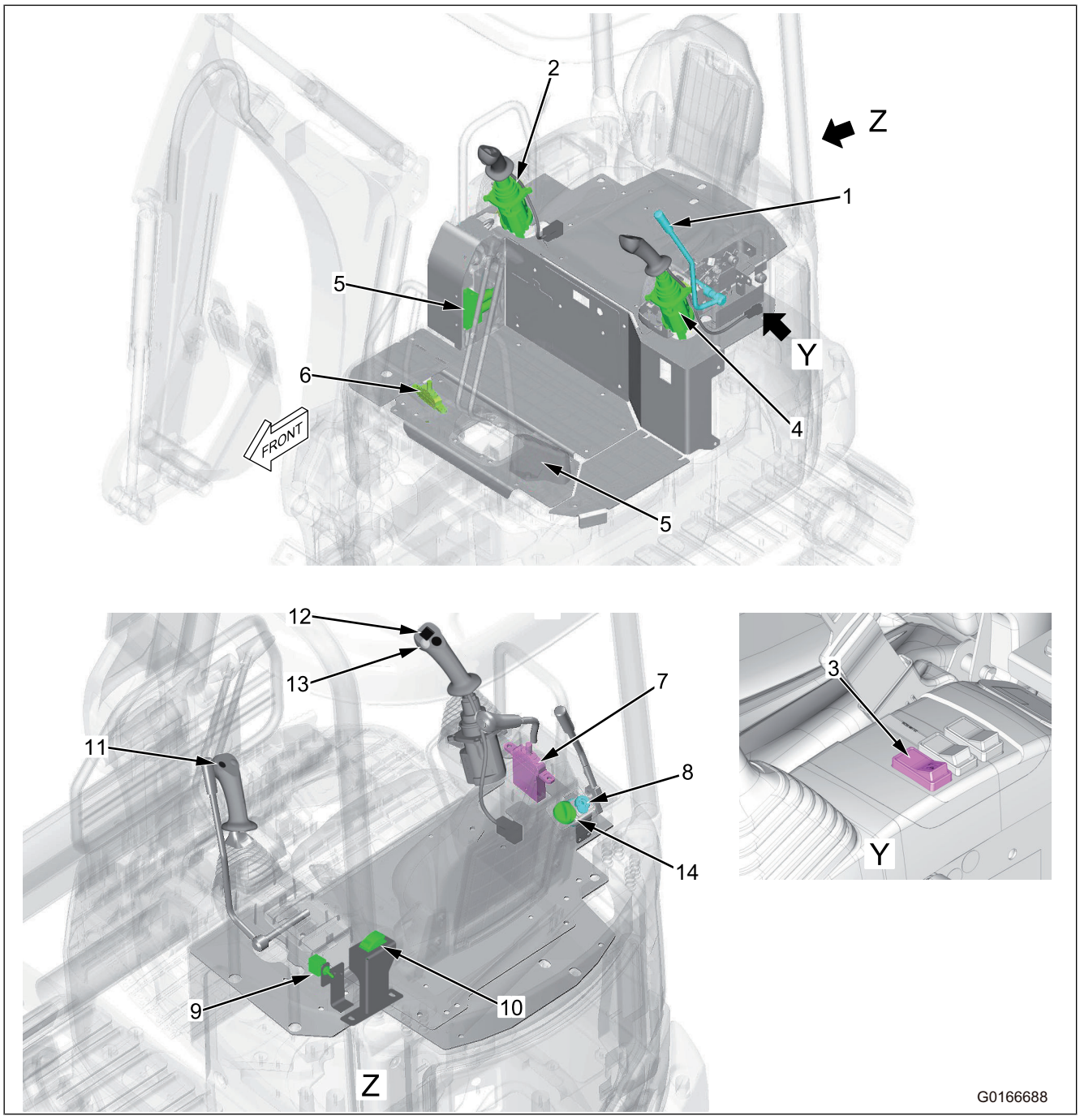
Travel Junction Valve of Control Valve

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.

Around Cab and Floor (Proportional Lever Specification)



1: Lock lever
2: R.H. work equipment PPC valve
3: Work equipment lock release switch
4: L.H. work equipment PPC valve
5: Attachment PPC valve
6: Boom swing PPC valve
7: Blade PPC valve
8: Starting switch
9: Lock lever lock cancel switch
10: Quick coupler enable switch
11: Quick coupler activation switch
12: 1st line attachment proportional switch
13: Attachment output hold switch
14: Max. flow adjust dial

Component Parts of Work Equipment System

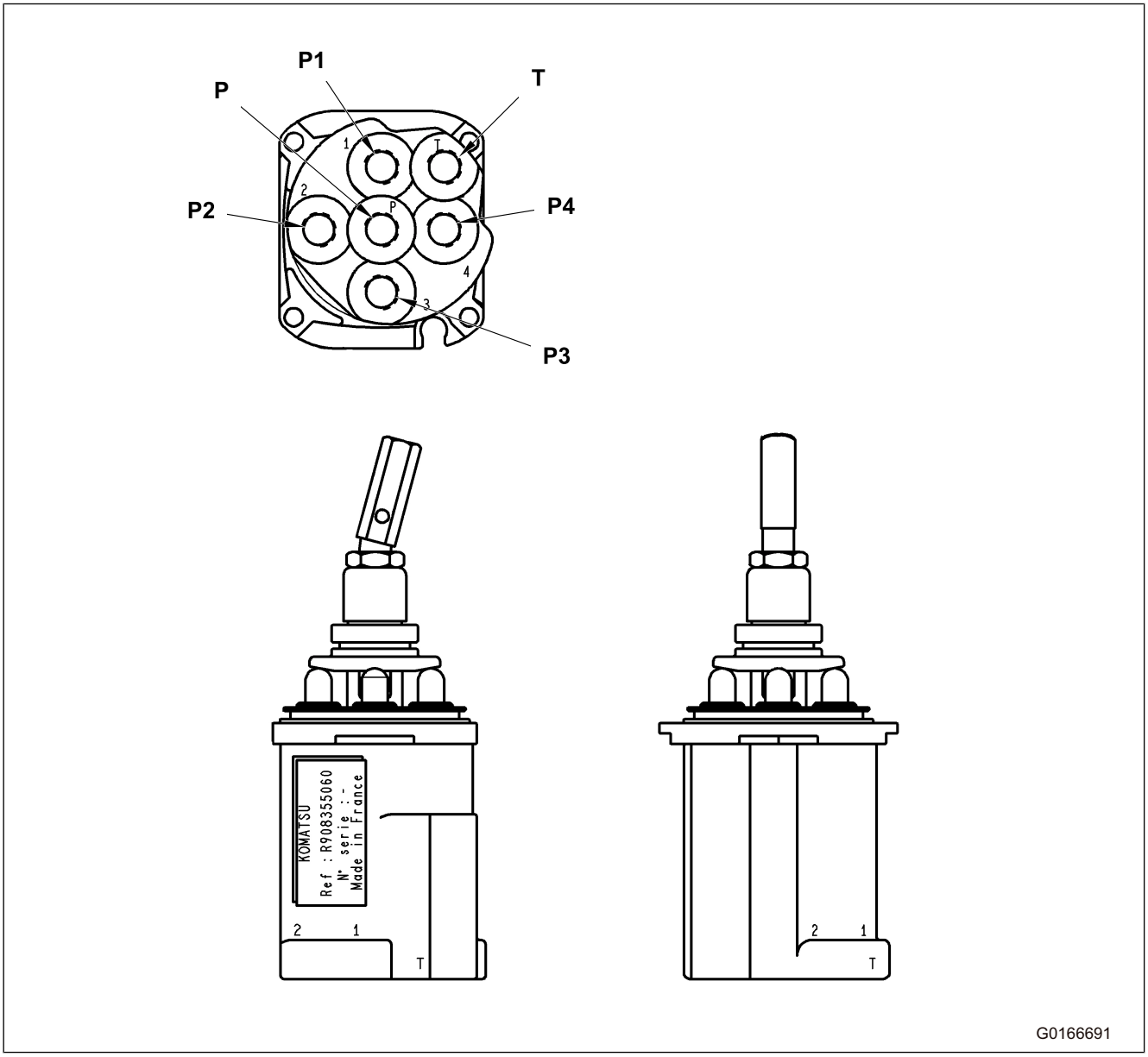
Work Equipment and Swing PPC Valve

PPC

Abbreviation for Proportional Pressure Control

Structure of Work Equipment and Swing PPC Valve

General View



L.H. work equipment control lever

P: From pilot pump

P1: To control valve (arm IN port)

P2: To control valve (arm OUT port)

P3: To control valve (swing RIGHT port)

P4: To control valve (swing LEFT port)

T: To hydraulic tank

Control relief valve

9: Adjustment screw

10: Lock nut

11: Plug

12: Return spring

13: Cover

14: Plunger

Check valve

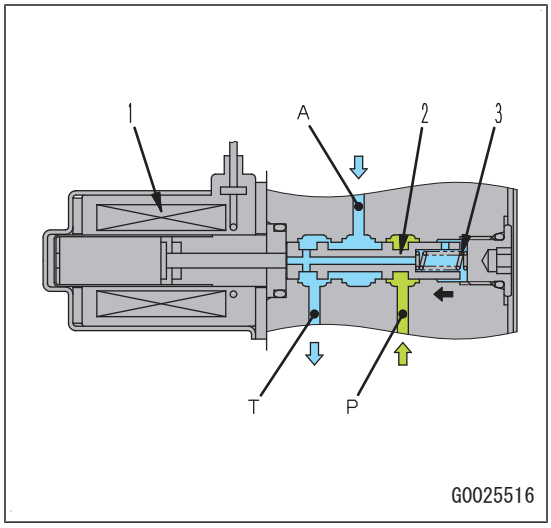
15: Plug

16: Plunger

Operation of Solenoid Valve and Check Valve

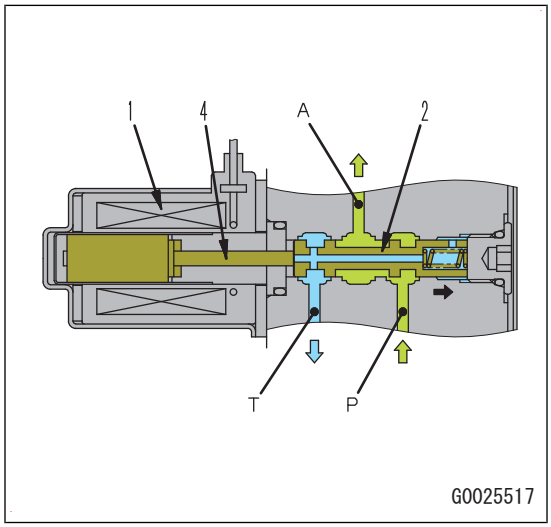
When Solenoid Valve is “De-energized” (Circuit is Cut Off)

1. The coil (1) is de-energized when the signal current does not flow from outside to the coil (1).
2. The spool (2) is pushed back to the left by the reaction force of the spring (3).
3. The port (P) and port (A) close, and the pilot pressure does not flow from the port (A) to the actuator. At the same time, the port (T) opens and the oil from the actuator is drained to the hydraulic tank.



When Solenoid Valve is “Energized” (Circuit is Connected)

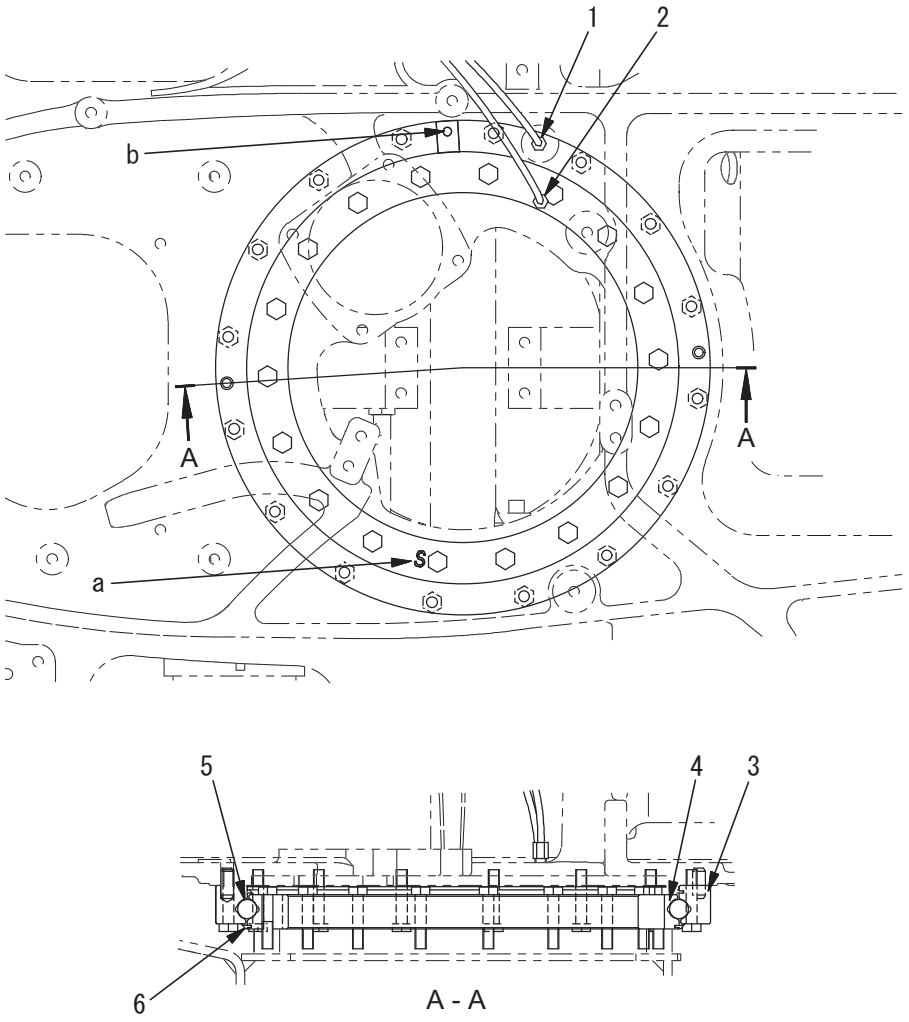
1. The coil (1) is energized when the signal current flows from outside to the coil (1).
2. The spool (2) is pushed back to the right by the push pin (4).
3. The ports (P) and (A) open and the pilot pressure flows from the port (A) to the actuator. At the same time, the port (T) closes and the oil from the actuator does not flow to the hydraulic tank.



Swing Circle

Structure of Swing Circle

General View and Sectional View



a: Position of inner race soft zone
b: Position of outer race soft zone
1: Greasing port of swing circle bearing
2: Greasing port of swing circle pinion
3: Outer race
4: Inner race
5: Ball
6: Seal

Specifications of Swing Circle

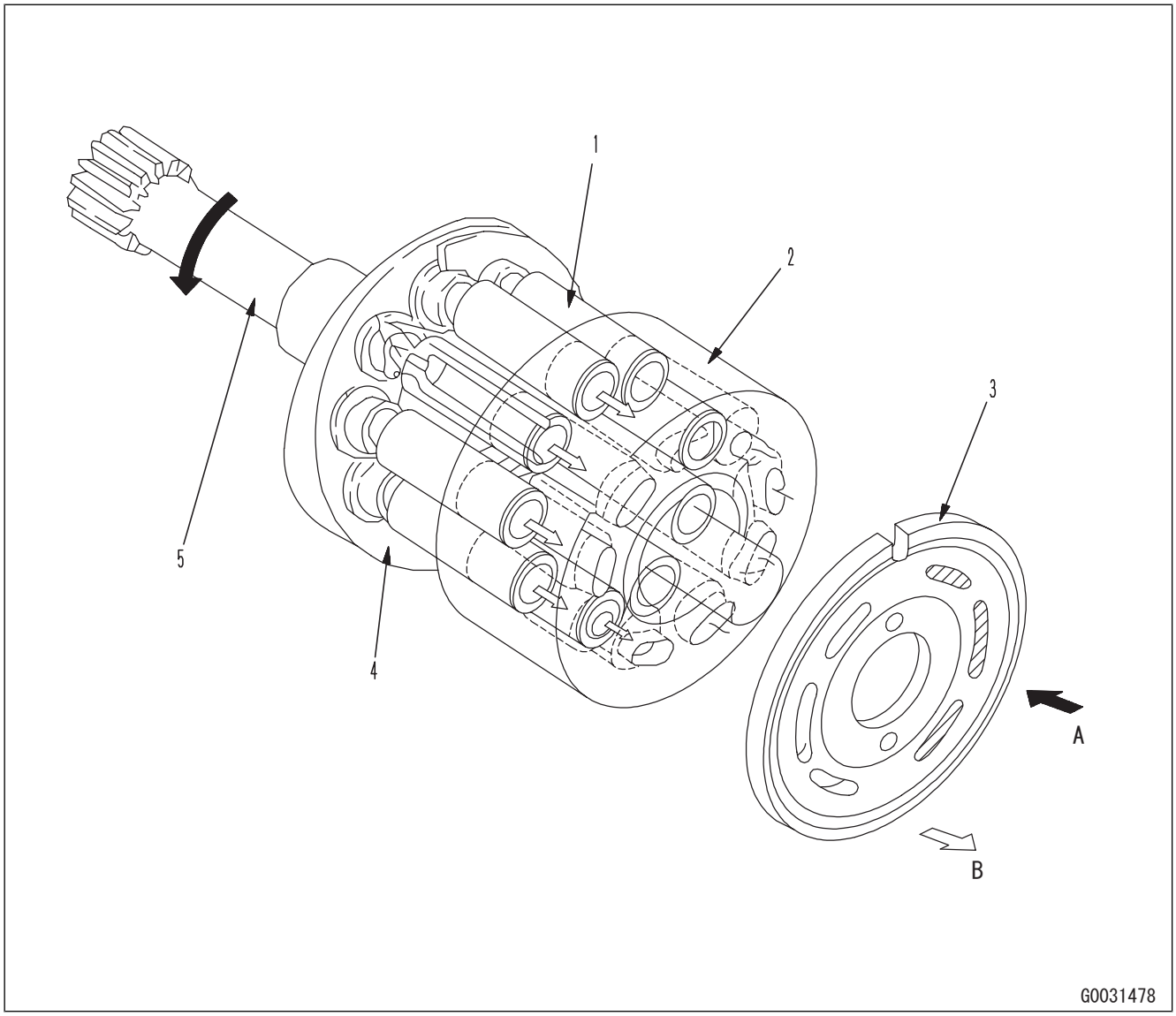
Reduction ratio: 82/13 = 6.31

Grease: G2-LI

Function of Swing Circle

The swing circle connects the upper structure and carrier unit.

Operation of Motor Part of Travel Motor



1. The pressurized oil from the hydraulic motor flows to the valve plate (3).
2. When the pressurized oil is supplied to the port (A), the oil flows to the cylinder port in the cylinder (2) for the port (A), and pushes the piston (1).
3. This pushing force changes to rotation force via the rocker cam (4), and is used to the shaft (5) that is spline connected with the cylinder (2).
4. The return oil in the cylinder port flows through the port (B) of the valve plate (3).
5. When the motor rotates in reverse, the pressurized oil flows from the port (B), and the return oil flows from the port (A).

Specifications of Undercarriage

Quantity of Carrier Plate (One Side)

1 piece

Quantity of Track Rollers (One Side)

3 pieces

Standard Value Table for Machine

Standard Value Table for Machine PC18MR-5

Engine: 3D67E-2A

The standard value for new machine and repair limit are the value when the machine is normal.

Engine Speed

Item	Test condition	Unit	Standard value for new machine	Repair limit
Engine speed at pump relief	• Engine coolant temperature: In the operation range • Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position • At arm IN relief • Engine speed = Fan speed/1.04	r/min {rpm}	Min. 2150 {Min. 2150}	Min. 2150 {Min. 2150}

Control Valve Spool Stroke

Item	Test condition	Unit	Standard value for new machine	Repair limit
Boom	• Spool operation with control valve • For details, see the “Fig. 1” of “MACHINE POSTURE AND PROCEDURES TO MEASURE PERFORMANCE”.	mm	ℓ=30 a=6 b=6	ℓ=30 a=6 b=6
Arm				
Bucket				
Swing				
Breaker				
Boom swing				
Blade				
L.H. travel				
R.H. travel				

Machine Posture and Procedures to Measure Performance

Fig. 1

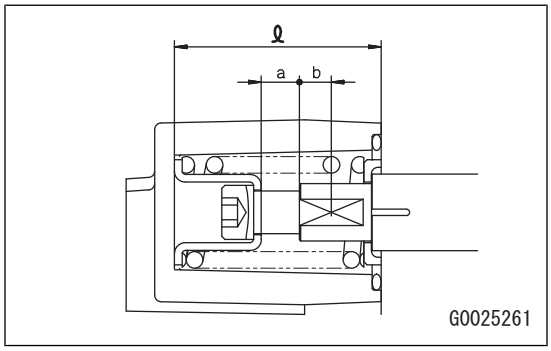


Fig. 2

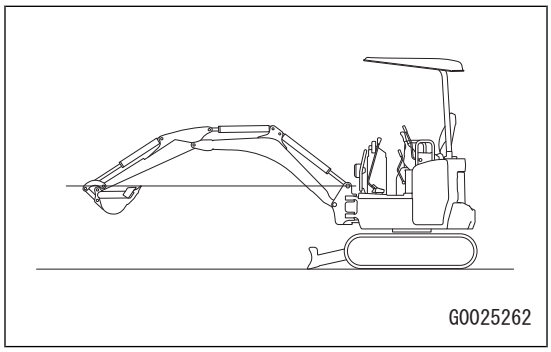


Fig. 3

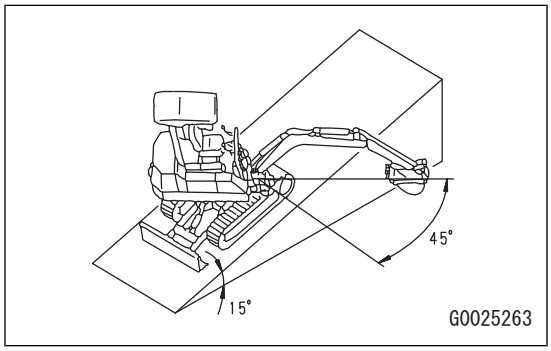


Fig. 4

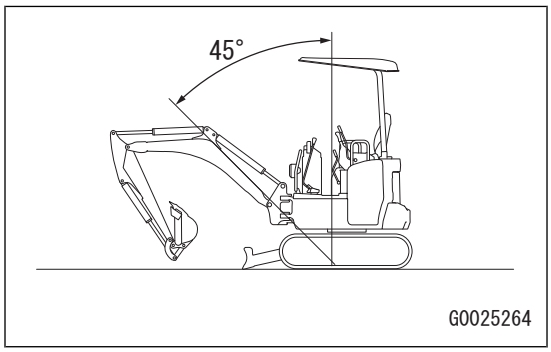
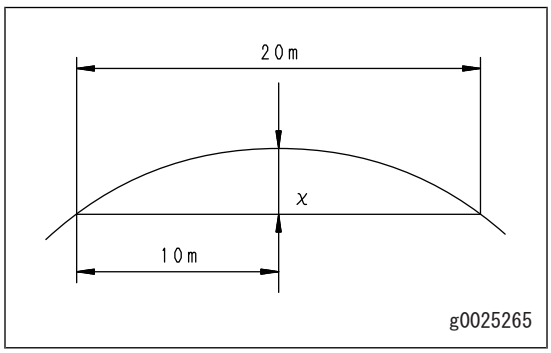


Fig. 5

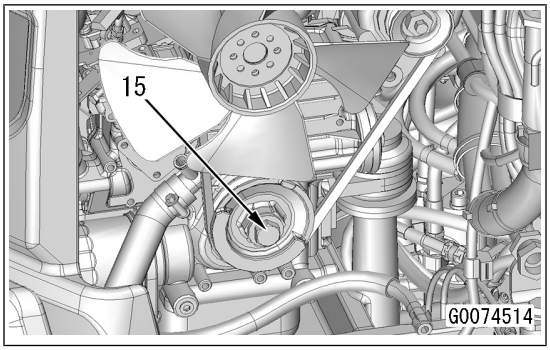


Symbol	Part No.	Part name	Q'ty	Remarks
C	Commercially available	Block	1	
D	Commercially available	Railroad tie	1	

Tools to Bleed Air from the Hydraulic Circuit

Symbol	Part No.	Part name	Q'ty	Remarks
A	Commercially available	Oil container	1	

9. Insert the socket wrench B into the mounting bolt (15) of the crankshaft pulley.

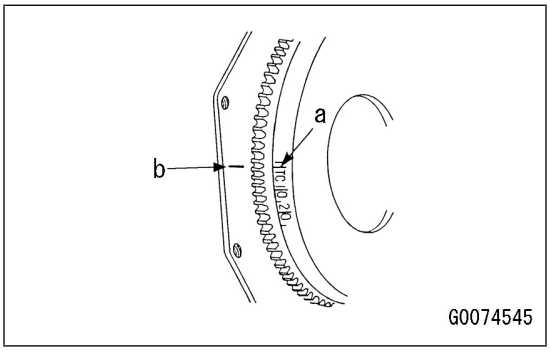


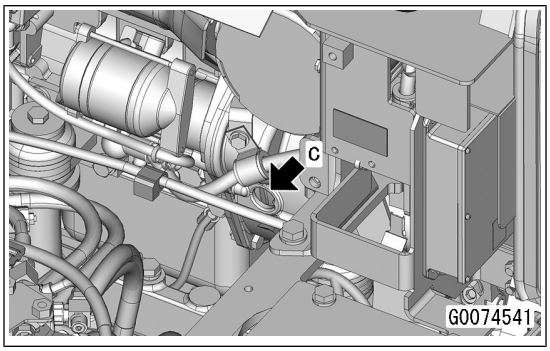
10. Rotate the mounting bolt (15) of the crankshaft pulley clockwise and rotate the crankshaft forward. Then, align the “1.TC” stamp line (a) of the flywheel with the stamp line (b) inside of the housing or the internal protruding part (e) of the inspection hole (c) of the flywheel housing.

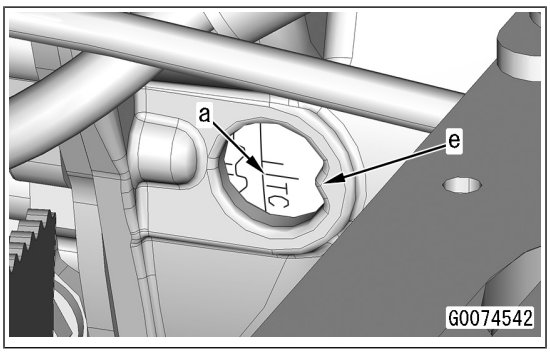
    The No. 1 cylinder is put at the compression top dead center.

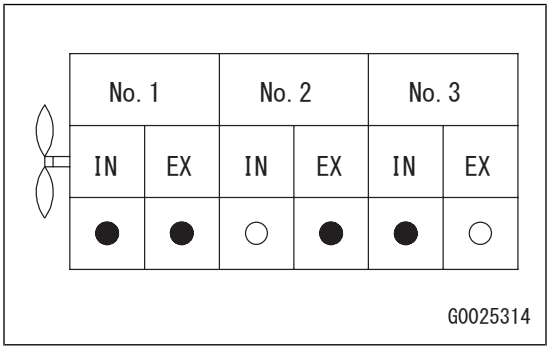
    REMARK

    - Do the work, checking the state from the inspection hole (c) of the flywheel housing.
    - When the No. 1 cylinder is put at the compression top dead center, the intake valve rocker arm and the exhaust valve rocker arm move by the clearance. If they do not move, further rotate the crankshaft 1 turn to align the marks.
    - While the No. 1 cylinder is at the compression top dead center, adjust the valve clearances marked by ● in the valve layout drawing in the order shown in the drawing.
    - If the stamp line (b) cannot be checked, check the position of the stamp line (a) at the internal protruding part (e) of the inspection hole (c).

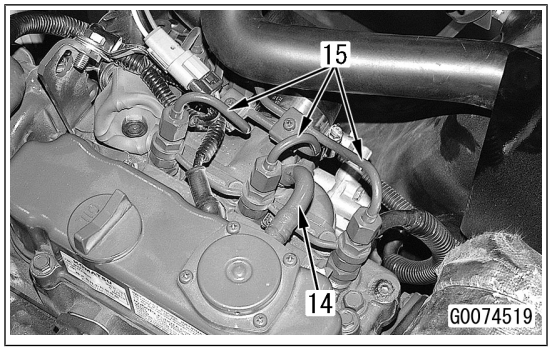








8. Disconnect the tube (14) which is connected to the intake side hose of the air cleaner and the cylinder head cover.
9. Place a container C under the engine to receive the fuel.
10. Disconnect the fuel injection pipes (15) (3 pieces).

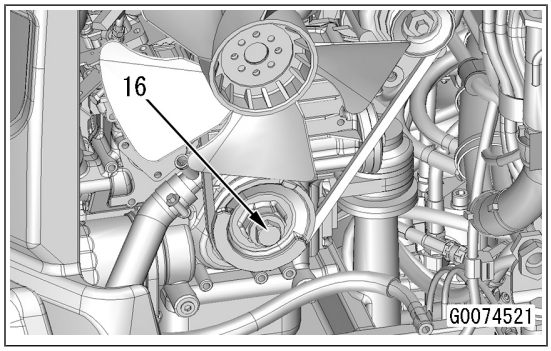


Set the measurement condition

11. Set the battery disconnect switch to the ON position.
12. Turn the starting switch to the ON position, and set the fuel control lever to the high idle position.

    ⚠ Hold the fuel control lever at high idle position during the test.

13. Insert the socket wrench B into the mounting bolt (16) of the clamp pulley.



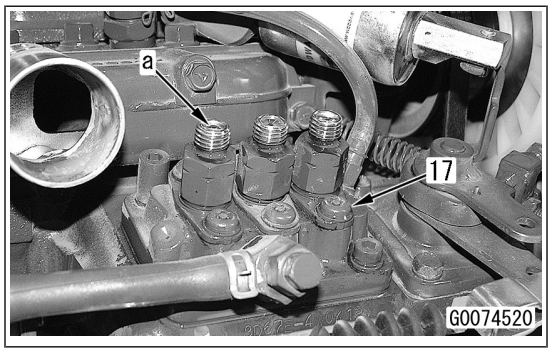
Do the testing

14. Turn the clamp pulley mounting bolt (16) slowly clockwise, and rotate the crankshaft forward. Stop turning it when the fuel flows out from the tip of No.1 delivery holder (a) of the fuel injection pump (17).

    REMARK

    Wipe off the fuel.

15. Turn the clamp pulley mounting bolt (16) approximately 20° counterclockwise, and rotate the crankshaft in the reverse direction.
16. Turn the crankshaft clockwise slowly again, and stop turning if the fuel rises through the hole of the delivery holder (a) of the fuel injection pump (17).



6. Put the machine back to the state it was in step 2 again. Check that the indicated value of the dial gauge A is set back to the 0 point.

   REMARK

   If the indicated value is not set back to the 0 point, do steps 3, 4, and 5 again.

Restoration

7. Remove the dial gauge A from the track frame.

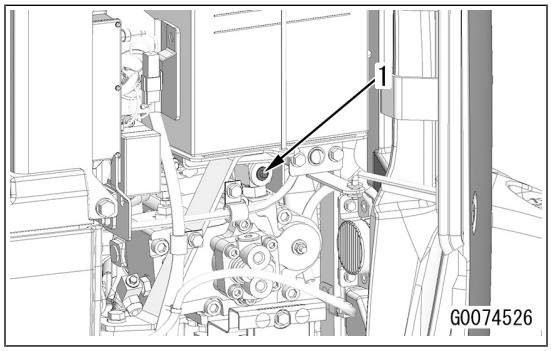
13. Remove the pin E.
14. Release the remaining pressure in the hydraulic tank in response to “RELEASE REMAINING PRESSURE FROM HYDRAULIC TANK”.
15. Remove the gauge A1 or B1.
16. Remove the nipple C.
17. Install the pickup plug (1).

    Pickup plug (1): 19.6 to 27.4 Nm {2.0 to 2.8 kgm}
18. Close the battery cover on the left side of the machine.
19. Pressurize the hydraulic tank. For details, see “How to Pressurize Hydraulic Tank”.

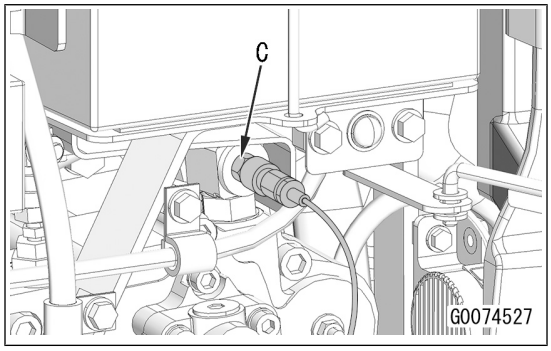
How to Examine Swing Relief Pressure

Setting the testing device

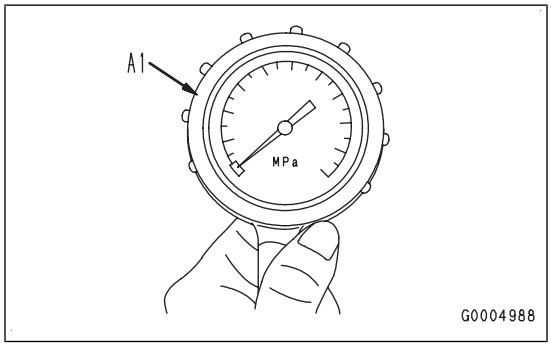
1. Release the remaining pressure in the hydraulic tank in response to “RELEASE REMAINING PRESSURE FROM HYDRAULIC TANK”.
2. Open the battery cover on the left side of the machine.
3. Remove the pickup plug (1).



4. Install the nipple C.



5. Install the gauge A1 or B1.



Setting of test condition

6. Start the engine.
7. Pressurize the hydraulic tank. For details, see “How to Pressurize Hydraulic Tank”.
8. Make sure that the hydraulic oil temperature is in the measurement condition range.

   Hydraulic oil temperature: 45 to 55 ˚C

9. Make sure that the hydraulic oil temperature is in the measurement condition range.
   Hydraulic oil temperature: 45 to 55 ˚C
10. Set the fuel adjustment lever to the high idle position.

Check procedure

11. Test the oil pressure when the PPC lock solenoid valve is set to the ON or OFF position.

REMARK

For the conditions for setting the PPC lock solenoid valve to the ON or OFF position, see “Operating condition of the PPC lock solenoid valve”.

Operating Condition of the PPC Lock Solenoid Valve

Solenoid valve	Operating condition	State of the solenoid
PPC lock solenoid valve	Lock lever: LOCK position (Lock lever pilot lamp: Lit)	OFF (de-energized)
	Lock lever: Set the lever to the FREE position, and then push the lock cancel switch (Lock lever pilot lamp: Not lit)	ON (energized)

Restoration

12. 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.

13. Release the remaining pressure in the hydraulic tank. For details, see “How to Release Remained Pressure from Hydraulic Tank”.
14. Remove the gauge A1 or B1.
15. Remove the nipple A2 from the adapter C.
16. Disconnect the outlet hose (1). Remove the adapter C.
17. Connect the outlet hose (1).
    Hose (1): 34 to 54 Nm {3.5 to 5.5 kgm}
18. Install the floor cover in response to “TILT TRAVEL PPC LEVER”.
19. Pressurize the hydraulic tank. For details, see “How to Pressurize Hydraulic Tank”.

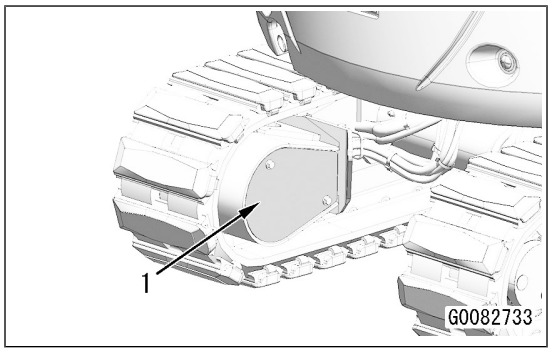
How to Examine Outlet Pressure of Travel Speed Increase Solenoid Valve

NOTICE

Check that the oil pressure in the control circuit is normal, and then test the pressure output from the solenoid valve.

Setting the testing device

1. Remove the travel motor cover (1).



Examine Parts Which Cause Hydraulic Drift of Work Equipment

Obey the procedure that follows to test parts causing hydraulic drift of the work equipment.

⚠ **Place the machine on a level ground, lower the work equipment completely to the ground in a stable posture, set the lock lever to LOCK position, and then 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.**

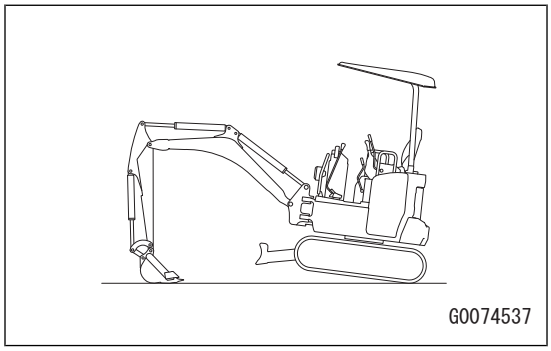
If the cause of hydraulic drift is defective cylinder packing, lowering speed can increase for the reasons that follow when the parts are tested.

- If the machine is set to the hydraulic drift measuring position of the work equipment (position where holding pressure is applied to the bottom side), oil leaks from the bottom side to the head side. Because the volume on the head side is smaller than that on the bottom side by the volume of the rod, the internal pressure on the head side increases due to the oil flowing from the bottom side.
- As the internal pressure on the head side increases, the internal pressure on the bottom side (it varies depending on the leakage volume) also increases. The pressures are balanced on the two side, and then the lowering speed decreases. At this time, when the head side of the cylinder to be tested is operated with the lever in the direction of drain to the tank circuit, the oil on the head side flows into the drain circuit (The bottom side is closed by the check valve). The lowering speed increases due to an imbalance between the pressure on the head side and the pressure on the bottom side.

How to Examine Parts that Cause Hydraulic Drift of Boom Cylinder

Preparing diagnostic tests in advance

1. Start the engine.
2. Set the work equipment to the state shown in the drawing.
3. Stop the engine.
4. Turn the starting switch to the ON position.



Check procedure

5. Operate the boom control lever to the lower side and test it.

   How to identify defects

   - When the lowering speed is increased: The cylinder packing is defective.
   - When the speed does not change: The control valve is defective.

   REMARK

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

How to Examine Parts that Cause Hydraulic Drift of Bucket Cylinder

Preparing diagnostic tests in advance

1. Start the engine.

Bleed Air from Hydraulic Circuit

Obey the procedure that follows to bleed air from the hydraulic circuit.

Tools to Bleed Air from the Hydraulic Circuit

Symbol	Part No.	Part name	Q'ty	Remarks
A	Commercially available	Oil container	1	

⚠ Place the machine on a level ground, lower the work equipment completely to the ground in a stable posture, set the lock lever to LOCK position, and then 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.

Do the air bleed procedure for the hydraulic circuit in the cases that follow.

- When a device in the hydraulic circuit is removed or installed.
- When hydraulic oil is replaced.

●: Do the operation.

REMARK

Make sure to apply for starting the use of the radio station after completing the radio station establishment on the machine side.

14. Tell the KOMTRAX administrator about the information below on the machine where the radio station establishment has been completed.

    Information on the machine where the radio station establishment has been completed (model, number, serial number)

    Part number of the KOMTRAX terminal

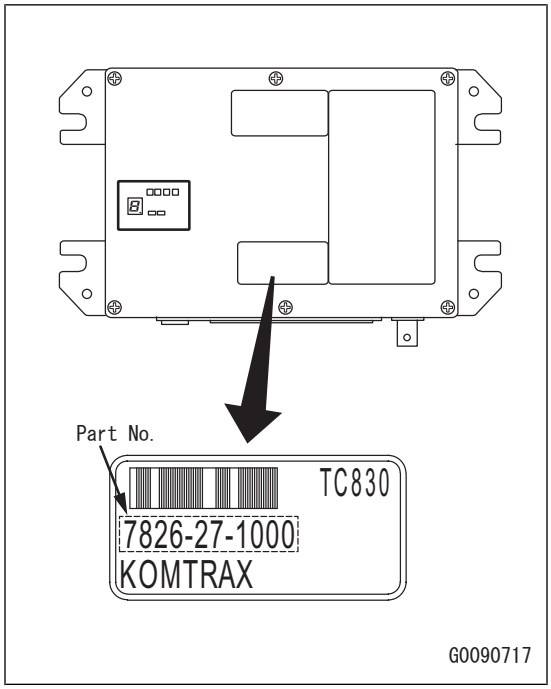
    Serial number of the KOMTRAX terminal

    Service meter value at the time when the KOMTRAX terminal is installed (in 0.1 h)

REMARK

The serial number is described on the right side of the terminal.

15. The KOMTRAX administrator does the machine registration with the KOMTRAX client personal computer.



REMARK

For the procedure, see “Global KOMTRAX Web Reference Manual (For Key Person)”.

The work has been completed.

How to Stop Use of KOMTRAX Terminal (Machine with KOMTRAX Terminal)

Stop using the KOMTRAX terminal in accordance with the explanation below when you sell, give over, or discard the machine.

Machine with Multi Monitor

Contents of work	Applicable steps	Give over the machine	Sell the machine	Discard the machine
Initialize the setting for the multi monitor	1. to 9.	Required	Required	Not required
Stop sending the radio waves	10. to 12.	Required	Required	Not required
Cancel the communication contract (submit the application of stop usage)	13.14.	Required	Required	Required

Machine Without Multi Monitor

Contents of work	Applicable steps	Give over the machine	Sell the machine	Discard the machine
Stop sending the radio waves	11.12.	Required	Required	Not required
Cancel the communication contract (submit the application of stop usage)	13.14.	Required	Required	Required

Initialize the setting for the multi monitor
The KOMTRAX key person does steps 1. to 9.

1. Cancel the “Engine Start Lock” of the machine.
2. Check that the “Engine Start Lock” is canceled.
3. Cancel the “Time Period Lock”.
4. Check that the “Time Period Lock” is canceled.
5. Initialize the “Monitor Password Lock”.

Pm Clinic Check Sheet PC18MR-5

NOTICE

Do the inspection after sufficient warm-up operation of the engine.

The standard value for new machine and repair limit are the value when the machine is normal.

Machine model	Machine serial number	Service meter	User name	Date of inspection	Inspector
PC18MR-5					

Engine

Item	Test condition		Unit	Standard value for new machine	Repair limit	Measured value	Good	No good
Engine speed at high idle	• Engine coolant temperature: In the operation range • Hydraulic oil temperature: 45 to 55°C • Fuel control lever: High idle position • All control levers, control pedals: NEUTRAL position • Engine speed = Fan speed/1.04		r/min {rpm}	2730 to 2830 {2730 to 2830}	2730 to 2830 {2730 to 2830}			
Engine speed at low idle	• Engine coolant temperature: In the operation range • Hydraulic oil temperature: 45 to 55°C • Fuel control lever: Low idle position • All control levers, control pedals: NEUTRAL position • Engine speed = Fan speed/1.04		r/min {rpm}	1475 to 1575 {1475 to 1575}	1475 to 1575 {1475 to 1575}			
Engine oil pressure	• Engine coolant temperature: In the operation range • All control levers, control pedals: NEUTRAL position • Engine oil (*1) EO30–DH EO10W30–DH EO15W40–DH	Fuel control lever: High idle position	MPa {kg/cm^2}	0.196 to 0.441 {2.0 to 4.5}	Max. 0.098 {Max. 1.0}			
		Fuel control lever: Low idle position		Min. 0.098 {Min. 1.0}	-			

*1: KES diesel engine oil

Related Information for Troubleshooting

General Troubleshooting Points

⚠ If you remove the radiator cap while the engine is still hot, hot coolant can spout out and can get a burn injury. Wait until they are cooled down, then do the inspection.

⚠ Be very careful not to touch the hot parts or be caught in parts that rotate or move.

⚠ Before you remove the plug or cap of the part where oil pressure, hydraulic pressure, or air pressure is applied, release the internal pressure first, then connect the measuring tool securely.

⚠ When you disconnect the wiring, remove the key and set the battery disconnect switch to the OFF position.

⚠ Stop the machine on level ground, and check the frame lock bar, chocks, and parking brake.

⚠ When you work in a group, make signs and keep the unauthorized persons away from the job site.

- Troubleshooting means to find the root cause of a failure, repair immediately, and prevent the failure to occur again.
- It is important that you understand the structure and operation of the machine when you do the troubleshooting.
- To do the troubleshooting effectively, it is also important to have an interview with the operator and set up the possible cause of failure in advance.
- If you disassembly the machine immediately when it has a failure, you can disassemble unnecessary parts and cannot find the cause. As a result, the costs of the man-hours, parts, oil, or grease can increase, and you will lose the confidence of the users and operators. Accordingly, sufficient advance check and correct procedure are necessary for troubleshooting.

1. Have an interview with the user or operator as follows.
   1) Does problem other than reported occur?
   2) Is there strange thing about the machine before the failure occurred?
   3) Did the failure occur suddenly, or were there problems with the machine condition before this?
   4) In what conditions did the failure occur?
   5) Has it been repaired before the failure? When has it been repaired?
   6) Did the same kind of failure occur before?
2. Check the items that follow before the troubleshooting.
   1) Is there a symptom of abnormality on the machine?
   2) Check items before starting
   3) Other check items
   4) Other necessary maintenance items that can be seen by appearance
3. Check the degree of the failure by yourself and judge if it is a real failure or it is a problem of handling or operation.

   When you operate the machine to reproduce the trouble phenomenon for check or measurement, be careful not to increase the failure.
4. Use the results of the check and measurement to narrow down the possible causes of the failure, then use the troubleshooting table or troubleshooting flow chart (matrix) to identify the failure.

   The basic troubleshooting procedure is as follows.
   - Start from the simple points.
   - Start from the most possible points.
   - Check other parts or information.
5. If the root cause is not corrected, a similar failure can occur again even if the current failure is repaired. Be sure to find out the cause of a failure first and remove the root cause of the failure.

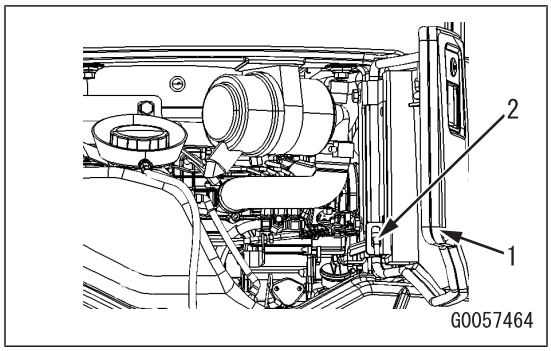
Examine Engine Oil Level (Oil Quantity in Oil Pan)

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

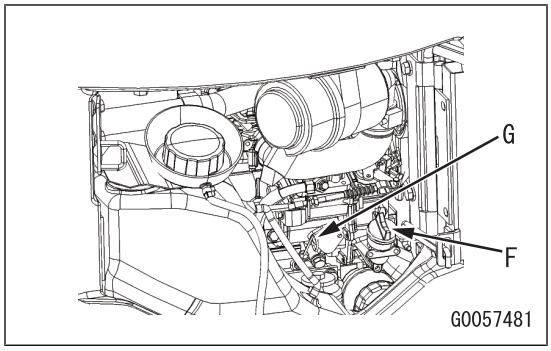
Items to be prepared

- Container to receive the drained oil
- Cloth

1. Open the engine rear cover (1) fully.
   The engine rear cover (1) is fixed by the rod (2).



2. Pull out the dipstick (G) from the dipstick pipe. Wipe off the oil with a cloth.
3. Insert the dipstick (G) fully into the dipstick pipe, and then pull it out.
4. Check the oil level with the dipstick (G).

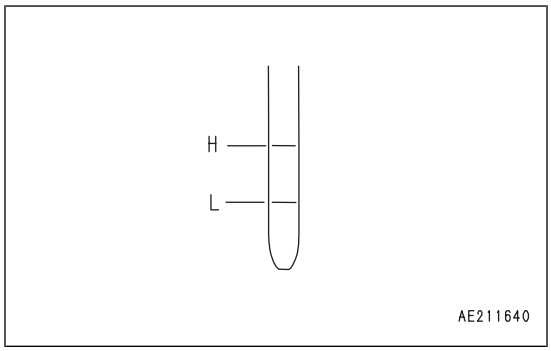


- If the oil level is between marks H and L, it is correct.
- **NOTICE**

  This machine uses a blowby reduction device.
  Do not allow the oil level to exceed the mark H when you add oil.
  If the oil level exceeds the mark H, a plenty of oil mist is sucked into the fuel chamber and it can cause a white smoke, an oil hammer, or sudden starts of engine.

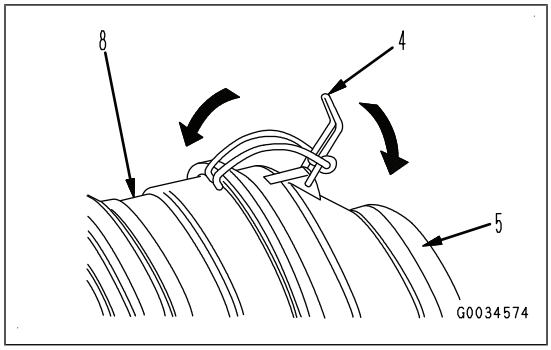
  If the oil level is below mark L, add oil through the oil filler port (F).

  1) Remove the cap of the oil filler port (F).
  2) Add oil through the oil filler port (F).
  3) Tighten the cap of the oil filler port (F).
  4) Check the oil level.

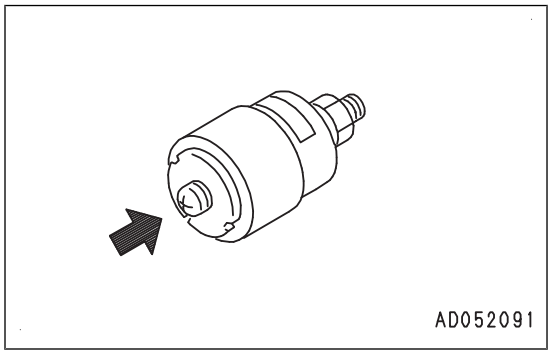


- If the oil level is above mark H, drain excessive oil in the steps that follow.

2) Make sure that the O-ring (10) is installed to the cover (5).
3) Align the cover (5) with the element.
   Insert it into the air cleaner body (8) with the vacuator valve (9) on the cover (5) at the bottom.
4) Put the hooks (4) (2 pieces) to the protrusions of the air cleaner body (8), and fix it.
5) Make sure that the clearance between the air cleaner body (8) and cover (5) is not too much.
   If it is too much, install it again.



10. Press the reset button of the dust indicator to put the red piston back.
11. Close the engine rear cover.



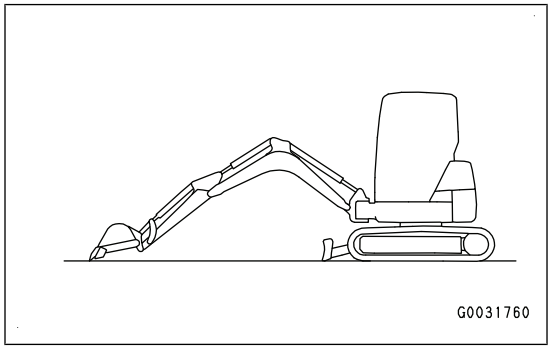
Examine Hydraulic Oil Level

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

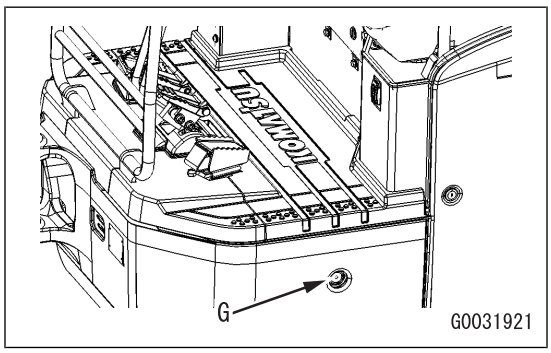
⚠ **When the oil filler cap is removed, oil could spurt out. Loosen it slowly to release the internal pressure, and remove it.**

Before you start the work, set the machine posture as shown in the figure, and stop the engine.

- Lower the blade end to the ground.
- Swing the boom to the center.
- Operate the arm cylinder and the bucket cylinder to make the work equipment at maximum reach posture (arm OUT end, bucket DUMP end), and lower the boom slowly until the tooth gets in contact with the ground.



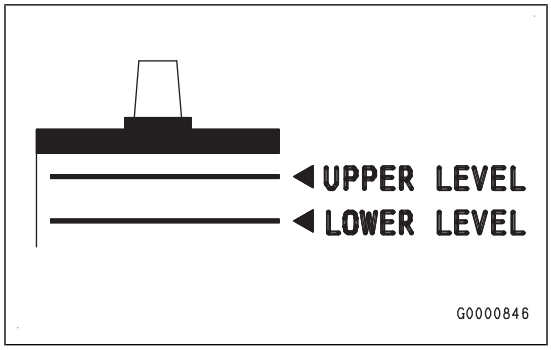
Check the oil level with the sight gauge (G).
Check it at the oil temperature before the operation (10 to 30 °C).



2) Clean around the electrolyte level lines with a wet cloth, and check that the electrolyte level is between the UPPER LEVEL (U.L.) and LOWER LEVEL (L.L.) lines.

NOTICE

Do not clean the battery with a dry cloth. Static electricity can cause an explosion.

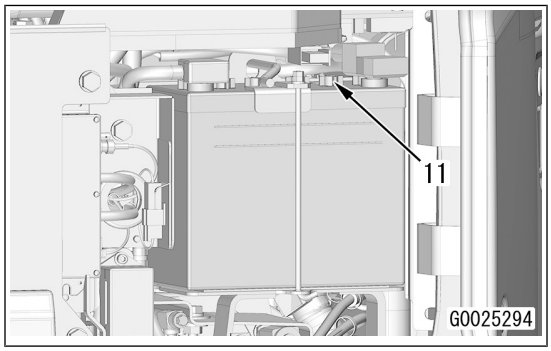


3) If the electrolyte level is below the center between the UPPER LEVEL (U.L.) and LOWER LEVEL (L.L.) lines, remove the cap (11) and add purified water (such as a commercially available battery replenisher) to the UPPER LEVEL (U.L.) line immediately.

4) Tighten the cap (11) securely after purified water is added.

REMARK

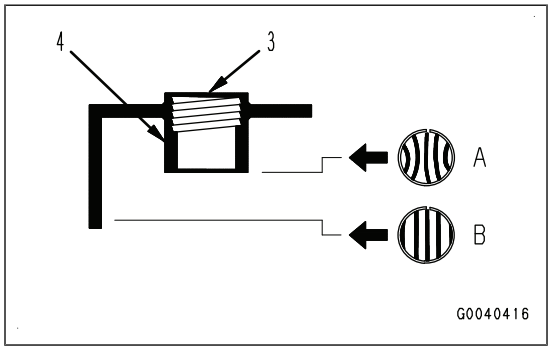
If the purified water is added to above UPPER LEVEL (U.L.) line, remove the fluid with a syringe to lower the level to UPPER LEVEL (U.L.) line. Neutralize the removed battery electrolyte with baking soda (sodium bicarbonate), and wash it away with a large quantity of water.



- When battery electrolyte level cannot be checked through the side of battery

1) Remove the cap (11) from the top of the battery. (As explained above)

2) See the filler port (6) and check the battery electrolyte level. If the battery electrolyte level is below the sleeve (7), be sure to add purified water (such as commercially available battery replenisher) until the battery electrolyte level reaches the bottom of the sleeve (UPPER LEVEL).
   - (A) Correct level: As the battery electrolyte level reaches the sleeve bottom, the shape of the electrode plates looks distorted by the surface tension.
   - (B) Low level: The electrolyte level does not reach the bottom of the sleeve, so the pole plate looks straight and not bent.



3) Tighten the cap (11) securely after purified water is added.

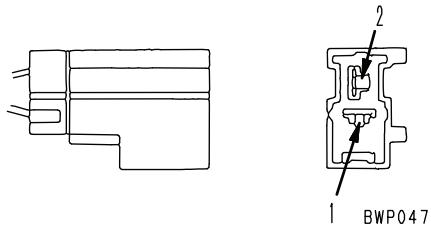
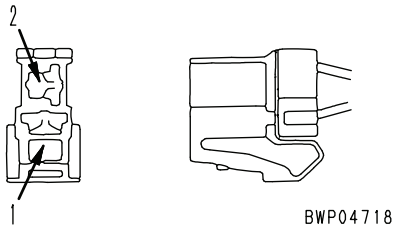
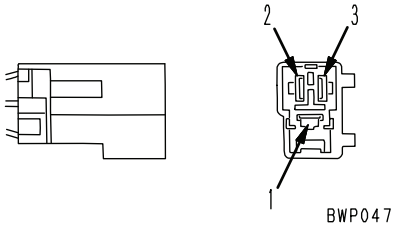
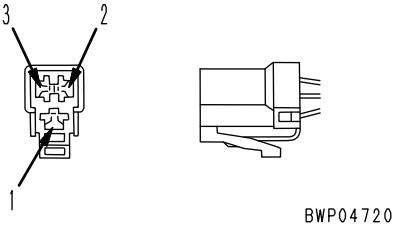
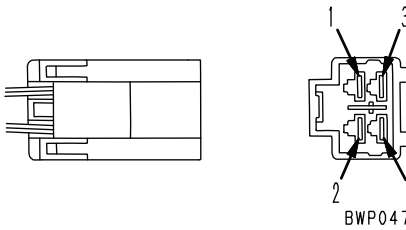
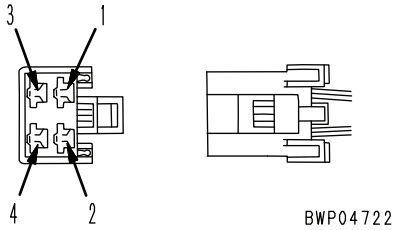
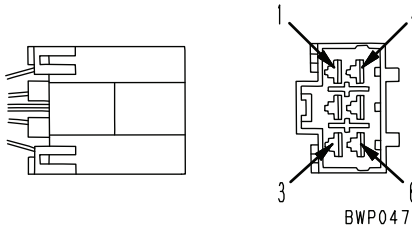
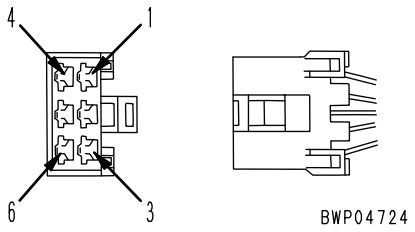
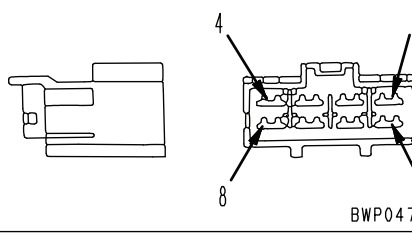
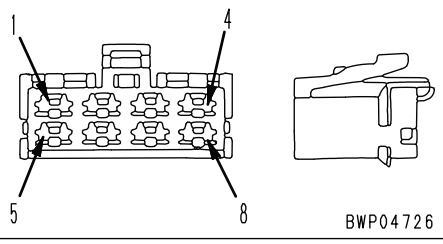
REMARK

If the purified water is added to above UPPER LEVEL (U.L.) line, remove the fluid with a syringe to lower the level to UPPER LEVEL (U.L.) line. Neutralize the removed battery electrolyte with baking soda (sodium bicarbonate), and wash it away with a large quantity of water.

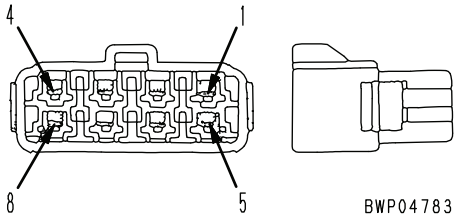
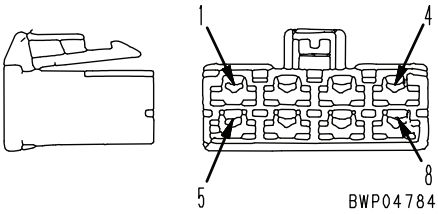
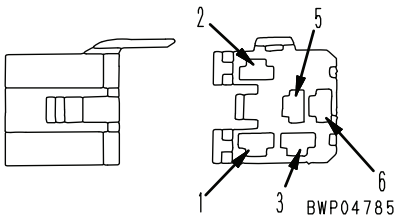
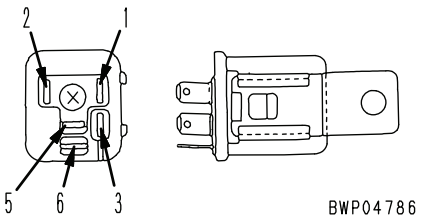
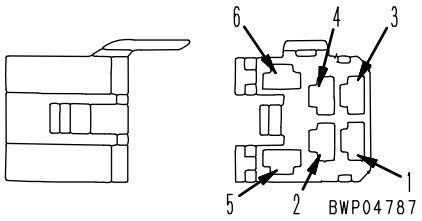
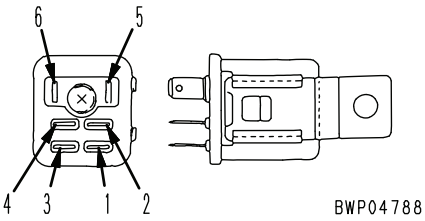
Check for disconnection, burnt areas, and peel-off of cover of wiring harness

11. Check the wiring harness and cables for discoloration and burn.
    If there is discoloration or burn, the circuit can be shorted or grounded.
12. Check the wiring harnesses and cables for damage and peel-off of the covers.
    If a failure is found, repair or replace the wiring harness or cables.

No.	Symptom and troubleshooting numbers	Troubleshooting
		Index
63	Swing drift on a slope is large (while swing parking brake is applied).	H-35
64	Swing drift on a slope is large (while swing parking brake is released).	H-36
RELATED TO MACHINE MONITOR		
65	When the starting switch is turned to the ON position, all items or a part of items on machine monitor does not operate.	E-4
66	Charge level caution lamp lights up while engine is in operation.	E-5
67	Fuel level monitor pilot lamp lights up while engine is in operation.	E-6
68	Engine coolant temperature monitor pilot lamp flashes while engine is in operation.	E-7
69	Engine oil pressure caution lamp lights up while engine is in operation.	E-8
70	Fuel gauge does not move from minimum or maximum.	E-9
71	Fuel gauge does not show the actual fuel level.	E-10
72	Coolant temperature gauge does not move from minimum or maximum.	E-11
73	Coolant temperature gauge does not show the actual temperature.	E-12
74	Actual travel speed does not change when travel speed setting is changed.	E-13
75	Alarm buzzer does not operate.	E-14
76	Alarm buzzer does not stop sounding.	E-15
77	Service meter is not shown while the starting switch is in the OFF position.	E-16
78	Service meter does not operate while engine is in operation.	E-17
Others		
79	Horn does not sound.	E-22
80	Horn does not stop.	E-23
81	Working lamp does not light up.	E-24
82	KOMTRAX system does not operate correctly.	E-25

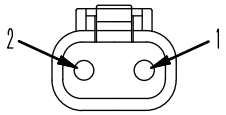
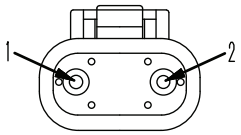
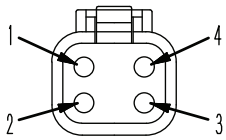
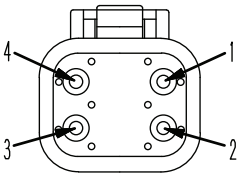
No. of pins	M type connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
1	Part No. : 08056-00171	Part No. : 08056-00181	799-601-7080 (T-adapter)
2	 BWP04717	 BWP04718	799-601-7090 (T-adapter)
	Part No. : 08056-00271	Part No. : 08056-00281	
3	 BWP04719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

G0026134

No. of pins	KES1 (Automobile) connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
8			—
	Part No. :08027-10810 (Natural color) 08027-10820 (Black)	Part No. :08027-10860 (Natural color) 08027-10870 (Black)	
No. of pins	Connector for relay (Socket type)		
	Male (female housing)	Female (male housing)	
5			799-601-7360 (T-adapter)
	—	—	
6			799-601-7370 (T-adapter)
	—	—	

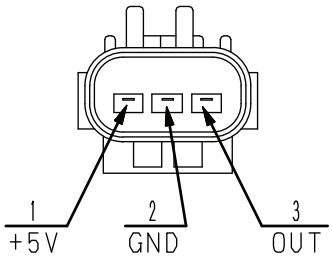
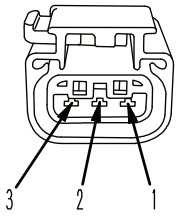
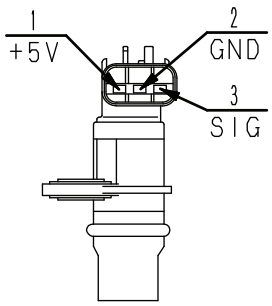
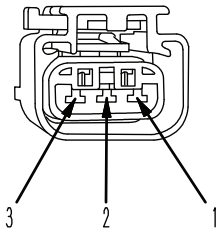
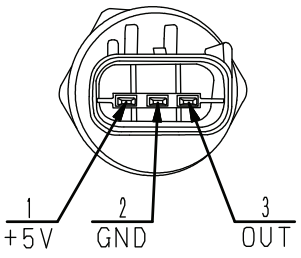
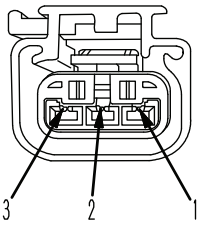
G0026144

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

No. of pins	DTP Series connector		
	Body (plug)	Body (receptacle)	Testing connection use special tool Part No.
2	Pin (female terminal)	Socket (male terminal)	
			–
	–	–	
4			799-601-4260 (T-adapter)
	Part No. :6261-81-2810	–	

G0026154

FRAMATOME connector for engine

No. of pins	Crankcase pressure sensor, ambient pressure sensor (95, 107, 114, 125, 140 engine) Dosing fuel pressure sensor (125, 140 engine)		
	Sensor side (plug)	Harness side (receptacle)	Testing connection use special tool Part No.
3			799-601-4140 (T-adapter) (Kit : 799-601-4101) (Kit : 799-601-4201)
	—	—	
	NE speed sensor (95, 107, 114, 125, 140 engine) and CAM sensor (95, 107, 114 engine)		
3			799-601-4130 (T-adapter) (Kit : 799-601-4101) (Kit : 799-601-4201)
	—	—	
	Boost (air intake) pressure sensor (125, 140 engine) Exhaust manifold pressure sensor (107, 114 engine)		
3			799-601-4180 (T-adapter) (Kit : 799-601-4101) (Kit : 799-601-4201)
	—	—	

G0026164

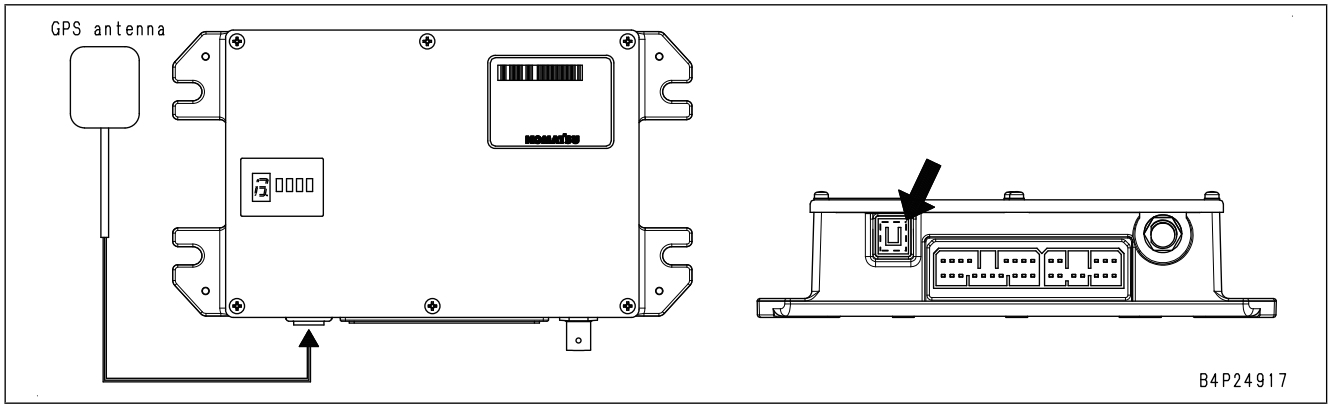
Part No.	Part name	Number of pins	ID marking	T-adapter kit														Non-kit part
				799-601-2500	799-601-2700	799-601-2800	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	799-601-4101	799-601-4201	
799-601-2840	Extension cable (ECONO type)	12	ECONO 12P	●	●				●									
799-601-2850	Case			●														
799-601-4350	T-box (for DRC60, ECONO)	60														●		
799-601-4360	Case															●		
799-601-7010	Adapter for X (T-adapter)	1							●		●							
799-601-7020	Adapter for X	2	X2P				●	●	●		●							
799-601-7030	Adapter for X	3	X3P				●	●	●		●							
799-601-7040	Adapter for X	4	X4P				●	●	●		●							
799-601-7050	Adapter for SWP	6	SW6P				●	●	●									
799-601-7060	Adapter for SWP	8	SW8P				●	●	●									
799-601-7310	Adapter for SWP	12	SW12P															●
799-601-7070	Adapter for SWP	14	SW14P						●		●							
799-601-7320	Adapter for SWP	16	SW16P															●
799-601-7080	Adapter for M (T-adapter)	1							●		●							
799-601-7090	Adapter for M	2	M2P				●	●	●		●							
799-601-7110	Adapter for M	3	M3P				●	●	●		●							
799-601-7120	Adapter for M	4	M4P				●	●	●		●							
799-601-7130	Adapter for M	6	M6P				●	●	●		●							
799-601-7340	Adapter for M	8	M8P															●
799-601-7140	Adapter for S	8	S8P				●	●	●		●							
799-601-7150	Adapter for S (white)	10	S10P				●	●	●		●							
799-601-7160	Adapter for S (blue)	12	S12P				●	●	●									
799-601-7170	Adapter for S (blue)	16	S16P				●	●	●		●							
799-601-7330	Adapter for S (white)	16	S16PW								●							
799-601-7350	Adapter for S (white)	12	S12PW															●
799-601-7180	Adapter for AMP040	8	A8P						●									
799-601-7190	Adapter for AMP040	12	A12P						●		●							
799-601-7210	Adapter for AMP040	16	A16P				●	●	●		●							
799-601-7220	Adapter for AMP040	20	A20P				●	●	●		●							
799-601-7230	Short socket adapter for X	2					●	●	●		●							
799-601-7240	Case						●	●										
799-601-7270	Case								●									
799-601-7510	Adapter for 070	10	07-10							●								
799-601-7520	Adapter for 070	12	07-12							●								

Failure Code [D862KA]

Action level	Failure code/ User code	Failure	GPS antenna open circuit (KOMTRAX system)
-	D862KA/ -		
Detail of failure	Open circuit is found in the GPS antenna circuit.		
Action of controller	If cause of failure disappears, machine becomes normal by itself.		
Phenomenon on machine	The GPS position system is not available.		
Related information	After repair is completed, check with operations shown below that the failure code is cleared. Procedure: Turn the starting switch to the ON position.		

No.	Cause	Procedure, measurement location, criteria and remarks
1	Defective GPS antenna and antenna cable	GPS antenna is possibly defective, antenna cable can have an open or short circuit, or contact at antenna cable connection (GPS) is not correct.

Configuration Diagram of GPS System



E-3 Preheating System Does Not Operate

Detail of failure	The preheating system does not operate.
Related information	-

No.	Cause	Procedure, measurement location, criteria and remarks			
1	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.			
2	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	TF1 (B) and TF5 (R1)	Starting switch: HEAT	Max. 1Ω
			TF1 (B) and TF6 (R2)	Starting switch: START	Max. 1Ω
3	Open circuit in wiring harness	1. Turn the starting switch to the OFF position. 2. Disconnect the negative (-) terminal R of the battery. 3. Disconnect the starting switch terminals TM5, TF5, and TF6. 4. Disconnect the connectors F07 and M02. Connect a T-adapter to the each female side and also use the each terminal to do the troubleshooting.			
		Resistance	Between TM5 and TF5		Max. 1Ω
			Between TF5 and TF6		Max. 1Ω
			Between TF1 and M02 (female) (1)		Max. 1Ω
			Between M02 (female) (2) and battery positive (+) terminal L		Max. 1Ω
4	Ground fault in wiring harness	1. Turn the starting switch to the OFF position. 2. Disconnect the connectors F07, M02, TM5, TF5 and TF6. Connect a T-adapter to the female side of one of the connectors and also use the each terminal to do the troubleshooting.			
		Resistance	Between ground and one of TM5, F07 (female) (8), TF5, and TF6		Min. 1MΩ
			Between ground and one of TF1 and M02 (female) (1)		Min. 1MΩ
5	Defective glow plug	1. Turn the starting switch to the OFF position. 2. Turn the starting switch to the preheating position (R1) to do the troubleshooting.			
		Voltage	Between TM5 and ground		10 to 15V

E-9 Fuel Gauge Does Not Move from Minimum or Maximum

Failure	Fuel gauge does not move from minimum or maximum.
Related information	• Make sure that there is no problem on the fuel level itself. • When the starting switch is turned to “OFF” position, the fuel gauge shows “E” and does not move. It is not a problem. • When the starting switch is turned to the ON position, if the display of fuel gauge does not move from minimum or maximum, the main power supply system is possibly defective. Do the troubleshooting for the “WHEN YOU TURN STARTING SWITCH TO ON POSITION, ALL ITEMS OF MACHINE MONITOR DO NOT WORK, OR ONE OF ITEMS DO NOT WORK” in E-mode.

No.	Cause	Procedure, measurement location, criteria and remarks			
1	Defective fuel level sensor	1. Turn the starting switch to the OFF position. 2. Disconnect the connector M08. Connect the T-adapter to the male side of M08 to do the troubleshooting.			
		Resistance	Between M08 (male) (2) and (male) (3)	Fuel level FULL	Min. 1MΩ
				Fuel level 1/2	50Ω (Reference value)
				Fuel level EMPTY	150{+10/-10}Ω
2	Open circuit in wiring harness	1. Turn the starting switch to the OFF position. 2. Disconnect the connectors M08 and F07. Connect the T-adapter to each female side to do the troubleshooting.			
		Resistance	Between F07 (female) (10) and M08 (female) (2)		Max. 1Ω
3	Ground fault in wiring harness (contact with GND or ground circuit)	1. Turn the starting switch to the OFF position. 2. Disconnect the connectors M08 and F07. Connect the T-adapter to the female side on one of the connectors to do the troubleshooting.			
		Resistance	Between ground and one of F07 (female) (13) and M08 (female) (3)		Min. 1MΩ
4	Hot short circuit in wiring harness	1. Turn the starting switch to the OFF position. 2. Disconnect the connectors M08 and F07. Connect the T-adapter to the female side on one of them. 3. Turn the starting switch to the ON position. Then, do the troubleshooting.			
		Voltage	Between ground and one of M08 (female) (3) and F07 (female) (13)		Max. 1V
5	Defective machine monitor	If no failure is found by the above checks, the machine monitor is defective. (Troubleshooting cannot be done because this is an internal defect.)			

E-14 Alarm Buzzer Does Not Operate

Failure	Alarm buzzer does not make sound.
Related information	Make sure that the fuse No.4 in fuse box FB1 is not disconnected.

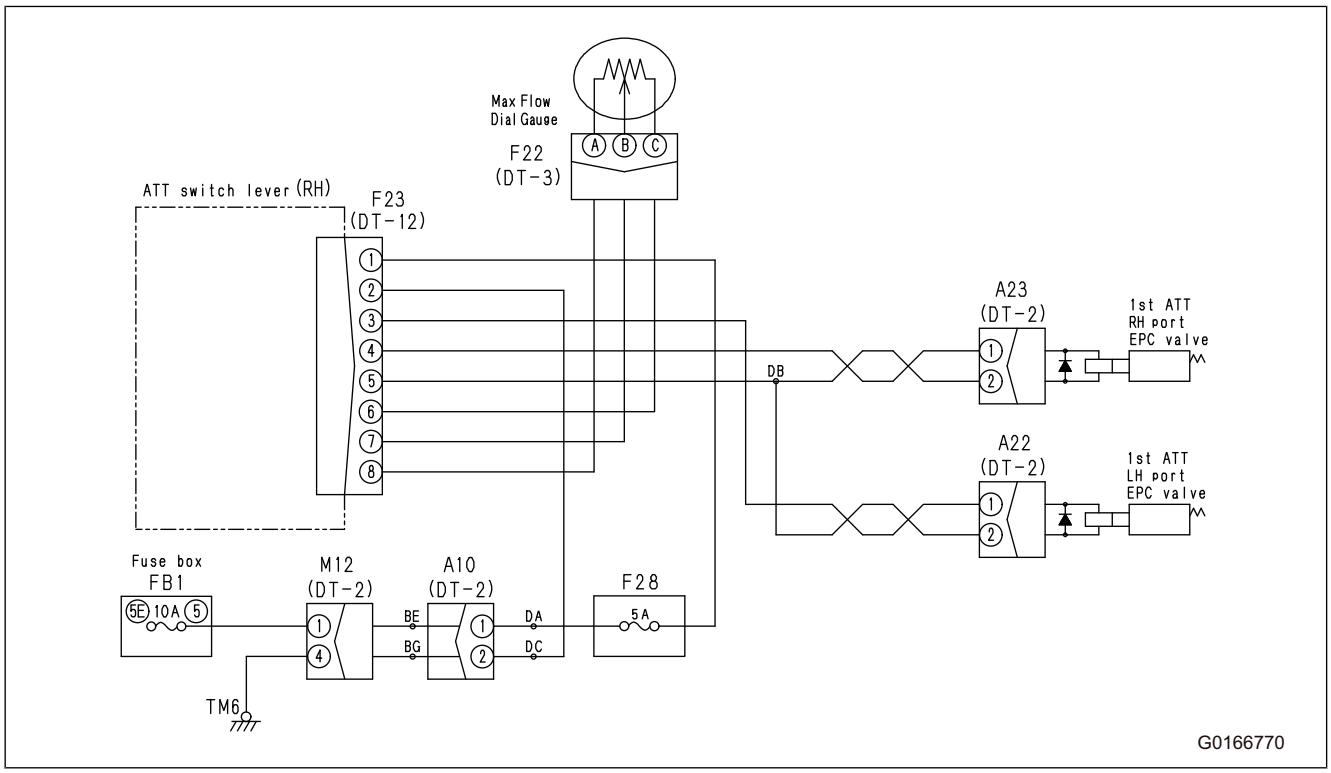
No.	Cause	Procedure, measurement location, criteria and remarks		
1	Defective fuse	If fuses No.3 and No.4 in fuse box FB1 are burnt out, the circuit probably has a ground fault. (See check on cause of wiring harness ground fault.)		
2	Open circuit in wiring harness	1. Turn the starting switch to the OFF position. 2. Disconnect the negative (-) terminal R of the battery. 3. Disconnect the connectors F07, F08, and J01. Connect the T-adapter to each female side to do the troubleshooting.		
		Resistance	Between F07 (female) (11) and F08 (female) (2)	Max. 1Ω
			Between FB1-4 and J01 (female) (13)	Max. 1Ω
			Between J01 (14) and F08 (female) (1)	Max. 1Ω
3	Ground fault in wiring harness	1. Turn the starting switch to the OFF position. 2. Disconnect the negative (-) terminal R of the battery. 3. Remove fuse No.4 in fuse box FB1. 4. Disconnect the connectors F07, F08, J01, F06, F11, R04, and R05. Connect the T-adapter to the female side of one of the connectors to do the troubleshooting.		
		Resistance	Between ground and one of F07 (female) (11) and F08 (female) (2)	Min. 1MΩ
			Between ground and one of J01 (female) (13) and FB1-4	Min. 1MΩ
			Between ground and one of J01 (female) (14) and F08 (female) (1)	Min. 1MΩ
			Between ground and one of J01 (female) (11) and R04 (female) (1)	Min. 1MΩ
			Between ground and one of J01 (female) (12), F06 (female) (A), and F11 (female) (3)	Min. 1MΩ
			Between ground and one of J01 (female) (15) and R05 (female) (3)	Min. 1MΩ
4	Short circuit in wiring harness	1. Turn the starting switch to the OFF position. 2. Disconnect the connectors F08 and J01. Connect the T-adapter to the female side of F08 to do the troubleshooting.		
		Resistance	Between F08 (1) and (2)	Min. 1MΩ

E-19 All Work Equipment, Swing, Travel Cannot be Locked

Failure	All work equipment, swing and travel cannot be locked.
Related information	-

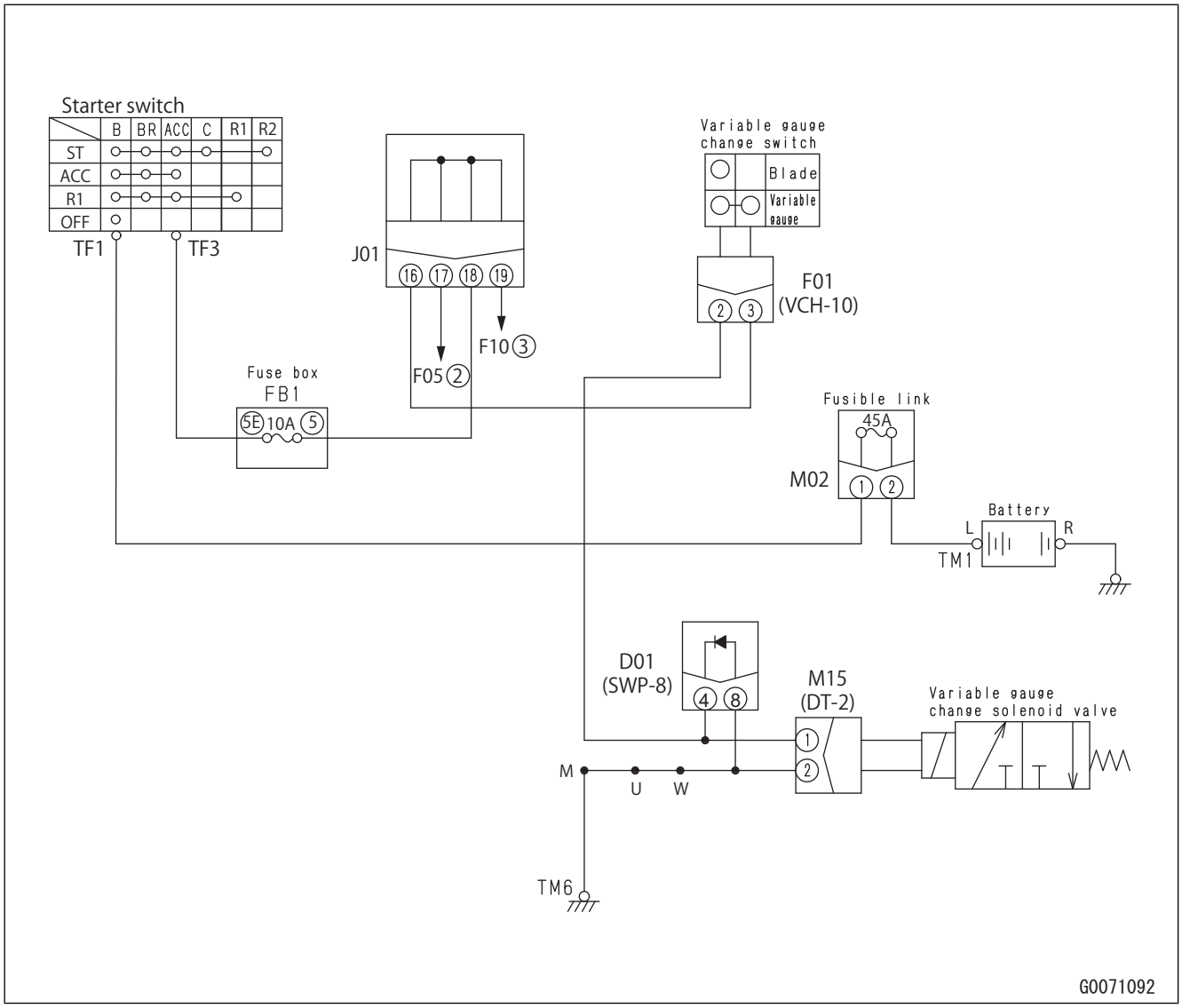
No.	Cause	Procedure, measurement location, criteria and remarks			
1	Defective lock lever lock (PPC lock) switch (L.H.)	1. Turn the starting switch to the OFF position. 2. Disconnect the connector F06. Connect the T-adapter to the male side. 3. Operate the lock lever to do the troubleshooting.			
		Resistance	Between F06 (female) (A) and (B)	Lock lever: LOCK	Max. 1Ω
				Lock lever: FREE	Min. 1MΩ
			Between F06 (female) (A) and (C)	Lock lever: LOCK	Min. 1MΩ
				Lock lever: FREE	Max. 1Ω
			Between F06 (female) (B) and (C)	Lock lever: LOCK	Min. 1MΩ
				Lock lever: FREE	Min. 1MΩ
2	Defective lock lever lock (PPC lock) switch (R.H.)	1. Turn the starting switch to the OFF position. 2. Disconnect the connector F02. Connect the T-adapter to the male side. 3. Operate the lock lever to do the troubleshooting.			
		Resistance	Between F02 (female) (A) and (B)	Lock lever: LOCK	Min. 1MΩ
				Lock lever: FREE	Max. 1Ω
			Between F02 (female) (A) and (C)	Lock lever: LOCK	Max. 1Ω
				Lock lever: FREE	Min. 1MΩ
			Between F02 (female) (B) and (C)	Lock lever: LOCK	Min. 1MΩ
				Lock lever: FREE	Min. 1MΩ
3	Defective double lock switch of work equipment	1. Turn the starting switch to the OFF position. 2. Disconnect the connector F11. Connect the T-adapter to the male side. 3. Operate the switch to do the troubleshooting.			
		Resistance	Between F11 (male) (1) and (2)	Work equipment double lock switch: RETURN	Min. 1MΩ
				Work equipment double lock switch: PUSH	Max. 1Ω
			Between F11 (male) (2) and (3)	Work equipment double lock switch: RETURN	Max. 1Ω
				Work equipment double lock switch: PUSH	Min. 1MΩ
			Between F11 (male) (1) and (3)	Work equipment double lock switch: Always	Min. 1MΩ

Circuit Diagram

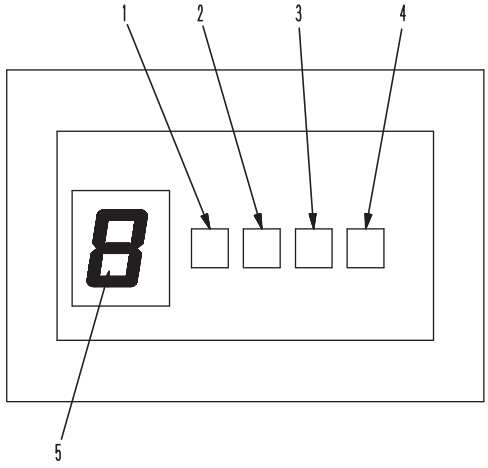


No.	Cause	Procedure, measurement location, criteria and remarks		
6	Ground fault in wiring harness	1. Turn the starting switch to the OFF position. 2. Disconnect the connectors F01, M15, D01, J01, F10, and F05. Connect the T-adapter to the female side of one of the connectors to do the trouble-shooting.		
		Resistance	Between ground and one of F01 (female) (3) and J01 (female) (16)	Min. 1MΩ
			Between ground and one of F01 (female) (2) and M15 (female) (1)	Min. 1MΩ
			Between ground and one of J01 (female) (17) and F05 (female) (2)	Min. 1MΩ
			Between ground and one of J01 (female) (19) and F10 (female) (3)	Min. 1MΩ

Circuit Diagram of Blade and Variable Gauge Selector Switch



Display Part

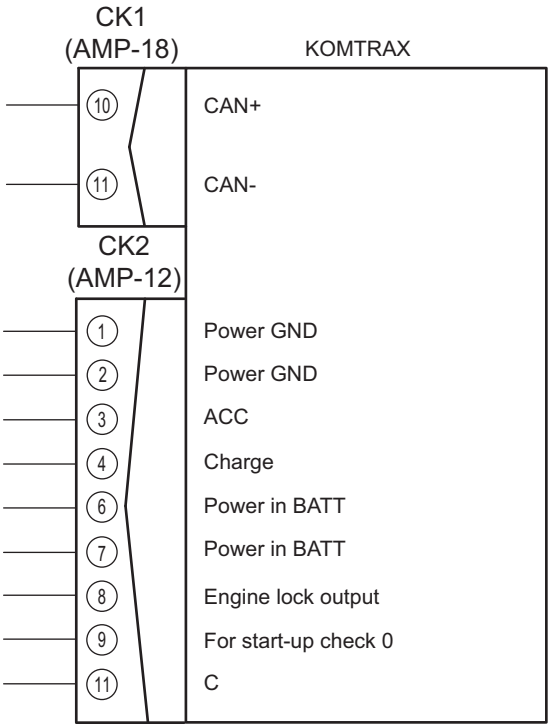


G0071090

LED display

1. LED-1 [green]: R signal, ACC signal state
2. LED-2 [red]: Starting output state
3. LED-3 [yellow]: S-NET, C signal state
4. LED-4 [green]: CAN connecting state
5. Segment [red]: Radio station establishment, operation state

KOMTRAX Connector Part



G0071096

H-9 Boom Speed or Power is Low

Failure	Boom speed 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°C.

No.	Cause	Procedure, measurement location, criteria and remarks		
1	Malfunction of R.H. PPC valve (boom 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	R.H. work equipment control lever: NEUTRAL	0MPa {0kg/cm^2}
			R.H. work equipment control lever: Boom RAISE and boom LOWER	2.84 to 3.43MPa {29 to 35kg/cm^2}
2	Malfunction of boom 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 boom spool is stuck or seized with control valve body. (It must be moved smoothly and must not be caught.) • Remove the boom 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 boom control valve (pressure compensation valve)	Check the pressure compensation valve of the boom control valve because it is possibly defective.		
4	Malfunction of boom control valve (suction valve) or defective seal	Check the suction valve of boom control valve (bottom side) because it is possibly defective.		
5	Malfunction of boom lock valve	1. Remove the pressure that remains in the hydraulic oil tank and piping. 2. Do the troubleshooting with the engine stopped.		
		• Check if pilot spool is stuck or seized with the valve body. • Remove the pilot 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.		
		1. Be prepared with the engine stopped. 2. Start the engine. Then, do the troubleshooting with the engine at high idle.		
		Boom relief pressure	Boom RAISE relief	21.92 to 23.88MPa {224 to 244kg/cm^2}
		• If only the relief pressure of anti-drop valve side is low among the work equipment relief pressures, safety valve is possibly defective. Replace the safety valve assembly.		
6	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.		

H-17 Hydraulic Drift of Bucket is Large

Failure	Hydraulic drift of bucket is large.
Related information	Do the troubleshooting with the hydraulic oil temperature at 45 to 55°C.

<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measurement location, criteria and remarks</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Defective bucket cylinder</td><td colspan="3">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>Leakage from bucket cylinder</td><td>Bucket CURL relief</td><td>Max. 10 mℓ/min</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Malfunction of bucket valve (suction valve)</td><td colspan="3">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>Bucket relief pressure</td><td>Bucket CURL or DUMP relief</td><td>21.92 to 23.88MPa
{224 to 244kg/cm^2}</td></tr>
<tr><td colspan="3">REMARK
If only bucket DUMP relief pressure is low out of the work equipment relief pressures, check the suction valve because it is possibly defective.
• Check that the check valve is seated on the valve body in position (it is not stuck halfway).
• Remove the check valve from the body, and check it for damage and dirt.
• Check the spring for fatigue and deformation.
• When you make the machine to be original state, be careful not to allow the dirt to enter.</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Malfunction of bucket control valve (spool)</td><td colspan="3">1. Remove the pressure that remains in the hydraulic oil tank and piping.
2. Do the troubleshooting with the engine stopped.</td></tr>
<tr><td colspan="3">• Check for stuck or seized bucket spool in control valve body. (It must be moved smoothly and must not be caught.)
• Remove the bucket 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.</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Malfunction of safety valve</td><td colspan="3">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>Bucket relief pressure</td><td>• Bucket CURL relief
• Bucket DUMP relief</td><td>21.92 to 23.88MPa
{224 to 244kg/cm^2}</td></tr>
<tr><td colspan="3">If oil pressure is not correct even after adjustment, check the safety valve for malfunction (fatigue of spring), internal defect (defective valve seat, pinching of dirt), etc.</td></tr>
</table>

No.	Cause	Procedure, measurement location, criteria and remarks		
6	Malfunction of R.H. travel control valve (pressure compensation valve)	1. Be prepared with the engine stopped. 2. Start the engine. Then, do the troubleshooting with the engine at high idle.		
		Travel relief pressure	R.H. travel FORWARD relief	21.92 to 23.88MPa {224 to 244kg/cm^2}
7	Malfunction of L.H. travel control valve (pressure compensation valve)	1. Be prepared with the engine stopped. 2. Start the engine. Then, do the troubleshooting with the engine at high idle.		
		Travel relief pressure	L.H. travel FORWARD relief	21.92 to 23.88MPa {224 to 244kg/cm^2}

H-32 Upper Structure Overruns Too Much When It Stops Swing Operation (Only One Direction)

Failure	Upper structure overruns excessively in only one direction when it 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 swing PPC valve	1. Be prepared with the engine stopped. 2. Start the engine. Then, do the troubleshooting with the engine at high idle.		
		Swing PPC valve outlet pressure	L.H. work equipment control lever: NEUTRAL	0MPa {0kg/cm^2}
			L.H. work equipment control lever: Swing LEFT, swing RIGHT	2.84 to 3.43MPa {29 to 35kg/cm^2}
2	Malfunction of control valve (spool)	The swing control valve spool is possibly defective. Check if the spool is stuck or has damage.		
3	Malfunction of swing motor (safety valve)	1. Be prepared with the engine stopped. 2. Start the engine. Then, do the troubleshooting with the engine at high idle.		
		Swing relief pressure (pump pressure)	L.H. work equipment control lever: Swing LEFT relief, swing RIGHT relief	18.33 to 20.78MPa {187 to 217kg/cm^2}
		If oil pressure is not correct even after adjustment, the seal of the safety valve can be defective.		
4	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.		
5	Defective seal of swing motor (check valve)	Exchange the check 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-4 Engine Startability is Unsatisfactory

Failure	The engine startability is not good.
Related information	-

No.	Cause	Point to check, remarks	Remedy
1	Defective battery	When you measure the battery voltage and the specific gravity, you find they are low. • Battery voltage: Min. 12V • Specific gravity of battery electrolyte: Min. 1.26	Fill battery electrolyte and charge the battery.
2	Low fuel level	It is found by check that the fuel tank is empty.	Add fuel.
3	Use of unspecified fuel	Unspecified fuel is used.	Use the correct type of fuel specified in the Operation and Maintenance Manual.
4	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.
5	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.
6	Mixing of foreign materials into fuel	When the fuel is drained from fuel tank, the rust or water comes out.	Replace the fuel.
7	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.
8	Leakage from fuel piping system	There is a fuel leakage from the fuel piping. (Reference: See Testing and Adjusting, “Examine Fuel Circuit for Leakage”.)	Repair or replace the fuel piping circumference.
9	Defective fuel injection pump	Check the fuel injection pump. (Reference: See Testing and Adjusting, “Examine and Adjust Fuel Injection Timing”.)	Adjust the fuel injection pump.
10	Clogged air cleaner element	Air cleaner dust indicator is at caution level.	Check and clean the air cleaner element.
11	Defective intake air heater	• The installation part of the intake air heater does not get warm during preheating operation. • The engine preheating monitor does not operate correctly during preheating operation or when the temperature is low.	Replace the intake air heater.
12	Defective fuel injection valve (clogged fuel injection valve, defective injection)	Check “fuel injection valve”. (Reference: See Engine Shop Manual.)	Adjust the fuel injection valve.
13	Defective contact of valve and valve seat	• Measure the compression pressure. (See standard value table) (Reference: See Testing and Adjusting, “Examine Compression Pressure”.) • Check the valve clearance. (Reference: See Testing and Adjusting, “Examine and Adjust Valve Clearance”.)	Repair the contact surface between valves and valve seats, or replace the valves.

S-11 Fuel Consumption is Excessive

Failure	The fuel consumption is excessive.
Related information	-

No.	Cause	Point to check, remarks	Remedy
1	Defective fuel injection valve (clogged fuel injection valve, defective injection)	Check “fuel injection valve”. (Reference: See Engine Shop Manual.)	Adjust the fuel injection valve.
2	Fuel leakage from inside of cylinder head	• Check if the oil level has increased. • Check if there is a smell of diesel fuel.	Repair the defective area.
3	Internal defect of fuel injection pump	• Check if the oil level has increased or there is a smell of diesel fuel. • Check the internal seal of fuel injection pump.	Repair the fuel injection pump.
4	External fuel leakage	Check if there is a fuel leakage to outside of engine.	Repair the defective area.

50 Disassembly and Assembly

Special Tool List

How to Read the Tool List

- Part No.:
  Tools with part number 79*T-***-**** are not supplied (to be locally manufactured).

Special Tools to be Used When You Disassemble and Assemble the Recoil Spring Assembly

Symbol	Part name	Part No.	Specifications	Q'ty	Remarks
A	Sleeve	792-371-1400		1	Disassembly and assembly of recoil spring

Special Tools to be Used When You Disassemble and Assemble the Idler Assembly

Symbol		Part name	Part No.	Specifications	Q'ty	Remarks
A		Push tool kit	790-101-5001		1	Installation of bearing
	1	Plate	790-101-5131		1	
	2	Grip	790-101-5021		1	
	3	Bolt	01010-50816		1	
B		Spacer	790-201-2720		1	Installation of oil seal

Special Tools to be Used When You Disassemble and Assemble the Track Roller Assembly

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

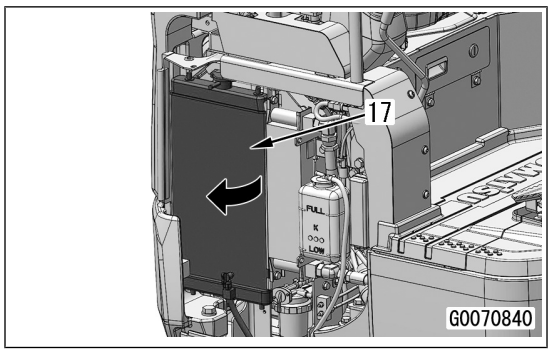
Special Tools to be Used When You Disassemble and Assemble the Work Equipment Cylinder Assembly

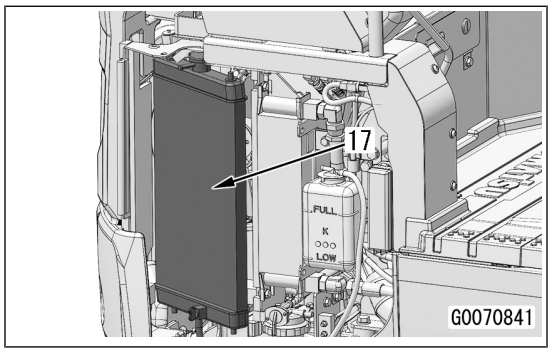
Symbol		Part name	Part No.	Specifications	Q'ty	Remarks
A	1	Repair stand	790-502-1003		1	Disassembly and assembly of steering cylinder assembly
	2	Hydraulic pump	790-101-1102		1	
B		Wrench assembly	790-330-1100		1	Removal and installation of cylinder head

12. Move the radiator assembly (17) as shown in the figure to remove it.

REMARK

Remove the radiator assembly (17) carefully not to damage its fin.





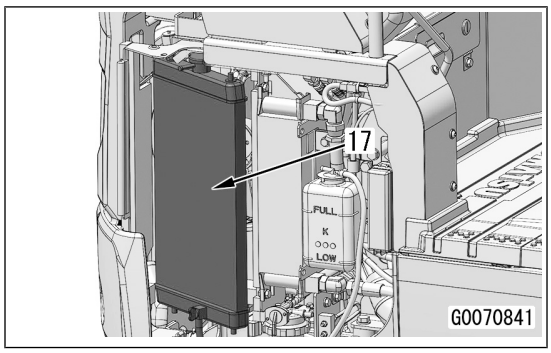
How to Install Radiator Assembly

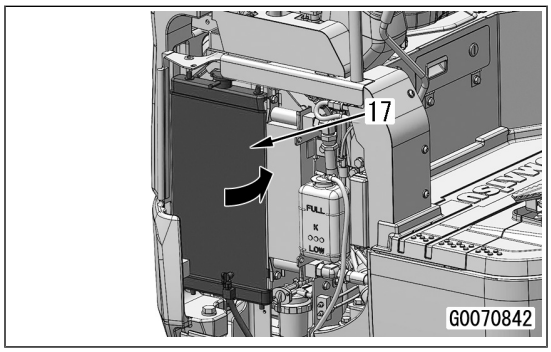
Radiator assembly

1. Move the radiator assembly (17) to the installation position as shown in the figure.

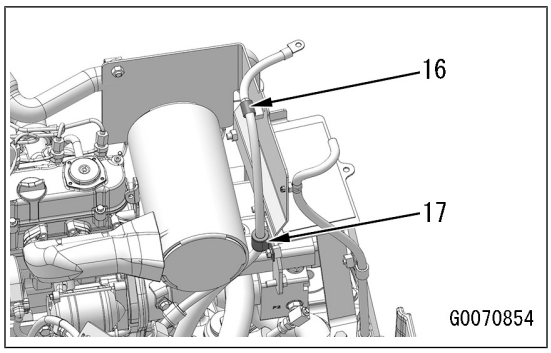
REMARK

Be careful not to damage the fin of the radiator assembly (17).

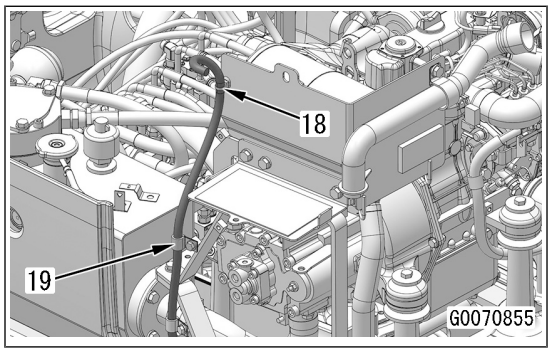




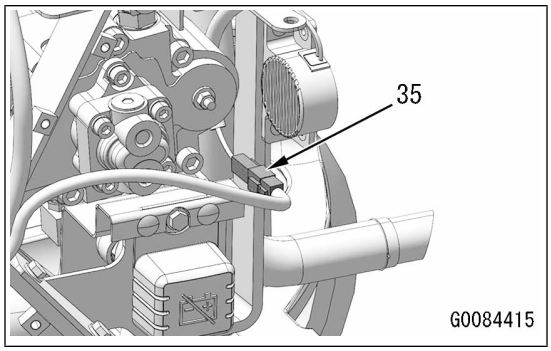
13. Remove the clamps (16) and (17).
    Tool: Socket wrench
    Bolt for clamps (16) and (17): Width across flats 13 mm, M8



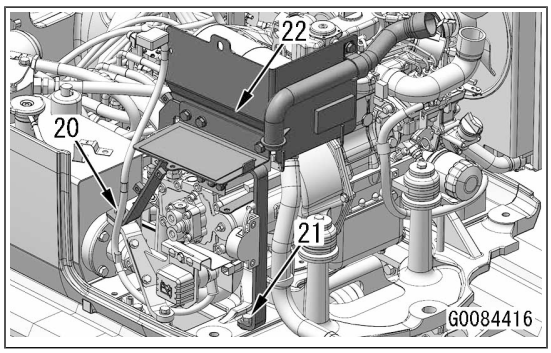
14. Remove the clip (18).
15. Remove the clamp (19).
    Tool: Socket wrench
    Bolt for clamp (19): Width across flats 13 mm, M8



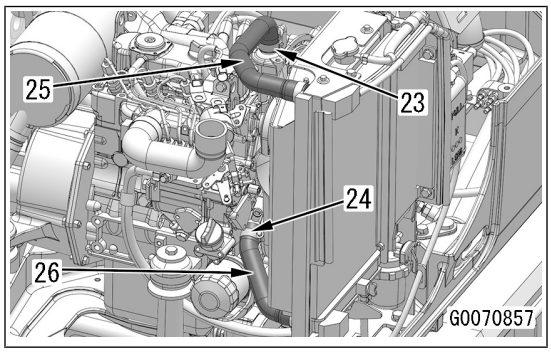
16. Disconnect the connector A05 (35).



17. Remove the bolts (20) and (21), and remove the battery stand (22).
    Tool: Socket wrench
    Bolt (20): Width across flats 17 mm, M10
    Bolt (21): Width across flats 19 mm, M12



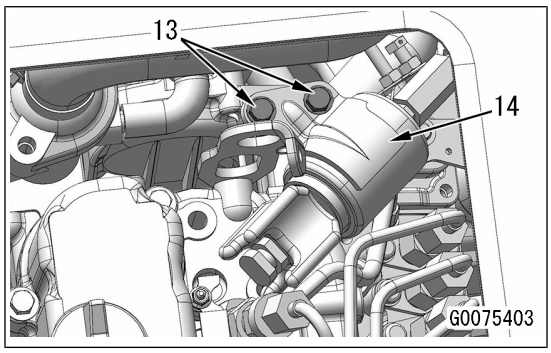
18. Remove the clamps (23) and (24), and disconnect the hoses (25) and (26) on the engine side.
    Tool: Socket wrench
    Clamp (23), (24): Width across flats 7 mm



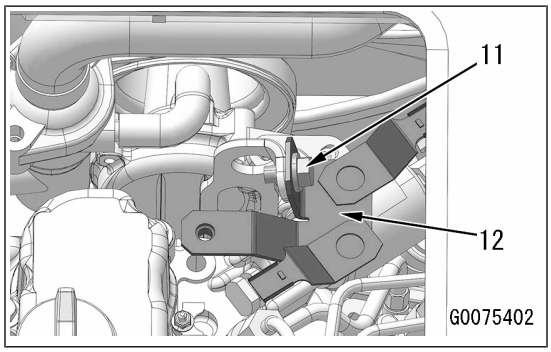
How to Install Engine Stop Solenoid

Engine stop solenoid

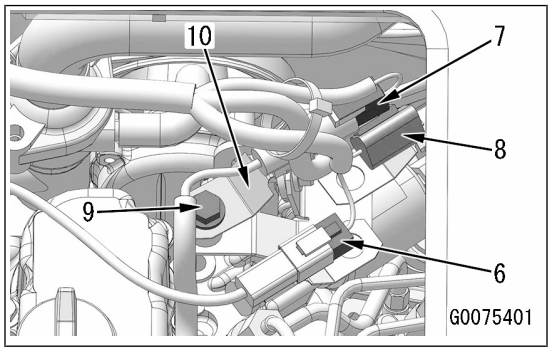
1. Install the engine stop solenoid (14) with the bolts (13) (2 pieces).
   Tool: Torque wrench (socket)
   Bolt (13): Width across flats 10 mm, M6
   Bolt (13): 11.8 to 14.7 Nm {1.2 to 1.5 kgm}



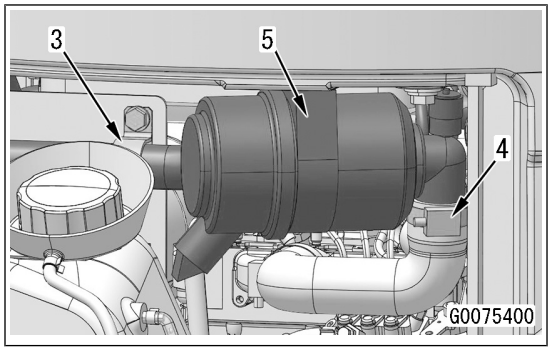
2. Install the clip (12) with the bolt (11).
   Tool: Torque wrench (socket)
   Bolt (11): Width across flats 13 mm, M8
   Bolt (11): 27 to 34 Nm {2.8 to 3.5 kgm}



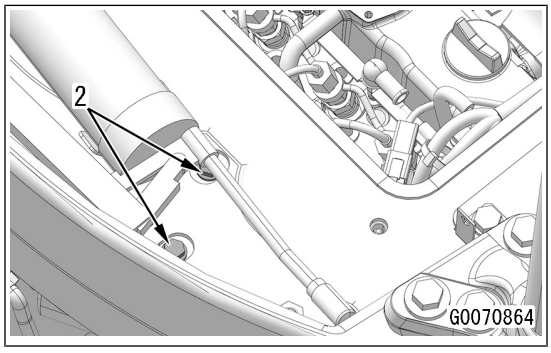
3. Install the clip (10) with the bolt (9).
   Tool: Torque wrench (socket)
   Bolt (9): Width across flats 13 mm, M8
   Bolt (9): 27 to 34 Nm {2.8 to 3.5 kgm}
4. Install the connector M04 (8) to the clip.
5. Connect the connectors M06 (6) and M16 (7).



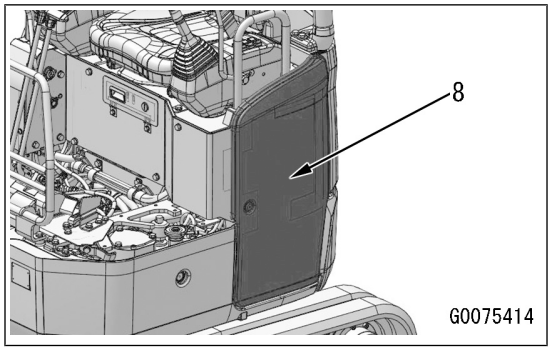
6. Set the air cleaner (5) to the installation position, and install the clamps (3) and (4).
   Tool: Torque wrench (socket)
   Bolt for clamp (3): Width across flats 17 mm, M10
   Clamp (4): Width across flats 8 mm
   Bolt for clamp (3): 59 to 74 Nm {6 to 7.5 kgm}
   Clamp (4): 8.8±0.5 Nm {0.9±0.05 kgm}



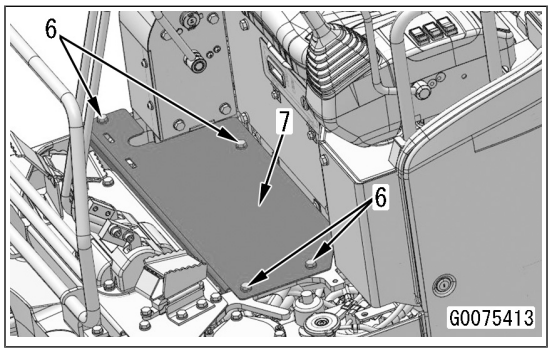
7. Install the bolts (2) (2 pieces).
   Tool: Torque wrench (socket)
   Bolt (2): Width across flats 13 mm, M8
   Bolt (2): 14.7 to 25.5 Nm {1.5 to 2.6 kgm}



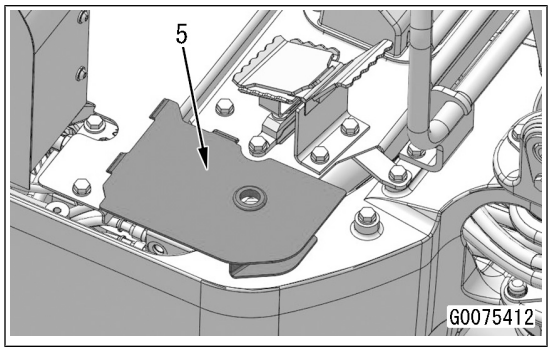
7. Close the cover (8).



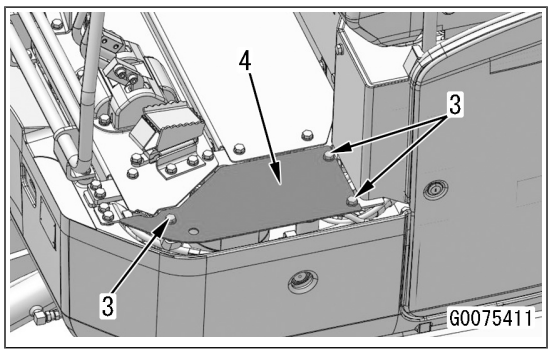
8. Install the cover (7) with the bolts (6) (4 pieces).
   Tool: Torque wrench (socket)
   Bolt (6): Width across flats 17 mm, M10
   Bolt (6): 59 to 74 Nm {6 to 7.5 kgm}



9. Install the cover (5).



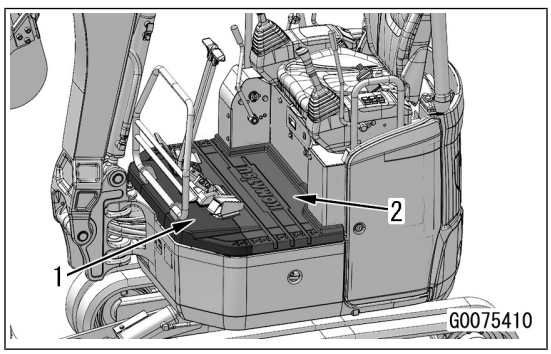
10. Install the cover (4) with the bolts (3) (3 pieces).
    Tool: Torque wrench (socket)
    Bolt (3): Width across flats 17 mm, M10
    Bolt (3): 59 to 74 Nm {6 to 7.5 kgm}



11. Install the floor mats (1) and (2).

    REMARK

    Install the floor mat. For details, see Testing and Adjusting, “Tilt of Cover of Travel PPC Lever”.



Disassemble and Assemble Idler 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	Socket wrench	Commercially available	13 mm	1	
2	Socket wrench	Commercially available	17 mm	1	
3	Snap ring pliers	Commercially available		1	
4	Torque wrench (socket)	Commercially available	20 to 200 Nm {2.04 to 20.4 kgm}	1	

List of Special Tools

Symbol		Part name	Part No.	Specifications	Q'ty	Remarks
A		Push tool kit	790-101-5001		1	Installation of bearing
	1	Plate	790-101-5131		1	
	2	Grip	790-101-5021		1	
	3	Bolt	01010-50816		1	
B		Spacer	790-201-2720		1	Installation of oil seal

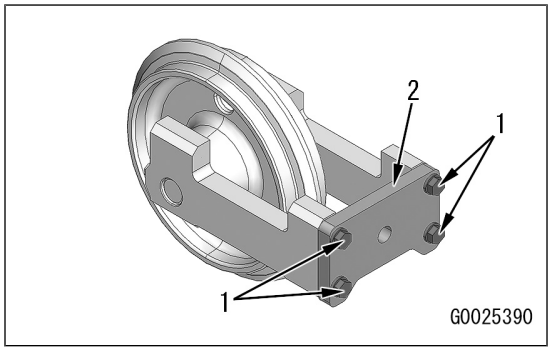
How to Disassemble Idler Assembly

Idler assembly

1. Remove the bolts (1) (4 pieces), and remove the plate (2). (Rubber shoe specifications)

   Tool: Socket wrench

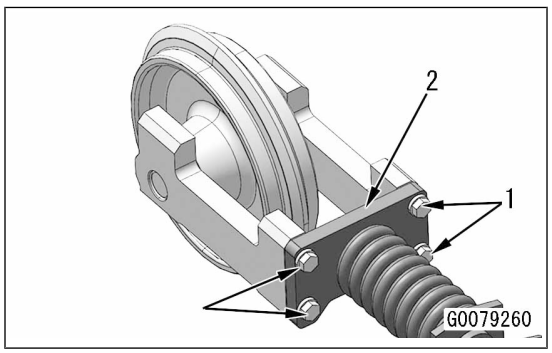
   Bolt (1): Width across flats 17 mm, M10



2. Remove the bolts (1) (4 pieces), and remove the plate (2). (Steel shoe specification)

   Tool: Socket wrench

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



Counterweight and fuel tank assembly

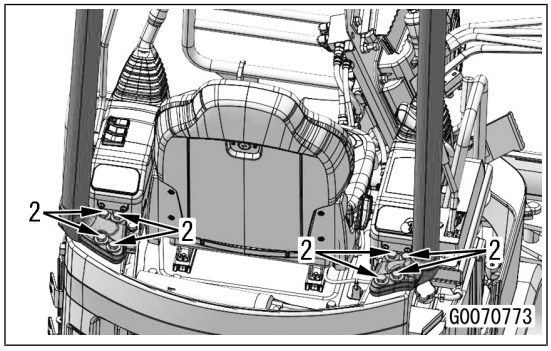
2. Lift the canopy (3), and hold it.

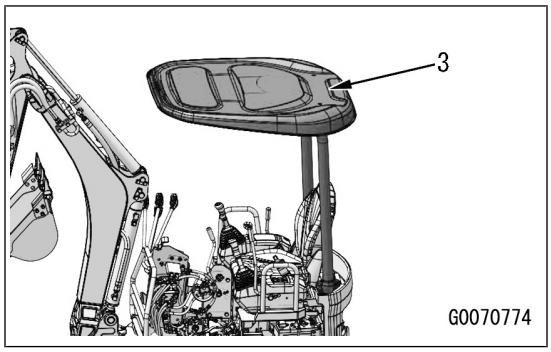
   Canopy (3): 65 kg

3. Remove the bolts (2) (8 pieces), lift the canopy (3), and remove it.

   Tool: Socket wrench

   Bolt (2): Width across flats 19 mm, M12

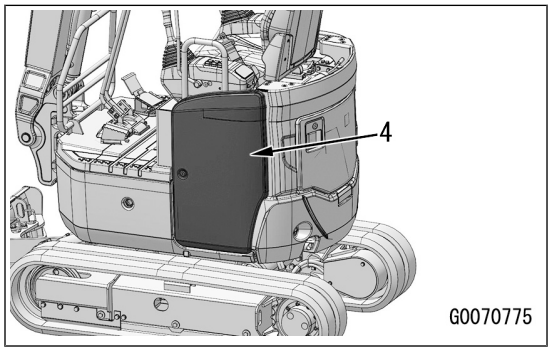




4. Open the cover (4).

   REMARK

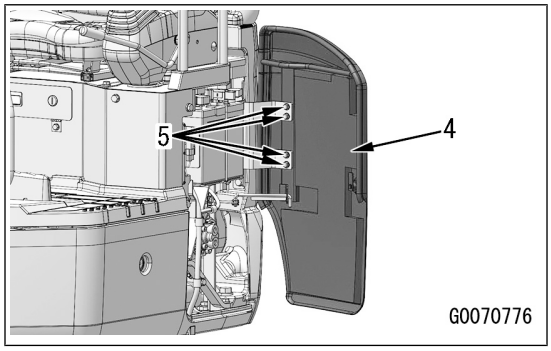
   Make sure that the lock bar is securely fixed.



5. Remove the bolts (5) (4 pieces), and remove the cover (4).

   Tool: Socket wrench

   Bolt (5): Width across flats 13 mm, M8



6. Open the cover (6).

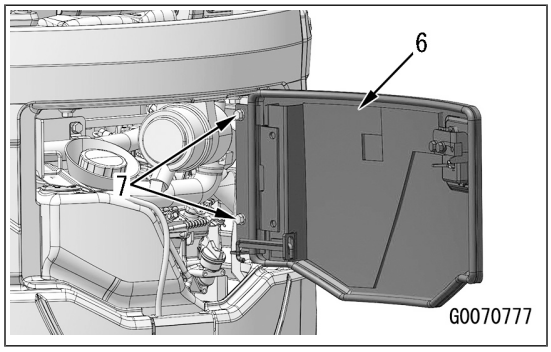
   REMARK

   Make sure that the lock bar is securely fixed.

7. Remove the bolts (7) (2 pieces), and remove the cover (6).

   Tool: Socket wrench

   Bolt (7): Width across flats 17 mm, M10



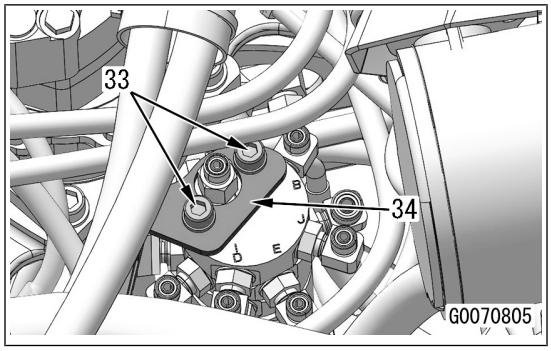
2. Install the lock (34) with the hexagonal socket head bolts (33) (2 pieces).

   Tool: Torque wrench (hexagonal)

   Hexagonal socket head bolt (33): Width across flats 8 mm, M10

   Hexagonal socket head bolt (33): Liquid adhesive (LT-2)

   Hexagonal socket head bolt (33): 59 to 74 Nm {6 to 7.5 kgm}

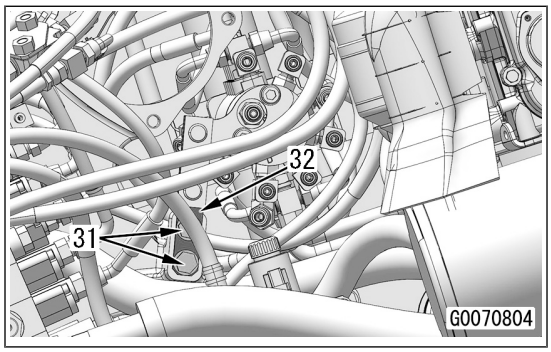


3. Connect the lock (32) with the bolts (31) (2 pieces).

   Tool: Torque wrench (socket)

   Bolt (31): Width across flats 17 mm, M10

   Bolt (31): 59 to 74 Nm {6 to 7.5 kgm}

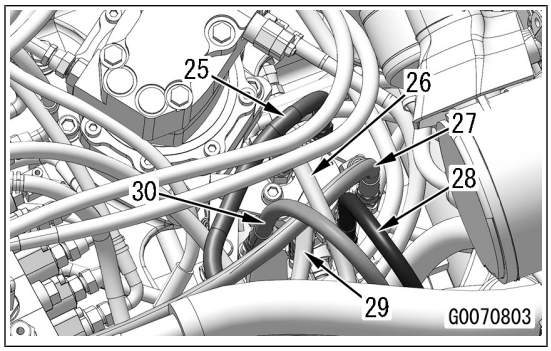


4. Connect the hoses (25), (26), (27), (28), (29), and (30).

   Tool: Torque wrench (open-end)

   Hose (25), (26), (27), (28), (29), (30): Width across flats 19 mm, nominal 02

   Hose (25), (26), (27), (28), (29), (30): 34 to 54 Nm {3.5 to 5.5 kgm}

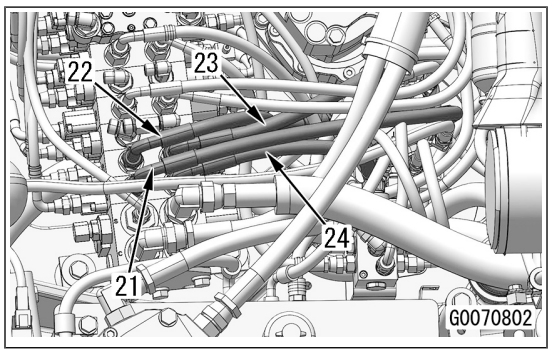


5. Connect the hoses (21), (22), (23), and (24).

   Tool: Torque wrench (open-end)

   Hose (21), (22), (23), (24): Width across flats 22 mm, nominal 03

   Hose (21), (22), (23), (24): 54 to 93 Nm {5.5 to 9.5 kgm}

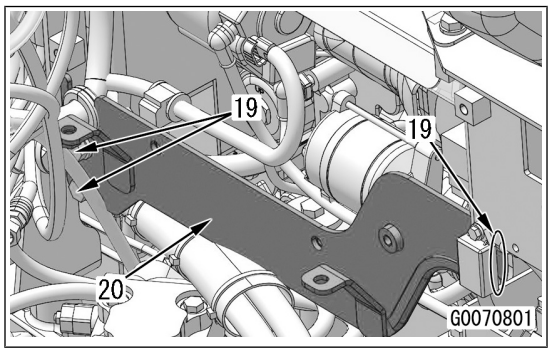


6. Install the cover (20) with the bolts (19) (4 pieces).

   Tool: Torque wrench (socket)

   Bolt (19): Width across flats 17 mm, M10

   Bolt (19): 59 to 74 Nm {6 to 7.5 kgm}

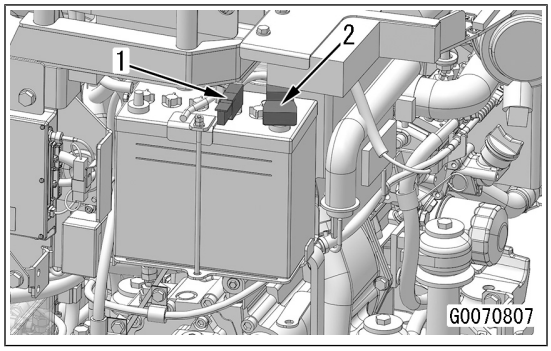


Release pressure remained in hydraulic circuit

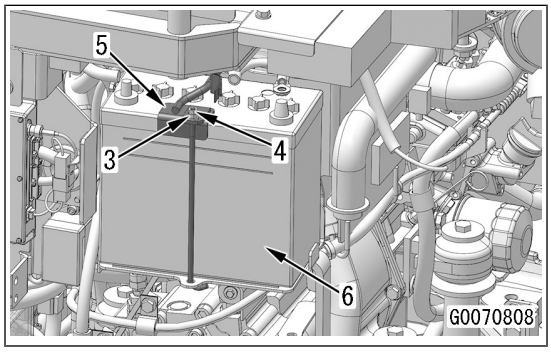
2. Release pressure in the hydraulic circuit. For details, see Testing and Adjusting, “Release Remained Pressure in Hydraulic Circuit”.

Main pump assembly

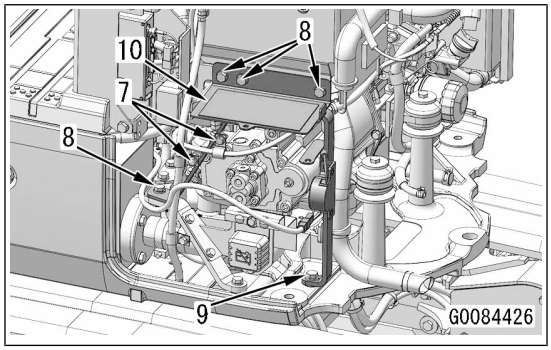
3. Remove the connector M02 (1) from the clip.
4. Disconnect the battery (+) terminal (2).

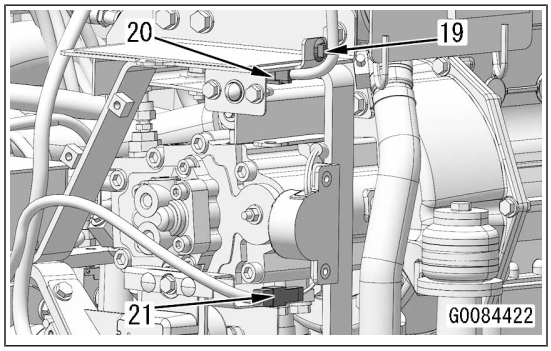


5. Remove the nut (4) while you hold the nut (3).
   Tool: Open-end wrench, box-end combination wrench
   Nut (3), (4): Width across flats 10 mm
6. Remove the nut (3), and remove the bracket (5).
   Tool: Box-end combination wrench
   Nut (3): Width across flats 10 mm
7. Remove the battery (6).



8. Remove the clamps (7) (2 pieces).
   Tool: Socket wrench
   Bolt for clamp (7): Width across flats 13 mm, M8
9. Remove the clip (19), and disconnect the connectors M17 (20) and A05 (21).
10. Remove the bolts (8) (4 pieces) and (9), and remove the battery stand (10).
    Tool: Socket wrench
    Bolt (8): Width across flats 17 mm, M10
    Bolt (9): Width across flats 19 mm, M12





Disassemble and Assemble Work Equipment Cylinder Assembly

Piston rod assembly	-	Piston assembly	-	Cylinder head assembly	-	Piston rod assembly	-	Cylinder assembly

Standard tool list

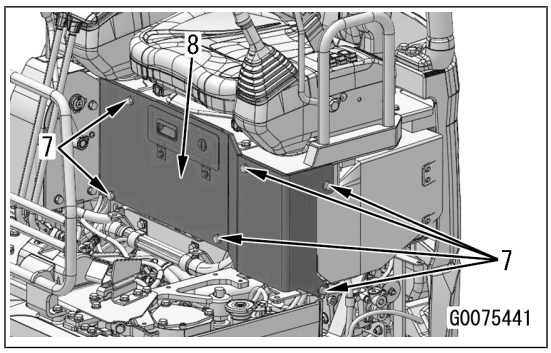
The listed parts are for reference only. You can use the part that is not listed if it is applicable.

No.	Part name	Part No.	Specifications	Q'ty	Remarks
1	Socket wrench	Commercially available	32 mm	1	
2	Socket wrench	Commercially available	36 mm	1	
3	Socket wrench	Commercially available	41 mm	1	
4	Torque wrench (socket)	Commercially available	10 to 1000 Nm {1.2 to 102 kgm}	1	Depth: 80mm or more
5	Oil container	Commercially available		1	

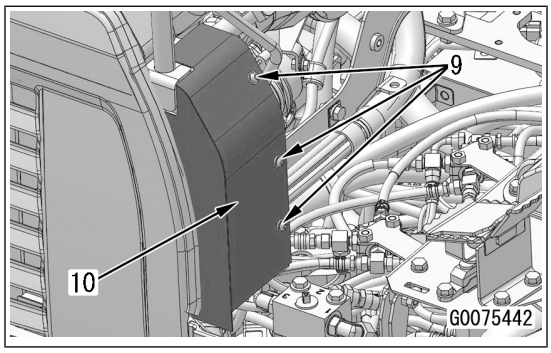
List of Special Tools

Symbol		Part name	Part No.	Specifications	Q'ty	Remarks
A	1	Repair stand	790-502-1003		1	Disassembly and assembly of steering cylinder assembly
	2	Hydraulic pump	790-101-1102		1	
B		Wrench assembly	790-330-1100		1	Removal and installation of cylinder head
C		Push tool kit	790-201-1702		1	Press-fit of bushing
	1	Push tool	790-201-1721	For bucket, swing, and variable gauge	1	
	2	Push tool	790-201-1731	For arm and blade	1	
	3	Grip	790-101-5021		1	
	4	Bolt	01010-50816		1	
D		Push tool kit	790-201-1500		1	Installation of dust seal
	1	Plate	790-201-1530	For bucket, swing, and variable gauge	1	
	2	Plate	790-201-1540	For boom, arm, and blade	1	
	3	Grip	790-101-5021		1	
	4	Bolt	01010-50816		1	
E		Expander	790-720-1000		1	Installation of piston ring

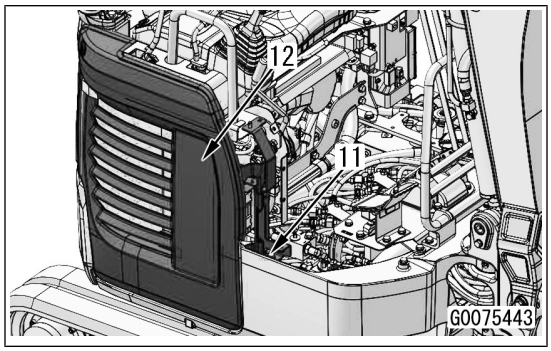
7. Remove the bolts (7) (6 pieces), and remove the cover (8).
   Tool: Socket wrench
   Bolt (7): Width across flats 17 mm, M10



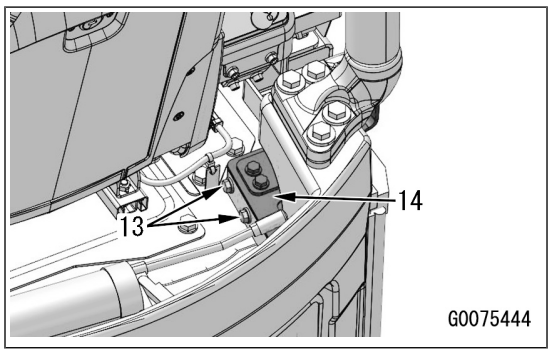
8. Remove the hexagonal socket head bolts (9) (3 pieces), and remove the cover (10).
   Tool: Hexagonal wrench
   Hexagonal socket head bolt (9): Width across flats 5 mm, M8



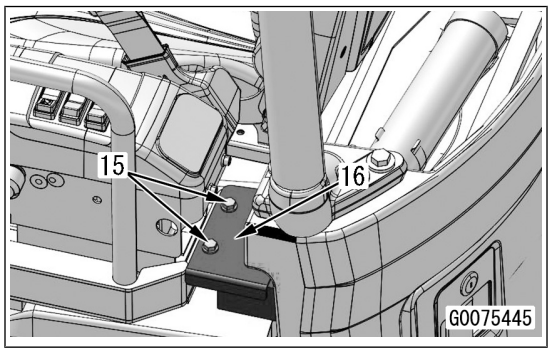
9. Remove the bolt (11), and remove the cover (12).
   Tool: Socket wrench
   Bolt (11): Width across flats 17 mm, M10



10. Remove the bolts (13) (2 pieces), and remove the bracket (14).
    Tool: Socket wrench
    Bolt (13): Width across flats 13 mm, M8

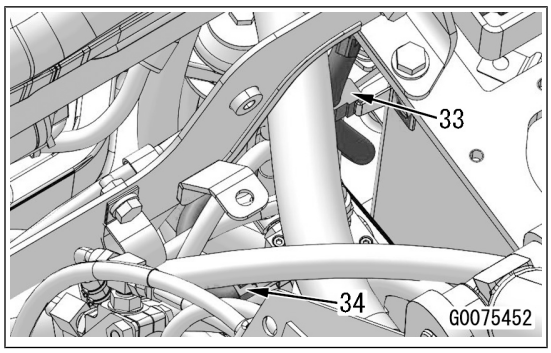


11. Remove the bolts (15) (2 pieces), and remove the bracket (16).
    Tool: Socket wrench
    Bolt (15): Width across flats 17 mm, M10

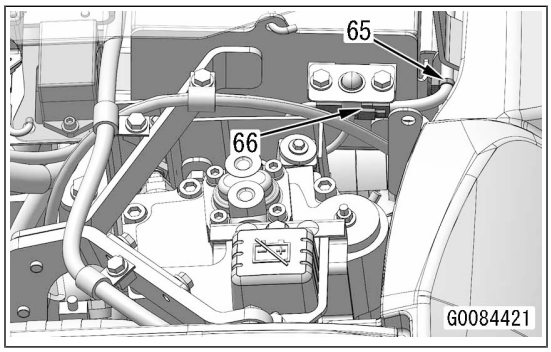


12. Open the cover of the travel PPC lever. For details, see Testing and Adjusting, “Tilt of Cover of Travel PPC Lever”.

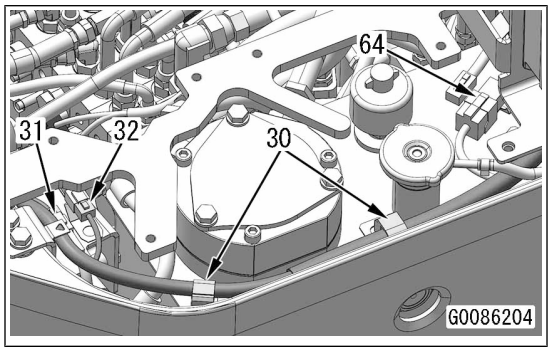
24. Connect the connector M15 (34), and install the clip (33).



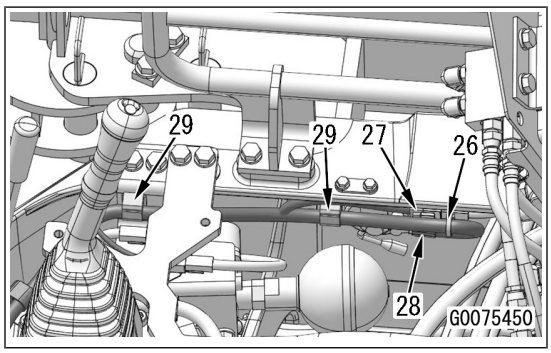
25. Connect the connector M17 (66), and install the clip (65).



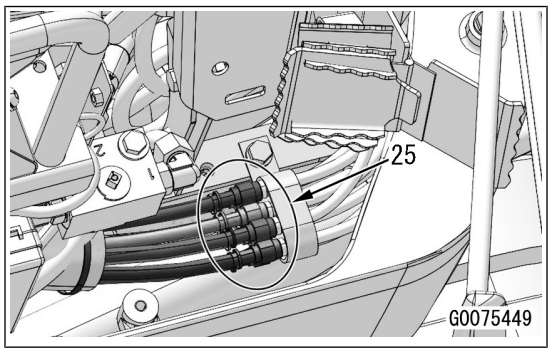
26. Connect the connectors M10 (31), M09 (32), M12 (64), and install the clips (30) (2 pieces).



27. Install the clips (29) (2 pieces).
28. Connect the connectors W01 (27) and M01 (28), and install the band (26).



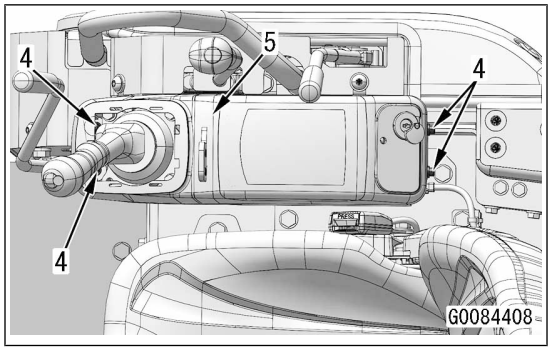
29. Connect the hoses (25) (8 pieces).



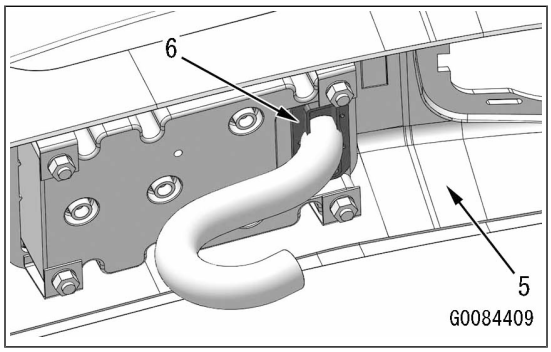
3. Remove the hexagonal socket head bolts (4) (4 pieces), and let the cover (5) floated.

   Tool: Hexagonal wrench

   Hexagonal socket head bolt (1): Width across flats 5 mm, M6



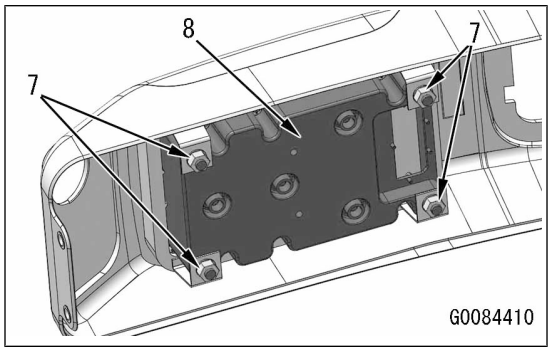
4. Disconnect the connector F07 (6) while the cover (5) is floated.

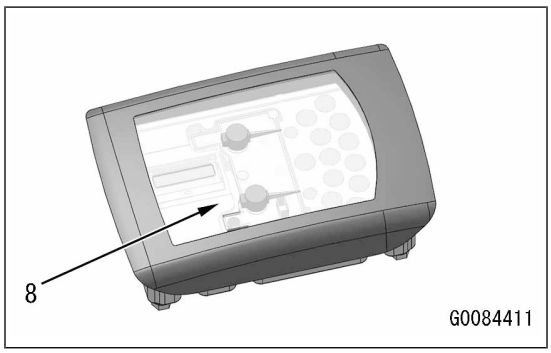


5. Remove the nuts (7) (4 pieces), and remove the machine monitor assembly (8).

   Tool: Socket wrench

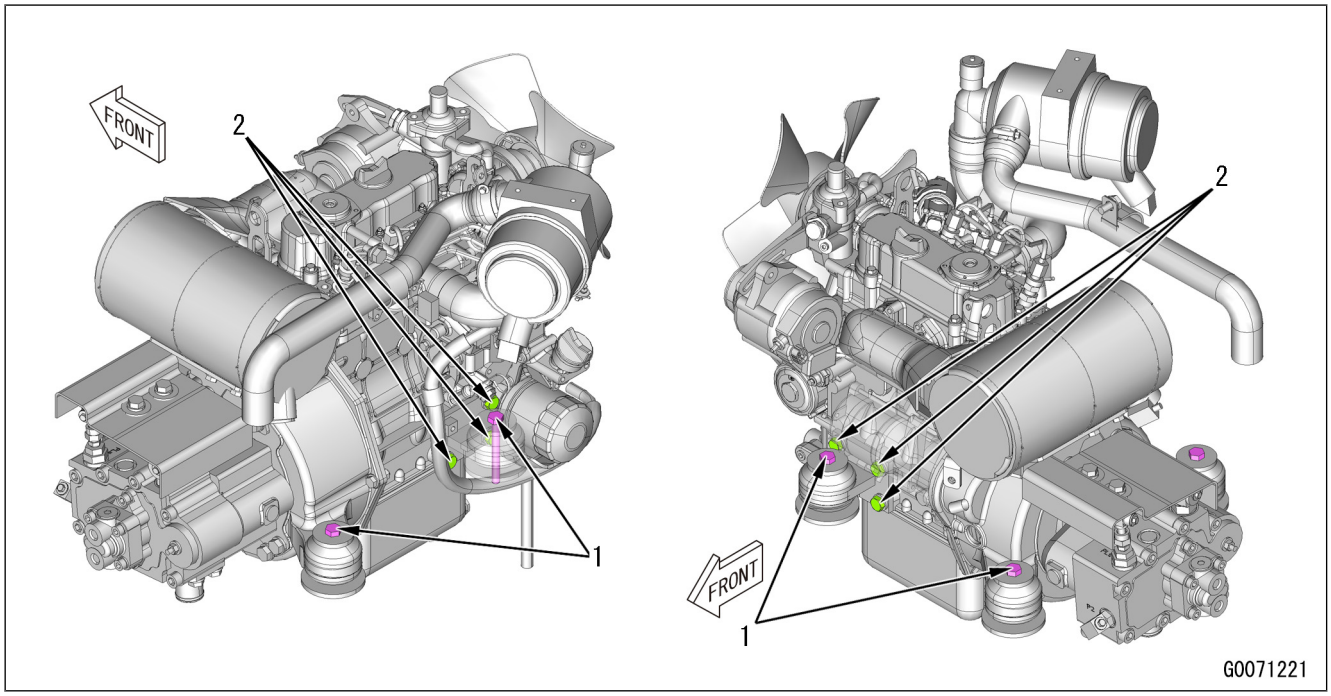
   Nut (4): Width across flats 10 mm





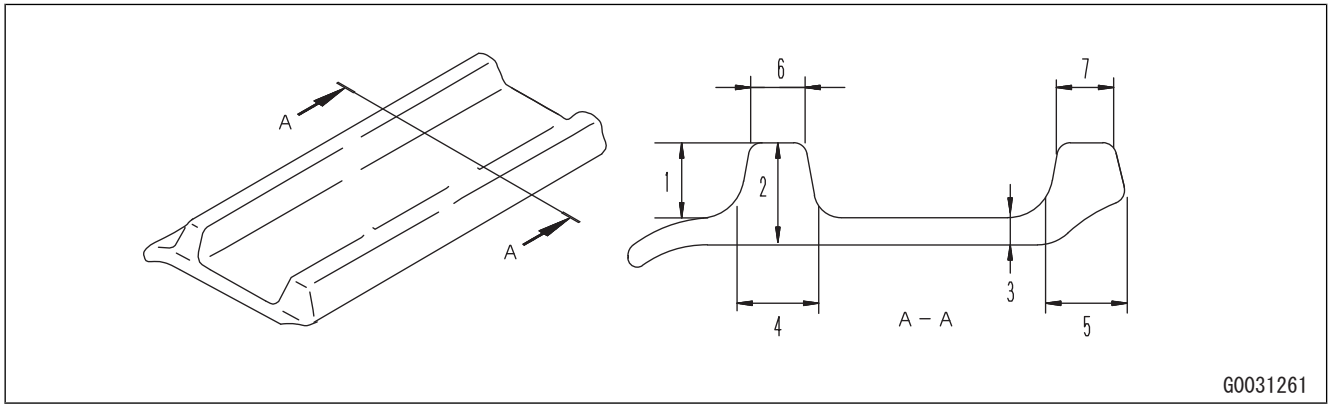
Engine and Cooling System

Maintenance Standard for Engine Mount



No.	Item	Judgment criteria	Remedy
1	Tightening torque of bolt	59 to 74 Nm {6 to 7.5 kgm}	Retighten
2	Tightening torque of bolt	59 to 74 Nm {6 to 7.5 kgm}	

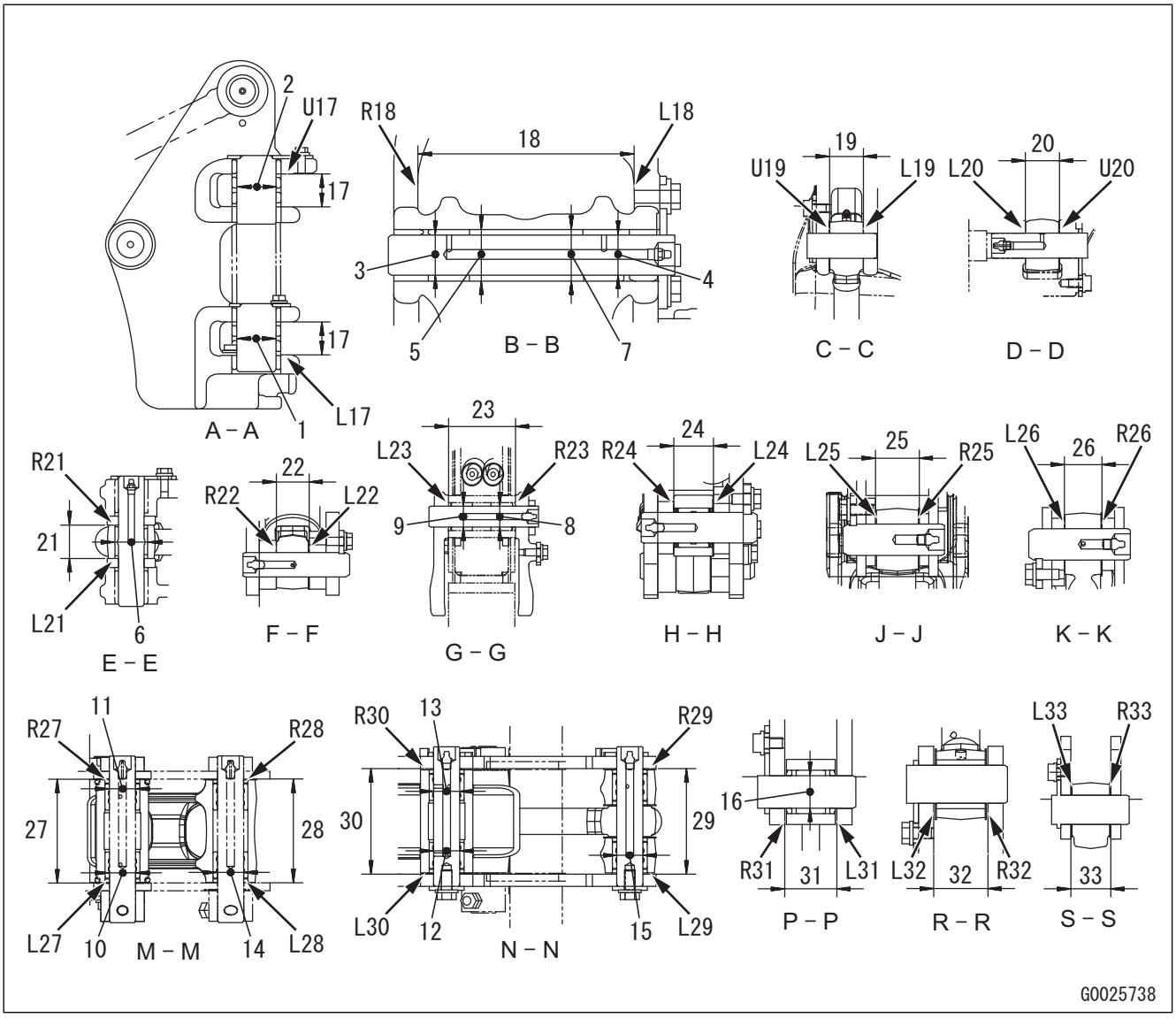
Maintenance Standard for Double Shoe



No.	Item	Judgment criteria		Remedy
1	Overall height of grouser	Standard dimensions	Repair limit	Repair by lug weld or replace
		16.5 mm	10 mm	
2	Overall height of shoe	22 mm	15.5 mm	
3	Thickness of plate	5.5 mm		Repair by build-up welding or replace
4	Length of grouser base	13 mm		
5	Length of grouser base	14 mm		
6	Length of grouser end	9 mm		
7	Length of grouser end	9 mm		

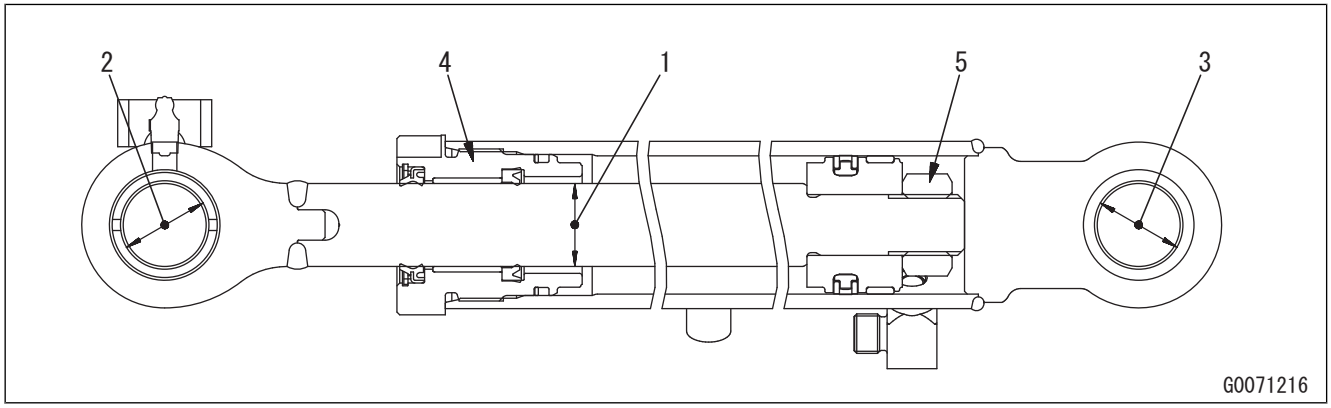
No.	Item	Judgment criteria					Remedy
1	Spool return spring (Attachment, boom swing, boom, blade, bucket, arm, left travel, right travel)	Standard dimensions			Repair limit		Replace the spring if it is damaged or deformed.
		Free height x outside diameter	Installed height	Load at installed height	Free height	Load at installed height	
		29 x 17.5 mm	28.5 mm	22.6 N {2.3 kg}	-	18.0 N {1.84 kg}	
2	Spool return spring (swing)	20.25 x 17.6 mm	19.85 mm	17.7 N {1.81 kg}	-	14.1 N {1.44 kg}	
3	Spool return spring (swing)	13.07 x 16.7 mm	7.45 mm	68.2 N {6.95 kg}	-	54.5 N {5.56 kg}	
4	Suction valve spring	36.3 x 4.45 mm	33.3 mm	2.6 N {0.27 kg}	-	2.16 N {0.22 kg}	
5	Suction valve spring	39.2 x 4.45 mm	33.5 mm	5.1 N {0.52 kg}	-	4.12 N {0.42 kg}	
6	Tightening torque of valve	39.2 to 49 Nm {4 to 5 kgm}					Retighten
7	Tightening torque of bolt	6.9 to 9.8 Nm {0.7 to 1.0 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 dimensions	Tolerance		Standard clearance	Allowable clearance	
				Shaft	Hole			
1	Clearance between mounting pin and bushing of revolving frame and boom swing bracket	Revolving frame side	55 mm	-0.036 mm -0.090 mm	+0.146 mm +0.086 mm	0.122 to 0.236 mm	1.0 mm	Replace the pin and bushing.
2		Swing bracket side	55 mm	-0.036 mm -0.090 mm	+0.046 mm 0 mm	0.036 to 0.136 mm		

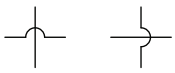
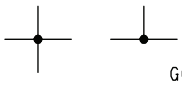
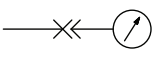
Maintenance Standard for Bucket Cylinder



No.	Item	Judgment criteria					Remedy
		Standard dimensions	Tolerance		Standard clearance	Allowable clearance	
			Shaft	Hole			
1	Clearance between piston rod and bushing	30 mm	-0.020 mm -0.053 mm	+0.133 mm -0.007 mm	0.013 to 0.186 mm	0.486 mm	Replace the bushing.
2	Clearance between piston rod support shaft and bushing	30 mm	-0.090 mm -0.130 mm	+0.117 mm +0.080 mm	0.170 to 0.247 mm	1.0 mm	Replace the pin and bushing.
3	Clearance between cylinder bottom support shaft and bushing	30 mm	-0.110 mm -0.150 mm	+0.117 mm +0.080 mm	0.190 to 0.267 mm	1.0 mm	
4	Tightening torque of cylinder head	539±54.0 Nm {55±5.0 kgm}					Retighten
5	Tightening torque of piston fixing nut	343±34.0 Nm {35±3.5 kgm} (width across flats: 32 mm)					

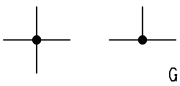
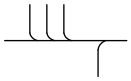
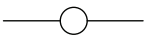
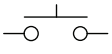
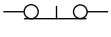
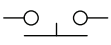
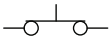
Hydraulic Circuit Diagram

Symbols Used in Hydraulic Circuit Diagram

Symbol	Content
G0009586	Main piping route
G0009587	Pilot and drain pipe route
 G0009588	Flexible piping such as hose
 G0009589	Crossing of route that is not connected
 G0009590	Connected route
G0009591	Flow of fluid
 G0009592	Throttle
 G0009593	Variable
 G0009594	Electric
 G0009595	Spring
 G0009596	Pickup port
 G0009597	Pickup port and pressure gauge

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